

**T.C.
ISTANBUL AYDIN UNIVERSITY
INSTITUTE OF GRADUATE STUDIES**



**CHANGING STRUCTURE OF SUPPLY CHAIN MANAGEMENT IN
TURKEY AFTER COVID-19**

MASTER'S THESIS

OMAR ALTALEB

**Department of Business
Business Administration Program**

JULY 2022

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APPROVAL PAGE

DECLARATION

I hereby declare with the respect that the study “Changing Structure of Supply Chain Management in Turkey After Covid-19”, which I submitted as a Master thesis, is written without any assistance in violation of scientific ethics and traditions in all the processes from the project phase to the conclusion of the thesis and that the works I have benefited are from those shown in the Bibliography.
(22/07/2022)

OMAR ALTALEB

FOREWORD

First and foremost, I would like to express my everlasting appreciation to God for helping me to be who I am today and for assisting me in discovering the patience and strength inside myself to finish this thesis.

I must express my gratefulness to everyone who has been always supportive and encouraging during my years of education and the process of researching and writing this thesis. I'd also like to thank my family for not just supporting me to obtain a master's degree, but also for teaching me to never give up on my objectives. This achievement would not have been achievable without their assistance. I would also like to thank my friends Aws, and Mayar, for their support with this study.

Finally, I would like to express the appreciation and thankfulness to my supervisor Dr. Hatice Şehime ÖZÜTLER, for her supervision advice, and support throughout my study.

(22/07/2022)

OMAR ALTALEB

CHANGING STRUCTURE OF SUPPLY CHAIN MANAGEMENT IN TURKEY AFTER COVID-19

ABSTRACT

The significance of supply chain systems comes from the fact that they are the essential component of smooth operating most businesses, whether commercial, industrial or service. Supply chain management is critical for organizational performance and achieving customer satisfaction, as well as for lowering operational expenses and enhancing the company's financial condition.

This study explores the concept of supply chain management, its elements, and organizational structure to determine what supply chain management's main objective will be in the future to enhance supply chain resilience in the unpredictable post covid era. Therefore, the destructive impact of Covid-19 on every company's supply chain is investigated in this study

Until recently, the unsolved Covid-19 pandemic had wreaked huge havoc. The supply chains have experienced numerous obstacles whether it's frozen meals, agricultural or grocery products, emergency items, or even services. The development of crisis management solutions is critical for industrial organizations with complex supply chains. Because demand is high and supply is limited, some items have grown more desirable resulting in price hikes as the manufacturing sectors struggled with various issues during the lockdown. Labor shortages, the lack of local law enforcement, and transport restrictions all emerged as sources of high transportation costs, scarcity of raw materials, and a vulnerability in the supply chain

The core data for this study was gathered using a structured questionnaire in which 280 employees from the manufacturing, wholesaler, retailer, e-business, cargo, and service sectors participated. After the analysis, it was found that the changing structure of SCM in the post-Covid era is positively correlated with digitalization, diversification, localization, and flexibility.

Keywords: SCM, Supply Chain, Supply Chain Management, Globalization, Covid-19, Agile Organizations

COVID-19 SONRASI TÜRKİYE'DE TEDARİK ZİNCİRİ YÖNETİMİNİN DEĞİŞEN YAPISI

ÖZET

Tedarik zinciri sistemlerinin önemi ticari, endüstriyel veya hizmet olsun, işletme faaliyetlerinin sorunsuz sürdürülmesinde önemli bir bileşen olmasından kaynaklanmaktadır. Tedarik zinciri yönetimi, organizasyonel performans ve müşteri memnuniyetinin sağlanması, ayrıca operasyonel giderlerin düşürülmesi ve şirketin mali durumunun iyileştirilmesi için kritik önemdedir.

Bu çalışma, öngörülemez covid sonrası dönemde tedarik zinciri direncini artırmak için gelecekte tedarik zinciri yönetiminin nasıl şekilleceğini belirlemek için tedarik zinciri yönetimi kavramı, bileşenleri ve organizasyon yapısını araştırıyor. Bu nedenle çalışmada aynı zamanda Covid-19'un şirketlerin tedarik zincirleri üzerindeki yıkıcı etkisi de araştırılmıştır.

Bugüne kadar halen tam anlamı ile çözülememiş olan Covid-19 salgını çok büyük hasarlara yol açtı. Dondurulmuş gıdadan ve tarım yada perakende ürünlerine, acil durum ürünleri ve hatta hizmet sektörü dahil tedarik zincirleri sayısız engelle karşılaştı. Kriz yönetimi çözümlerinin geliştirilmesi, karmaşık tedarik zincirlerine sahip endüstriyel kuruluşlar için ise çok daha kritik. Talebin yüksek ve arzın sınırlı olması nedeniyle, imalat sektörü karantina sırasında çeşitli sorunlarla mücadele ederken bazı ürünler daha cazip hale geldi ve fiyat artışlarına neden oldu. İşgücü kıtlığı, yerel mevzuat uyumsuzlukları yada eksiklikleri ve ulaşım kısıtlamaları ise yüksek nakliye giderleri, hammadde kıtlığı ve tedarik zincirindeki kırılabilirlik kaynakları olarak öne çıktı.

Bu çalışmanın temel verileri, imalat, toptancı, perakende, e-ticaret, kargo ve hizmet sektörlerinden 280 çalışanın katıldığı yapılandırılmış bir anket kullanılarak toplanmıştır. Analizlere göre Covid sonrası dönemde TZY'nin değişen yapısının

dijitalleşme, çeşitlendirme, yerelleşme ve esneklik ile pozitif yönde ilişkili olduğu bulunmuştur.

Anahtar Kelimeler: SCM, Tedarik Zinciri, Tedarik Zinciri Yönetimi, Küreselleşme, Covid-19, Çevik Organizasyonlar

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ABBREVIATIONS

AI	: Artificial intelligence
APICS	: American Production and Inventory Control Society
APS	: Advanced planning and scheduling
ATP	: Available-to-promise
BPR	: Business process reengineering
CD	: Compact disc
CDC	: Centers for Disease Control and Prevention
CDS	: Credit default swap
CEO	: Chief executive officer
CIM	: Computer integrated manufacturing
CMO	: Chief marketing officer
CO2	: Carbon dioxide
CPC	: Cost per click
CRM	: Customer Relationship Management
CSCMP	: Council Supply Chain Management Professionals
EDI	: Electronic data interchange
ELV	: End-of-life vehicles
ERP	: Enterprise Resource Planning
EU	: European Union
FDA	: Food and Drug Administration of the United States
FLP	: Facility location problem
GSC	: Global Supply Chain
GSCM	: Global Supply Chain Management
GVC	: Global value chain
HR	: Human resources
IEA	: International Energy Agency
IT	: Information technology
JIT	: Just in Time
KPI	: Key performance indicators

LTX	: Provider of freight management and transportation supply chain solutions based in USA
MES	: Manufacturing execution systems
MNC	: Multinational corporations
MRO	: Maintenance, Reparation, and Operation
MRP	: Material requirements planning
OMS	: Order management system
OP	: Operations planning
PC	: Personal computer
PE	: Private equity
RAM	: Random-access memory
RFID	: Radio Frequency Identification
ROI	: Return on investment
RSCM	: Reverse Supply chain management
S&OP	: Sales and Operations planning
SAP	: Enterprise resource planning software developed by the company
SAP SE	
SARS	: Severe Acute Respiratory Syndrome
SC	: Supply chain
SCM	: Supply chain management
SCND	: Supply Chain Network Design
SCOM	: Supply chain Operations Manager
SKU	: Stock Keeping Unit
SME	: Small and medium-sized enterprises
SRM	: Supplier relationship management
TCO	: Total cost of ownership
TEPAV	: Turkish Economic Policy Research Foundation
THY	: Turkish airlines
TMS	: Transport management system
ULISA	: Institute of International Relations and Strategic Studies /Turkey
UNWTO	: United Nations World Travel Organization
VC	: Venture capital
VUCA	: Volatility, unsure, complex, and ambiguous
WEEE	: Waste electrical and electronic equipment
WHO	: World Health Organization
WMS	: Warehouse management system's

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I. INTRODUCTION

Supply Chain Management (SCM) is the system in charge of monitoring and controlling every aspect of the product's lifecycle. It plays a crucial role in improving the company's overall performance as it is the most interactive with the internal and external environment which is a necessary condition for the survival, success, or failure of a business. Adaptation of the performers of a supply chain including suppliers, wholesalers, Sub-partners, retailers, customers, etc., through responding to the external variables requires companies to pay attention to the supply chain performance enhancement by providing mechanisms and strategies enabling to manage of the risks.

Supply chain management is the pillar that sustains the dynamic movement of the world economy. For every house, phone, truck, and piece of clothing there exists a long history of workers, components, and shipping that all merge to establish a supply chain. This can be observed in practice by dozens of different SCM components such as the levels of productivity, on-time delivery, technical support, after-sales or pre-sales services, inventory turnover, etc. Therefore, each company or organization needs to adopt a consistent and integrated approach to manage its supply chain to reduce the weakness of its processing chains and deal with the variables in the external and internal environment to prevent the company from losing its competitive position in the market.

The structural impact of the epidemic on the global and local economies, global trade, and worldwide economic integration cannot be understood unless the identification of risks with an assessment of the traditional and potential strategies of SCM, as well as value chains. Therefore, researchers in this field focus on deepening the link between supply risks and their impact on organizational economic performances in the context of the threats they pose to local economies, considering the changes in state policies and the tendency of major countries to adopt more conservative economic policies to raise awareness towards these risks due to the lack of awareness among society.

SCM must assume that the enterprise aspires to long-term success. Because, identification of the factors improving efficiency and effectiveness of individual, local, or global SCs is critical due to their strong ties with profitability which is essential but not enough condition for sustainability.

Finally, the Logistics aspect, which is an aspect of the supply chain that focuses on activities related to the actual tracking of inventory and handling of a product from manufacturing to delivery that works within the supply chain may mix with some concepts. The concept of supply chain management is broader and general, and logistics is only part of it.

After the outbreak of COVID 19, for any corporation attempting to accomplish its economic competitiveness goals, the SCM has become a strategic issue. Although the COVID 19 crisis has sparked a broad debate on the shifts of global supply chains, this issue was not the result of the crisis or any of its implications because led by the one between China and the West, trade wars had started much earlier as the advanced countries systemically started to reverse what they build in previous decades, possible by the threat China carries for their economies on several fronts. The motive behind this scenario was that the global markets have found themselves relying on China and its rapid development in promising areas such as the medical and rare earth elements industries controlled by China and the Chinese raw materials.

As these developments are crucial for Enterprises to adapt to the new normal after the COVID-19 outbreak, this study will search in the literature on Management to find some answers to these questions like which SC operational procedure is the most efficient to manage disruptions at different levels of severity of the epidemic spreading. how long a Supply Chain can sustain a disruption, and how long is the recovering time for the supply chain after an epidemic spreads.

II. CONCEPTS AND FUNDAMENTALS OF SUPPLY CHAIN MANAGEMENT

A. Supply Chain, Supply Chain Management, and Its Elements

A supply chain is a network of associated and interdependent organizations that collaborate to control, manage, and improve the movement of materials and information from suppliers to clients. As a result, a structure of action is a precise ordering of labor activities around a time and place with a beginning and an ending, as well as acknowledged inputs and outputs. (LYSONS & FARRINGTON, 2016:86)

Supply chain management (SCM) is defined as the integration and coordination of material, information, and financial flows across departments and businesses to transform and use SC resources in the most efficient manner across the whole value chain, from raw material suppliers to customers. SCM is one of the most important aspects of any business, and it is in charge of balancing demand and supply on its own. (Ivanov & Dolgui, 2020:9)

The goal of Supply Chain Management (SCM) is to ensure that physical, financial, and informational flows are efficiently exchanged among all supply chain actors (suppliers, subcontractors, wholesalers, retailers, customers, and so on) for Intra/inter-organizational coordination. (Aguzzoul & Pires, 2019:10)

This concept is currently a strategic challenge for any company attempting to accomplish its economic competitiveness goals, distribution, and excellent service, particularly in an economic environment marked by globalization, trading complexity, increased competition, and the need for long-term growth. (Aguzzoul & Pires, 2019:10)

Supply chain management has evolved over a century, starting with enhancements to basic, labor-intensive processes and progressing to modern engineering and complicated worldwide networks.

Nowadays, this idea may be a strategic issue for any company seeking to

achieve its goals in terms of economic competitiveness, delivery, and service quality; especially in an economic environment shaped by the globalization of trade, the complexity of trade flows, growing competition, and, as a result, the need for sustainable development.

The most common characteristics of the supply chain will be presented in the following sections because each industry has its own supply chain network.

1. Demand Forecasting and Managing the Demand

The demand represents what the consumer wants and how much really wants. Hence, demand determines the supply and manufacturing plans, which in consequence instruct the firm's marketing, financial, and logistics strategies. Mistaken demand information is the core cause of business disappointments since it leads to supply insufficiency, which leaves consumers unsatisfied, or excess supply, which invites the waste of valuable resources. Though, due to the variable and ambiguous nature of demand, reliable demand information is difficult to get. (Min, 2015:89-90)

The demand management process involves matching the needs of customers with the supply chain capabilities. (Croxtton et al., 2002:51)

The future demand forecasts are essential for making supply chain strategic choices. Demand predictions are at the heart of every supply chain planning. In the supply chain, all pushing activities are carried out in response to consumer demands, and all pull activities are implemented in response to the market. A director must plan the degree of activity for push activities, whether it is manufacturing, shipping, or any other planned activity. Management should plan the amount of reachable capacity and inventory for pull activities, but not the exact number to be done. The first step management must do in either case is to estimate what consumer demand would be. (Chopra & Meindl, 2007:187)

Different demand forecasting techniques are used to calculate the commodity needs in the future in order to match consumer demand as precisely as feasible. As a result, forecasting makes inventory-holding decisions easier, such as what we need to stock, what is the right quantity to stock, and what infrastructure is needed. The most frequent strategies for predicting using time series are moving averages and exponential smoothing. It is often remarked that all forecasting mistakes turn

into inventory problems, either too much or too little quantity. (Rushton et al., 2014:210-211)

Demand forecasting is an important part of demand management, but its accuracy is dependent on the forecasting methodologies used, the time frames used, and the nature of the demand. More significantly, the prediction will be useless if correct demand information is not provided to manufacturers and their suppliers. (Crum & Palmatier, 2003) The rate at which demand information is shared across supply chain participants can have an impact on how demand is handled. The following steps may be taken via demand management. (Crum & Palmatier, 2003:9-11):

- Demand planning: is predicting, the demand for products to ensure they can be delivered and satisfy customers,
- Transmitting demand: this entails integrating supply chain partners and developing a production strategy that spans the entire supply chain, including communication,
- Demand influencing: includes marketing, promotions, prices, and product positioning methods,
- Demand prioritization entails keeping track of customer orders and categorizing them. (Crum & Palmatier, 2003:9-11).

Despite the inherent inaccuracies in looking to expect the future, forecasts necessarily pressure policy setting and planning. For instance, how can the Federal Reserve Board realistically modify interest rates without some perception of future economic boom and inflationary pressures, how can an operations supervisor realistically set manufacturing schedules without some estimate of future sales, and how can a business enterprise determine to staff for its call centers without some guess of the future call for service, or how can a financial institution make realistic plans without some forecast of future deposits and loan balances? Forecasting is truly vital to move forward in today's ever-changing and quite interactive commercial enterprise environment. (Hanke & Wichern, 2014:2)

Concerning the management of supply chains, demand forecasting is the cornerstone in the construction of a supply chain. The decision on which subsequent

decisions of a chain concerning the processing of all raw materials, storage, production, and distribution, shall be based on that decision (Ali & Saeed, 2018:296).

Therefore, accurate forecasting of the demand is one of the pillars in the process of building an efficient supply chain, with its components reducing the appearance of two problems which are excess storage if the forecast demand is greater than the actual demand, and the inability to meet the demand if the forecast demand is less than the actual demand. (Ali & Saeed, 2018:296).

In general, there is no accurate forecast of as100%, because of non-quantitative factors controlling demand, and because of the possibility that sudden variables will appear controlling future demand. So, we can say the less erroneous forecast than actual demand is what we call an accurate forecast (Ali & Saeed, 2018:296).

It's impossible to predict with 100 percent accuracy. When demand and supply are equal, this is called equilibrium. The major goal of forecasting, on the other hand, is to be able to evaluate correct predictions across time. Furthermore, the focus is on eliminating ambiguity and predicting errors, which will help to refine the data to be used. The majority of supply chain predictions are made using a combination of basic statistical forecasting and judgment. When a judgmental modification is applied to an original statistical forecast, it is a widely utilized strategy. In order to proceed with the statistical projection, the data may be gathered by the analyst from many departments inside the organization, such as the marketing department, and the estimate may be changed to include the extra specifics. Many of the updated projections will be viewed as the final forecast in the supply chain. Such predictions established within operational integration, it is thought, are extremely important in predictive action. (RASHED, 2017:8).

Precise forecasting is critical to the success of any supply chain system. It has been stated that supplying a wider range of data is critical. The supply chain could be able to boost profits and reduce waste or lead time by sharing information and making cooperative predictions. Negative data, on the other hand, could lead to negative changes in the statistic prediction, which could lead to downwards changes in the estimations. (Rashed, 2017:9).

There were functional walls and specific impediments that could never be integrated from various positions inside the business in a case study for a factory that produces electronics. Olivia and Watson (2011) looked at the design of the supply chain and the activation process as factors that could influence forecasting success. However, there is inadequate proof that enhanced data integration or statistical characteristics of forecasting efforts will improve prediction accuracy. A large number of elements must be considered in order to have a good picture of the benefits of collecting new data via statistical analysis. There are a number of potentially deceptive interactions between the utilization of various information sources and predictive performance indicators that are based on organizational procedures. (RASHED, 2017:9).

2. Order Management

As markets become more competitive, managing purchaser orders becomes more important. Order management is responsible for managing and controlling customer orders throughout the order life cycle, for instance from the time a customer inquires to the time an order is shipped. (Stadtler et al., 2015:288)

The initial order promise is created as part of the order management job. Order management, in conjunction with sales, provides particular allocation techniques for assigning the available production supply to customer categories. Orders must be modified if the supply, capability, or demand situation changes, in order to obtain a new realistic promise. (Stadtler et al., 2015:288)

Order management is addressed by practically every framework and mechanism in the supply chain. Many businesses no longer have control over their internal orders. Several parties, such as producers of parts and materials assembly, packaging services, and distribution regions, may lose visibility and delivery capability as a result of this. This necessitates costly manual methods for accurately completing and fulfilling the request. Through the automation of manual processes and the reduction of errors, an order management system (OMS) can help decrease expenses and generate money. (IBM, 2021)

Order management has a significant impact on how a customer perceives a company or brand from the outside. In an omnichannel world, customers expect a seamless experience. A customer can place an order online, but if they have any

questions, they must contact a call center to complete the transaction. When the order is being fulfilled, the customer expects to get notifications such as emails along the process. If there is a problem, customers may wish to return it through a tangible channel such as a store. (IBM, 2021)

3. Inventory Management

The goal of inventory management is to create a system that allows you to make informed decisions about the appropriate inventory levels and how to adjust them. The decision criteria must address the two essential concerns of “When should an order be placed to refill the inventory?” in order to maintain the optimal inventory level. To find the answer to two fundamental questions “When will an order to replenish the inventory be placed?” and “What is the required order quantity?”.

The decision guidelines guide the inventory supervisor or computerized materials control system in comparing the present-day situation of the inventory and figuring out if some actions, including replenishment, are required. Various kinds of inventory management structures contain different policies to decide “when” and “how much.” Some judgments are based on time, while others are based on inventory levels; yet the important decisions are the same. Even when “when” complexities are included, like uncertainties in demand and delivery durations, figuring out “how many” and “when to order” nonetheless remains the basis of sound inventory management (Meredith & Shafer, 2016:185).

4. Customer Relationship Management

CRM processes are essential to the supply chain since they contain a significant amount of interaction between an organization and its clients. The client should be the beginning point when attempting to grow the supply chain excess because they are the source of all demand and, as a result, money in the long term. (Chopra & Meindl, 2007:489)

Consequently, when it comes to enhancing supply chain performance, the CRM macro method is commonly the beginning point. It's also important to remember that CRM procedures, as well as programming applications, must be integrated with internal operations in order to get optimal results. Client-targeted devices are widely used by businesses to operate independently of their core

functions. The importance of CRM to a strong supply chain is underscored by the necessity for interaction between CRM and internal operations, which may explain why CRM software has been the fastest growing software program. (Chopra & Meindl, 2007:489)

CRM software suppliers have concentrated on enhancing CRM techniques; however, there is more effort to be done to improve integration between CRM and internal operational procedures. (Chopra & Meindl, 2007:489)

Future achievement will be partly pushed by a combined CRM system with internal business processes. Siebel Systems (The most famous CRM systems providers), which rose to popularity in the 1990s and early 2000s, Salesforce.com, and ERP companies like SAP and Oracle, which give an efficient cooperation story and powerful ecosystems, are the most well-known CRM software suppliers. (Chopra & Meindl, 2007:489)

5. Transportation and Transportation Management System

Transportation transports manufactured items to far-flung markets, adding value to customers when the goods arrive on schedule, undamaged, and in the quantities required. Transportation delivers customer service in this way, which is one of the foundations of customer satisfaction: a vital component of the marketing concept. Because the transport generates place efficacy and leads to time usefulness, all of which are essential for an effective marketing campaign, transportation availability, suitability, and cost influence company decisions. One of the most significant logistical costs is transportation, which can account for a large portion of the selling price of particular goods. (Lambert et al., 1998:217)

In general, as the percentage of item costs spent on incoming and outbound transportation increases, effective transportation management becomes increasingly important to a company. Even with high-value commodities, transportation costs are crucial, even if they represent a small percentage of the sales price because the entire cost of transportation in basic terms is high. (Lambert et al., 1998:217)

Transportation management allows the well-known seven rights to be achieved: the right item in the correct quantities, at the right place, at the proper moment, for the correct customer at the right price. Because of the large distances that can separate a company from its clients, transportation is a vital aspect of any

global logistics work. Other logistics processes must be accommodated by the transportation system. In the past, national governments exerted strong economic control over transportation corporations, either through outright ownership or by legislation aimed at regulating the way they were run. As governments privatize state-owned corporations and liberalize privately owned corporations, this governmental development in the transportation market is steadily diminishing. The competitive nature of today's commodities movement implies that logistics managers have more possibilities to acquire superior service or cheaper rates from transportation companies. Road, train, water, pipelines, and air are the five modes of transportation. (Kumar & Shirisha, 2014:14)

Transportation management deals with transportation type, navy size, route choice, and truck scheduling and shipping consolidation. All four parts are economically interrelated and should be arranged in an integrated manner to achieve the highest benefit. (Kumar & Shirisha, 2014:16)

With increasing transportation costs due to the unpredictability of fuel prices combined with rising labor expenses, there is a growing need to modernize transportation operations, identify any potential cost savings, and improve supply chain visibility through better transportation planning. For such a necessity, a transport management system (TMS) is ideal for the operation.

A TMS offers numerous structure benefits if correctly applied. Those benefits contain (Min, 2015:253):

- Cost savings,
- Increased client loyalty through better route planning/scheduling, delivery assurance, and claims processing,
- Enhanced visibility of the supply chain thanks to real-time cargo monitoring and meticulous shipment notification,
- Weakened body duties because of automating.

6. Information Technology (IT)

Information technology (IT) allows companies to communicate with one another at any time and from any location, allowing the companies to form powerful business relationships that can boost data-sharing and increase supply chain

visibility. (Ivanov et al., 2019:12)

IT for SCM was first developed in the early 1980s. In the 1970s, initial functions comparable to accounting jobs have been automated for the first time. The 1980s saw the development of material requirements planning (MRP), manufacturing execution systems (MES), and sales and operations planning (S&OP). Extra functions such as product styling and quality management are always included under the CIM umbrella (computer-integrated manufacturing). These systems were dubbed "island solutions" since they didn't integrate with each other and provided significant benefits and convenience for managers. In the 1990s, integrated enterprise planning systems (ERP) were developed since these systems shared a lot of data. SCM prompted the creation of APS (advanced planning and scheduling) systems and other IT for SC collaboration in the twenty-first century. SCOM's IT development trends include mobile technologies, the internet of things, smart manufacturing, and industry 4.0, as well as radio frequency identification, e-business, and cloud computing. (Ivanov et al., 2019: 53)

It provides a brand-new level of coordination capabilities within the services provided to SCs and has additionally changed important progress in responsiveness and suppleness in the field of advanced support services. Contemporary data technology has the potential to enable nearly any idea of integration and coordination. Effective organization coordination, collaborative culture, as well as trust are the most critical challenges. To begin, the issues that surround IT infrastructure investment must be recognized. This is primarily about how much the company must spend on IT. It is available for purchase, but it can also be rented or utilized via cloud computing. It might also be possible to get it through outsourcing. Whatever alternative is chosen, a total cost of ownership (TCO) model for analyzing direct and indirect costs should be used. It's worth noting that hardware and software package expenses account for only roughly 20% of overall ownership costs. Installation of processes, systems, models, training, support, maintenance, infrastructure, downtime, energy, and energy area are all examples of different costs. (Ivanov et al., 2019:54-55)

Additional networking, centralization, and service standardization can all help to lower TCO. Planning, identifying risks, calculating needed resources, scheduling work, separating tasks, observing project implementation, reporting progress, and

analyzing results are all activities in an IT project. Scope, time, money, quality, and risk are the five primary aspects to consider while developing an IT project. Despite improved project management, empirical data shows that 30-40% of IT projects miss their deadlines, and budgets, and fail to meet their objectives. For instance, may fail to accommodate basic business requirements or supply regulatory benefits, may have an advanced and unstructured user interface, or knowledge may be inaccurate or inconsistent. (Ivanov et al., 2019:55)

7. The Return System

Supply chains and reverse supply chain activities have received more attention in recent years because of factors such as changing financial and competitive difficulties, increasingly challenging clients, and complicated regulations. many businesses are understanding that reverse supply chain and sustainable supply chain management is a crucial method for boosting quality and profitability, as product life cycles shorten. (Jain, 2012:1239)

Reverse logistics, also known as reverse supply chain management, is outlined as improving the efficiency and administration effectiveness of a sequence of processes required to retrieve a product from a purchaser in order to either dispose of it or recover its worth, due to the growing importance of RSCM, primarily on supply contracts for extra products and increased manufacturer commitments. Because extra product agreements are correlated to returned products, which can be substantial in some businesses, with returns of up to 50% of sales, extended producer obligations address the needs for enterprises to efficiently manage the product's whole life cycle. (Erol et al., 2010: 43)

Because of the actual challenges in their implementation, directives on waste electrical and electronic equipment (WEEE) and end-of-life vehicles (ELV) are two well-known instances. Traditional network design of supply chain, product design, manufacturing planning, and stock management challenges become more complicated when using the RSCM technique. (Erol et al., 2010:44)

Though complex models and methods are developed, and these kinds of issues are extensively studied particularly by European researchers, identical problems do not seem to be thought about in an exceedingly elaborate fashion in growing countries like Turkey.

As a result, RSCM activities are either unknown or unexplored in core businesses. A number of research have investigated RSCM in Turkey from a conceptual standpoint. However, there is currently a scarcity of empirical studies on RSCM procedures in many industries. Given the legal requirements emerging from Turkey's EU membership, it is stated that producers, distributors, and third-party service providers ought to be highly concerned with RSCM and its effective execution. (Erol et al., 2010: 44).

B. A Historical Review for The Supply Chain Management

Regardless of the fact that the quotation "supply chain management" is newer to the government sector, supply chain management seems to have a lengthy history dating back to Fredrick Taylor in 1911. Fredrick Taylor, the creator of industrial management, intended to enhance the mechanical loading process in his 1911 book *The Principles of Scientific Management*. (Redwood Logistics, 2021)

SC management has a century-long historical background which appeared with modifications to basic, labour-intensive practices and has progressed to contemporary engineering and complex global networks. The commencement of operations of the supply chain sector is also investigated, as industrial management began with logistics. (Flash Global, 2021).

As a result, supply chain engineering evolved from the principles of industrial engineering and operations research. According to operations research, these notions have evolved considerably during the previous six decades. During World War II military operations in the 1940s, its analytic value had become a logistical approach. (Redwood Logistics, 2021)

Pallets and lift mechanization were the focus of logistics in the 1940s and 1950s, making pallet transportation simple and efficient. During this time, the unit load idea was established and used in warehouses, but the transportation sector rapidly noticed and embraced the concept as well. Intermodal containers were first used across the ocean, train, and truck transportation industries, laying the groundwork for supply chain globalization. Because the necessity for physical distribution grew more important and trucks became a faster means of transportation than the railway, the National Council of Physical Distribution Management began

undertaking research and training in supply chain management in the 1960s. (Redwood Logistics, 2021)

Furthermore, Jay Forrester (1958) is widely regarded as a pioneer of modern-day supply chain management during this period. His important study on demand amplification was examined using systems dynamics modeling, a well-known phenomenon that several practical administrators have witnessed. This covered things like demand waveforms propagating upstream in the supply chain, order patterns causing "rogue seasonality," and decision-makers being caught off guard as a result. (Geary et al., 2006:2).

As a trend in the 1960s, time-sensitive freight transit was directed toward trucks rather than trains. Warehousing, material handling, and freight transportation all formed part of physical distribution. The National Council of Physical Distribution Management Organization took over as the sector head in 1963, and a lot of research and training took place with a lot of industries. As a result, the arrival of computers in the 1960s and 1970s ushered in a paradigm change away from academic acceptance. Manual records and transactions were the norms until 1960, when data computerization opened up new possibilities and breakthroughs in logistics planning, such as randomized warehouse storage, truck routing, and inventory optimization. Operations research technologies, in particular, were the only ones accessible. To go from theory to practice, researchers just had to test theoretical models. (Flash Global, 2021).

The Georgia Tech Production and Distribution Research Center, a computational optimization center, a distribution research facility and a material handling center were all focused on what could be done with computing technologies in supply chain management within a few years, and their efforts resulted in a major shift in supply chain management in the 1980s. (Redwood logistics, 2021)

Because of new technology that allowed several databases to be combined when Firm Resource Planning Systems (ERP) were introduced in the 1990s, logistics increased even quicker. By the year 2000, nearly all significant businesses and enterprises had implemented ERP systems. Furthermore, the accessibility and accuracy of the information have been substantially enhanced. The program also revealed just how much additional software was needed to improve logistics and planning integration. Shortly after, the Advanced Planning and Scheduling (APS)

program was developed. (Flash Global, 2021).

1. Globalization and Supply Chain Management

The phrase became widely adopted in the 1990s due to the globalization of the supply chain. With China's expanding manufacturing and importing, the word grew even more popular. Imports from China increased from \$45 billion to nearly \$300 billion annually between 1995 and 2006. The need for logistics and supply chain management developed as networks got more complex and diverse, with global supply and demand more important than ever. (Bowersox et al., 2002:4)

In the early 1990s, it took an organization anywhere from fifteen to thirty days to process and deliver products to a client from warehouse inventories, and sometimes much longer. The standard order-to-delivery process included order creation and transfer via telephone, fax, electronic data interchange (EDI), or public mail; order processing, which included the use of manual or laptop systems, credit authorization, and order assignment to a warehouse for selection; and cargo delivery to a customer. When everything went according to plan, a customer's request for items took a long time to arrive. When something went wrong, such as inventory being out of stock, a lost or misplaced work order, or a misdirected shipment, The length of time it took to serve customers grew rapidly. It became common to apply stockpile inventory to support this long and unpredictable period. (Bowersox et al., 2002:4)

The supply chain has been observing strategic issues since 2005, while logistics has referred to the operational and tactical components. The name change of the Council of Logistics Management to the Council of Supply Chain Management Professionals in 2005 reflected this merging of strategy and operations. Supply chain management, according to the council determination , is the systematic, strategic coordination of standard business functions and tactics across these business functions within a specific company and across businesses within the supply chain in order to improve individual companies' long-term performance and, as a result, the entire supply chain. (Redwood logistics, 2021)

2. The future of Supply Chain Management

Computer technology has considerably surpassed supply and logistics

utilization since the 1980s. The use of the internet has exploded, altering our ideas of communication. Despite the emergence of private computers, supply chain and logistics planning remain concentrated on distributed models. A new generation of supply chain and logistics planning technology-supported centralized planning with dispersed cooperation is on the horizon, thanks to academic research. The importance of research in traditional supply chain and logistics domains such as warehousing and distribution, transportation, and manufacturing logistics is immense. Traditional supply chains and logistics will reap significant benefits in a variety of non-traditional areas, such as health care and humanitarian logistics, and the global insights gained through a systematic supply chain. As a result, global market insights generated through the rigorous supply chain and logistics performance studies are tremendously significant. (Flash Global, 2021).

Companies like LTX Solutions, which offers customized transportation management software and services based on specific business needs, regardless of how unique those needs are, are the future of supply chain management. Companies like LTX Solutions, which are at the forefront of supply chain management, use the most up-to-date data consolidation technology to increase supply chain efficiency and profits. (Redwood logistics, 2021)

C. Supply Chain Planning Activities

One of the most crucial stages is this one. It is critical to complete and implement the strategy before beginning the entire supply chain. It is critical to examine the demand for the product or service, as well as the viability, cost, profit, and manpower, among other things. It will be very hard for the company to deliver effective and long-term benefits without a proper plan or strategy in place. Planning aids in the identification of market supply and demand trends, which in turn aids in the creation of a system for effective supply chain management. (I Qualify Uk, 2021)

Consider a world where manufacturing, transportation, storage, and even information are all endless and free. Imagine having no lead periods and being able to make and distribute items right now. There would be no need to plan ahead of time to meet demand in this scenario because every time a buyer asks for a product, the demand is promptly satisfied.

Aggregate planning is irrelevant in our reality. However, in the actual world, capacity is a factor, and lead times are frequently significant. Long before demand is known, make decisions about capacity, manufacturing, outsourcing, and promotions. A business must foresee demand and plan ahead of time how to meet it.(Chopra & Meindl, 2007:2019)

Shall we build a huge factory to ensure that we can meet demand even during the heaviest months? Should a corporation establish a smaller facility yet pay the expense of inventory maintenance during slow months in anticipation of more demand in the future? These are the kinds of questions that aggregated planning may help organizations solve.

A company's overall strategic planning process is used to determine ideal capacity, production, outsourcing, warehouse, inventory, and even price levels within a given time horizon. Overall planning aims to meet demand and maximize profit. It solves problems with aggregated decisions rather than decisions at the storage unit (SKU) level, as the name implies. Aggregated planning, for example, establishes the total level of output at a plant for a given month but not the amount of each SKU that will be produced. Overall planning is a great technique for thinking about decisions within a 3 to 18-month interval because of this level of depth. However, it is too early to identify production levels by SKU currently, and it is also often too late to add capacity. As a result, overall planning deals with the question: how should a company use the current facilities to its greatest advantage? (Chopra & Meindl, 2007:218-219).

Planning helps decision-making by finding options for future actions and picking some excellent ones or even the greatest ones. The planning process can be divided into several stages. Because plans aren't made to last forever. A plan's validity is limited to a predetermined planning horizon. When the planning horizon is reached, at the very least, a new plan must be created that represents the current state of the supply chain. Planning tasks are commonly grouped into three different planning levels based on the length of the planning horizon and the relevance of the decisions to be made. (Stadtler et al., 2015:72).

Models for short-term planning require the most precision and detail. The planning horizon can be as short as a few days or three months. The upper levels' judgments on the structure and quantitative scope constrain short-term planning.

Nonetheless, it is a crucial factor in the supply chain's overall success, including lead times, delays, customer service, and other strategic challenges. (Stadtler et al., 2015:72).

Mid-term planning defines an overview of routine operations, particularly rough amounts and timings for flows and resources within a specific supply chain, within the framework of strategic choices. The planning horizon varies from 6 to 24 months, allowing for seasonal changes in demand, for example. The basic level of planning, short-term planning, must describe all actions as precise instructions for rapid execution and control. (Stadtler et al., 2015:72).

Operational planning refers to the first two layers of planning. As a result, long-term planning decisions at this level are referred to as strategic decisions, and they will provide the groundwork for the future development of an enterprise supply chain. They usually involve the architecture and structure of a supply chain and have long-term consequences that are evident over time. (Stadtler et al., 2015: 72).

A naive approach to planning is to look at the options, assess them against the stated criteria, and choose the most effective option. Unfortunately, in most situations, this basic method faces three main obstacles. (Stadtler et al., 2015: 72).

Moreover, strategic planning takes place to support an administration's strategy; before delving into logistics strategy, it's vital to grasp the fundamental concept of organizational strategy in general.

Transportation and storage planning, as well as storage and capacity, locations, and circumstances such as structural design, security, and accessibility, are all part of logistics planning. It also entails figuring out how to get Products to their primary distribution sites in a safe and timely manner. (SCM guide for Partners).

When approving the line, the procurement unit and supply chain have to plan in detail for activities, materials, conditions, and transactions to complete the line. This includes detailed selection and evaluation of stores and facilities, in addition to identifying the initial service insurers and vendors. (SCM guide for Partners).

D. Sales and Operations Planning (S&OP)

S&OP (sales and operations planning) is, to a substantial percentage, an

additional of the planning processes. described in the previous part of this chapter.

Master and Demand Planning are combined in Sales and Operations Planning (S&OP). By tradition, these duties are completed in the order listed. The forecast amounts are specified initially, and they are used as input in master planning. (Stadtler et al., 2015:173).

S&OP is a technique that has been recommended for over thirty years but has received limited traction. As many industrial organizations strive to improve their customer service, S&OP is becoming an important initiative. S&OP entails a collaboration between marketing and production to construct precisely what the consumer desires at the time they desire it. (Crandall et al., 2015:242).

As previously stated, there are two key areas in which this procedure may be improved. First, when sales and production choices are made concurrently, it may be feasible to find a less expensive option. Second, and most crucially, simply sequential sales and operations planning is frequently inefficient from an organizational standpoint. Because the supply side – manufacturing, logistics, procurement – and the demand side – sales, and marketing – have opposing aims, it is critical to have a shared understanding of demand and supply choices, as well as accountability for the outcomes. Everyone engaged must understand the impact of the S&OP master plan on sales, manufacturing volumes, and inventories as a requirement for this unified viewpoint. Simulation and collaborative capabilities in APS and associated software, as well as a consensus-based decision process, can help with this. (Stadtler et al., 2015:242). To make this transformation, companies must embrace a planning-oriented corporate culture, which generally takes years to implement. (Crandall et al., 2015:413).

S&OP is a commercial business approach that helps firms to keep demand and supply in balance, according to the Association for Operations Management, formerly known as the American Production and Inventory Control Society (APICS). It achieves it by using systems that specialize in large volumes—product families and groups—so that mix issues—individual products and client orders—can be handled more easily. It occurs on a monthly basis and displays data in each unit and currency. General management, sales, operations, finance, and product development are all involved in S&OP. It occurs at several levels inside the firm, up to and including the executive in charge of the business unit, such as the department

president, business unit general manager, or CEO of a smaller corporation. S&OP connects the company's strategic strategies and business plan to its specific process—the order entry, master scheduling, and buying tools it employs on a week-to-week, day-to-day, and hour-to-hour basis to manage the firm. When used effectively, S&OP helps corporate executives to see the business as a whole and gives them a glimpse into the future. (Michael, 2017:207-208).

The technique through which a firm takes actions each month to best fulfill its annual sales objectives is by continuously adjusting sales and operational strategies as predictions change. The S&OP process may be broken down into five phases, as indicated in the figure below.

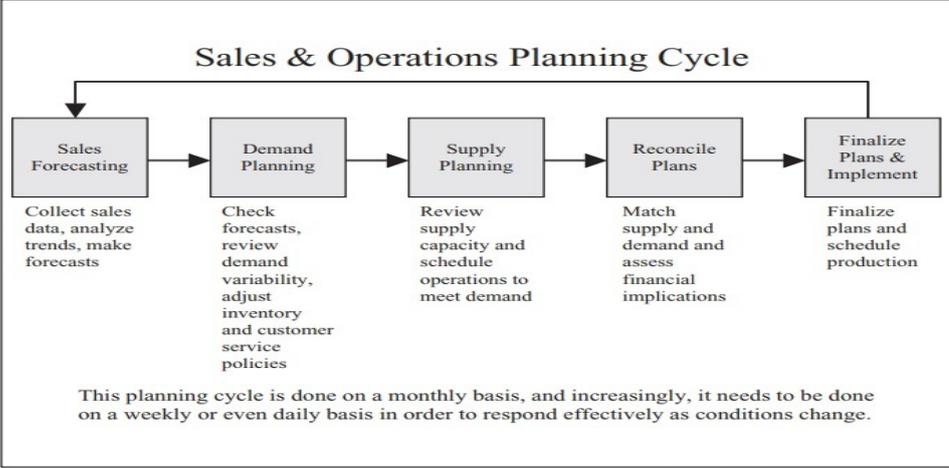


Figure 1 Sales and operation planning cycle

Source (Michael, 2017:209)

Rather than attempting to do one plan annually and then spending the rest of the year implementing that one plan, S&OP takes the approach of continually reevaluating demand and supply circumstances and continuously modifying plans in light of changing conditions. It's a method of adapting to change continuously. Fixed yearly plans performed better in the past century's slower and more predictable industrial economy. (Michael, 2017:208).

Because the collection of large amounts of unneeded data or inaccurate information can slow down the planning process and prevent admins from making effective decisions on time. Good S&OP practice defines the minimum quantity of data required to make certain decisions and focuses on obtaining that information quickly and ensuring its accuracy. (Michael, 2017:210).

E. Supply Chain Execution

At the forecasting stage, supply chain implementation is unclear. This necessitates supply chain protection in the event of outages and disturbances. As a result, supply chains must be stable, forceful, and robust enough to (1) maintain their basic qualities and ensure execution; and (2) change their performance in the event of disruptions to achieve intended execution utilizing recovery processes. (Ivanov et al., 2019:467)

Firstly, to begin with, risk mitigation, inventory varies from traditional safety stock in that it is thought to be decoupled from disruptive riskiness. In this regard, useful methodologies and patterns for supply chain design and planning in the face of uncertainty have been developed. (Ivanov et al., 2019:467)

Secondly, new supply chain tactics like stretchable, nimble, and sensitive supply chains can be utilized to make supply chains more flexible in a broader sense. (Ivanov et al., 2019:467)

The third strategy relates to improved supply chain coordination and includes concepts such as combined planning, forecasting, and replenishment. Fourth, you can use a set of delayed outcomes like rolling/adaptive planning, or product postponement. Supply chain redundancy encompasses all of these strategies. (Ivanov et al., 2019:467)

The preceding mentioned redundancies are commonly used to address two issues. First and foremost, they are designed to protect the supply chain from disruptions caused by certain reserves. This issue has to do with the supply chain's sturdiness. Second, redundancies are intended to increase the fork diversity of supply chain paths, allowing them to respond rapidly and flexibly to changes in the real-world execution environment. This problem is linked to the supply chain's flexibility. (Ivanov et al., 2019:467)

For SC execution, the points to be considered are (Stadtler et al., 2015:322):

- ***The Processes:*** There are three types of supply chain processes SC planning, SC execution, and SC controlling. The SCP matrix, which includes integrative and collaborative activities, is referred to as supply chain planning. Because supply chain planning directly involves operative processes such as

production, and order management, SC execution must also be taken into account too. For example, generating start and completion lists, or calculating ATP amounts and due dates. Finally, SC controlling must monitor and evaluate SCM-related KPIs to maintain a continuous enhancement process. (Stadtler et al., 2015:322).

- ***The Organization:*** Understanding SCM methods almost certainly necessitates certain structural adjustments, such as a shift in responsibilities, the implementation of supply chain planning units, or possibly the establishment of a new SCM department. (Stadtler et al., 2015:322).

- ***The Systems:*** The system environment, as like well as the introduction of interfaces then enhancements, especially aid the planning and controlling processes whilst pattern manner requirements, which may include a deviation from maintained software standards, with the associated development and maintenance costs. For two reasons, mapping the upgraded solution to the desired program usually results in a concept adaption. The first is that every business has its specializations when it comes to processes, and no APS will be able to cover all of them, resulting in functional gaps. The second is to reduce time and money on a project, industry-specific and pre-configured outlines are frequently used. (Stadtler et al., 2015:322).

Subsequently, most companies must accept agreements and trade-offs, such as a redefinition of the venture opportunity or changing internal processes. The major APS functions that are required to improve the solution are verified in order to discover operational shortcomings. For instance, by developing a tiny pilot with a restricted collection of data. To have a consistent basis for cost and risk assessment, it is important to identify the major gaps early in the project. (Stadtler et al., 2015:323).

Recent technological advancements have always acted as a catalyst for change. Higher computing control, additional data storage, and process capabilities, among other things, are currently providing new technology- and data-enabled business models, similar to online retailers or mobile app service providers. Emerging technologies such as the internet of things (IoT) or big data analytics are also changing the way SC execution is done and have the potential to make a difference. (Hellingrath & Lechtenberg, 2019:283).

Distribution center computerization is one of the greatly examined areas for the utilization of AI recognition approaches. Not as it was inquired about even though especially industry is inquisitive about utilizing upgrades in AI with mechanical autonomy to mechanize classic distribution center operations such as canister picking. Amazon indeed has organized a “bin picking challenge” to encourage teams from various colleges and other organizations to compete with their selecting robot solutions. (Hellingrath & Lechtenberg, 2019:291).

Picking robots appears to be a very intriguing project, and many researchers are working on various parts of these robots. One of the most important is allowing the robot to recognize the objects it is supposed to choose. Typically, this is accomplished by using a machine learning algorithm that has been trained on and learned from standard photos. A bin-picking robot's typical setup is stationary and includes a robot arm with a gripper that recognizes items using a 3D sensor and prepares its motions. consequently, To outspread this setting and make the robot more versatile in terms of its operation area, offer a comprehensive system that includes a mobile robot that is capable of active object detection and grasp planning. (Hellingrath & Lechtenberg, 2019:291)

Before beginning the process, the robot must first learn target models, which are diagrams that demonstrate combinations of basic shapes and outlines, such as cylinders. After being trained, the robot may distinguish items by detecting elements of the schematic to be searched in the captured scene, such as finding a specific screw in a transport box full of screws or even other goods. Even in the presence of noise, occlusions, inaccurate measurements, and missing data, the technique demonstrated robust behavior. (Hellingrath & Lechtenberg, 2019:291).

A warehouse management system's (WMS) success is normally defined by the accuracy and timeliness of data it gets from other supply chain execution systems or supply chain resolution software. Examples of such systems include enterprise resource planning (ERP), electronic data interchange (EDI), a transportation management system (TMS), barcoding, radio frequency identification (RFID), and a voice-directed system. As a reason, WMS is frequently used in conjunction with ERP, EDI, and TMS. (Min, 2015:204).

As an illustration, inaccurate data from ERP could cause a meaningless order to be released to the warehouse, resulting in labor hours being lost by the WMS.

Unless the order is hauled out and released by the warehouse, delivery activities and outbound transportation carriers cannot be scheduled. (Min, 2015:204).

In contrast to the conventional procedure measure, the visibility provided by a solo WMS is insufficient for how long it takes a warehouse operator to pick a set of orders or how long it takes to drive a forklift truck along an aisle.

Consequently, incorporating RFID into a warehouse management system can generate interaction for warehouse operational labor by pinpointing inventory locations and directing order pickers to those places. For example, data synchronization through a supply chain execution system such as RFID can result in a 3–5% reduction in out-of-stocks, a 0.2–0.7% reduction in logistics budgets, and a 0.5 percent reduction in inventory. However, in transition, barcoding remains the most cost-effective method of categorizing products or containers and complying with customer requests. (Min, 2015:204).

Combining new communication technology, such as a voice-directed system, can further enhance the WMS advantages. The WMS, which is aided by a voice-directed technology, lets warehouse employees to work in hands- and eye-free surroundings while performing request-picking activities, reducing picking errors and work exhaustion. (Min, 2015:204).

For instance, a top U.K. supermarket store named Somerfield was able to reduce its warehousing staff by 60%–70% while also reducing pickup inaccuracies and late picks by 50% using a mix of a voice-directed system and WMS. According to a survey handled by the Accenture consultants, combining a voice direct system with a warehouse management system improved picking accuracy by 40% on average and boosted warehouse efficiency by 12 to 20%. To take advantage of this benefit, all (100%) of the surveyed WMS customers included a voice-directed system in their WMS. Additional labor-intensive sectors, such as e-commerce and nutrition industries, may advantage from this innovation due to its adequacy in expanding work efficiency. (Min, 2015:204-205).

SCM difficulty or tasking is also possible in order to provide a good overview of SCM planning tasks in the supply chain planning matrix and demonstrate them with two dimensions: long, medium, short, long- and supply chain process, that is, procurement, production, distribution, and sales. The SCM tactics are also classified

accordingly. The matrix, nevertheless, is focused on planning tasks and therefore had to be extended to include tasks from the execution of the supply chain and supply chain units, E.g., assessment of performance. Also, for each class, their design varies from the specific situation. Their setup is universal. However, they provide a good summary of the many duties that are part of the management of the supply chain. (Hellingrath & Lechtenberg, 2019:288).

Here, we can mention two tasks as essential. Firstly, there is supply chain monitoring, such as for cold chain shipments. Secondly, automated warehousing includes activities such as the creation of an automated ordering management system. (Hellingrath & Lechtenberg, 2019:289).

This area comprises applications that assist people in their daily operations from the standpoint of operation support. For instance, a neural network uses geographical addresses in production or transportation. This aids in the delivery of mail and shipments, which is especially important given the increasing amount requested because of e-commerce, etc. The extraordinary challenge of addresses is that they exist in many formats and that it must therefore be possible to discern between key components such as the street name.(Hellingrath & Lechtenberg, 2019:292)

A neural network can extract certain fields in a raw text format from an address and give the same representation. A system outfitted with a neural network to process human speech may be presented with aid in the production and can detect what the operator is currently doing, e.g., which parts are being handled at the time. This information allows the system to answer queries and deliver information that is suitable and relevant for the situation and problem. Automatic recognition of counterfeit electronic components is another application to enhance industrial processes to prevent the assembly of and likely outcome problems or automated recognition of pieces for rework, i.e. to distinguish components that can and cannot be further utilized.(Hellingrath & Lechtenberg, 2019:292)

In addition, they use a deep-seated neural network to examine the so-called container manifests, which indicate the commodities in a container, to promote behaviors that occur every day. Radiography of the containers is taken, and the incoherence of loads can be identified based on those containers. As previously said, these are the fields indicated as ideal sectors for the acknowledgment of AI approaches in the delivery of supply chains. While the class or example list is not

completed, It can nevertheless give insight into the past and give ideas where additional applications are likely to be considered (Hellingrath & Lechtenberg, 2019:292).

Concerning the methodologies utilized, while research shows a high level of machine learning, it is particularly evident that the most applied technique is the overall and neural networks. The number of resources that handle difficulties with identification remains mysteriously tiny, but it was evident that it was quite appropriate to use AI to address recognition concerns, particularly in the area of supply chain implementation, by looking at other instances from this section. Research still mostly addresses the development or enhancement of algorithms and does not utilize them in an actual environment. (Hellingrath & Lechtenberg, 2019:293).

There is just a small number of experiments or certain genuine scenarios for applicability. The majority of publications test a data set strategy based on, for example, simulations or benchmarks. Moreover, there is scarcely any discussion on organizational, procedural, and human issues. In most situations, the sources listed do not report the technique for classifying goods and promising cases, nor how to choose and implement an effective approach. Publications concentrate on the application of an AI approach to a given problem, but it is important to assess how appropriate an application is for a successful resolution. This alone can at least raise the chances for success and lower the chance of failure in the application of AI. Although no classified resources have yet considered this feature, it is a good possibility for coming researches. (Hellingrath & Lechtenberg, 2019:293).

F. Procurement

Procurement is the tracking procedure that a company uses to obtain the commodities and required services. The methods used by the company to track its revenue include loans and collections. (Michael, 2017:67).

Procurement shall also be carried out in order to design, procure, monitor inventory, traffic, receive, examine, and spare processes. (Crandall et al., 2015:255).

Managers must determine the form of procurement and methods, including widespread supplies, direct and indirect. The fundamental mechanism for enhancing

supply chain revenues is always important to distinguish. For instance, a company should create direct material procurement, so that the supplier plus the buyer may coordinate effectively. In addition, MRO (Maintenance, Reparation, and Operation Supply) procurements should be designed to guarantee that operation costs are at a low level (Chopra & Meindl, 2007:59).

Effective procurement makes people aware of how many items are purchased in all sectors of the company, including by each operating division. It is necessary to be aware of how much of what types of things are purchased from whom and at what cost. (Michael, 2017:64).

Increasingly, procurement executives turn out to be of strategic importance to corporations for their sustainable competitive improvement in unstable periods. Procurement is presented as a key integrative company operation in today's changing market condition and its focus has extended from short-term cost reduction to long-term value generation and distribution (Hong & Kwon, 2012:452).

Corporations depend greatly on purchasing activities to facilitate them accomplish their supply chain strategy by gaining quality materials and services at the best cost when they are required. Purchasing is expected to be able to rapidly distinguish and qualify suppliers, negotiate contracts for the best price, organize transportation, and then maintain to oversee and manage these suppliers. Lately, purchasing has been given the added obligation in many businesses for also providing major services to the business, such as information technology, accounting, human resources, and other formerly internal tasks. Another familiar term for the purchasing task is procurement. Whereas “purchasing” implies a monetary transaction, “procurement” is the responsibility for obtaining the commodities and services the business requires, by any means. Hence, it may consist of scrap and recycled as well as purchased materials. Procurement consequently permits the consideration of environmental characteristics of acquiring and distributing manufactured goods (Meredith & Shafer, 2016:177).

It is critical to examine the commodities that the procurement method will be utilized to get while developing the procedure. There are two major kinds of goods purchased: direct and indirect. The elements utilized for the production of finished items are direct materials. Direct materials for a PC maker include for example RAM, hard disks, and CD drives. Indirect materials are commodities used to support

a company's activities. For automotive manufacturing, PCs are instances of indirect materials. The acquisition of direct and indirect materials is connected to each procurement procedure within a company (Chopra & Meindl, 2007:448).

The procuring method for direct materials is meant to guarantee that elements are provided in the correct place, in the correct amount, and at the correct time when the direct link to the manufacturing is provided. The main goal of direct material procurement is to coordinate the complete supply chain and to ensure that supply and demand match. Consequently, the procurement method should be designed to make the producer's manufacturing strategies and existing product range apparent to the supplier. This view allows suppliers to manufacture elements under manufacturers' specifications. To assign the parts order to the right supplier in a time-limited way, the current capacity of the suppliers should be made accessible to the producers. The procurement operation should also be warned of likely gaps between supply and demand by both the customer and the supplier (Chopra & Meindl, 2007:449).

More effective procurement processes can drastically reduce the entire cost of acquiring. This is especially useful for products with a large number of low-value transactions. (Chopra & Meindl, 2007:419)

Besides that, better procurement mechanisms can enhance forecasting and planning while also speeding up coordination with suppliers. Stocks are reduced and supply and demand are better aligned as a result of better coordination. (Chopra & Meindl, 2007:419).

Cisco's eHub project is a great model of a procurement practice that concentrates on these purposes. eHub is designed to offer matched planning and supply chain insight from beginning to end. Cisco intends to have more than 2000 suppliers, distributors, and agreement microelectronic producers for its exclusive trading network in the long run. Another model is the 2002 Jeep Liberty partnership between Johnson Controls and Daimler Chrysler. Johnson Controls assembled a cockpit module from 35 different vendors and delivered it to Chrysler. Johnson Controls only had Two hours and twenty-four minutes to manufacture and deliver the unit to Chrysler. Every day, this happened 900 times for roughly 200 various colors and interior patterns. The procurement procedure was concentrated on ensuring perfect production synchronization at Daimler Chrysler and Johnson Controls. As a result, there was a significant decrease in stock and a closer match

between product supply and end-customer need.(Chopra & Meindl, 2007:449)

Given the emphasis on various low-value practices, the indirect material procurement process must concentrate on decreasing the operation cost of every single purchase. The complication of picking commodities such as out-of-date catalogs, gaining permission, generating, and posting a buying order drives up transaction costs for indirect supplies. Because there is no single system for indirect materials in corporations, the problem is frequently exaggerated. Instead, they employ a slew of inefficient and disjointed methods. A robust procurement strategy can assist reduce transaction costs by making exploration simple and automating approval and delivery of purchase orders. (Chopra & Meindl, 2007:449)

Other interested parties, such as accounts payable and receiving, are required to be updated as part of the e-procurement process. This is only possible with providers who utilize online collections and computerize all purchaser interactions. Johnson Controls and Pfizer are two companies that have had success with e-procurement for indirect materials. Both companies combined existing technologies to create their e-procurement systems. Pfizer combined an Ariba system with an American Express (CPC) program, while Johnson Controls integrated a Commerce One resolution in addition to the existing Oracle Accounting program. Both companies are alleged to have saved a significant amount of money as a result.(Chopra & Meindl, 2007:449-450)

Another requirement for direct and indirect materials procurement is the capability to place combination orders by product and provider. In the case of direct materials, merging orders enhances economies of scale at the supplier and during shipment, as well as allowing the company to take benefit of any bulk discounts offered by the supplier. When it comes to indirect materials, merging expenditures with a supplier repeatedly lets the company get a greater purchase discount. (Chopra & Meindl, 2007:450)

In this circumstance, procurement's goal must be to lower acquisition or transaction costs. Bulk purchases, essentials, and strategic goods can all be classified as direct materials. Suppliers tend to obtain the same selling rate for most bulk buy goods, for instance, packaging supplies and bulk chemicals. It is critical for purchasing to distinguish between suppliers based on the services they offer and their performance, as well as any other factors that influence the total cost of ownership.

For bulk buy items, well-designed auctions are likely to be most effective. Long-lead-time elements and specialty compounds are among the most important items. The main goal in sourcing essential commodities is to ensure availability, not to save money. For this scenario, purchasing must collaborate with both the purchaser and the supplier to enhance the synchronization of manufacturing plans. For vital commodities, having a reliable, albeit expensive, supply source as a backup can be quite advantageous. Electronics for an auto manufacturer, for example, fall into the last group, strategic parts. The buyer-supplier relationship is long-term for strategic parts. As a result, suppliers must be evaluated based on the lifetime cost/value of the relationship. Purchasing has to seek dealers who are willing to collaborate in the design stage and coordinate design and production activities with other supply chain competitors. (Chopra & Meindl, 2007:450).

G. Warehousing

Warehousing has long been a significant component of business growth. Private families were responsible for storage in the pre-industrial era since they were required to function as self-sufficient economic parts. The users were in charge of storage and were aware of the dangers that came with it. It became feasible to join in the specialization when transportation capacity was created.

The storage of manufactured goods is moving from households to merchants, wholesalers, and producers. Warehouses serve to coordinate product supply and buyer demand in the logistics channel by storing goods. (Bowersox et al., 2002:381).

The oldest documented application of warehousing was as a reserve or buffer against supply fluctuations. The book of Genesis, one of the first writings in Western culture, recounts the task of warehousing in ancient Egypt to avoid starvation. (Ackerman & Brewer, 2017:225)

Nowadays, storage may be used for a variety of purposes. The most significant difference is that held inventory is now routinely employed as a buffer against demand volatility and to enhance customer service. The better service a warehouse or distribution base can provide, the closer it is to its clients. In the twentieth century, the development of distribution bases was intended to improve customer service. However, because of significant enhancements in delivery

facilities made possible by the usage of nighttime air transport, some distributors have been able to significantly decrease the number of distribution sites without relinquishing customer service. (Ackerman & Brewer, 2017:226)

A new variation in the form of warehousing has emerged, with various broad aims, such as owned, customized, leased, or conducted by 3rd party. When a company has outsourced this work to a 3rd party logistics contributor, the last option is applied. Moreover, as transportation evolved within the early twentieth century, warehousing became a way of achieving superior scope and scale economies, which had significant consequences for shipping. (Ackerman & Brewer, 2017:226).

Warehouses were typically regarded as necessary evils that added expense to the delivery procedure since the quantity of strategic inventory has not been comprehended well. The assumption that intermediaries may easily raise costs stems from this. It was only necessary to supply commodities collections on a limited basis. During this period, labor output, materials handling efficiency, and inventory return were not priorities. Human Resources were exploited without limitation since labor was very inexpensive. Efficiency in space usage, labor practices, and material control were not given any thought. Despite their flaws, these early warehouses served as a vital link between manufacturing and presentation. Following World War I, management's focus moved to strategic warehousing. The necessity for massive warehouse networks began to be questioned by management. In distributive productions like as retailing and wholesaling, it was once frequent practice to designate a warehouse holding and a full inventory collection for each selling period. The government began to challenge such hazardous inventory arrangements as prediction and manufacturing arrangement methods improved. Manufacturing planning became more trustworthy as interruptions and time delays were eliminated throughout the process. While warehousing was still required for seasonal manufacturing and consumption, the overall demand for storage to support consistent manufacturing and consumption forms was decreased. The decrease in storage obtained as a result of these production enhancements was more than compensated by shifting retailing requirements. When faced with the problem of providing customers with a growing selection of items, retail businesses found it more difficult to maintain purchasing and transportation economics when obtaining from suppliers. (Bowersox et al., 2002:381).

The cost of transferring tiny cargoes was direct ordering prohibitively expensive. This generated an occasion to create strategically positioned warehouses to deliver well-timed and cost-effective inventory renewal for retailers. Sophisticated wholesalers and integrated retailers developed ultramodern warehouse systems to logistically sustain retail renewal. As a consequence, the emphasis on warehousing shifted from passive storage to planned collection. Production quickly embraced enhancements in retail warehouse productivity. Strategic warehousing provided a means for manufacturers to decrease the storing or dwell time of parts and materials. Warehouse services converted to Just in time (JIT) manufacture approaches and no stock inventory. Though the primary idea of JIT is to lessen work-in-process inventory, these production approaches necessitate dependable logistics. (Bowersox et al., 2002:382).

Reaching such logistical support among geography like the U.S. needs strategically located warehouses. Developing centralized elements inventory at the main warehouse lowers the necessity for inventory at every manufacturing site. Products may be bought and transported to the main warehouse, which is ideally placed, to reap the benefits of combined transportation. Products are categorized, scheduled, and transported to particular production factories as required at the warehouse. Where fully integrated, sortation and sequencing facilities turn out to be a necessary extension of production. (Bowersox et al., 2002:382).

Warehouses can be used to generate product collections for client freight on the outward side of production. Clients gain from the opportunity to obtain a variety of product cargos for two reasons. For starters, logistical expenditures are decreased since a collection of goods may be provided while utilizing combined transportation. Second, because smaller amounts may be obtained as part of a merged cargo, inventories of slow-moving manufactured goods can be decreased. Producers that provide an assortment of product cargoes can have competitiveness. Full elasticity is an important charge in storage. Information technology can help achieve this level of adaptability. Technology-driven applications have affected nearly every aspect of warehouse processes, resulting in new and improved techniques of handling and storage. Elasticity is an additional key component of being able to react to increasing customer demand regarding product collections and the delivery and submission of cargoes. This flexibility is made easier by information technology, which permits

warehouse operatives to immediately respond to changing purchaser requirements. (Bowersox et al., 2002:382).

The warehouse shows a considerable part in this. The warehouse selecting and despatching of products must be faultless in order to provide the correct product in the correct amount. To deliver to the correct purchaser at the proper time, the goods must be accurately labeled and put onto the relevant track with enough time to meet the delivery date. The warehouse must also guarantee that the product exits the warehouse in good condition. We need a cost-effective, value-for-money approach to offer at the correct pricing. (Richards, 2018:27).

As a result, the warehouse is essential in delivering the ideal order — on time, in full damaged free, and with all necessary paperwork. In the past, warehouses were viewed primarily as storage facilities, aiming to meet supply to demand and play a role as a shield between raw material and element suppliers and producers, as well as between producers and wholesalers, retailers, or purchasers. (Richards, 2018:27).

The primary duty of warehousing is storing, which is defined as the duty of putting commodities in a particular place. For instance, (1) Storage of main raw materials awaiting approval of distribution to another site in the SC, (2) temporary stockpiling of unfinished goods at many points in the supply chain channel, and (3) stockpiling of complete products close to production point, and (4) stockpiling of retail and wholesale inventory awaiting delivery to clients and end-buyers are all examples of warehousing. (Ackerman & Brewer, 2017:225).

The execution of commodity flows from one section of the supply chain to another is the other duty of warehousing, which has resulted in the shift of warehouses to distribution sites today. Based on these two major tasks, the most crucial challenge in warehousing is time and space management. (Ackerman & Brewer, 2017:225).

When overall cost declines are attainable, the storage warehouse becomes economically viable due to (A) merging plus breakbulk, (B) variety, (C) postponement, (D) stockpiling, as well as (E) reverse logistics advantages. (Bowersox et al., 2002:382).

H. Logistics

Without logistics, it's not easy to imagine marketing, production, or worldwide trade. A high degree of logistical proficiency comes naturally to most customers in developed industrialized countries. They believe item delivery to be completed as promised when they buy commodities in a store, by phone, or on the internet. Every time they make a request, they want timely and error-free logistics. Failure to execute is met with a smattering of acceptance if not complete rejection. While logistics was used since the dawn of civilization to carry out the most complex procedures, it is one of the most fascinating and difficult parts of supply chain management. We choose to define the rapid shift in top practice as a resurrection since logistics is both old-fashioned and modern. The administration of order process, stock, transport, and a mixture of storage, raw material handling, and packing throughout a network of facilities is referred to as logistics. (Bowersox et al., 2002:31-32).

The logistics role connects multiple members of a supply chain altogether. Its geographical scope of impact has expanded from a local to a worldwide focus.

Though its main purpose is to accelerate the movement of commodities and information across the supply chain, it is converting to combining the glue that holds the supply chain connected. Logistics can be defined as (Crandall et al., 2015:293):

- The art and science of collecting, manufacturing, and distributing raw material and manufactured goods in the right place and amounts in industrial terms,
- In military terms, in which it is more commonly used, it also refers to personnel mobility.

The following is a definition approved by the Council Supply Chain Management Professionals (CSCMP): **“Logistics: The process of planning, executing and controlling procedures for the efficient and effective transportation and storage of merchandise including services, and related information from the point of origin to the point of consumption to conform to customer requirements. This definition contains inbound, outbound, internal, and external movements”**. (Crandall et al., 2015:293)

CSCMP defines logistics management as a wider concept **“Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption to meet customers’ requirements.”** (Crandall et al., 2015:293)

Managing inbound and outbound shipments, material control, order execution, logistics network establishment, and third-party logistics resource management are all examples of logistics management operations. (Crandall et al., 2015:293)

To differing levels, the logistics work as well contains tracking and procurement, manufacture preparing and organizing, packing and assembly, and customer support. It is engaged in all stages of strategic, operational, and strategic planning and implementation. Logistical management is a work that organizes and adjusts all logistics processes, besides linking logistical operations to other tasks like sales, production, financial, and IT. (Crandall et al., 2015:293).

The military is commonly acknowledged for creating the terminology logistics to outline efforts to transfer equipment, supplies, and soldiers to the required location. Many armed forces were tasked with organizing the movement of commodities to faraway places and failing to transfer support items for soldiers usually resulted in defeats. To this day, asset mobility is a crucial element of military tactics. (Crandall et al., 2015:293).

The target of logistics is to assist market distribution, procurement, operational requirements, and production Inside a corporation the task is to organize operational proficiency into an integrative framework concentrated on customer service. Operating harmonization between buyers, materials, and service providers is required in the larger supply-chain architecture to integrate internal and external activities as a single unified activity. The better skill to design and manage systems to regulate the movement and geographic positioning of materials, uncompleted, and completed items at the lowest overall cost is referred to as lean logistics. (Bowersox et al., 2002:32).

To reach the lowest overall cost, human and financial resources dedicated to

logistics must be limited to a bare minimum. It's also required to keep direct operating expenses as low as practicable. (Bowersox et al., 2002:32).

The concentration of lean logistics may be traced back to the most recent modifications in the whole costing concept and method. The traditional study demonstrating air freight economics presented a new standpoint regarding logistical cost in 1956. Lewis, Culleton, and Steele developed the total cost logistics criterion to define conditions in which high-priced air transportation may be justified. (Bowersox et al., 2002:36).

Total cost was arranged to consist of all expenses that are required to complete logistical obligations. The authors explain an electronic components distribution method in which savings in traditional inventory and warehouse ground costs more than compensated for the high variable cost of air transport from the plant to the customer. They discovered that the most cost-effective logistical method for providing the necessary customer support was to consolidate goods in a single warehouse and deliver goods by air transportation. When organizations build their supply chains, they often focus on one of two major goals: enhancing supply chain efficiency or lowering supply chain costs. (Bowersox et al., 2002:36).

Despite its simplicity, this total cost approach has not before been applied to logistical operations. The overall cost suggestion sparked a lot of debate, perhaps due to the economic situation at the time and the radical change in the recommended procedure. The existing managerial practice, reinforced by financial and accounting supervision, was to concentrate on reaching the lowest feasible costs for every logistics objective, with a bit or no consideration for the entire cost. Traditionally, administrators have concentrated on lowering functional expenses such as transportation in the hopes of achieving the lowest total costs. The study of how functional costs are interrelated and affect each other was the first step in improving the total cost idea. Later enhancements provided a more awareness of logistical cost aspects and identified the essential requirement for improving functional cost study and activity costing facilities. Nonetheless, executing efficient logistical procedure costing is a new century issue. Many long-standing accounting practices continue to act as roadblocks to fully implementing total cost logistical resolutions. (Bowersox et al., 2002:36)

III. ORGANIZATIONAL STRUCTURE AND SUPPLE CHAIN MANAGEMENT

The organizational structure encompasses all of the techniques through which an organization divides its labor into various tasks and coordinates them. (LYSONS & FARRINGTON, 2016:113).

A. New Type Organizations

Vertical task departmentalization and inflexible hierarchies are characteristics of old-style bureaucratic systems. Because they are often regarded as excessively inflexible, sluggish, and lacking creativity to meet the demands of flexible workers, 'red tape' becomes a problem for rapidly changing companies and their clients. The restructuring process of traditional hierarchical organizations has transformed five particular areas as follows (LYSONS & FARRINGTON, 2016:121):

- Contemporary action, involving the re-engineering of business activities tracked by organizational restructure and utilization of multifunctional units,
- The search for 'right-sizing and 'horizontal' structures, caused a decrease in management levels and horizontal structures,
- The demand for accuracy, quickness, and flexibility in the implementation of programs and approaches increased,
- Enhancing influential information systems and automating knowledge collection, resulting in people's engagement in the management of company activities,
- They concentrate on customer satisfaction and retention through increased organizational understanding.

In procurement, an additional factor is the shift from purely transactional activities have become an important factor in the competitiveness and company performance when sourcing takes precedence over purchasing.

Though countless companies currently coordinate procurement through traditional hierarchical structures, the aforementioned factors are gradually driving the development of procurement and supply chain systems, as well as the implementation of lean and agile principles.

Seven features of new type organizations were found by Lysons and Farrington, which have significance for supply chain management and procurement procedures (LYSONS & FARRINGTON, 2016:121-122):

- a. Revolutionary decentralization: this, along with the concept that 'little is beautiful,' divides the enterprise into numerous tiny, autonomous entities in which individuals are the smallest component and must be empowered and given independence,
- b. Strong interconnection: this underlines interdependence and interdisciplinary methods are applied through the building of teams and alliances to seek joint aims. Both persons and the corporation realize that in order to compete, they must collaborate,
- c. Demanding expectations: corporations and their personnel have such a strong sense of the objectives which they are supposed to attain. Personnel requiring others to assist and await their assistance as a due,
- d. Shared supervision: supervision is not limited only to the highest rank administration, but it's shared among those in the company who, in most cases, need to demonstrate responsibility and competence,
- e. Transparent working standards: claiming that success criteria and metrics are established and presented transparently so that everyone is aware of how they are performing concerning others,
- f. Boundary breaking: Personal, physiological, organizational, operational, social, mental, and practical impediments to collaboration and interaction are deliberately removed to reach adaptation and elasticity,

Networking and reciprocity: the abdication of traditional inflexible

organizational structures encourages and simplifies straightforward communication and relationship among people, regardless of their positions, jobs, culture, prestige, or place, so that a universal way of life of reciprocity and swap moderates all relations (LYSONS & FARRINGTON, 2016:121-122).

New organizational forms are rising, frequently in tech-led environments which have offers for constructing organizational environments, geared for cooperation, innovation, and permanent adaptation. Examples of enterprises with cooperative, non-hierarchical aspects of organizing include Google, Wikipedia, Spotify, and Nike. Instead of fixed structures, work is delivered through a network of activities and teams of teams. Such enterprise structures are built to be changeable, to enable agile operating practices, and enhance efficiency. They are flexible, with strong systems and learning approaches. (Holbeche, 2018:156-157).

B. Agile Organizations and Productions

Organizational agility, or the capability of continuously modifying and adapting strategic directions of an enterprise, regularly, is becoming extremely relevant for its success with its unstable financial and commodity marketplaces and geostrategic variabilities, the term 'VUCA' is widely used to explain the high volatility, unsure, complex, and ambiguous globe we presently live in. Financial instability has been more severe and has lasted longer than in the past. The commercial environment is just so quick-shifting in a world undergoing constant and complex change that businesses must adapt quickly just to remain. (Holbeche, 2018:1)

The financial crisis that started in 2008 made a lot of corporate structure designs, many business models became obsolete. In a 2010 IBM research, the majority of CEOs described their operational environment as, unlike anything they had seen previously. (Holbeche, 2018:1)

The days of strategic planning based on extrapolations from the early years pushing businesses up with trends appear to be over. In a VUCA environment, no company can consistently outperform the markets. Demographics, connectivity, digitalization, free trade, worldwide competitiveness, and business strategy creation all are driving the entry of new rivals and the development of new business

techniques. (Holbeche, 2018:1)

Variable consumer mood, increased complexities, increasing unpredictability, an abundance of data, and a shortage of sources are all challenges that organizations grapple with. Many of these trends have unknown effects, but there are certain common motifs and many connections between them, indicating that their repercussions will be complicated and long-lasting. (Holbeche, 2018:1)

Such a mixture of circumstances is forcing several businesses to rethink how future commercial results will come from, as past achievements are no good indicator of future success. Just one guarantee is that any business will be truly tested in terms of changing tactics that it has never done before, and the previous tactics could not always be the optimal tactics. The capability to modify endlessly and effectively is essential for existence and long-term success. To put it another way, these deep shifts in the worldwide economic conditions need innovative techniques in leadership and management. (Holbeche, 2018:1)

The terms "lean" and "agile" are often used interchangeably. High levels of quality of product are required for both agility and leanness. They additionally need the shortest overall lead times, defined as the time it takes for a client to create a product or service request till it is completed. Because demand is very unpredictable and hence hard to estimate, overall lead time must be reduced to empower agility. If a supply chain's end-to-end lead time is too long, it won't be able to react fast enough to take advantage of the current demand. Moreover, successful cycle time-reducing design invariably results in significant reductions in production costs and profitability. (Aitken et al., 2002:4)

There are, nevertheless, substantial variances. According to Aitken et al. (2002), the distinction between lean and agile is clear when Webster's Dictionary defines lean as "**containing little fat**" and agile as "**nimble**." Table 1 shows some comparisons among lean and agile methods of production (LYSONS & FARRINGTON, 2016:139).

Table 1 The defining characteristics of lean and agile supply differentiating

Distinguishing characteristics	Lean supply	Agile supply
Typical products	Commodities	Fashion goods
Marketplace	demand Predictable	Volatile
Product variety	Low	High
Product lifecycle	Long	Short
Customer drivers	Cost	Availability
Profit margin	Low	High
Dominant costs	Physical costs	Marketability costs
Stockout penalties	Long-term, contractual	Immediate and volatile
Procurement policy	Buy goods	Assign capacity
Information enrichment	Highly desirable	Obligatory
Mechanism for forecasting	Algorithm	Consultative

(Aitken et al., 2002:4)

Leanness entails establishing a value chain to minimize any wastage, especially time, and to facilitate a constant timetable.

Agility refers to the use of market information and a virtualized business to capitalize on profit possibilities in an unpredictable market. (LYSONS & FARRINGTON, 2016:139)

In general, lean manufacturing works best when there is little variety, a lot of volumes, and predictable demand. Agile manufacturing, on the other hand, is best suited to unexpected demand and custom-made items. As a result, as previously said, fashion merchandises, such as fashionable apparel, have a short lifetime and significant demand unpredictability, exposing the supply chain to stockouts and expiration concerns. Tinned soups, for instance, have relatively lengthy lifecycles and minimal demand uncertainty since they are well-established industrial products with consistent consumption patterns. (LYSONS & FARRINGTON, 2016:139)

Leanness and agility are complementing instead of conflicting concepts, and leanness is frequently thought of as a catalyst for agility. The strategic usage of a decoupling point can merge leanness with agility and thereby take advantage of the benefits of both approaches. This combined approach is called ‘legality’, which is outlined as the integration of the lean and agile models inside an entire supply chain architecture by setting the decoupled points to better meet the necessity of reacting to a fluctuating demand while providing level planning upwards from the market.(LYSONS & FARRINGTON, 2016:139-140)

C. Business Relationships in A Supply Chain

A link or affiliation can be used to describe a relationship. When persons, organizations, and groupings interact both inside and outside the corporation, relationships are formed. Separate from the discipline of business social work, relationship management is the study of commercial relations which is related to examining social communications. Supplier relationship management (SRM) is a joint effort among two organizations to integrate their operations so that the purchaser gets greater value for his money and the supplier gets a higher profit margin, all while contributing to both organizations' strategic goals. This is not a contract to the main source or outsourcing to a vendor, but rather a contract that combines features of both businesses for joint advantage (LYSONS & FARRINGTON, 2016:194).

Individual companies today rarely possess all the needed technological competence to develop and produce products of a particular complexity quickly and efficiently with advanced technology. Single organizational units no longer carry out development and production. Instead, these duties are distributed between several firms or between several organizational units within a corporation. Hence, it is essential to understand how enterprises are established and also how their boundaries to the outside and their internal structures change. (Schönsleben, 2004:69)

Suppliers provide to clients in the majority of modern business interactions. In such buyer-seller procedures, there is sometimes substantial friction since each party wants the greatest financial bargain. Neither side has complete faith in the other. Because certain demand or planned data is not provided, sellers must make educated guesses about the demands of buyers. In such circumstances, firms' opportunity to accomplish overall operating efficiency is restricted as they seek fast returns at the cost of their trading counterpart. The concept of a combined supply chain, on the other hand, emphasizes the enhanced advantages of companies working together to achieve common objectives. The concept of concentrated cooperative agreements, combined with real-life duration responsibility is revolutionizing the way businesses collaborate to simplify distribution. The possibility for enhanced overall productivity because of decreased task redundancies and duplicates is amazing. The topic of how to foster cooperative conduct has received a lot of attention. (Bowersox et al., 2002:586)

Most organizations, though, do not have a clear understanding of these behaviors. Many corporate executives believe that behavioral transformation is very hard to attain. They frequently find each other discussing collaboration far more than putting it into reality. To improve company partnership, three adjustments must occur. (Bowersox et al., 2002:586) To begin, partnerships must promote the joint trust and value that is required to create and maintain harmonized processes and tactics. Actual cooperation is not controlled by or serving one partner within the contract; buyer and provider should have a shared vision and goal in terms of interdependence and collaboration principles. Attempts to achieve targets must concentrate on giving excellent final customer value regardless of where the requisite proficiencies occur in the supply chain. This point of view is critical to the supply chain's long-term survival (Bowersox et al., 2002:586). Secondly, regulations and contracts should identify management positions and joint duties, establish rules for exchanging proprietary processes and operating information, and establish financial connections that create organizational reliance on each other's success. Companies should also promote risks and profit contributions by specifying how bonuses and fines will be distributed between alliance partners. Such transparency demonstrates responsibility to the notion that individual company achievement is connected to the performance of the whole supply chain. Furthermore, official standards should be developed that specify shared operational rules and processes for dealing with both normal and unanticipated occurrences. Finally, in order to be effective in reality, cooperative activities must be aware of the possible negative features of interconnecting contracts (Bowersox et al., 2002:586). Last and thirdly, participating companies should be brave enough to face tough challenges linked to relationships' lack of integration well before a supply chain procedure needs to be dissolved. While most cooperative agreements are voluntary and, as a result, can be terminated at any moment, formal departure processes are recommended to minimize property conflicts. A section on the relationship's duration and termination ensures that it should not exceed its utility to the parties (Bowersox et al., 2002:586). This improvement is aided by modern company relations which provide among the most effective residual chances for lower total cost and value enhancement. However, according to Frazier et al. (1988), these opportunities generally need a close connection. Distributors have maintained trade relations for decades by continued investment in their clients to keep track of business contacts from out-Distributors.

However, there reaches a moment where strengthening working relationships requires both the distributor and the client to be willing to commit to this distinct form of cooperation, as relations, where the purpose for remaining in is solely determined by the supplier's investments, are inherently unstable. Customers have a commercial motive to switch suppliers once rivals provide advantages in alternative commercial interactions (Fazlollahtabar, 2018:104).

D. Company Boundaries to The Outside and Within the Company

The transaction cost theorists have sometimes drawn a clear and sharp distinction between the seemingly purely hierarchical coordination of economic activity within the firm, and the apparently purely non-hierarchical coordination of activity between firms or between firms and other actors (by Coase examination 1937). This methodology was created to determine if a certain collection of trade interactions is better managed in companies or markets as a whole. In the easiest form of this narrative, there are important borders or subdivisions inside companies, and there are obvious and distinct boundaries between companies and markets (Cantwell, 2007:1).

The focus was on the company's role as a continual producer of understanding through local investigation of works in or throughout manufacturing which more accurately describes company heterogeneity. Such issue-solving projects, on the other hand, typically necessitate information transfers among companies as well as among companies and other stakeholders. The borders among organizations may begin to dissolve if information transfers between companies expand significantly, as well as the amount toward which companies depend on outside abilities. Knowledge development among multiple segments or organizational units is part of the evolutionary route of technical learning in transcontinental organizations. Multinational corporations (MNCs) have been extremely engaged in comprehension generation in both domestic and overseas operations, and as a result, information is frequently requested to move both inside and among companies (Cantwell, 2007:1).

Multinational corporations are currently seen as being immersed in a variety of decentralized and geographically dispersed internal and external commercial chains. In the changing environment of the information era. Their

networks facilitate access to a larger variety of creative nodes. Within MNCs, this process of business network generation blurs company borders while also creating new borders or divisions, as well as new decentralized nodes of power or influence. Considering that subsidiary companies or other subdivisions begin and contribute to distinct networking on an individual basis and that the corporation's headquarters is unable to gain or maintain a complete understanding of these networks while they grow. Consequently, in some respects, this brings the administrative costs and the corporation's developmental accounts closely together as well (Cantwell, 2007:3).

E. Partnership Strategies in A Supply Chain

The advantage of communicating with other corporations has become obvious. More so, what derives co-partnership and cooperation together reflects their advantages. The ability to exhibit organizational compatibility is based on the presence of partnership and collaboration among relationship members according to Young et al. (2013) and Kumar and Banerjee (2012). Much more, when these elements are combined, they elicit integration which is critical to success (Flynn, Hou, & Zhao, 2010). This network of relational enterprises succeeds in the idea that harmony is evoked according to the Relational View theorem (Kumar et al., 2017). This emphasizes the relationship of businesses that serves as the entity of study (Wieland & Wallenberg, 2013). In line with the concept, members get a competitive edge through their interconnections from which they draw unique skills (Mofokeng & Chinomona, 2019:2). These distinct skills emerge as a result of the network's ability to:

- Invest in relational assets,
- Create procedures for inter-firm information transfer,
- Utilize effective governance systems and,
- Utilize complementary abilities (Mofokeng & Chinomona, 2019:2).

That network supports the creation of a collaborative structure that encourages successful planning and exchanging activities (Kumar et al. 2017). SMEs collaborate in an entire supply chain to ensure goods and services are delivered to the final consumer. The supply chain should outperform the industry norm to become competitive. According to the relational view theory, SMEs may achieve greater

performance via networking, which offers advantages. integration and Cooperation describe networking as a partnership. (Mofokeng & Chinomona, 2019:2)

Supply chain partnership

Supply chains have gotten increasingly intricate as the workplace world has evolved considerably in recent years. Since there is an emphasis on quality, reduced cost, and, very recently in the scholarly, concern for the environment, the concept of supply chain collaboration has grown in importance. As a result, supply chain collaborations are seen as essential to achieving the above objectives. (Klassen & McLaughlin, 1996; Montauban, Scrouge, & Narasimhan, 2007; De Bakker, Fischer, & Brick, 2002; Klassen & McLaughlin, 1996; Montauban, Scrouge, & Narasimhan, 2007). The scope and size of supply chain collaborations are determined by rigorous, company-wide activities that involve strategic and operational exchanges. (Mofokeng & Chinomona, 2019:2-3).

Partnership characteristics, communication behavior, and conflict resolution methods were all key variables in relationship success according to Mohr and Spackman (1994). Since then, significant theoretical research regarding supply chain collaboration has also been conducted (Ellram & Hendrick, 1995; Graham, Daugherty, & Dudley, 1994; Mentzer et al., 2000). Furthermore, in recent years, plenty of practical investigations have been done (Goffin et al., 2006; Nyaga et al., 2010; Sodhi & Son, 2009). Trust is essential in supply chain connections according to Ramanathan and Gunasekaran (2014), Chen and Paulraj (2004), and Li and Lin (2006). Supply chain collaboration, according to Youn et al. (2013), is described as successful long-term partnerships between supply chain trade partners facilitated by joint trust, structural harmony, supervisory support, and sharing of information (Mofokeng & Chinomona, 2019:2-3).

F. Mapping the Supply and Value Chain

The map is a visible illustration of a fact. We may also use maps to understand and share information. Maps facilitate understanding since a picture is worth a thousand words. Maps may convey both specific and broad data. Designers' blueprints and detailed maps separately transmit comprehensive and broad data and

an example of supply chain maps is a supply network diagram (LYSONS & FARRINGTON, 2016:139).

Supply and value chain mapping is accepted for a specific goal, usually to restructure or alter the supply chain or to eliminate or reduce waste. There are several mapping options available to satisfy the needs of operators. As illustrated in the table below, Cooper and Gardner distinguish overall supply chain mapping from process mapping based on three features: direction, amount of detail, and objective as shown in the below table (LYSONS & FARRINGTON, 2016:139).

Table 2 Differentiating between Mapping supply chain and a Process Mapping

Characteristics	Supply chain mapping	Process mapping
Orientation	External: examines the movement of commodities, information, and money upstream, downstream, and through a company.	Internal (typically): an enterprise's emphasis on a particular activity or system.
Level of detail	Low to moderate: focuses on high-level metrics including volume, cost, and lead time. Provides a broad overview of how business processes interact with one another. Non-critical items may be excluded.	High: deconstructs a process into its many activities and stages. Each phase provides data that describes the system being mapped.
Purpose	Strategic: mapping seeks to either establish a supply chain that adheres to a plan or ensure that the present chain sufficiently complies with that strategy.	Tactical: a process map is created when a problem area is identified and the need to increase operational efficiency is identified. The objective is to make changes to the way things are done now. Normally, efforts are focused on a single process or function at a time.

(LYSONS & FARRINGTON, 2016:140)

According to Cooper and Gardner, a very well overall supply chain map can enhance the planning process, assist supply chain redesign or adjustment, explain channel dynamic behavior, deliver a general perception, improve operational efficiency, permit strategy implementation checking, and provide a foundation for supplier evaluation. As a result, a map may be very useful in comprehending a company's supply chain, analyzing the present supply chain, and predicting supply chain adjustment (LYSONS & FARRINGTON, 2016:140).

A supply chain map can be generated manually or connected to or constructed straight under a database. According to Cooper and Gardner, three supply chain map elements influence the complexity of mapping: Engineering,

viewpoint, and execution difficulties. Engineering is concerned with things like (LYSONS & FARRINGTON, 2016:140):

- The number of sequent units that execute the transactions till the final buyer,
- Length,
- Direction,
- Assemblage width; a tier's level of specificness,
- Spatial; the map is geographically representative,
- Point of focal; how that maps are viewed from the perspective of the company or the industries.

A supply chain is a system that links a company as well as its providers to a manufacturer and then delivers goods to the final customer. It further reflects the processes required to transport goods or services from their starting state to their final client. From raw materials to finished items, a supply chain consists of all the corporations and people involved in the manufacturing of a good. SC operations include agricultural, refinement, designing, production, packaging, and shipping. It begins with the transfer of materials from a provider to the manufacturing and ends with the delivery of the final product or service to the end customer. From conception through sale, SCM controls all elements of a corporate business (Dubey et al., 2020:177).

The value chain, on the other hand, has five phases that allow a company to create value that is more than the cost of supplying a product or service to customers. Increasing activity in any of the five phases provides a company with a competitive advantage over its industry's competitors. The five phases of a value chain can be listed as (Dubey et al., 2020:177):

- Input logistics: acceptance, storage, and stock control,
- Processes: actions that generate value by converting inputs into outputs,
- Output logistics: the actions necessary for delivering a completed product to a client,

- Sales and marketing: the actions involved in persuading a purchaser to acquire merchandise,
- Customer support: actions that help to preserve and improve the value of an item.

A lucrative value chain necessitates links between people's desires and what the firm gives. Product testing, innovation, R&D, and marketing are all heavily emphasized in value chains.

The phrase "value chain" was used by Porter in 1985 to define an entire set of activities required to transport a good or service from thought to different phases of manufacturing, distribution to clients, and disposal of products after using it. As the product moves from one actor in the channel to another, it is anticipated to gain value. As a result, the value chain can be used to break down a company into its core functions, allowing for the discovery of competitive advantage sources (Brown, 1997). Over the years, this notion has always been the subject of fast-growing literature in business and administration. (Dubey et al., 2020:177)

Value chain analysis has been shown to search and evaluate whole sectors, industrial groups, and business systems. It was used to investigate operations that are much more globally dispersed, even called (GVC) "global value chain". World market chains, global manufacturing networks, and worldwide supply chains are all terms used in the value-chain literature to describe this subject (Sturgeon, Linden, and Zhang, 2012). A transition to higher-value-added goods, services, and manufacturing phases with growing expertise and effective international and domestic connections (Ernst, 2004). It also highlights the significance of international links in establishing cross-border forward and reverse directions links, such as global knowledge links, to substitute for the local knowledge base's shortage (Lal, 1997; Ernst, 2004). This research has recently been grown to explore if economic improvement, particularly in multinational corporations, inevitably results in social improvements that are described as enhancement in personnel's rights and privileges, as well as enhancement of the quality of their work (Dubey et al., 2020:177-178)

G. Reengineering Improvement into The Supply Chain

Raw materials, intermediary goods, and final commodities have been acquired, put in storage, and sold through the supply chain which comprises the organizations and procedures involved. Product flows in the supply chain are linked by physical, monetary, and informational exchanges of information. For various people, the word "supply-chain management" has a variety of meanings. All logistical operations, customer-supplier collaborations, new product development and launch, inventory management, and facilities are included in the fullest definition of the term. It is also applicable to service-based enterprises as illustrated in several of the examples provided. Many supply chain management experts define the term more narrowly. It's not uncommon for them to limit the scope of development and the initiatives outside of their firm to actions that are carried out within their organization. Many times, the arduous process of achieving internal change justifies this view. Indeed, smaller local initiatives at reengineering typically fall well short of pledges or expectations. Mistakes and time and money waste are more likely to occur as a project's scope expands. With the help of the University of Georgia and Ernst & Young, Craig Gusting undertook a study of supply-chain integration initiatives in the context of logistics systems reengineering. It was revealed in 1995 research, however, that reengineering initiatives are still in their infancy. In the survey, just 9 percent of respondents said they had been successful in their endeavors. Forty-two percent were working on it at various levels, and twenty percent were ignoring it (Ayers, 2001:360-361).

Business process reengineering (BPR) has various meanings, much like supply chain management. In contrast with other process modifications, BPR is extreme and dramatic according to Hammer and Champ, the writers who popularized the term. Others use the word "reengineering" to describe a wide range of projects. If not all, then at least most people are looking for less than spectacular results or aims. Authors expect the focus of reengineering to continue to shift as new terms are coined. In the opinion of Stephens, Gusting, and Ayers, the development has taken place in three distinct phases (Stephens et al., 2001:15).

During stage 1, the focus is on the department. Improvement of processes is conceptualized, produced, and managed at this level of the organization's hierarchy. These attempts frequently result in department "silos". Consequently, optimization

occurs at the departmental level while potentially causing harm to other departments or even other companies beyond the boundaries. Enterprise-wide solutions emerge in stage 2. With senior management support, reengineering begins to influence the entire organization. Enterprise-wide solutions include initiatives such as cellular workgroups and specialized factories that are organized on segmented client requirements. Stage 3 focuses on the supply chain and extends to smart corporate operations outside of the organization. A supply chain strategy is implemented for a myriad of purposes. Enhancing competitive strategy is the best choice. Strategic situations, according to Michael E. Porter, a very well strategic researcher, are built on activity systems that are difficult to copy. Competence through performing operations that provide value to the customer, not cost cutting, provides a long-term competitive edge (Stephens et al., 2001:15). The supply chain is critical to firms' long-term strategy. A supply-chain reengineering project in stage 3 includes four features (Stephens et al., 2001:15-16):

- Can change the competitive landscape,
- Has a measurable improvement goal that is aggressive rather than gradual,
- Multiple companies are involved in the supply chain,
- Will include a balanced approach that encompasses the four perspectives outlined above.

H. Implementing Integrated Supply Chain Management

Supply chain management methods were the subject of much controversy in the business world in recent years. The internal operations of businesses grow more interconnected as they attempt to create partnerships and improve information linkages with commercial partners. Physical transportation is becoming increasingly reliant on digital technologies which may also be used to facilitate new forms of cooperation. A network of procedures, connections, and technology created interdependence and a shared destiny for firmware. A company's ability to successfully execute supply chain management, therefore, gives a competitive edge for them. This literature review is being undertaken to document and evaluate current literature on supply chain management methods. There are a number of sub-sections

inside it (Power, 2005:252).

Through enhanced communication, partnerships, alliances, and collaboration, this phase addresses challenges related to the integration of essential commercial activities throughout corporate borders. New technologies are also being used to enhance the flow of information and manage items transportation among business parties (Power, 2005:252). Trading partners should view the management of the supply chain as a strategic issue, as well as the planning necessary. This sub-group focuses on variables that seem to be critical to the successful implementation of supply chain actions, as well as challenges related to the internal elements of supply chain actions (Power, 2005:252). The strategic orientation of businesses makes it impossible to separate or contemplate the integration of SC activities across investing in collaborative arrangements as well as technology. If the parties involved do not have a plan in place, the execution will at best be ineffective after that at most terrible counterproductive and whittle down the competitive edge. An analysis of each area's literature can shed insight on important concerns for one or both of the other two fields, as a result of their interconnectedness (Power, 2005:253).

"Remove communication barriers and reduce redundancies," says Kaufman (1997:14) while listing the aims of the supply chain. According to Clancy, it is an attempt to enhance the connections inside each component, (to allow) effective decisions, and (to get) all the chain's components to communicate more effectively, leading to increased supply chain visibility and the identification of bottlenecks (Potager, 1998: 55). According to (Handfield & Nichols, 1999) and (Power, 2005:253): (1) integration is the age of the information revolution, (2) customer demands, and demand-driven marketplaces are being driven up by the global competition, (3) inter-organizational interactions are evolving into new forms. According to them, the three main components of an interconnected logistics system are data management, logistics and distribution networks, (4) accounting, inventory management, and information and financial flow management are critical for integration as much as the relationships within the supply chain and the management of trading partners' relationships.

i. Building a network in an Unpredictable Environment

One of the strategic concerns in SCM that must be addressed is this.

Assigning clients to newly opened facilities and linking facilities via flow assignment choices are the main components of this challenge. To solve the facility location problem (FLP), one must choose the optimum locations of required facilities so that all clients or a portion of them may be supplied, at least by one operational facility, in order to achieve pre-defined objectives (minimizing total costs or maximizing total revenues). However, the SCND is also well-versed in reverse logistics (also known as recovery chain) planning for reusing and reworking surplus materials and returned goods (Nasiri & Jolai, 2018:264)

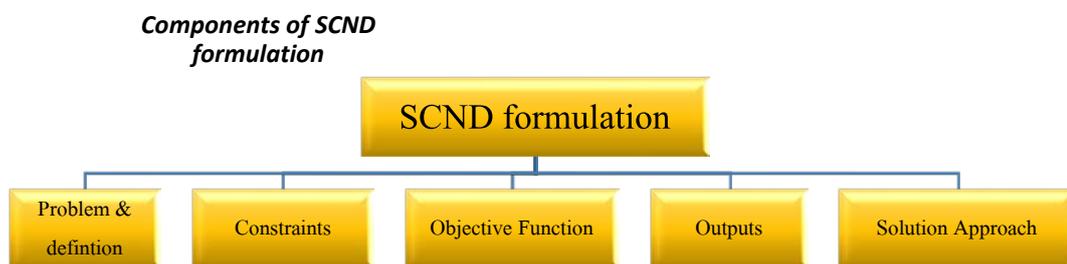


Figure 2 Components of SCND formulation

Source(Nasiri & Jolai, 2018:264)

Volatility, complexity, and ambiguity are three main indications of uncertainty in supply chain management (SCM) which all make future prediction difficult or impossible. Uncertainty, complexity, and high fluctuations in the corporate environment are major effects of globalization at the present. Economic development and prosperity are boosted by free trade between countries. Companies' operations are also becoming more complicated as a result of shifting market demands and a shorter product life cycle (Nasiri & Jolai, 2018:267).

Classification of SCND problem

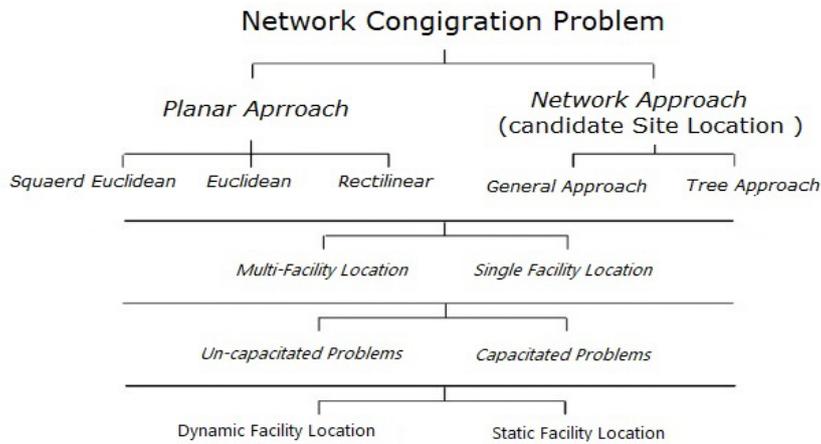


Figure 3 Classification of SCND problem

Source(Nasiri & Jolai, 2018:267)

Due to the changing nature of the business environment, organizations must take into account sources of risk and uncertainty while building their SCs. Strategic choices in an SC should be made by identifying and managing sources of uncertainty within important SC processes. This will enhance risk management and SC efficiency. (Nasiri & Jolai, 2018 : 268)

J. Risk Management and Network Design

Everyone has heard about risk. Despite the lack of a precise definition, we typically associate risk with unpleasant events that may occur. An investment may fail, a train could be late, we could have a car accident, or someone could become sick. Regarding administrators, the risk is the possibility that something may occur that would interrupt routine activity or prevent things from going as planned. If a new product doesn't sell well, a project fails, raw material costs go up, consumers aren't delivered on time, a supplier goes bankrupt, or a warehouse burns down. We can't predict what would occur tomorrow, so we've been taking a gamble. As much as we try to predict the future, it is impossible to do so with accuracy. (Waters, 2007:1)

Risk management is not a new concept. It has been around for centuries. When an insurance firm charges a higher amount for taking risky contracts, or when people pay a higher rate of interest for riskier credit for the bank, risk managing had

already moved beyond its original home in finance. As a result, it has expanded to become an integral element of management and is engaged in most decisions. According to Handy 1999, risk management is not considered separate from management, but rather is the basis of management (Waters, 2007:4).

In past years, risk management has advanced beyond its traditional financial underpinnings and the perception that this is a specific profession performed by statisticians. Conversely, it's growing a wider job that influences the majority of activities and is become a component of management. Risk 4 is the supply chain risk management, according to Handy (1999), and is not a special task from administration, but rather an inherent component of it. Delayed delivery of basic materials can cause manufacturing to be interrupted, increase prices by requiring a switch to shared mobility, resources, or processes, increase work-in-progress inventories, or force partners to rethink their trade ties. According to (Hendricks & Singhal 2003), on the day that an interruption is disclosed, investor profit decreases between 7–8 percent, operational profit drops around 42percent while earnings per share drop around 35 percent. A supply chain faces two types of risk (Waters, 2007:7-8):

- **Internal risks;** delays, excess inventory, bad predictions, and financial risks are all examples of problems that occur in routine operations. Minor accidents occur due to human mistakes, and information technology systems might malfunction for a variety of reasons,
- **Environmental risks;** include disasters such as earth tremors, storms, work stoppages, battles, terrorism, epidemics, rising prices, issues among trade partners, input materials shortages, criminality, noncompliance with laws or regulations, etc. are examples of events that occur outside of the supply chain (Waters, 2007:7-8).

1. Identifying Your Risks

Processes of procurement and supply have grown extremely complicated. External, as well as internal stakeholders, are affected by these value chain risks. One of the most significant concerns is choosing a supply management strategy that is compatible with the organization's operations. Knowing the product's origins, shipment, and delivery timetables, and the supplier's internal procedures are all

important factors in evaluating supplier risks. They must know the conditions under which their suppliers operate, as well as the security measures in place to protect them. This helps to create a delivery lead time, and supplier performance standards, and handle demand and inventory fluctuation concerns (Supply Chain Risk, 2017).

2. Assessing Your Risks

When a process or action is unclear, it creates a certain amount of risk. For a company to protect its value chain, risk assessment has become essential due to changing market circumstances and the rising presence of technology throughout the production process. Because of this, supply chain risk assessment, procurement risks, their possible effects, and methods to manage them are identified and analyzed. He or she must monitor real-time trends, conduct a risk analysis of suppliers and anticipate the price trends. Identifying important stakeholders and their associated risks, as well as assessing their supply capacity and its influence on total price is essential to ensuring supply chain security. (Supply Chain Risk, 2017)

3. Mitigating the Risks

To guarantee procurement regularity and the smooth flow of value chain processes, the business must manage supply chain risks. To safeguard its procurement and guarantee flawless supply chain management, it must create strategies based on supplier market intelligence. To control hazards in the supply chain, (1) supply chain visibility, identification of bottlenecks and appropriate action should be the focus of supply management strategy, (2) quality standards should be established, communicated with the suppliers, and ensured that they are met by the suppliers, (3) supplier's capability and concerns must be recognized, and joint work should be used to eliminate risks that might impede production and overall performance, (4) delays should be minimizing that might be caused by financial difficulties, labor union strikes, and political instability, etc. and company must be alert and monitor supplier's situation (Supply Chain Risk, 2017).

Furthermore, risks can be mitigated by (1) analyzing and identifying current risks and vulnerabilities, (2) priorities based on likelihood and impact of occurrence, (3) assurance of the quality of suppliers, (4) more diversely represented suppliers, (5) keeping an eye on the risks posed by the suppliers, (6) participating with partners in risk planning, (7) cargo Insurance, (8) open and honest communication with partners

(Supply Chain Risk, 2017).

K. Steps for Dealing with Disasters

Any event that causes damage, devastation, ecological disturbance, loss of human life, human suffering, or degradation of health services as defined by the World Health Organization (WHO) is considered a catastrophe (Haghani & Afshar, 2009:1). The supply chain may be affected because of pandemics, nature-induced disasters, the failures and delays in the transportation system, product-related issues, fluctuations in the price of products.

As a result, managing supply chain disruptions requires (1) developing a supply chain emergency strategy, (2) compiling an inventory of products and services, (3) analyzing the supply chain vulnerabilities, (4) identifying the suppliers with backups, (5) providing a broader range of products by diversifying supplier base, (6) working with a logistics professional to develop a plan, (7) implementing risk evaluation tools (Haghani & Afshar, 2009:1).

L. Global Supply Chain

"Global Supply Chain Management" (GSCM) is widely debated by practitioners and academics, but little is known in the literature about the challenges and problems that are now developing in the global supply chain (Lambert & Cooper, 2000). The goal of Lambert and Cooper's study was to identify major determinants of supply chain performance in a complex business environment, and evaluate the hurdles that companies encountered while implementing new "supply chain strategies". Identifying possible unanticipated disturbances to the supply chain's complexities, as well as the resilience necessary to overcome them, researchers and practitioners will get valuable insight into global supply chain sourcing difficulties and opportunities as a result of the concerns that will be highlighted on GSCM problems and practices (Amegashie, 2015:3).

"Global supply chain management" is closely linked to the emergence of internationalization, yet there is no specific time in history since the supply chain begins at a different time for each firm. The architecture, plan, execution, supervision, and tracking of supply chain operations are to produce added value,

develop a competing foundation, influence international logistics, integrate demands, and monitor progress worldwide (Tiwari and Jain, 2013) (Amegashie, 2015:4).

In the 21st century, companies face untold pressures including marketplace expansion, globalization, strong competition, and expanding buyer expectations in a dynamic commercial environment where competitors always upgrade abilities to stay competitive. This helps companies to give superior customer service and decrease total costs via developing logistics abilities (Lau et al., 2019:1). Businesses such as Wal- Mart, Cisco, General Electric, Dell, and Southern Book Company are capable to manage supply chains and root out market volatilities. (Lau et al., 2019:1)

A competitive SC is a key driver for companies to achieve a competitive edge by enhancing efficiency, reducing operating costs, maintaining solid partnerships, raising revenue, and enhancing customer services. As a result, today's corporate competition usually puts one supply chain against another, rather than one firm against another. (Lau et al., 2019:1)

Efficiency in SCM does not depend just on the degree of integration or internal harmonization in each organization, but also connected with other participants along the supply chain. Higher supply chain collaboration promotes innovation in business models and is accepted by companies in more globalized marketplaces where competitive degrees are, as stated previously, no longer measured among companies but between the supply chains themselves (Lau et al., 2019:2).

In a globalized age, extra volatility of supply and demand, quicker product life cycle, and the blurring of usual organizational boundaries occur. Hence, supply networks must be adaptable and flexible sufficient to encounter unstable situations. Keeping this in mind, the SCM aims to decrease operating costs to increase profitability, enhance customer service based on competitiveness and quality, handle expansion and growth, consolidate the leadership situation of the supply chain, and present a constant stream of data, commodities, and funding at various levels of the supply chain (Lau et al., 2019:2).

IV. THE CHANGE IN SUPPLY CHAIN MANAGEMENT STRUCTURE AFTER COVID-19

A. Trends in Post-Crisis Supply Chains

Regarding presenting such worldwide patterns, it's indeed essential to delve into two main points which have been significantly touched by the present situation: The supply chain and business ownership.

Table 3 The actions taken by the supply chain in response to the pandemic

No	Set	Specific Actions
1	Make the multitier supply chain transparent.	Identify major elements and the source of supply Evaluate disruption probability and identifying possible tier 2 and higher risks. If your providers are in a disaster-stricken area, look for alternatives.
2	Increase the capability of manufacturing and distribution.	Examine the effect on processes and the capability of resources. Maintain workers' safety and maintain open lines of communication with them. Depending on the available capability, execute contingency planning and examine the effectiveness on processes. Enhance restricted manufacturing based on the influence on public health, profit, and potential cost/penalty.
3	Determine the end customer's actual demand.	Collaborate with sales and operations planning to identify the needed supply. Make use of consumer straightforward communication methods. Estimate for customers' customers using market analysis information.
4	The accessible inventory Estimation	Calculate inventories at various points throughout the value chain, including spare components and regenerated stock. To keep manufacturing going, use after-sales stock as a bridge.
5	Determine and secure logistics capabilities	Calculate the logistical capability that is accessible. Customs clearance should be accelerated. Given existing exposure, change methods of transportation and pre-book air/rail capacities. Work side by side with all participants to maximize cargo capacities.
6	Monitor the status of your revenue and working capital	Conducting supply-chain simulations against main providers' financial statements to determine whenever supplying concerns become a source of financial or liquidity challenges.

Supply chain recovery is perhaps a much more important topic across the post-pandemic age. During the outbreak, many of the chains, as well as the whole company, were greatly affected. The speed and dependability of the recuperation will

influence not just the current as well as the coming years. According to McKinsey's (2020) analysis, there are six types or sets of activities that could make a supply chain more flexible (Negrutiu, 2021:90).

Kearney continues the research by doing industry-specific analyses. The majority of the conclusions are comparable to those of McKinsey, highlighting the importance of a comprehensive digitalization of the organization. According to (Kearney, 2020), senior management should prioritize the following areas: automation, artificial intelligence, information security, cell phone and e-business, supplier risk management, HR processes, and cost management. Another area that will undergo significant change is the supply chain, particularly before the last deliveries. This tendency had already begun, but the rising health crisis and the growth of e-trading had put distribution networks under pressure. Flexibility and adaptability must accompany end-to-end transparency as well as on deliveries while still maintaining your minimum cost for each item. When it comes to nutrition or groceries distribution networks, which grew exponentially even during crises, there is an extra element of complexity. People who purchased their essential needs online rather than visiting their local convenience shop are willing to keep this behavior. Digitization and omnichannel strategies are required to shift the supply chain within the modern generation. The below Table summarizes the major modifications in supply chain configuration (Negrutiu, 2021:91).

Table 4 Changes in the supply chain

<i>Key change</i>	<i>Actions</i>
<i>Dual sourcing</i>	Maintain stable multi-sourcing among territories (both provider base and production plants) to reduce vulnerability to areas. continuous alternative source credential. IP property for element design tools and manufacturing operations should be increased in order to transfer sources or switch to CMO approaches.
<i>Reduced complexity</i>	Minimize the supply chain's worldwide reach by concentrating it on a small number of places. Main business concerns, including batteries manufacture in the car industry, shouldn't be outsourced.
<i>Localizing</i>	To reduce susceptibility to rising shipping expenses in the event of a crisis, increase the usage of domestic suppliers and production capacity. Reduce risk to international trading stream interruptions caused by union negotiations or situations like COVID-19 allow for lower safety stocks allowing for quicker pivoting in times of disruptions

The study by McKinsey concludes only with private equity (PE) and venture capital (VC) (McKinsey ,2020d). Because investors engage in fresh and ambitious

ventures with the goal of making a profit, this sector is unique in that it serves as a trends and talent hunter. As a result, the beginning wherein PE/VC engaged well after the pandemic would be a strong predictor of the future. The fund managers' primary concern with the current portfolio of investment firms is profitability and liquidity danger. It really is frequently stated that money is power, however for the beginning, it is critical. As they are in the development period, these firms typically have negative cash flows, necessitating the assistance of their own PE/VC. Interaction between entrepreneurs and investment managers is critical here; McKinsey recommends establishing a shared "financial operations room". New threats must be considered once monetary threats have been mitigated, beginning with threats to workers' and clients' health, protection, and efficiency. Often these beginning have tiny staff, and one employee's sickness could put the entire operations of the company in jeopardy. Other threats, both long-term and short-term, but also less apparent ones, must be properly considered. A beginning is a dynamic corporation that may quickly respond to new realities, thus the firm plan must be reviewed with fresh eyes near the end (Negrutiu, 2021:91). Finally, the private equity and venture capital industries should learn from the financial catastrophe of 2008. The first is wealth generation and portfolio optimal during a crisis. A downturn is frequently a chance to close attractive transactions since a fund may acquire at lower valuations than usual. General partners with value-creation teams, according to (McKinsey, 2020d), achieved better profits even during the previous downturn and earned more money subsequently. Additionally, according to the study findings, partners who were more acquisitive during the crisis performed better and made more money. For short and long terms, fund managers who were brave and unfazed in the face of a crisis had superior returns (Negrutiu, 2021:92).

B. Review of the situation of Global Supply Chains During the COVID 19 Crisis: Tariff and Non-Tariff Barriers to Trade

The coronavirus (COVID 19) pandemic has far-reaching human consequences. This disease has impacted people all around the world since it was first reported to the World Health Organization (WHO) back in December 2019. It has been linked to several million verified cases and hundreds of thousands of documented fatalities, according to the CDC. As a result of the pandemic's threats,

the world economy is expected to shrink by 3% in 2020. The pandemic effect is amplified by the global economy's interconnectivity which has spread rapidly through travel and transportation channels. Because of this epidemic, worldwide trade, as well as global supply chains (GSCs) that link manufacturing in different places across the world have been directly affected. In order to minimize inventory and create items only when needed, GSCs frequently rely on specialist suppliers that are sometimes grouped in certain areas. (ILO, 2020:1)

Global trade volume is predicted to fall by between 13 and 32 percent in 2020 with all areas suffering double-digit losses in trade volume while foreign direct investment is expected to plummet by 30 to 40 percent between 2020 and 2021. Initially, industrial reductions in China slowed the spread of COVID 19. Finally, components and equipment for downstream sectors – such as automotive and chemical manufacturing and computer equipment manufacturing, and garment and textile manufacturing – were in short supply (ILO, 2020:2).

In contrast, non-tariff barriers are government-imposed, non-tax measures designed to favor domestic providers over international ones. It's important to note that non-tariff barriers can take several forms. There are a few that don't have a huge impact on the market. Packing and labeling regulations, for example, can be a hindrance, but only minimally. Non-tariff procedures such as limits, non-profit export restraints, trade limitations under the agreement of the effective materials, non-automatic import permissions, and even changeable import taxes have far-reaching consequences (Barriers to Trade 2021). The Supporters of capitalism think that governments should abstain from interfering in the workings of the free market.

Government-imposed restrictions on the movement of international products or services are known as trade barriers. Many times, these constraints aren't evident. Most direct trade barriers are embargoes - a political agreement or blockade that inhibits a foreign country's capacity to export or import goods from the United States. They still exist, but they are difficult to enforce and only used in wartime conditions, so they're not very prevalent. Tariffs, or taxes on imports, are the most frequent trade obstacle. Due to tariffs, imported products cost more than domestic commodities .A government subsidy toward a particular domestic industry is another typical trade obstacle. As a result of subsidies, many items are cheaper to produce than they would be on international markets. There is a resultant reduction in

domestic pricing. Foreign products become more expensive relative to domestic ones as a result of both tariffs and subsidies. (Barriers to Trade, 2021).

Because of the pandemic, in a world dominated by combined and very often just-in-time production operations, the above activities cause noticeable declines in the supply of factory-made merchandise, at first in China, but after a while in the whole world. After March 2020, about 80 countries and customs regions imposed export bans or strict limits as an instant reaction to the global epidemic. The epidemic generated staff shortages at port facilities which hindered the transportation of commodities even more. In many nations, however, employment closures and consequent salary losses lowered demand for retail items and exchanged services (Barlow et al., 2021). Furthermore, there are additional barriers that have emerged due to the crisis because of the closing between cities inside the countries and because of the closure of roads between rural areas and cities as well.

C. Analyze the Changing Structure of Supply Chains in Turkey in Different Sectors

Increased expenses are a result of the COVID-19 pandemic's rapid expansion. Many nations have closed their borders to travelers and halted international flights in order to reduce the expenses associated with the illness. The United States and some other countries raised the alarm and declared a national emergency as a consequence. The whole of Italy and Spain, as well as 13 towns in China, including Wuhan, were quarantined. A partial lockdown was established in France, and Bulgaria declared an emergency (YILMAZ & ÖZAYTÜRK, 2021:1).

Worldwide, schools, universities, and sporting activities were closed, and the 2020 European Football Championship and the 2020 Eurovision Song Contest were postponed to 2021. Airlines such as THY, Air Canada, United Airlines, Finnair, British Airways, and Qatar Airways, have halted flights to China while the United States has halted flights to the European Union and Canada. In China, Tesla and Apple temporarily shut down part of their factories while Starbucks and Ikea chose to shut down more than half of their locations. Volkswagen halted production at its facilities for two weeks, as did Renault, Skoda, Airbus, Fiat, Michelin, Ferrari, Lamborghini, and Maserati as well as Toyota in its Sakarya-Turkey facility. According to the steps taken by both the private and governmental sectors, early

restrictions were placed on the economy's supply side. Stopping production or limiting production capacity in some facilities, particularly the closure of some enterprises in the service and retail sectors resulted in a decrease in productivity while restrictions on travel, imposition of curfews, and decreases in household income all contributed to a decrease in productivity. As a result, the pandemic took on a new dimension that influenced both output and demand for production (Deloitte, 2020). (YILMAZ & ÖZAYTÜRK, 2021:1)

1. Automotive sector

The automobile industry is regarded as one of the most important sectors to have been impacted by the COVID-19 epidemic. To demonstrate, the annual turnover of the automobile sector, which employs about 14 million people, is equivalent to the world's sixth-biggest economy. Despite facing significant challenges in the aftermath of the 2008 global financial crisis as a result of low supply and demand, the industry was able to begin a recovery process (ILO, 2020). However, the advent of the COVID-19 pandemic in China, which is regarded as the “global export base,” had a detrimental impact on supplies. In other words, it caused major interruptions in the delivery of raw materials and other components. The sector nearly came to a stop as a result of production delays throughout Europe and the closure of the assembly plant in the US. Automobile manufacturing, which noticed already a significant drop in worldwide demand, is now under tremendous strain as a result of the COVID-19 epidemic (Vitale, 2020). According to current research data from the survey organization "Counterpoint", a 7 percent drop in worldwide passengers resulted in a 7 percent drop in sales. Furthermore, when the worldwide passenger vehicle figures for 2019 and 2020 (as of July) are reviewed, it is discovered that the automotive sector is facing a global decline in demand, particularly in the United States and Europe. (YILMAZ & ÖZAYTÜRK, 2021:6)

The nature of the automotive sector, which includes the other side and subsectors (textile, steel, chemical, electronics, and so on), has a direct influence on employment and economic growth. Furthermore, shifting customer behaviors have resulted in structural alterations and advances in corporate strategy. The peak in uncertainty during the pandemic era harmed decision-makers, and the largest demand shock in recent years was encountered (Accenture, 2020), (YILMAZ & ÖZAYTÜRK, 2021:7).

2. Health Sector

Because of COVID-19, economic activity has been suspended all across the world for the first time in history (Ducarme, 2020). Many nations in the industrialized world (Japan, the United States, Spain, France, etc.) were unable to satisfy the increasing demand for health care experts, hospitals, and beds as well as other medical equipment and resources as the virus spread. Even in Japan, which has the largest number of hospital beds per capita, there has been a surge in demand for medical equipment and supplies, necessitating expenditures in this area. Although some affluent nations did not take the issue seriously enough. Even today, health institutions are fighting the epidemic while also planning for the future. Every day, more good examples increase the market for medical items, and world-famous multinational businesses like Ford or Suzuki have begun to be engaged in the health industry (YILMAZ & ÖZAYTÜRK, 2021:7).

COVID-19 has also resulted in major advances in information technology. In the pandemic, modern technological applications such as artificial intelligence and big data have come to the core. Currently, cutting-edge technology is being used to make the most efficient use of personnel as well as other equipment and supplies (baslangicnoktasi.org, 2020). As a result, the demand for the health services information technologies market is increasing by the day. The worldwide health information technology industry is estimated to expand from about 228 billion dollars within 2020 to more than 270 billion dollars through 2021 (Markets and markets, 2020). As a result, numerous entrepreneurs are helping the process by developing tools and applications that aid in monitoring COVID-19 (YILMAZ & ÖZAYTÜRK, 2021:7).

3. Food Sector

Because of the ambiguity and lack of knowledge in the early stages of the pandemic, there has been some disagreement about whether the virus is transferred through water and nutrition goods. The Food and Drug Administration of the United States (FDA) stated that the virus was not spread by food or water. However, it was also noted that the virus may live on surfaces for days or even weeks that customers should avoid direct contact with food goods and containers, and that sanitary methods should be used like disinfectant, wet wipes, gloves, etc. (magzter.com,

2020). Furthermore, the virus's transmission to humans via the oral and respiratory tract has resulted in significant changes in customers' dietary and social habits, forcing businesses to make fundamental adjustments to their manufacturing processes. For example, the closing of numerous cafés, restaurants, and dining halls drove individuals to consume at home, causing food-producing industries to be more cautious and conscious of “food safety”. This catastrophic shift in consumer behavior and demand hastened the transfer from the food service channel to the retail channel. To put it another way, consumers' rejection of ready-made meals and adoption of a consuming habit of producing their consumable items under their supervision have resulted in a considerable demand increase in the retail industry (Labs, 2020), (YILMAZ & ÖZAYTÜRK, 2021:7-8).

4. Tourism sector

Tourism is a fast-growing industry that contributes significantly to the economic prosperity of developing countries. The tourist industry influences and is influenced by variables such as the environment, technology, politics, and society. In addition, the tourist industry is impacted by unanticipated events such as terrorist attacks, political incidents, and diseases. With its demand dimension, the sector has a dynamic structure that responds quickly to changing conditions, either favorably or adversely (YILMAZ & ÖZAYTÜRK, 2021:8).

Due to its dynamic structure, it is one of the industries most afflicted by the Coronavirus outbreak. The fast-spreading of COVID-19 around the world through March 2020 put global tourism to a halt. Travel restrictions, airline cancellations, and the closure of touristic facilities all had an immediate impact on the supply and demand for local and international tourism services. Tourism has a multiplier impact on sectors such as agriculture, transportation, handicrafts, and food-beverage services, and these industries are also facing significant challenges as a result of COVID-19 (ILO, 2020). According to a report issued by the United Nations World Travel Organization (UNWTO), diseases and worldwide crises encountered before the COVID-19 pandemic decreased tourism demand, but not to the point of bringing tourism to a halt. While there was a 0.4 percent drop in the world during the SARS outbreak of 2003, the total number of visitors worldwide died only by 4 percent during the global economic crisis of 2009. Furthermore, around 1.5 billion individuals participated in tourism activities worldwide in 2019. Due to international

tourism limitations, the World Tourism Organization predicts that foreign visitor visits would drop by 20-30% in 2020 (YILMAZ & ÖZAYTÜRK, 2021:9).

5. Transportation sector

The global quarantine has resulted in the confinement of one-third of the world's population in their homes, causing significant harm to transportation firms. This scenario has a particularly severe impact on airline businesses (ULISA12, 2020). Flight restrictions to China and Iran were implemented in Turkey on February 3 and February 23 respectively and were followed by flight restrictions to South Korea, Iraq, and Italy on February 29. The number of nations to which flights were prohibited had reached 68 as of March 21, 2020. Along with Turkey, several other nations, including China, the United States, Italy, Spain, the Czech Republic, and Poland, suspended flights to other countries. Since the commencement of the COVID-19 epidemic in December 2019, airline businesses' customer income per kilometer has fallen by 40%. As a consequence of the detrimental impact of the COVID-19 epidemic on demand for air transportation, American Airlines, and Southwest Airlines, the two largest airlines in the United States, stated that they lost money in the second quarter of the year (YILMAZ & ÖZAYTÜRK, 2021:10).

Furthermore, because of the continued impacts of COVID-19, the other airline firms' 2020 sales were anticipated to fall by at least \$100 billion. Domestic and international travel restrictions have been lifted as part of the “new normalization” process conducted in Turkey and other countries, and a number of steps have been done to restore public trust in air travel and to stimulate demand for air transportation. The reduction in trust in air travel has also reduced demand. However, governments began to open their borders after April 2020, and the growth in demand for air transportation was followed by increased trust in air travel (YILMAZ & ÖZAYTÜRK, 2021:10).

6. Energy sector

COVID-19 has a significant impact on energy resources, which are the primary inputs of the contemporary world. The demand for oil, natural gas, and other energy resources has fallen significantly as a result of COVID-19. Travel restrictions have reduced the movement of nearly three billion people to the bare minimum. Furthermore, flight limitations in the aviation industry, which account for 60% of

total oil use, have harmed oil demand. The slowdown of the industrial sector and the decrease in trade volume have played a significant influence on the fall in oil consumption (Deloitte, 2020). All of these circumstances have resulted in a supply-demand mismatch. During COVID19 when oil demand was dropping, Saudi Arabia boosted its oil production capacity. This resulted in an oversupply of supply which was reflected in oil prices as a dramatic reduction. The IEA study indicated that, in addition to a decline in the production propensity of several oil-dependent industries, major importing nations such as China and Europe reduced their oil imports. As a result, world demand for oil decreased. This virus has not only disrupted supply networks in China but has also reduced industrial production throughout the world by accelerating the global cyclical recession.(YILMAZ & ÖZAYTÜRK, 2021:10-11)

7. Banking and Finance Sector

The banking and finance industry, which was severely harmed during the 2008 global crisis, has now been severely harmed by COVID-19 (BIS, 2020). COVID-19 is intensifying the uncertainty climate in overall economies, and this uncertainty carries it with danger and anxiety, badly influencing the financial market (TEPAV, 2020). The market's reaction to risk and anxiety has influenced financial capital flows, direct foreign investments, international banks, and currency exchange rates. (YILMAZ & ÖZAYTÜRK, 2021:11)

An investor who wishes to invest in a country will offer financing to the government in return for the bonds he or she purchases so that at the end of the period, the investor receives his or her capital back. However, if he feels that the country in which he has invested may be unable to pay its obligations, he can protect his/her investment by insuring it against default risk. This circumstance necessitates the use of CDS. According to TEPAV's (2020) study, CDS premiums in nations with the largest number of COVID-19 cases, such as China, the United States, and Italy, have increased fast. On the other hand, the problem of loan suppression to underprivileged parts of society has a detrimental impact on banks and financial organizations. The closure of firms in various industries, the slowdown or stopping of production, a fall in revenues, and employees being compelled to stay at home all have a negative impact on debt rollover and the increase in non-performing loans. The need and demand for liquidity are growing as a result of COVID-19 and the

actions implemented. To relieve the unavoidable issues in the banking and financial industry, governments and central banks should give different assistance packages such as providing liquidity, deferring corporate tax and credit obligations, and supporting SMEs. To handle this process, the Turkish government launched the “Economic Stability Shield” package on March 18, 2020, intending to create a buffer against any supply and demand shocks. The limitations imposed as a result of COVID-19 are likely to force the closure of several industries, and restrictions on social activities may cause the closure of numerous enterprises in the service and manufacturing sectors. (YILMAZ & ÖZAYTÜRK, 2021:11-12)

D. Reviewing the Predictions of The Future Supply Chains

As part of the future supply chain initiative, for example, a wide supply chain view was established, starting with sourcing and progressing through production, transportation, and finally to the store or customer (Chukwuma, 2020:5). In the future: (1) the value chain must be viewed as a whole and not as a series of isolated silos, (2) the physical construct and mechanics of the supply chain must be re-evaluated, (3) information exchange along the value chain must be real-time, adaptable, and standard with consumer-driven demand data as the starting point, (4) shopping from home and neighborhood distributing can coexist with a time-tested store-oriented supply chain (Chukwuma, 2020:6-7).

It will need a fresh approach to measure the future value chain, an approach that is tailored to new criteria. KPIs like availability to consumers (percentage in stock) and reduction in costs, and also gross profit margin, operating cash flow ratio, ROI, or brand equity are used to measure most supply chains in today's supply networks (Chukwuma, 2020:6).

The KPIs mentioned above may be used to assess supply chain proficiency, but they do not go far enough in terms of supply chain resilience. Additional key performance indicators (KPIs) include:

Energy consumption: Organizations and companies should seek to employ increased renewable energy sources while consuming less total energy. According to the International Energy Outlook 2007 (IEO2007), global energy

consumption is expected to increase by 57 percent from 2004 to 2030(Chukwuma, 2020:6),

- **CO2 emissions:** When it comes to transportation, the quantity of CO2 released is proportional to the vehicle's weight, type, and the mileage traveled. CO2 emissions are closely related to the type of energy used to run warehouses and stores. Governments are increasingly promising to cut CO2 emissions and passing legislation to do so. For example, the British Climate Change Bill, which was issued in November 2007, established a legislative target for the country to reduce national carbon dioxide emissions by 60 percent by 2050. Alternatively, the United States energy bill seeks a 40 percent increase in fuel mileage requirements for cars and trucks by 2020 to a median of 35 miles a gallon (Chukwuma, 2020:6-7),
- **Traffic congestion:** Different government agencies and regulatory authorities are using this new measure as a deterrent to inner-city pollution and congestion. Numerous metropolitan areas had established schemes that charge or prohibit the entry of cars into urban areas. Some motorists in London's Congestion Fee Zone, for example, must pay a congestion charge. In Netherlands' capital city Amsterdam where 5,000 trucks pass through the city center every day with certain limitations on truck weight and length, as well as limited time slots, for replenishing the city's supply (Chukwuma, 2020:7),
- **Water consumption:** Environmental changes will occur as a result of a decrease in the availability of drinking water. The rising concern has led authorities and non-governmental associations to develop policies and awareness campaigns (Chukwuma, 2020:7),
- **Security compliance:** In the future years, there will be a lot of attention. Everyday procedures should include recovering action programs including both data and physical operations. In order to ensure the safety of people and the traceability of products according to laws, security standards in warehouses and transportation must be strengthened. Even in bigger and more sophisticated collaborative forms, future supply

chains will have to prove their stability and dependability. Companies should keep a close eye on their compliance levels (Chukwuma, 2020:7)

V. RESEARCH METHODOLOGY & QUESTIONNAIRE DESIGN

In this chapter, researchers discuss the research analysis in detail. The collected data in this survey are presented in various tables in this chapter along with hypothesis testing frequency tables, regression models, factor analyses, and correlation analyses. The questionnaire comprises two parts. The first part demonstrates the demographic data of surveyed sample, and the latter part discusses the various factors in the context of job satisfaction and dissatisfaction. I started with descriptive statistics followed by some statistical models for further analysis.

A. Conceptual Framework and Hypotheses

The goal of this study is to track company behavior and responses to the coronavirus outbreak.

The dependent variable for the study is the Changing structure of SCM after Covid-19 and the independent variables of the conceptual framework for the study are digitalization, diversification, localization, and flexibility.

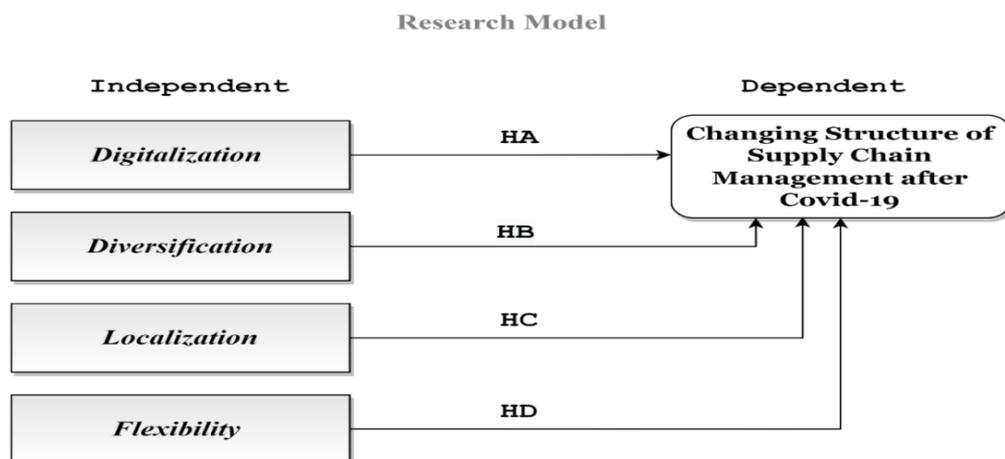


Figure 4 Research Model

HA0=Digitalization has an impact on the changing structure of SCM after Covid-19.

HA1=Digitalization has no impact on the changing structure of SCM after Covid-19.

HB0=Diversification has an impact on the changing structure of SCM after Covid-19.

HB1=Diversification has no impact on the changing structure of SCM after Covid-19.

HC0=Localization has an impact on the changing structure of SCM after Covid-19.

HC1=Localization has no impact on the changing structure of SCM after Covid-19.

HD0=Flexibility has an impact on the changing structure of SCM after Covid-19.

HD1=Flexibility has no impact on the changing structure of SCM after Covid-19.

B. Demographic analysis

The first part demonstrates the demographics of the selected sample of the survey. The below tables display the demographic data that includes industry, occupation, number of employees, company city, and time spent in the respective company.

Question A: Industry

Among the 280 respondents, 91 (32.5%) of them Manufacturing, 148 (52.9%) Wholesaler, 17 (6.1%) Retailer, 6 (2.1%) e-business, 14 (5.0%) Service, 4 (1.4%) Cargo / Logistics, that means the majority of this study is from wholesalers

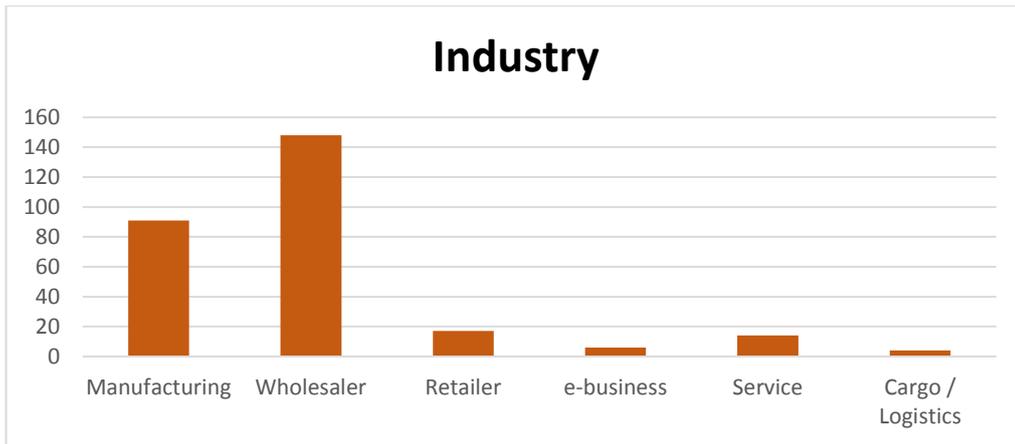


Figure 5 Demographic Industry

Question B: Respondent position

Among the 280 respondents, (163) 58% from top management, around (92) 33% from middle management, from first-line management (9) 3.2%, and lastly from normal employees (non-manager) is (16)5.7%. That is mean the majority of this study is from top management.

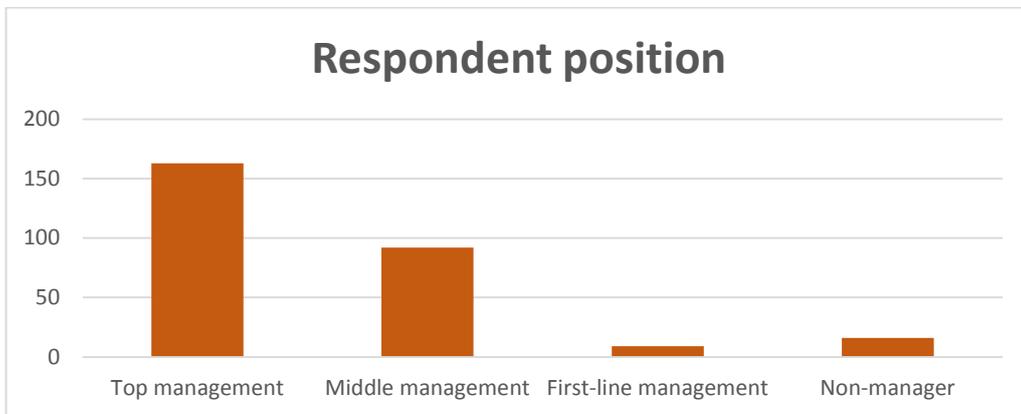


Figure 6 Demographic Respondent position

Question C: Years in operation

Among the 280 respondents, the company age in which respondents have applied. 158(56%) of companies age between 1 to 3 years, 9 (3%) from companies age between 3 to 5 years, from companies age between 5 to 10 years is 17 (6.1%), and lastly from company age more than 10 years is 96 (34.3) %.

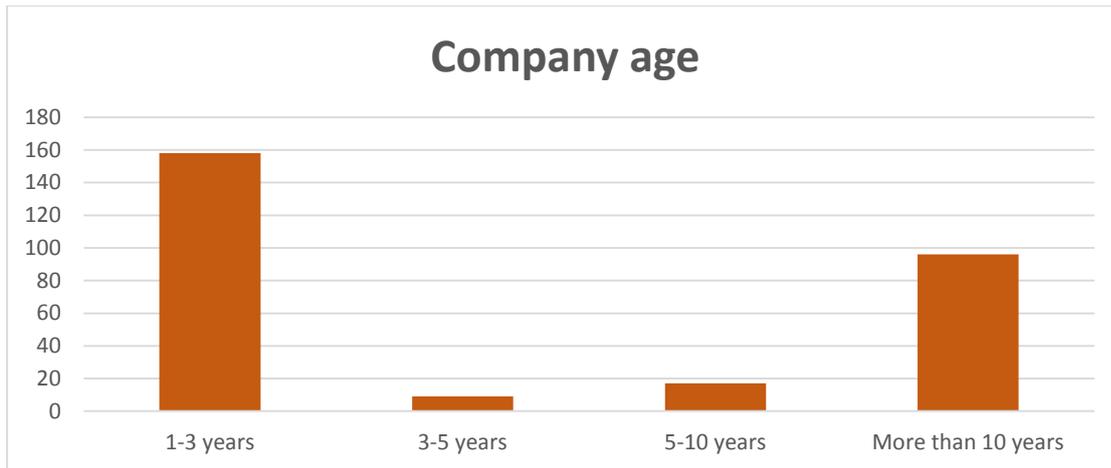


Figure 7 Demographic Years in operation

Question D: Number of employees

Among the 280 respondents, the number of employees in a company for which respondents have applied. 156 (55.7%) from the micro company (less than 10 employees), 31(11.1%) from companies of small size (employees between 10 to 50), companies of medium size is 70 (25%) (employees between 50 to 250), and lastly, large companies are 23 (8.2%) (greater than 10 employees).

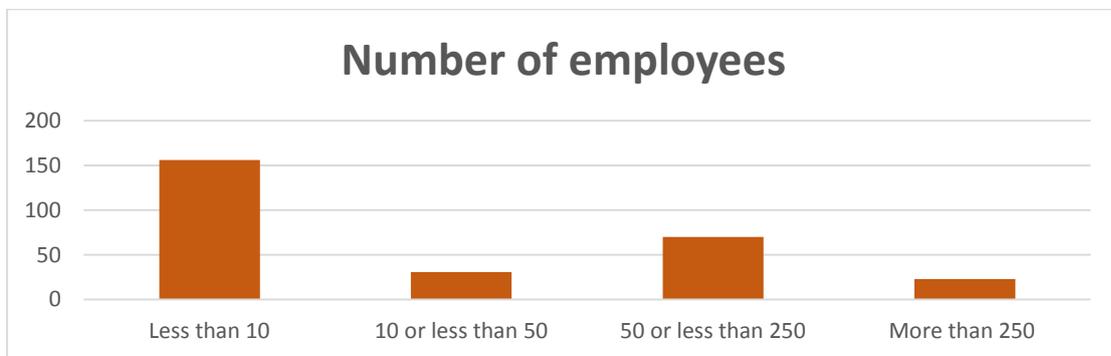


Figure 8 Demographic Number of employees

Question E: Company City

Among the 280 respondents, the company city operation for which respondents have applied. 2 (0.7%) from the Bursa, 5 (1.8%) from companies of Gaziantep, companies of Istanbul city is 269 (96.1%), and lastly, companies from Izmir are a 4 (1.4%). that is mean the majority of this study will be evaluated the companies in Istanbul city.

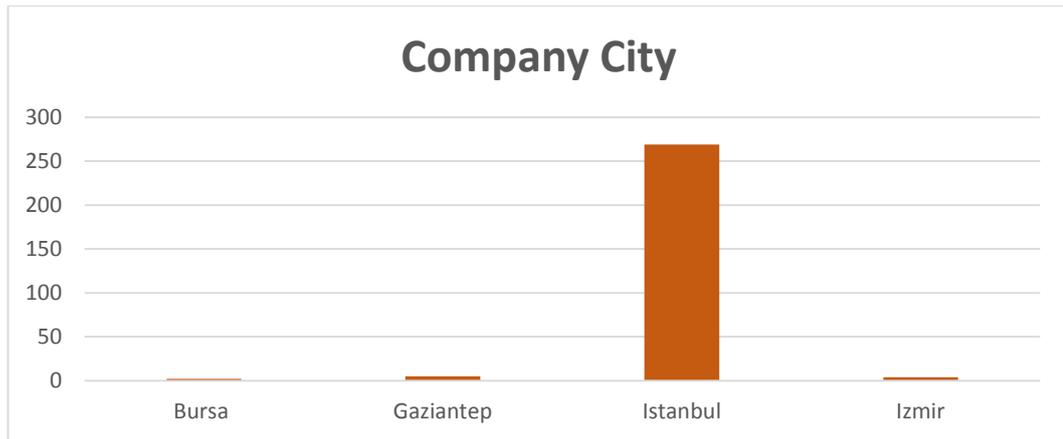


Figure 9 Demographic operation city

C. Frequencies

1. Questions for SCM

Q1: Our firm has changed its supply chain management approach due to Covid-19.

Among the 280 respondents, 114 (40.7%) strongly agreed, 155 (55%) agreed, 7 (2.5%) responded neutrally, 3 (1.1%) disagreed, although 1 (0.4%) replied with strong disagreement.

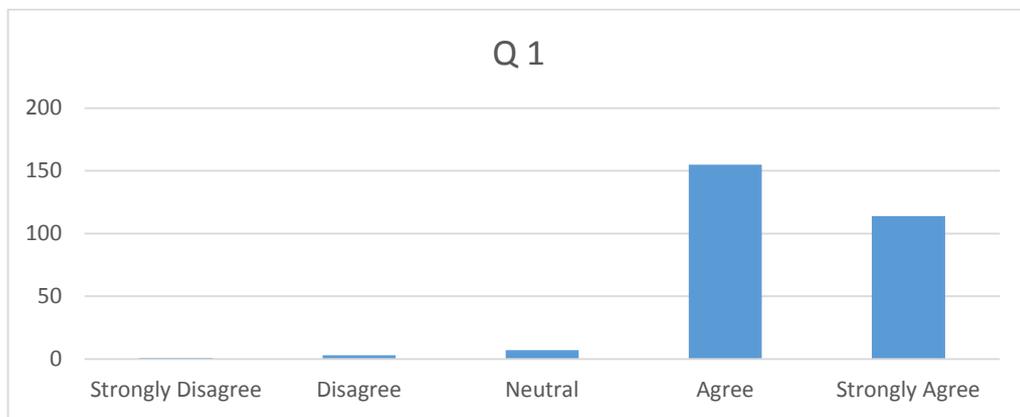


Figure 10 SCM Q1

Q2: Our firm has reorganized its supply chain policies temporarily due to Covid-19.

Among the 280 respondents, 112 (40%) strongly agreed, 105 (37.5%) agreed, 53 (18.9%) responded neutrally, 10 (3.6%) disagreed.

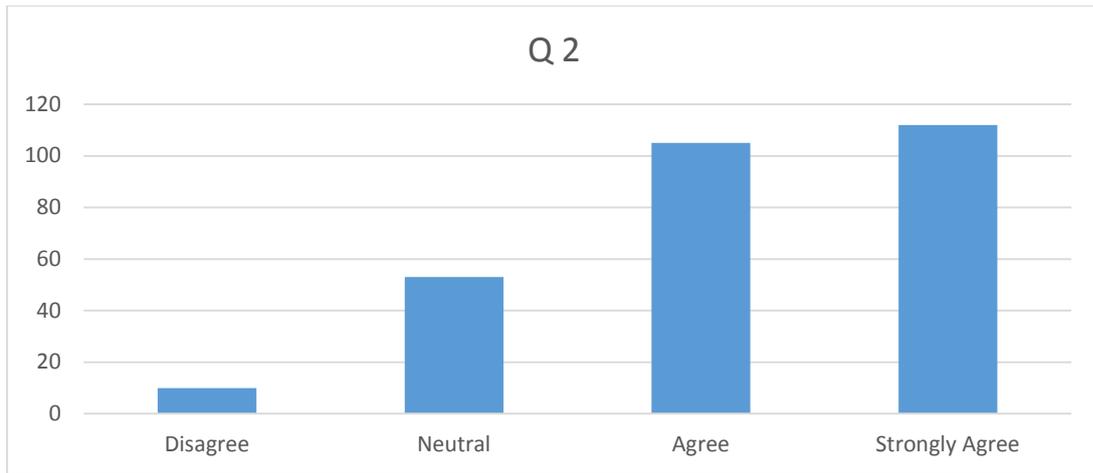


Figure 11 SCM Q2

Q3: Our firm has reorganized its supply chain policies permanently due to Covid-19.

Among the 280 respondents, 99 (35.4%) strongly agreed, 146 (52.1%) agreed, 31 (11.1%) responded neutrally, 3 (1.1%) disagreed, although 1 (0.4%) replied with strong disagreement.

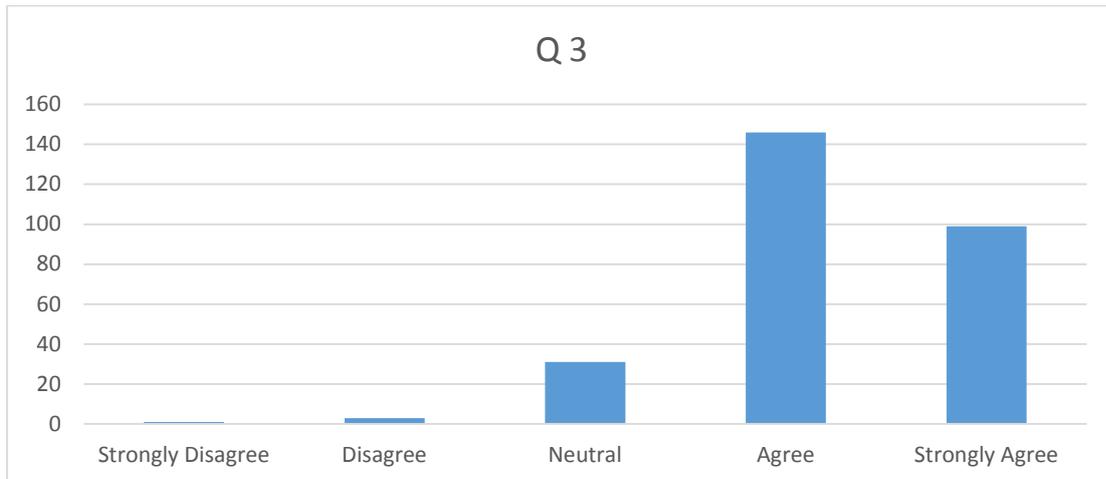


Figure 12 SCM Q3

Q4: Our firm has restructured and will continue to restructure its supply chain policies after Covid-19 since we learned lessons from Covid-19—gains, losses, risks, and opportunities

Among the 280 respondents, 154 (55%) strongly agreed, 117 (41.8%) agreed, 4 (1.4%) responded neutrally, 2 (0.7%) disagreed, although 3 (1.1%) replied with strong disagreement.

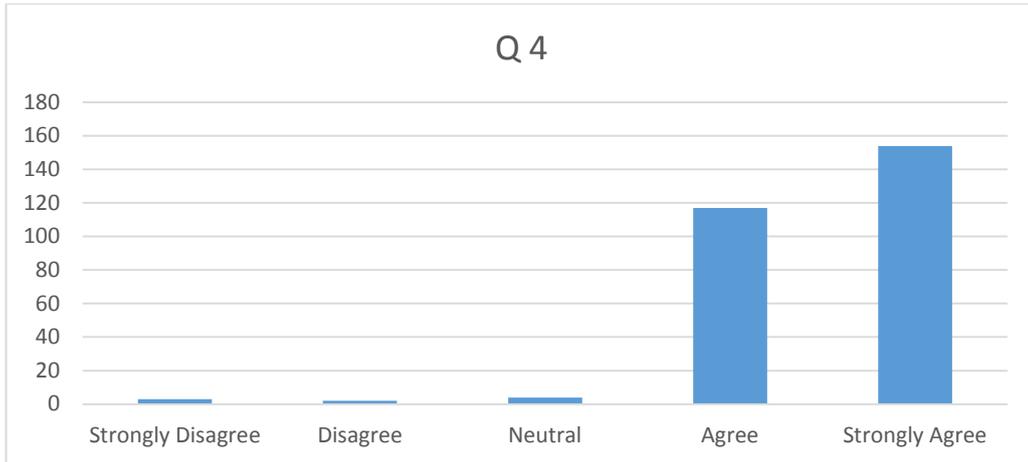


Figure 13 SCM Q4

Q5: Our firm has restructured and will continue to restructure its supply chain policies after Covid-19 due to global conditions and changing business trends in supply chain management.

Among the 280 respondents, 126 (45%) strongly agreed, 140 (50%) agreed, 10 (3.6%) responded neutrally, 3 (1.1%) disagreed, although 1 (0.4%) replied with strong disagreement.

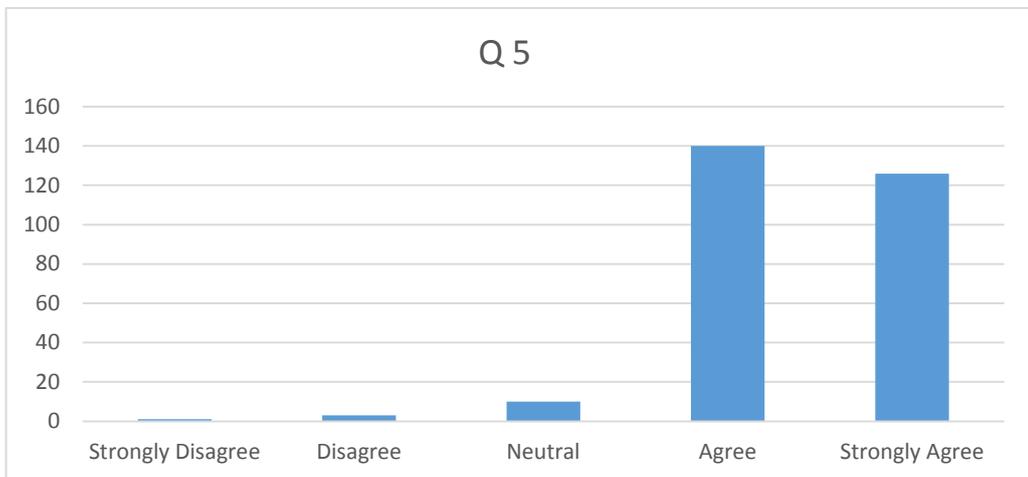


Figure 14 SCM Q5

2. Questions for Digitalization

Q6: Our firm has turned most of the paper-based formalities into digital after Covid-19.

Among the 280 respondents, 135 (48.2%) strongly agreed, 136 (48.6%) agreed, 4 (1.4%) responded neutrally, 3 (1.1%) disagreed, although 2 (0.7%) replied with strong disagreement.

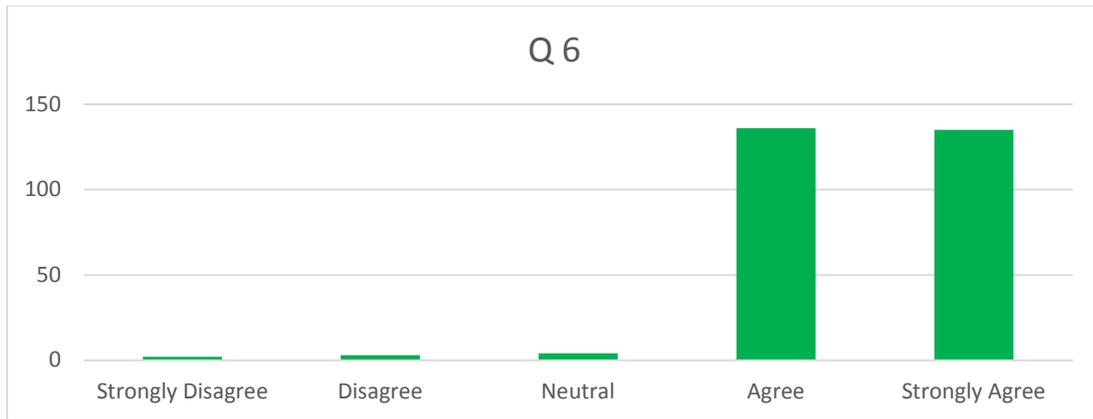


Figure 15 Digitalization Q6

Q7: Our firm has been suffering from a lack of digitalization since Covid-19.

Among the 280 respondents, 101 (36.1%) strongly agreed, 118 (42.1%) agreed, 57 (20.4%) responded neutrally, 4 (1.4%) disagreed.

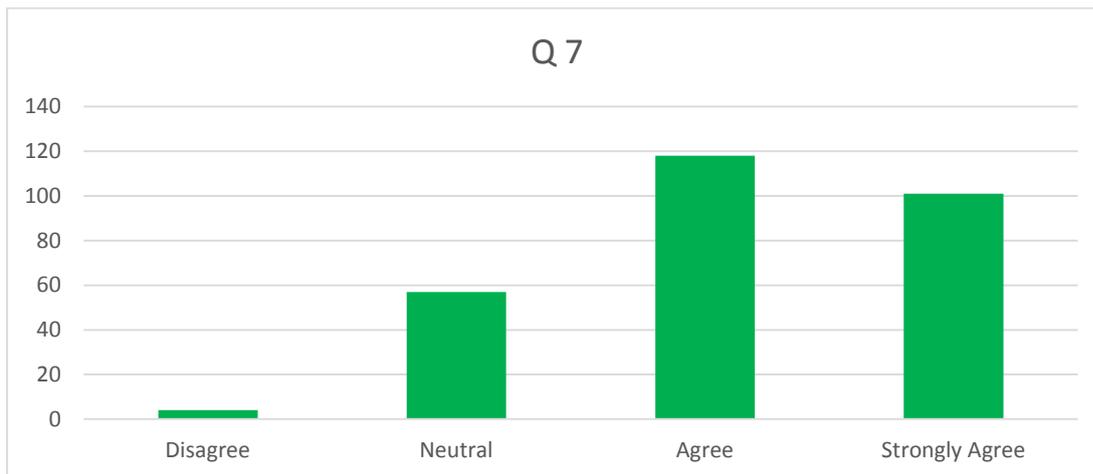


Figure 16 Digitalization Q7

Q8: Our Communication and business process with customers became more digitalized after Covid-19.

Among the 280 respondents, 169 (60.4%) strongly agreed, 107 (38.2%) agreed, 2 (0.7%) responded neutrally, 2 (0.7%) disagreed.

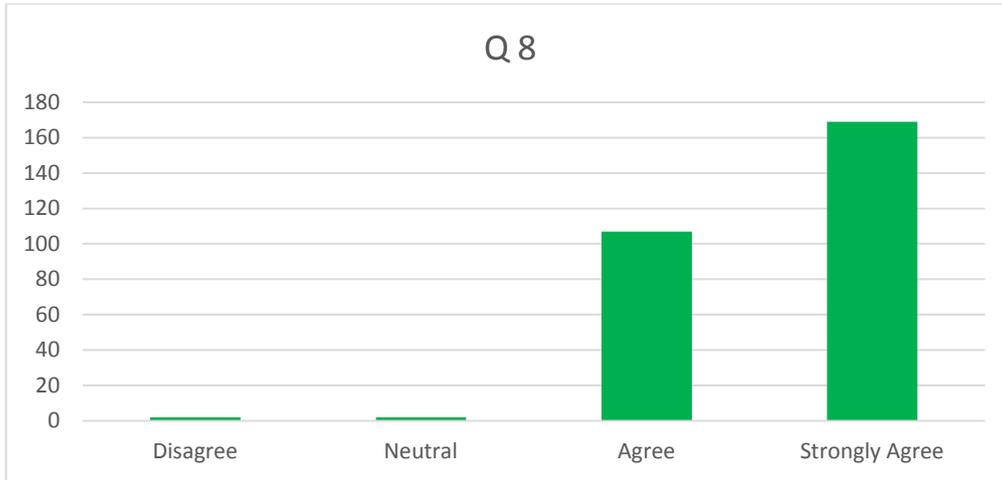


Figure 17 Digitalization Q8

Q9: Our communication and business process with suppliers became more digitalized after Covid-19.

Among the 280 respondents, 156 (55.7%) strongly agreed, 121 (43.2%) agreed, 2 (0.7%) responded neutrally, 1 (0.4%) disagreed.

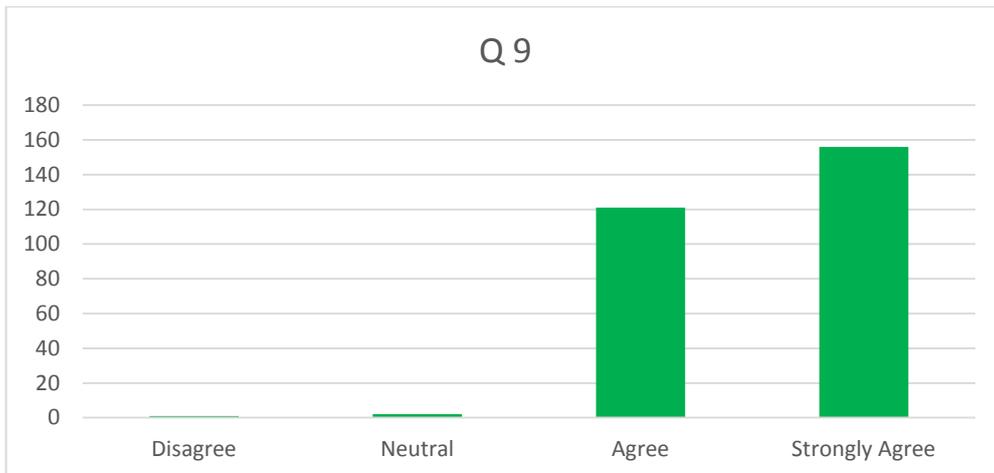


Figure 18 Digitalization Q9

Q10: Digitalized logistics information systems (LISs) were a preference before Covid-19, however; we have been, and we will be using LIS more in supply chain management even after the Covid-19 since it became a necessity for SCM success.

Among the 280 respondents, 140 (50%) strongly agreed, 135 (48.2%) agreed, 3 (1.1%) responded neutrally, 2 (0.7%) disagreed.

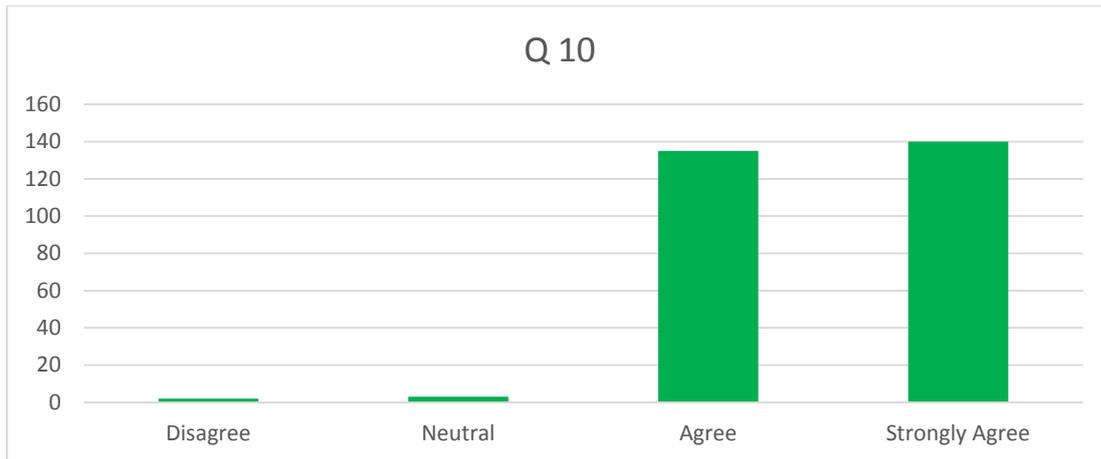


Figure 19 Digitalization Q10

3. Questions for Diversification

Q11: Our firm’s supply chain became more diversified after Covid-19.

Among the 280 respondents, 141 (50.4%) strongly agreed, 133 (47.5%) agreed, 4 (1.4%) responded neutrally, 1 (0.4%) disagreed, although 1 (0.4%) replied with strong disagreement.

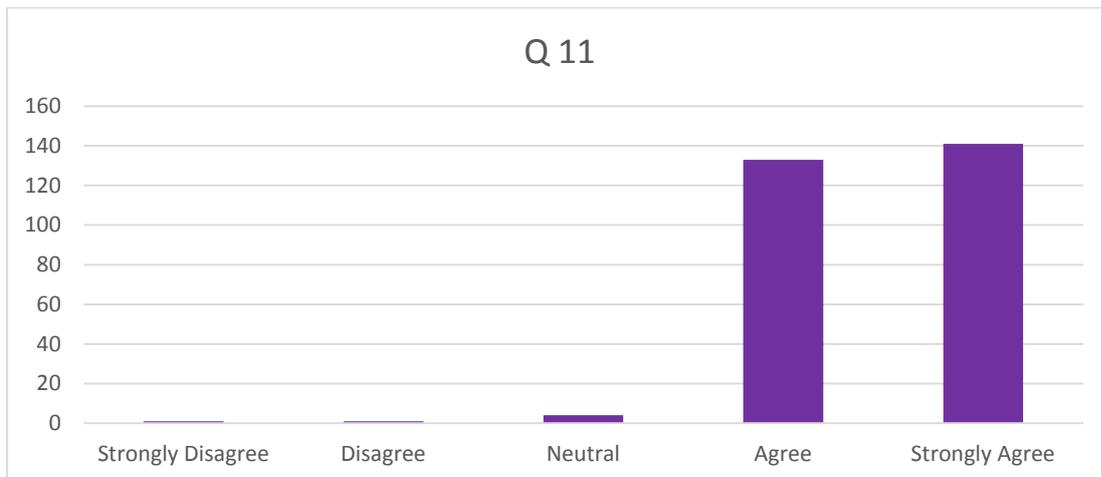


Figure 20 Diversification Q11

Q12: Our firm has been using a multi-source strategy for supply chain success after the Covid-19 outbreak.

Among the 280 respondents, 109 (38.9%) strongly agreed, 166 (59.3%) agreed, 3 (1.1%) responded neutrally, 2 (0.2%) disagreed.

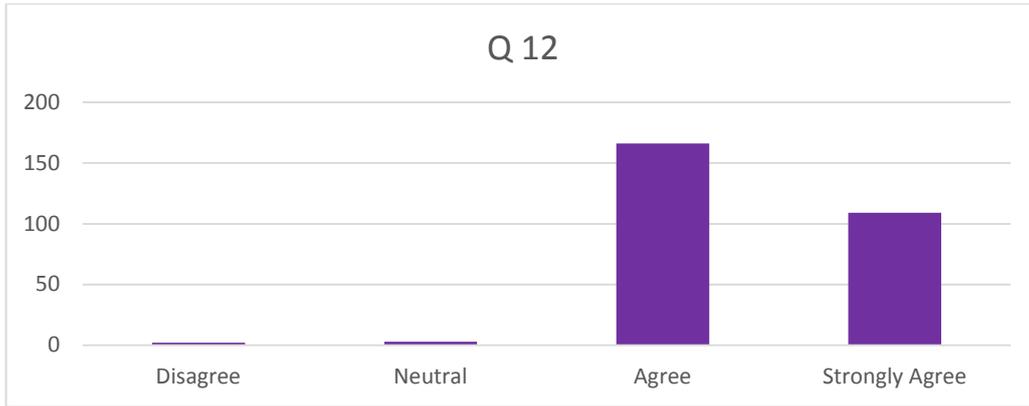


Figure 21 Diversification Q12

Q13: Our firm has diversified its range of products after Covid-19.

Among the 280 respondents, 88 (31.4%) strongly agreed, 169 (60.4%) agreed, 18 (6.4%) responded neutrally, 5 (1.8%) disagreed.

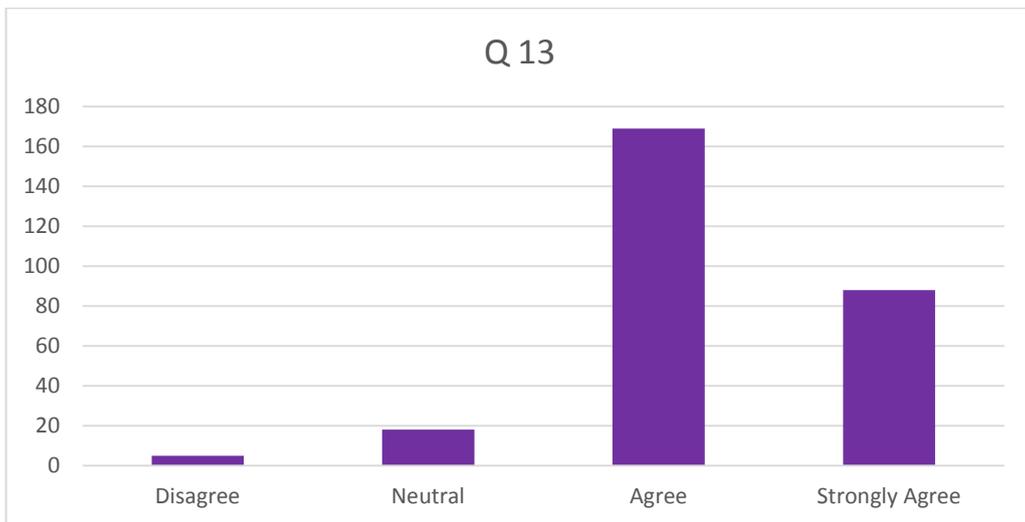


Figure 22 Diversification Q13

Q14: Our firm has diversified its inventory and concentrated on inventory management after Covid-19.

Among the 280 respondents, 108 (38.6%) strongly agreed, 123 (43.9%) agreed, 46 (16.4%) responded neutrally, 3 (1.1%) disagreed.

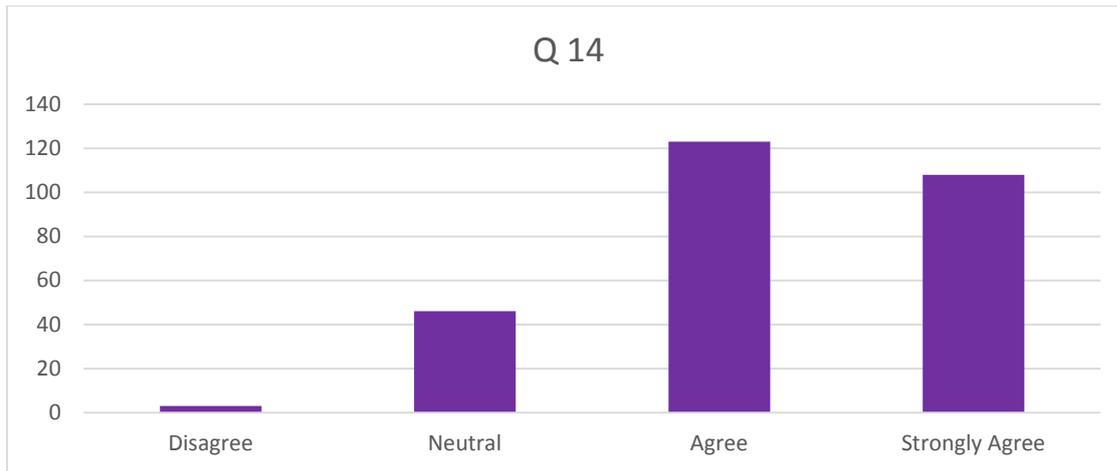


Figure 23 Diversification Q14

Q15: Our firm has diversified its Ecosystem partnerships and manufacturing network after Covid-19 to benefit from multiple supply locations.

Among the 280 respondents, 83 (29.6%) strongly agreed, 152 (54.3%) agreed, 39 (13.9%) responded neutrally, 5 (1.8%) disagreed, although 1 (0.4%) replied with strong disagreement.

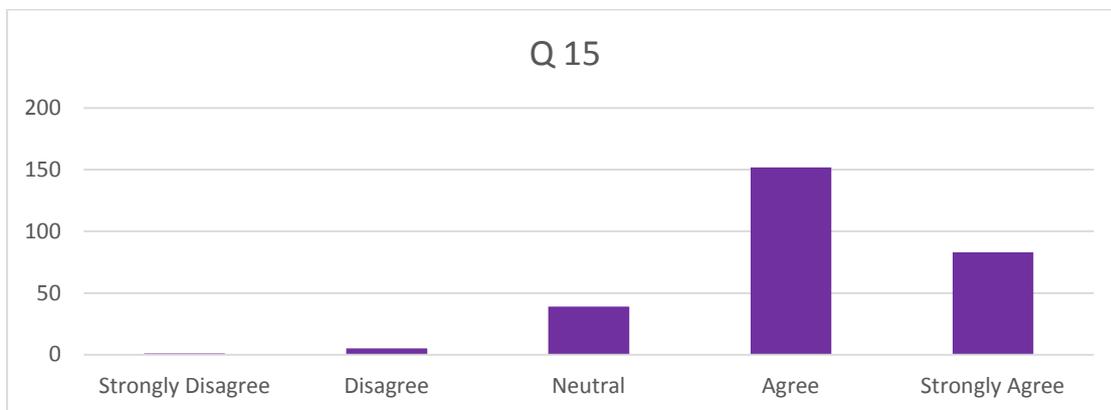


Figure 24 Diversification Q15

4. Questions for Localization

Q16: Our firm has been using a near-sourcing strategy for supply chain success after the Covid-19 outbreak.

Among the 280 respondents, 131 (46.8%) strongly agreed, 144 (51.4%) agreed, 3 (1.1%) responded neutrally, 1 (0.4%) disagreed, although 1 (0.4%) replied with strong disagreement.

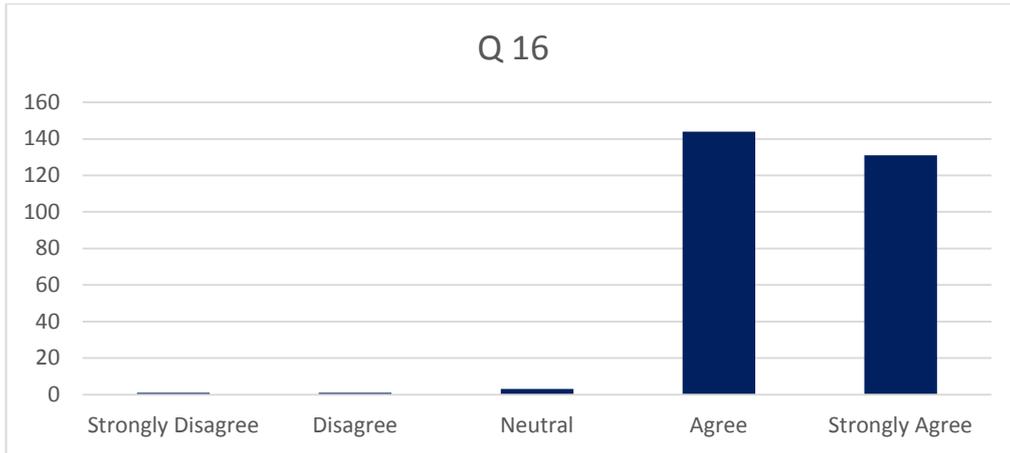


Figure 25 Localization Q16

Q17: Our firm turned to local suppliers after covid-19 since they became more attractive due to increased transportation prices of distant suppliers.

Among the 280 respondents, 118 (42.1%) strongly agreed, 141 (50.4%) agreed, 10 (3.6%) responded neutrally, 3 (1.1%) disagreed, although 8 (2.9%) replied with strong disagreement.

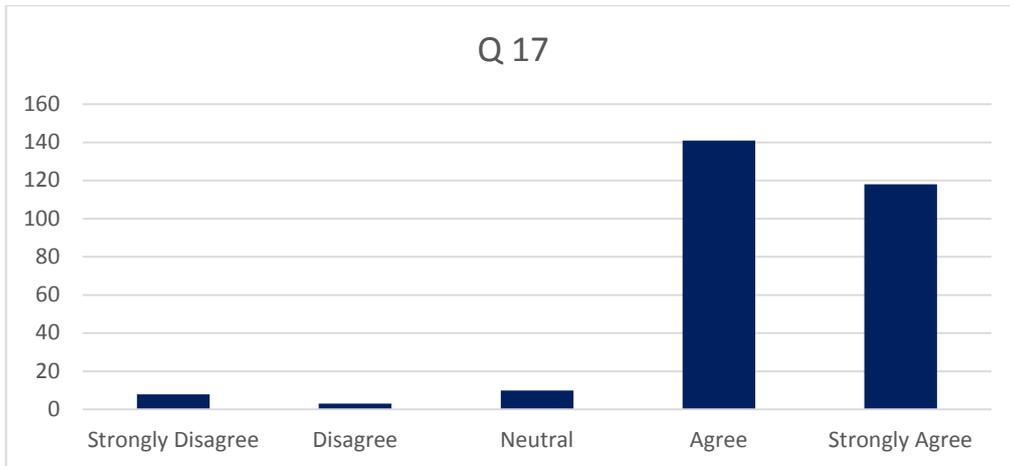


Figure 26 Localization Q17

Q18: Our firm has been using local or regional suppliers more after the Covid-19 to avoid supply chain disruptions.

Among the 280 respondents, 136 (48.6%) strongly agreed, 130 (46.4%) agreed, 6 (2.1%) responded neutrally, 1 (0.4%) disagreed, although 7 (2.5%) replied with strong disagreement.

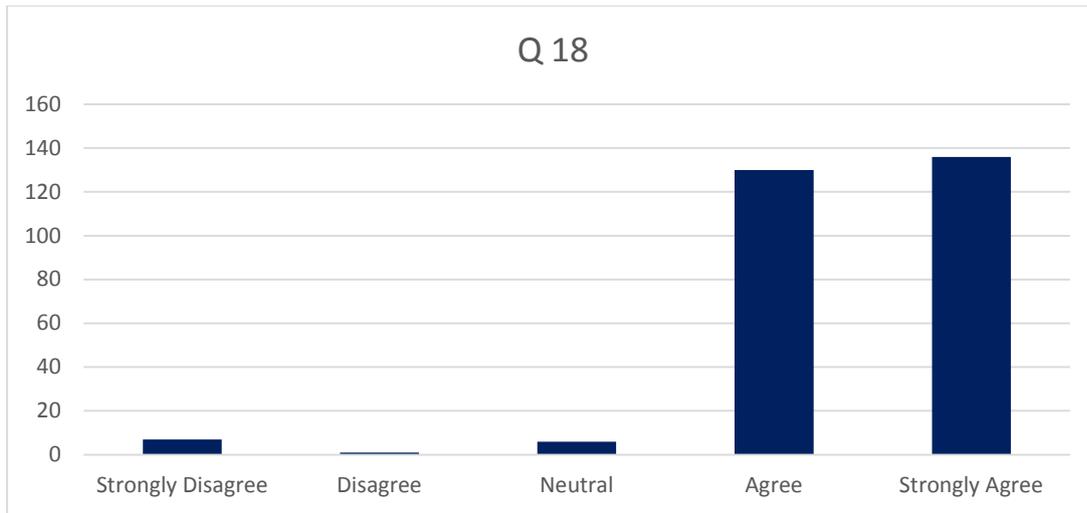


Figure 27 Localization Q18

Q19: Our firm turned to local markets for sourcing due to Covid-19 restrictions on the free movement of goods

Among the 280 respondents, 112 (40%) strongly agreed, 154 (55%) agreed, 12 (4.3%) responded neutrally, 2 (0.7%) disagreed.

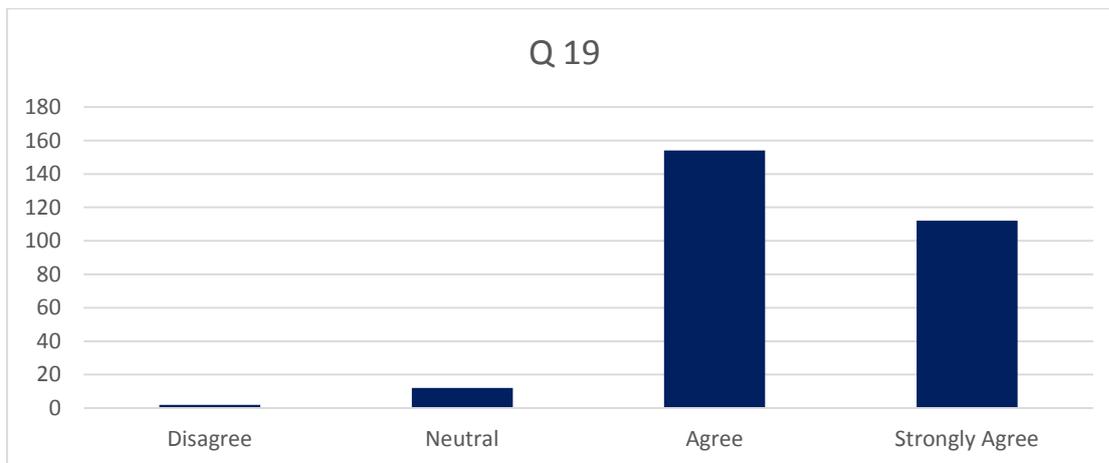


Figure 28 Localization Q19

Q20: Our firm turned to domestic consumers due to Covid-19.

Among the 280 respondents, 106 (48.6%) strongly agreed, 144 (51.4%) agreed, 17 (6.1%) responded neutrally, 5 (1.8%) disagreed, although 8 (2.9%) replied with strong disagreement.

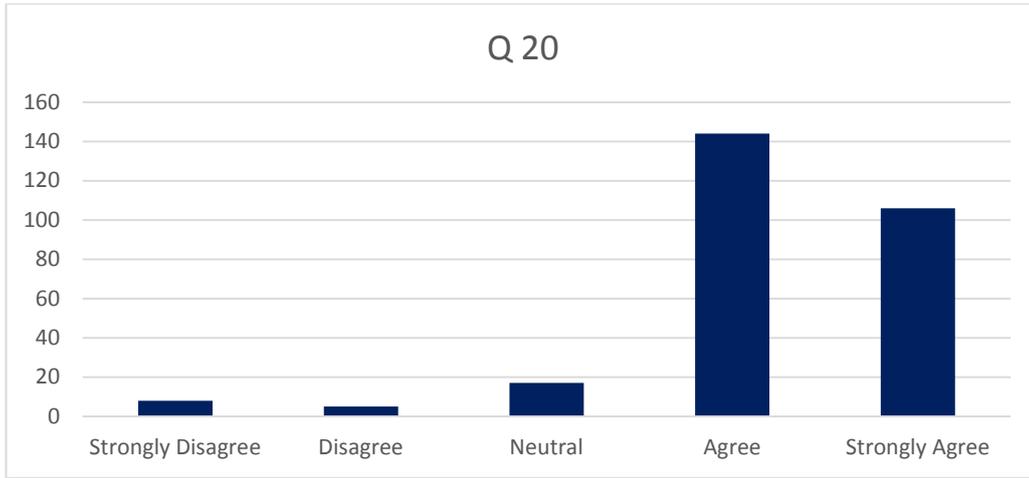


Figure 129 Localization Q20

5. Questions for Flexibility

Q21: Our firm followed a flexible manufacturing system strategy due to Covid-19.

Among the 280 respondents, 120 (42.9%) strongly agreed, 153 (54.6%) agreed, 6 (2.1%) responded neutrally, 1 (0.4%) disagreed.

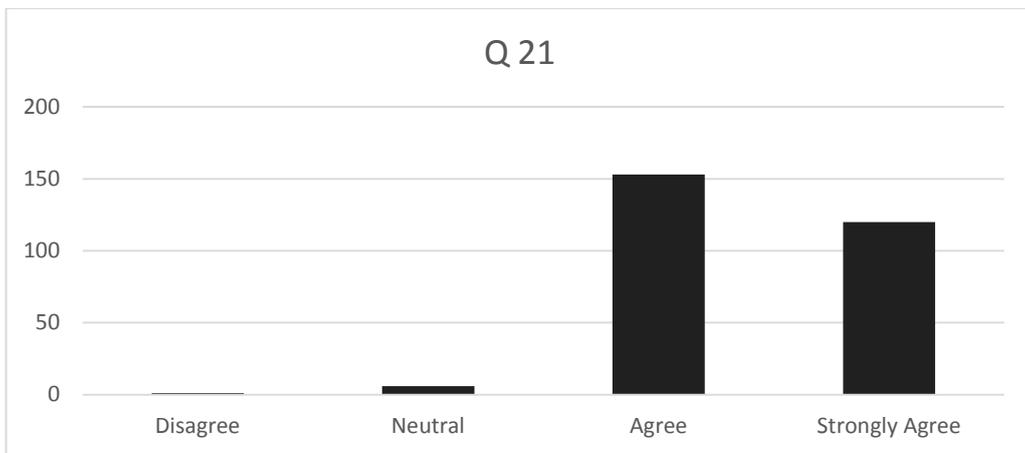


Figure 30 Flexibility Q21

Q22: We learned and implemented change management to our business after Covid-19.

Among the 280 respondents, 157 (56.1%) strongly agreed, 120 (42.9%) agreed, 3 (1.1%) responded neutrally.

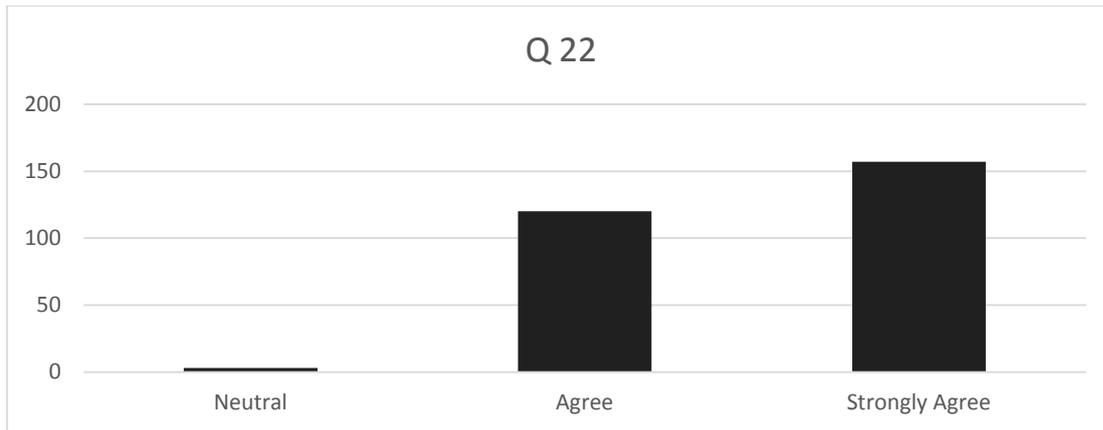


Figure 31 Flexibility Q22

Q23: First-level managers were given more authority for decision making in our firm after Covid-19.

Among the 280 respondents, 116 (41.4%) strongly agreed, 104 (37.1%) agreed, 44 (15.7%) responded neutrally, 12 (4.3%) disagreed, although 4 (1.4%) replied with strong disagreement.

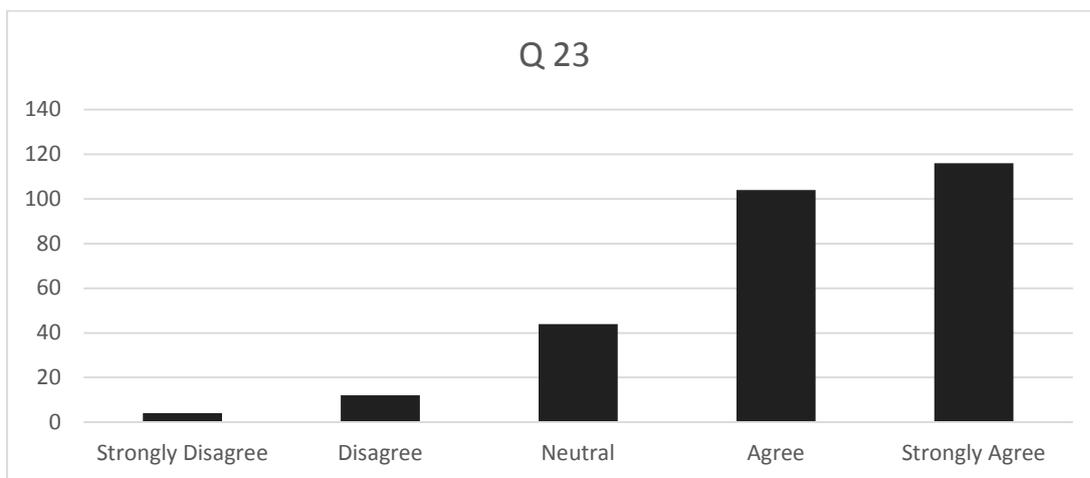


Figure 32 Flexibility Q23

Q24: Our management became more decentralized and delegated more power after Covid-19

Among the 280 respondents, 148 (52.9%) strongly agreed, 117 (41.8%) agreed, 11 (3.9%) responded neutrally, 3 (1.1%) disagreed, although 1 (0.4%) replied with strong disagreement.

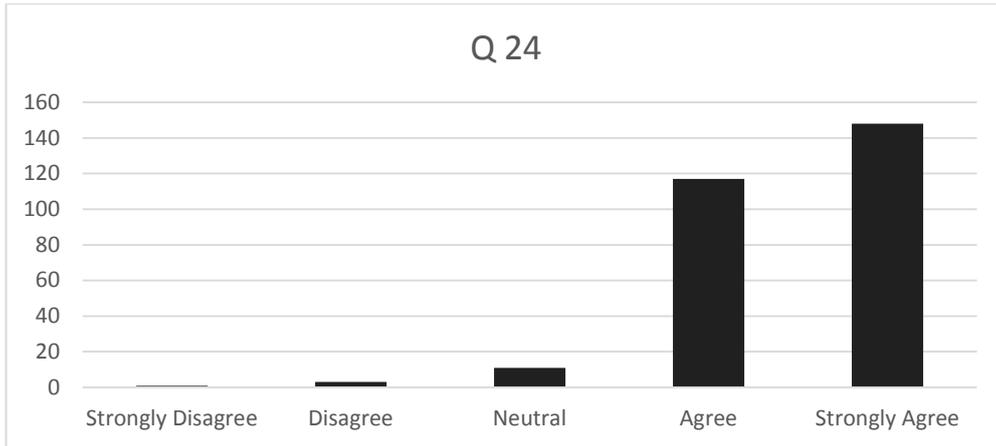


Figure 33 Flexibility Q24

Q25: Our firm shared all the information that the employees need to work on for flexibility after Covid-19.

Among the 280 respondents, 148 (52.9%) strongly agreed, 128 (45.7%) agreed, 2 (0.7%) responded neutrally, 1 (0.1%) disagreed, although 1 (0.4%) replied with strong disagreement

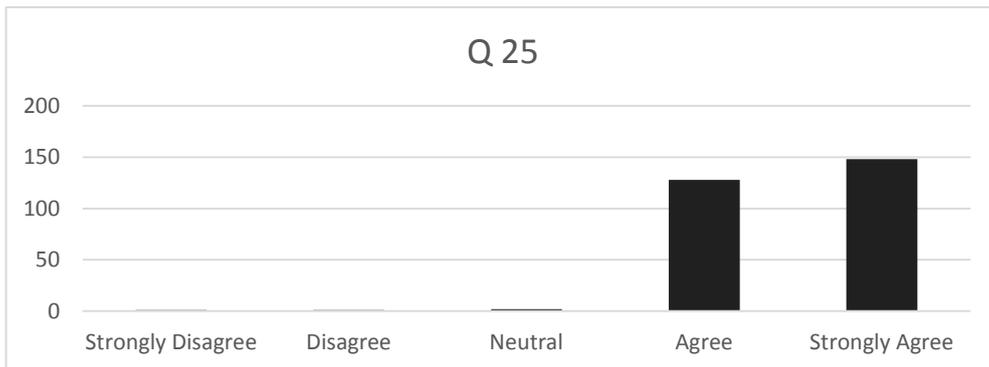


Figure 34 Flexibility Q25

D. Descriptive Statistics of variables

The descriptive analysis was done to quantify general qualities of the respondents with respect to their organization structure and organization success with leadership style. The table below shows discoveries and fluctuation with respect to three components of green advertising and purchaser buy conduct just as consumer loyalty.

1. Descriptive Statistics for SCM:

The table below shows descriptive analysis in detail for all questions related to SCM as below:

Table 5 Descriptive Statistics of SCM

	N	Minimum	Maximum	Mean	Std. Deviation
1. Our firm has changed its supply chain management approach due to Covid-19	280	1	5	4.36	.624
2. Our firm has reorganized its supply chain policies temporarily due to Covid-19	280	2	5	4.08	.882
3. Our firm has reorganized its supply chain policies permanently due to Covid-19.	280	1	5	4.13	.727
4. Our firm has restructured and will continue to restructure its supply chain policies after Covid-19 since we learned lessons from Covid-19— gains, losses, risks, and opportunities	280	1	5	4.53	.671
5. Our firm has restructured and will continue to restructure its supply chain policies after Covid-19 due to global conditions and changing business trends in supply chain management.	280	1	5	4.39	.663
Valid N (listwise)	280				

2. Descriptive Statistics for digitalization:

The table below shows descriptive analysis in detail for all questions related to digitalization as below:

Table 6 Descriptive Statistics of digitalization

	N	Minimum	Maximum	Mean	Std. Deviation
6. Our firm has turned most of the paper-based formalities into digital after Covid-19.	280	1	5	4.41	.650
7. Our firm has been suffering from a lack of digitalization since Covid-19.	280	1	5	3.81	.870
8. Our Communication and business process with customers became more digitalized after Covid-19.	280	1	5	4.61	.589
9. Our communication and business process with suppliers became more digitalized after Covid-19.	280	1	5	4.47	.580
10. Digitalized logistics information systems (LISs) were a preference before Covid-19, however; we have been, and we will be using LIS more in supply chain management even after the Covid-19 since it became a necessity for SCM success.	280	2	5	4.45	.614
Valid N (listwise)	280				

3. Descriptive Statistics for diversification:

The table below shows descriptive analysis in detail for all questions related to diversification as below:

Table 7 Descriptive Statistics of Diversification

	N	Minimum	Maximum	Mean	Std. Deviation
11. Our firm's supply chain became more diversified after Covid-19.	280	1	5	4.45	.643
12. Our firm has been using a multi-source strategy for supply chain success after the Covid-19 outbreak.	280	2	5	4.33	.562
13. Our firm has diversified its range of products after Covid-19.	280	2	5	4.15	.669
14. Our firm has diversified its inventory and concentrated on inventory management after Covid-19.	280	2	5	4.13	.812
15. Our firm has diversified its Ecosystem partnerships and manufacturing network after Covid-19 to benefit from multiple supply locations.	280	1	5	4.04	.765
Valid N (listwise)	280				

4. Descriptive Statistics for localization:

The table below shows descriptive analysis in detail for all questions related to localization as below:

Table 8 Descriptive Statistics of Localization

	N	Minimum	Maximum	Mean	Std. Deviation
16. Our firm has been using a near-sourcing strategy for supply chain success after the Covid-19 outbreak.	280	1	5	4.44	.620
17. Our firm turned to local suppliers after covid-19 since they became more attractive due to increased transportation prices of distant suppliers.	280	1	5	4.24	.727
18. Our firm has been using local or regional suppliers more after the Covid-19 to avoid supply chain disruptions.	280	1	5	4.39	.674
19. Our firm turned to local markets for sourcing due to Covid-19 restrictions on the free movement of goods	280	1	5	4.25	.642
20. Our firm turned to domestic consumers due to Covid-19	280	1	5	4.17	.782
Valid N (listwise)	280				

5. Descriptive Statistics for flexibility:

The table below shows descriptive analysis in detail for all questions related to flexibility as below:

Table 9 Descriptive Statistics of Flexibility

	N	Minimum	Maximum	Mean	Std. Deviation
21. Our firm followed a flexible manufacturing system strategy due to Covid-19	280	2	5	4.38	.585
22. We learned and implemented change management to our business after Covid-19.	280	2	5	4.55	.559
23. First-level managers were given more authority for decision making in our firm after Covid-19	280	1	5	3.93	.998
24. Our management became more decentralized and delegated more power after Covid-19	280	1	5	4.35	.751
25. Our firm shared all the information that the employees need to work on for flexibility after Covid-19	280	1	5	4.49	.656
Valid N (listwise)	280				

E. Factor Analysis

Table 10 KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.715
	Approx. Chi-Square	2459.102
Bartlett's Test of Sphericity	df	300
	Sig.	.000

Based on the above table, the KMO and Bartlett's test was utilized to diminish the number of factors into a more modest measure of variables. The outcomes uncovered the importance level to be under 0.05 and it was solid, as the sig. value is $p < 0.05$, which is mean acceptable and significant. The KMO for the variables in this study is 0.715. That means our values of the sample are meritorious and acceptable.

Table 11 Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %
1	4.580	18.320	18.320	4.580	18.320	18.320
2	2.541	10.165	28.485	2.541	10.165	28.485
3	2.261	9.042	37.527	2.261	9.042	37.527
4	2.139	8.554	46.081	2.139	8.554	46.081
5	1.659	6.635	52.716	1.659	6.635	52.716

Based on the above table, around 53% of the sample can be grouped together into 5 factors. And this percentage is more acceptable and valid.

Table 12 Rotated Component Matrix

Rotated Component Matrix ^a	Component				
	1	2	3	4	5
1. Our firm has changed its supply chain management approach due to Covid-19	.885				
2. Our firm has reorganized its supply chain policies temporarily due to Covid-19	.356				
3. Our firm has reorganized its supply chain policies permanently due to Covid-19.	.733				
4. Our firm has restructured and will continue to restructure its supply chain policies after Covid-19 since we learned lessons from Covid-19—gains, losses, risks, and opportunities	.829				
5. Our firm has restructured and will continue to restructure its supply chain policies after Covid-19 due to global conditions and changing business trends in supply chain management.	.809				
6. Our firm has turned most of the paper-based formalities into digital after Covid-19.			.501		
7. Our firm has been suffering from a lack of digitalization since Covid-19.			.526		
8. Our Communication and business process with customers became more digitalized after Covid-19.			.758		
9. Our communication and business process with suppliers became more digitalized after Covid-19.			.742		
10. Digitalized logistics information systems (LISs) were a preference before Covid-19, however; we have been, and we will be using LIS more in supply chain management even after the Covid-19 since it became a necessity for SCM success.			.828		
11. Our firm's supply chain became more diversified after Covid-19.				.486	
12. Our firm has been using a multi-source strategy for supply chain success after the Covid-19 outbreak.				.707	
13. Our firm has diversified its range of products after Covid-19.				.726	
14. Our firm has diversified its inventory and concentrated on inventory management after Covid-19.				.654	
15. Our firm has diversified its Ecosystem partnerships and manufacturing network after Covid-19 to benefit from multiple supply locations.		.306		.616	
16. Our firm has been using a near-sourcing strategy for supply chain success after the Covid-19 outbreak.					
17. Our firm turned to local suppliers after covid-19 since they became more attractive due to increased transportation prices of distant suppliers.					.889
18. Our firm has been using local or regional suppliers more after the Covid-19 to avoid supply chain disruptions.					.840
19. Our firm turned to local markets for sourcing due to Covid-19 restrictions on the free movement of goods					.410
20. Our firm turned to domestic consumers due to Covid-19					.765
21. Our firm followed a flexible manufacturing system strategy due to Covid-19	.713				
22. We learned and implemented change management to our business after Covid-19.	.738				
23. First-level managers were given more authority for decision making in our firm after Covid-19	.437			.322	
24. Our management became more decentralized and delegated more power after Covid-19	.722				
25. Our firm shared all the information that the employees need to work on for flexibility after Covid-19	.734				

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.^a
 a. Rotation converged in 5 iterations.

Based on the above table, shows all values questions grouped in 5 factors. And all values are more than 0.3 and these values are acceptable. Based on the above table, the questions related to digitalization are grouped in 1-factor number 3. Regarding the diversification questions grouped in 1-factor number 4. Regarding the relationship with localization questions grouped in 1-factor number 5. Regarding the flexibility questions grouped in 1-factor number 2. And lastly, the SCM questions were grouped in 1-factor number 1.

F. Reliability test:

Table 13 Reliability Test

Reliability Statistics		
Variable	Cronbach's Alpha	N of Items
Digitalization	.776	5
Diversification	.710	5
Localization	.703	5
Flexibility	.704	5
SCM	.710	5
Overall Items	.720	25

The above table discusses the reliability statistics for the variable digitalization that gives the value of 0.776 and has 5 items of internal validity that are good via Cronbach's alpha. Secondly, the reliability statistics for the variable diversification give the value as 0.710 and has 5th item internal validity that is good for via Cronbach's alpha. Thirdly, the reliability statistics for the variable localization give the value of 0.703 and have five items of internal validity that are good via Cronbach's alpha. Fourthly, the reliability statistics for the variable flexibility give the value as 0.704 and have 5 items of internal validity that are good via Cronbach's alpha. Further, the reliability statistics for the variable SCM give the value as 0.710 and have five items of internal validity that are good via Cronbach's alpha. Lastly, the reliability statistics for all variables collectively and the value is 0.720 and after testing 25 items together. The internal validity of all variables together is 72% which indicates excellent results via Cronbach alpha.

G. Correlation's test:

Table 13 Correlations

Correlations		SCM	Digitalization	Diversification	Localization	Flexibility
SCM	Pearson Correlation	1				
	Sig. (2-tailed)					
Digitalization	N	280				
	Pearson Correlation	.190**	1			
Diversification	Sig. (2-tailed)	.001				
	N	280	280			
Flexibility	Pearson Correlation	.166**	.260**	1		
	Sig. (2-tailed)	.005	.000			
Localization	N	280	280	280		
	Pearson Correlation	.188**	.107	.128*	1	
Flexibility	Sig. (2-tailed)	.002	.073	.032		
	N	280	280	280	280	
Digitalization	Pearson Correlation	.159**	.204**	.367**	.085	1
	Sig. (2-tailed)	.008	.001	.000	.156	
Flexibility	N	280	280	280	280	280

Above table discusses correlation analysis of total variables. This particular analysis is an excellent test to find out the understanding about the relationship among variables and also its p value can be used for hypothesis testing. The best thing about correlation analysis is that it investigates and measures the relationship among all variables collectively.

In the above table a moderate relationship between SCM and digitalization that gives the value 0.190 and the relations significant because the sig value .001, SCM and diversification has value at 0.166 and the relations significant because the sig value .005. The analysis has figured out that the variable SCM with flexibility has value stands at 0.188 and the relations significant because the sig value .002. Lastly, SCM with localization has value stands at 0.159 and the relations significant because the sig value .008. Note, the significance value should be less than 0.05 to be accepted and significant.

H. Regression Analysis

1. Regression Analysis between SCM and digitalization

a. Model Summary

Table 14 Model Summary / SCM and digitalization

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.190 ^a	.036	.033	.50163

a. Predictors: (Constant), Digitalization

The model summary reflects the overall correlation of the model that is having a 0.036 R-square value. Therefore, SCM may explain %3.6 of variations in the digitalization.

b. Anova

Table 15 ANOVA / SCM and digitalization

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.629	1	2.629	10.447	.001 ^b
	Residual	69.954	278	.252		
	Total	72.583	279			

a. Dependent Variable: SCM
b. Predictors: (Constant), Digitalization

According to ANOVA results, the significance value is 0.001 which is less than 0.05 reveals that the regression analysis is accepted.

c. Coefficients

Table 16 Coefficients / SCM and digitalization

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.298	.316		10.438	.000
	Digitalization	.229	.071	.190	3.232	.001

a. Dependent Variable: SCM

The beta coefficient denotes the degree of change in the dependent variable for every 1-unit of change in the independent variable. According to the results, use 1 unit of digitalization will increase SCM by %22.9. And the relation is significant because of the sig. value is .001

2. Regression Analysis between SCM and diversification

a. Model Summary

Table 17 Model Summary / SCM and diversification

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.166 ^a	.027	.024	.50390

a. Predictors: (Constant), diversification

The model summary reflects the overall correlation of the model that is having a 0.027 R-square value. Therefore, SCM may explain %2.7 of variations in the diversification.

b. ANOVA

Table 18 ANOVA / SCM and diversification

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.995	1	1.995	7.856	.005 ^b
	Residual	70.588	278	.254		
	Total	72.583	279			

a. Dependent Variable: SCM
b. Predictors: (Constant), diversification

According to ANOVA results, the significance value is 0.005 which is less than 0.05 reveals that the regression analysis is accepted.

c. Coefficients

Table 19 Coefficients / SCM and diversification

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.496	.294		11.908	.000
	Diversification	.192	.068	.166	2.803	.005

a. Dependent Variable: SCM

The beta coefficient denotes the degree of change in the dependent variable for every 1-unit of change in the independent variable. According to the results, use 1 unit of digitalization will increase SCM by %19.2. And the relation is significant because of the sig. value is .005.

3. Regression Analysis between SCM and Localization

a. Model Summary

Table 120 Model Summary/ SCM and Localization

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.188 ^a	.035	.032	.50187

a. Predictors: (Constant), Localization

The model summary reflects the overall correlation of the model that is having a 0.035 R-square value. Therefore, SCM may explain %3.5 of variations in the localization.

b. ANOVA

Table 21 ANOVA/ SCM and Localization

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.562	1	2.562	10.170	.002 ^b
	Residual	70.021	278	.252		
	Total	72.583	279			

a. Dependent Variable: SCM
b. Predictors: (Constant), Localization

According to ANOVA results, the significance value is 0.002 which is less than 0.05 reveals that the regression analysis is accepted.

c. Coefficients

Table 22 Coefficients/ SCM and Localization

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.481	.263		13.240	.000
	Localization	.192	.060	.188	3.189	.002

a. Dependent Variable: SCM

The beta coefficient denotes the degree of change in the dependent variable for every 1-unit of change in the independent variable. According to the results, use 1 unit of localization will increase SCM by %19.2. And the relation is significant because of the sig. value is .002.

4. Regression Analysis between SCM and Flexibility

a. Model Summary

Table 223 Model Summary/ SCM and Flexibility

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.159 ^a	.025	.022	.50449

a. Predictors: (Constant), Flexibility

The model summary reflects the overall correlation of the model that is having a 0.025 R-square value. Therefore, SCM may explain %2.5 of variations in the flexibility

b. ANOVA

Table 24 Model Summary/ SCM and Flexibility

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.829	1	1.829	7.188	.008 ^b
	Residual	70.753	278	.255		
	Total	72.583	279			

a. Dependent Variable: SCM
b. Predictors: (Constant), Flexibility

According to ANOVA results, the significance value is 0.008 which is less than 0.05 reveals that the regression analysis is accepted.

c. Coefficients

Table 25 Coefficients/ SCM and Flexibility

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients		
1	(Constant)	3.523	.297	Beta	11.872	.000
	Flexibility	.180	.067	.159	2.681	.008

a. Dependent Variable: SCM

The beta coefficient denotes the degree of change in the dependent variable for every 1-unit of change in the independent variable. According to the results, use 1 unit of flexibility will increase SCM by %6.7. And the relation is significant because of the sig. value is .008.

i. Hypothesis testing:

Hypotheses Testing table reflects that hypothesis are supported or not by considering the P-Values of regression analysis and correlation analysis tables, it is stated as below table:

Table 26 Hypothesis Testing

H	Hypothesis	P Value	Result
HA0	Digitalization has an impact on the changing structure of SCM after Covid-19	P Value is 0.001	Supported
HA1	Digitalization has no impact on the changing structure of SCM after Covid-19	P Value is 0.000	Not Supported
HB0	Diversification has an impact on the changing structure of SCM after Covid-19	P Value is 0.002	Supported
HB1	Diversification has no impact on the changing structure of SCM after Covid-19	P Value is 0.000	Not Supported
HC0	Localization has an impact on the changing structure of SCM after Covid-19.	P Value is 0.001	Supported
HC1	Localization has no impact on the changing structure of SCM after Covid-19.	P Value is 0.000	Not Supported
HD0	Flexibility has an impact on the changing structure of SCM after Covid-19	P Value is 0.002	Supported
HD1	Flexibility has no impact on the changing structure of SCM after Covid-19	P Value is 0.000	Not Supported

VI. CONCLUSION

The thesis studied SCM's crucial role in the success or failure of a business since it is the backbone of the world economy. The study proposed ways to reduce the supply risks and their effect on the performance of economic trends to adopt more conservative policies. The main challenge arises for the Statistical process control when COVID-19 surrounded the world and disturbed trading. For this purpose, different strategies are applied and given importance to the relationships in an SC and decided the boundaries of the company. The improvements in the supply chain should be re-engineered, network design needs a specific environment, and identifying, assessing, and mitigating the risks is necessary to make changes in SCM.

The structural impact of the epidemic on the global and local economies, global trade, and worldwide economic integration cannot be understood unless the identification of risks with an assessment of the traditional and potential strategies of SCM, as well as value chains. Because identification of the factors improving efficiency and effectiveness of individual, local, or global SCs is critical due to their strong ties with profitability. However, this is a necessary but not a sufficient condition for sustainability. Although the COVID-19 crisis has sparked a broad debate on the shifts in global supply chains, this issue was not the result of the crisis or any of its implications. Because, leading by the one between China and the West, trade wars had started much earlier as the advanced countries systemically started to reverse what they build in previous decades, possibly by the threat China carries for their economies on several fronts. The motivation for this scenario was that global markets have come to rely on China and its rapid expansion in promising areas such as the Chinese medicinal and rare earth element industries, as well as Chinese raw materials.

In today's global economy, global supply chains play a key role. Concerns about the present and the future abound as most countries go into

lockdowns as a result. lockdowns may be due to an environment or natural disasters. Political crises and wars play a strong role in the lockdowns as well. Global supply networks are commonly thought to be responsible for spreading the problem across countries at the moment. The supply chains are expected to renationalize at least in part in the future, according to forecasts. Even if international lockdowns definitely add to the magnitude of economic downturns, local lockout measures are responsible for the bulk of GDP contractions. Severing global supply linkages would not make nations more robust to labor supply shocks of the pandemic type. In general, to put it another way, by cutting down on foreign input, national economies really increase their dependence on domestic sources. Renationalization is ineffective if domestic inputs are likewise restricted. Renationalization will strengthen the economy if the country has a more relaxed regime than its trade counterparts and vice versa.

The coronavirus crisis revealed major gaps in global trade, the most prominent of these gaps being the over-reliance on globalization in the production sector, which made supply chains long and very sensitive in the face of risks.

On the other hand, Because of the shift in customer behavior toward digital purchasing, even for daily necessities, online retail platforms have benefited the most from the coronavirus epidemic, and the business of Amazon and other firms in Turkey in this industry such as TrendYol and Hepsiburada platforms has risen their business during the pandemic, however, the emphasis was on the packaging system, which led to an increase in waste; more efficient recycling systems are required to avoid future problems, especially when many businesses will also need to switch to digital selling platforms.

Concerning high transportation costs, many corporations were reconsidering their manufacturing by attempting to put manufacturing sites closer to selling sites.

Last but not least, Because of the uncertain expectations for a recovery in fuel consumption following the coronavirus outbreak, oil refinery sites in the United States, Singapore, Japan, the Philippines, the Netherlands, and France have closed, putting additional pressure on global fuel prices. to high transportation costs. Thus, an increase in the cost of transportation globally.

As a result, for fuel prices, some countries have re-accredited nuclear power-producing projects.

At the level of countries and governments, the importance of sovereign wealth funds and their crucial role in obtaining funds to finance economic rescue packages during the Coronavirus crisis has emerged, to restore markets and supply chains to their almost normal status by rescuing projects that faced the risk of permanently closing.

While the Smart device and Automotive manufacturers industries are experiencing a semiconductor and electronic chip shortage, countries and significant investment foundations must work together to address this issue by expanding research and development to reduce the costs of setting up factories to produce electronic chips, as well as trying to increase production as soon as possible. Because the threat of war and natural disasters may destroy this industry if it continues to depend on Taiwan as a major exporter of electronic chips.

Despite the darker picture that emerged during the outbreak of the virus, there is a bright side. The beginning of the end of the era of globalization and moving away from China as the factory of the world will create opportunities for other countries and promote the growth of other economies such as Vietnam. Besides the policymakers in South Asia and Africa must encourage farmers to focus on increasing agricultural output and farm incomes, as South Korea, Taiwan, and China did decades ago. In Turkey, developing and expanding agricultural production, as well as focusing on establishing industries with higher technological value, may help to put the economy back on track.

Likewise, all countries can work to develop their industries in the near future, as low-cost workers will not be the only consideration in determining suppliers or designing the supply chain as a whole, but safety factors and geographical location will be taken into account more, especially with the high costs of transportation worldwide.

This, in turn, creates a new opportunity for investors. Projects aiming to provide a source of raw materials or semi-manufactured goods will have greater chances of success than before.

According to the global market issues and circumstances discussed above, businesses can tackle these challenges by taking the following steps:

- Due to the obvious high transportation costs, many corporations were reconsidering their manufacturing by attempting to put manufacturing sites closer to selling sites.
- Moreover, to reduce the problem of supply disruption, industrial organizations must also focus more on risk management and try to provide alternative suppliers.
- Companies may deal with the situation of the semiconductor market right now by rotating electrical chips from old and outdated products to reduce the consequences of the shortage.
- Considering the high fuel prices in the post-crisis supply of oil derivatives, airlines must engage in annual contracts to deliver oil derivative products at fixed prices. In the short term, this may be the best option for all Turkish companies in the airline sector. To lessen the impact of fluctuating fuel prices on the company's profitability.
- Countries that pay an exorbitant bill to import fuel need to accelerate the transition to renewable energy, encourage people to acquire electric cars, and develop new transportation methods such as transporting goods by electric trains.
- In the field of retail trade, since they are more appealing to a sizable segment of clients in the post-crisis market, electronic sales channels must be opened by the majority of retail stores.
- Due to the success of remote work throughout the epidemic's expansion, many institutions and organizations are now able to manage their operations in non-industrial departments remotely, working to cut rental costs and energy bills for the institution's facilities and contributing to cost-effectiveness.

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APPENDIX

APPENDIX A Descriptive Statistics on Control Factors

APPENDIX B Dependent Variable: The Changing Structure of SCM After COVID

19

APPENDIX C Independent Variable: Digitalization

APPENDIX D Independent Variable: Diversification

APPENDIX E Independent Variable: Localization

APPENDIX F Independent Variable: Flexibility

APPENDIX G: Survey approval

Appendix A Descriptive Statistics on Control Factors

Appendix A 1: Industry (A)

Industry		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Manufacturing	91	32.5	32.5	32.5
	Wholesaler	148	52.9	52.9	85.4
	Retailer	17	6.1	6.1	91.4
	e-business	6	2.1	2.1	93.6
	Service	14	5.0	5.0	98.6
	Cargo / Logistics	4	1.4	1.4	100.0
Total		280	100.0	100.0	

Appendix A 2: Your position in the company (B)

Your position in the company		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Top management	163	58.2	58.2	58.2
	Middle management	92	32.9	32.9	91.1
	First-line management	9	3.2	3.2	94.3
	Non-manager	16	5.7	5.7	100.0
	Total	280	100.0	100.0	

Appendix A 3: Years in operation (C)

Years in operation		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-3 years	158	56.4	56.4	56.4
	3-5 years	9	3.2	3.2	59.6
	5-10 years	17	6.1	6.1	65.7
	More than 10 years	96	34.3	34.3	100.0
	Total	280	100.0	100.0	

Appendix A 4: Number of employees (D)

Number of employees		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 10 (Micro-enterprise)	156	55.7	55.7	55.7
	10 or less than 50 (Small-sized enterprise)	31	11.1	11.1	66.8
	50 or less than 250 (Medium-sized enterprise)	70	25.0	25.0	91.8
	More than 250 (Large enterprise)	23	8.2	8.2	100.0
	Total	280	100.0	100.0	

Appendix A 5: Company City (E)

City you operate in?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bursa	2	.7	.7	.7
	Gaziantep	5	1.8	1.8	2.5
	Istanbul	269	96.1	96.1	98.6
	Izmir	4	1.4	1.4	100.0
	Total	280	100.0	100.0	

APPENDIX B Dependent Variable: The Changing Structure of SCM After COVID-19

Appendix B 1: SCM Question 1

1. Our firm has changed its supply chain management approach due to Covid-19					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.4	.4	.4
	Disagree	3	1.1	1.1	1.4
	Neutral	7	2.5	2.5	3.9
	Agree	155	55.4	55.4	59.3
	Strongly Agree	114	40.7	40.7	100.0
	Total	280	100.0	100.0	

Appendix B 2: SCM Question 2

2. Our firm has reorganized its supply chain policies temporarily due to Covid-19					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	10	3.6	3.6	3.6
	Neutral	53	18.9	18.9	22.5
	Agree	105	37.5	37.5	60.0
	Strongly Agree	112	40.0	40.0	100.0
	Total	280	100.0	100.0	

Appendix B 3: SCM Question 3

3. Our firm has reorganized its supply chain policies permanently due to Covid-19.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.4	.4	.4
	Disagree	3	1.1	1.1	1.4
	Neutral	31	11.1	11.1	12.5
	Agree	146	52.1	52.1	64.6
	Strongly Agree	99	35.4	35.4	100.0
	Total	280	100.0	100.0	

Appendix B 4: SCM Question 4

4. Our firm has restructured and will continue to restructure its supply chain policies after Covid-19 since we learned lessons from Covid-19—gains, losses, risks, and opportunities					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	1.1	1.1	1.1
	Disagree	2	.7	.7	1.8
	Neutral	4	1.4	1.4	3.2
	Agree	117	41.8	41.8	45.0
	Strongly Agree	154	55.0	55.0	100.0
	Total	280	100.0	100.0	

Appendix B 5: SCM Question 5

5. Our firm has restructured and will continue to restructure its supply chain policies after Covid-19 due to global conditions and changing business trends in supply chain management.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.4	.4	.4
	Disagree	3	1.1	1.1	1.4
	Neutral	10	3.6	3.6	5.0
	Agree	140	50.0	50.0	55.0
	Strongly Agree	126	45.0	45.0	100.0
	Total	280	100.0	100.0	

APPENDIX C Independent Variable: Digitalization

Appendix C 1: Digitalization Question 1/ (6)

6. Our firm has turned most of the paper-based formalities into digital after Covid-19.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	.7	.7	.7
	Disagree	3	1.1	1.1	1.8
	Neutral	4	1.4	1.4	3.2
	Agree	136	48.6	48.6	51.8
	Strongly Agree	135	48.2	48.2	100.0
	Total	280	100.0	100.0	

Appendix C 2: Digitalization Question 2/ (7)

7. Our firm has been suffering from a lack of digitalization since Covid-19.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	1.4	1.4	1.4
	Neutral	57	20.4	20.4	21.8
	Agree	118	42.1	42.1	63.9
	Strongly Agree	101	36.1	36.1	100.0
	Total	280	100.0	100.0	

Appendix C 3: Digitalization Question 3/ (8)

8. Our Communication and business process with customers became more digitalized after Covid-19.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	.7	.7	.7
	Neutral	2	.7	.7	1.4
	Agree	107	38.2	38.2	39.6
	Strongly Agree	169	60.4	60.4	100.0
	Total	280	100.0	100.0	

Appendix C 4: Digitalization Question 4/ (9)

9. Our communication and business process with suppliers became more digitalized after Covid-19.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	.4	.4	.4
	Neutral	2	.7	.7	1.1
	Agree	121	43.2	43.2	44.3
	Strongly Agree	156	55.7	55.7	100.0
	Total	280	100.0	100.0	

Appendix C 5: Digitalization Question 5/ (10)

10. Digitalized logistics information systems (LISs) were a preference before Covid-19, however; we have been, and we will be using LIS more in supply chain management even after the Covid-19 since it became a necessity for SCM success.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	.7	.7	.7
	Neutral	3	1.1	1.1	1.8
	Agree	135	48.2	48.2	50.0
	Strongly Agree	140	50.0	50.0	100.0
	Total	280	100.0	100.0	

APPENDIX D Independent Variable: Diversification

Appendix D 1: Diversification Question 1/ (11)

11. Our firm's supply chain became more diversified after Covid-19.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.4	.4	.4
	Disagree	1	.4	.4	.7
	Neutral	4	1.4	1.4	2.1
	Agree	133	47.5	47.5	49.6
	Strongly Agree	141	50.4	50.4	100.0
	Total	280	100.0	100.0	

Appendix D 2: Diversification Question 2/ (12)

12. Our firm has been using a multi-source strategy for supply chain success after the Covid-19 outbreak.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	.7	.7	.7
	Neutral	3	1.1	1.1	1.8
	Agree	166	59.3	59.3	61.1
	Strongly Agree	109	38.9	38.9	100.0
	Total	280	100.0	100.0	

Appendix 1 : Question 13

Appendix D 3: Diversification Question 3/ (13)

13. Our firm has diversified its range of products after Covid-19.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	5	1.8	1.8	1.8
	Neutral	18	6.4	6.4	8.2
	Agree	169	60.4	60.4	68.6
	Strongly Agree	88	31.4	31.4	100.0
	Total	280	100.0	100.0	

Appendix D 4: Diversification Question 4/ (14)

14. Our firm has diversified its inventory and concentrated on inventory management after Covid-19.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	1.1	1.1	1.1
	Neutral	46	16.4	16.4	17.5
	Agree	123	43.9	43.9	61.4
	Strongly Agree	108	38.6	38.6	100.0
	Total	280	100.0	100.0	

Appendix D 5: Diversification Question 5/ (15)

15. Our firm has diversified its Ecosystem partnerships and manufacturing network after Covid-19 to benefit from multiple supply locations.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.4	.4	.4
	Disagree	5	1.8	1.8	2.1
	Neutral	39	13.9	13.9	16.1
	Agree	152	54.3	54.3	70.4
	Strongly Agree	83	29.6	29.6	100.0
	Total	280	100.0	100.0	

APPENDIX E Independent Variable: Localization

Appendix E 1: Localization Question 1/ (16)

16. Our firm has been using a near-sourcing strategy for supply chain success after the Covid-19 outbreak.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.4	.4	.4
	Disagree	1	.4	.4	.7
	Neutral	3	1.1	1.1	1.8
	Agree	144	51.4	51.4	53.2
	Strongly Agree	131	46.8	46.8	100.0
	Total	280	100.0	100.0	

Appendix E 2: Localization Question 2/ (17)

17. Our firm turned to local suppliers after covid-19 since they became more attractive due to increased transportation prices of distant suppliers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	8	2.9	2.9	2.9
	Disagree	3	1.1	1.1	3.9
	Neutral	10	3.6	3.6	7.5
	Agree	141	50.4	50.4	57.9
	Strongly Agree	118	42.1	42.1	100.0
	Total	280	100.0	100.0	

Appendix E 3: Localization Question 3/ (18)

18. Our firm has been using local or regional suppliers more after the Covid-19 to avoid supply chain disruptions.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	7	2.5	2.5	2.5
	Disagree	1	.4	.4	2.9
	Neutral	6	2.1	2.1	5.0
	Agree	130	46.4	46.4	51.4
	Strongly Agree	136	48.6	48.6	100.0
	Total	280	100.0	100.0	

Appendix E 4: Localization Question 4/ (19)

19. Our firm turned to local markets for sourcing due to Covid-19 restrictions on the free movement of goods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	.7	.7	.7
	Neutral	12	4.3	4.3	5.0
	Agree	154	55.0	55.0	60.0
	Strongly Agree	112	40.0	40.0	100.0
	Total	280	100.0	100.0	

Appendix E 5: Localization Question 5/ (20)

20. Our firm turned to domestic consumers due to Covid-19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	8	2.9	2.9	2.9
	Disagree	5	1.8	1.8	4.6
	Neutral	17	6.1	6.1	10.7
	Agree	144	51.4	51.4	62.1
	Strongly Agree	106	37.9	37.9	100.0
	Total	280	100.0	100.0	

APPENDIX F Independent Variable: Flexibility

Appendix F 1: Flexibility Question 1/ (21)

21. Our firm followed a flexible manufacturing system strategy due to Covid-19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	.4	.4	.4
	Neutral	6	2.1	2.1	2.5
	Agree	153	54.6	54.6	57.1
	Strongly Agree	120	42.9	42.9	100.0
	Total	280	100.0	100.0	

Appendix F 2: Flexibility Question 2/ (22)

22. We learned and implemented change management to our business after Covid-19.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	3	1.1	1.1	1.1
	Agree	120	42.9	42.9	43.9
	Strongly Agree	157	56.1	56.1	100.0
	Total	280	100.0	100.0	

Appendix F 3: Flexibility Question 3/ (23)

23. First-level managers were given more authority for decision making in our firm after Covid-19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	1.4	1.4	1.4
	Disagree	12	4.3	4.3	5.7
	Neutral	44	15.7	15.7	21.4
	Agree	104	37.1	37.1	58.6
	Strongly Agree	116	41.4	41.4	100.0
	Total	280	100.0	100.0	

Appendix F 4: Flexibility Question 4/ (24)

24. Our management became more decentralized and delegated more power after Covid-19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.4	.4	.4
	Disagree	3	1.1	1.1	1.4
	Neutral	11	3.9	3.9	5.4
	Agree	117	41.8	41.8	47.1
	Strongly Agree	148	52.9	52.9	100.0
	Total	280	100.0	100.0	

Appendix F 5: Flexibility Question 5/ (25)

25. Our firm shared all the information that the employees need to work on for flexibility after Covid-19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.4	.4	.4
	Disagree	1	.4	.4	.7
	Neutral	2	.7	.7	1.4
	Agree	128	45.7	45.7	47.1
	Strongly Agree	148	52.9	52.9	100.0
	Total	280	100.0	100.0	

APPENDI G: Survey approval

Evrak Tarih ve Sayısı: 13.04.2022-47989



T.C.
İSTANBUL AYDIN ÜNİVERSİTESİ REKTÖRLÜĞÜ
Lisansüstü Eğitim Enstitüsü Müdürlüğü

Sayı : E-88083623-020-47989
Konu : Etik Onayı Hk.

13.04.2022

Sayın Omar ALTALEB

Tez çalışmanızda kullanmak üzere yapmayı talep ettiğiniz anketiniz İstanbul Aydın Üniversitesi Etik Komisyonu'nun 07.04.2022 tarihli ve 2022/06 sayılı kararıyla uygun bulunmuştur. Bilgilerinize rica ederim.

Dr.Öğr.Üyesi Alper FIDAN
Müdür Yardımcısı

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From: 11/08/2011 till: 01/08/2012 Job title: Accountant

IRAQ AL- KHAIR ADVERTISING /Iraq/ Baghdad

From: 01/08/2012 till: 01/08/2014 Job title: Accountant Receivable

QATAR AIRWAYS GSA | Iraq/ Baghdad

From: 05/08/2015 till: 18/05/2016 Job title: sales executive

MERIDIAN REAL ESTATE/ Turkey/ Istanbul

From: 21/05/2016 till: 01/05/2017 Job title: Finance Supervisor ISU

QATAR AIRWAYS / Iraq/Sulaymaniyah

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