

Dresden International University

Master Thesis

The Strategic SCM in the Digital Era  
Tactical vs Strategic

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# List of Abbreviations

Abbreviation	Definition
ADNOC	Abu Dhabi National Oil Company
AI	Artificial Intelligence
BOM	Bill of Material
CIPS	Chartered Institute of Procurement and Supply
Covid-19	Corona Virus Disease 2019 caused by SARS-CoV-2
CPAF	Cost-plus award fee contracts
CPFF	Cost-plus fixed fee contracts
CPIF	Cost-plus incentive fee contracts
CPO	Chief Procurement Officers
CSR	Corporate Social Responsibility
DBaaS	Database-as-Service
DIFOT	Delivered in Full on Time, measurement of logistics or delivery performance
DLT	Decentralized Ledger Technology
ERP	Enterprise Resources Planning
ESI	Early Supplier Involvement
ETI	Ethical Trading Initiatives
GHG	Greenhouse Gas
GPS	Global Positioning System
GS1	Global system of Supply Chain standards.
GSA	The American General Services Administration
HSSE	Health, Safety, Security & Environment
IaaS	Infrastructure-as-a-service
ILO	International Labour Organization
IMO	International Maritime Organization
IoT	Internet of Things
IP	Intellectual Property
IRS	United States Internal Revenue Service
ITT	Invitation to tender
JIT	Just in Time
KPI	Key Performance Indicator

MEAT	Most Economically Advantageous Tender
MRP	Materials Requirements Planning
P2P	Procure to Pay
PaaS	Platform-as-a-Service
Pay-as-you-go	A principle of non-contractual services
PEST	Political, economic, social and technological
PR	Purchase Requisition
QA	Quality Assurance
QC	Quality Control
R&D	Research and Development
RFID	Radio-Frequency Identification
Rfx	Request for information, quotation and proposal
ROI	Return on Investment
RPA	Robotic Process Automation
SaaS	Service-as-a-Service
SCM	Supply Chain Management
SLA	Service Level Agreements
SLC	Smart Legal Contract
SMEs	Small and medium-sized enterprises
SQL	Structured Query Language
SRM	Supplier Relation Management
SWOT	Strengths, weaknesses, opportunities, and threats analysis
TCO	Total Cost of Ownership
TSMC	Taiwan Semiconductor Manufacturing Company
UNIDO	United Nations Industrial Development Organization
ZB	Zettabyte is digital storage unit; one zettabyte is equal to a trillion gigabytes

# Abstract

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The perspective of procurement and supply chain management is changing dramatically; traditionally, it was seen as a support function; however, the procurement function is receiving increased attention and investment as an essential contributor to the strategic success and a business enabler. While an end-to-end digital supply chain is an opportunity as it unleashes the next level of strategic growth and involves minimal investment in infrastructure, it is still a challenge to optimize and transform. Furthermore, the recent pandemics and geopolitical disruptions of Covid-19, the Ukraine-Russian war, Brexit and the US-China trade war; have structurally changed the global economy and revealed a new risk assessment that will result in the re-introduction of buffers, boundaries across industries and a partial return to regionalization with sort of de-globalization in which existing just-in-time getting replaced by just-in-case strategy.

In this thesis study, I have gathered data from 150 professionals in the supply chain, procurement and logistics from 29 countries in 22 industry types to participate in the survey as an attempt to provide an informed picture of the supply chain market as it stands during the disruptions which could inform recommendations for the future.

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## **Key Words:**

Strategic, proactive, procurement, tactical, reactive, purchasing, sustainable, resilience, supply-chain, suppliers, sourcing, outsourcing, Make/do or buy, back sourcing, ESI, risk, industry 4.0, digitalisation, IoT, digital-twins, blockchain, smart contracts. RPA, Virtual-Assistants, Bigdata, AI, Cloud, analytics.



# Chapter 1 Introduction

Digitalization is redesigning the organizations' supply network and delivering new insights and opportunities. It has the potential to revolutionize procurement functionality and generate values; the digital era transformed the transactional reactive purchasing concept to be an intelligent, predictive, proactive, and specifically strategic procurement. Digitalization enhance sustainability, effectiveness, and efficiency as it reduces costs, improves transparency and provides real-time information. Investing now in a robust and reliable digital infrastructure is not limited to organizations with large sums, indeed, at low cost; small and medium enterprises can penetrate the market. Vast data storage, mobility, constant connectivity and fast processing forming cloud computing have brought new players to the market together with sensors they have carried production to life. With cloud-based infrastructure; organizations invest precisely in what they need with pay-as-you-go; they secure long-term profitability with payoff certainty, and with analytics; they secure a constant supply of the materials. When procurement, supply chain, and digital strategies align with corporate strategy, organizations can plan better supplier strategies and enable more efficient operations. Meanwhile, geopolitical conflicts such as Brexit, the US-China trade war, Ukraine-Russian war, and pandemics such as Covid-19 are constantly disturbing the supply chain; such disruptions in the supply chain cannot be avoided; however, they can be mitigated, concepts such as "just in case" have been underlined and both back sourcing and reshoring have been on the list.

## 1.1 Motivation

This master thesis is motivated by the unique situation of the pandemic and the recent geopolitical issues. Border closure, quarantines and complete shutdowns of many markets severely impacted local and global economies. Uncertainty and disruption have led to shifts in supply and demand, offering a chance to reconsider how an organization's supply and procurement strategy adopts resilience and agility. As supply chains progress more complexity, so do the risks they fetch. The pandemic and geopolitical issues have put the supply chain's resilience to the test; consequently, such high-impact disruption scenarios on a supply chain can be costly if handled improperly. Therefore, the organization's capacity to rearrange resources becomes crucial as an intermediary mechanism that enables a supply chain disruption-oriented organization to build resilience. Thus, to better identify and manage the

risk of supply chain interruption, it is necessary to find which approaches are more suitable than others and which have changed, what have remained, and what have been reconsidered and evaluated. These serve as motivations for this master thesis.

## **1.2 Objective and Research Questions**

The research objective is to provide an informed picture of the current global supply chain market as it stands, particularly with the disruption of the recent pandemic of Covid-19 or the geopolitical events such as the US-China trade war, Brexit, and the Russian-Ukraine war.

Therefore, to achieve this objective, I aim in this thesis to question the sampled organizations if the cost is the main driver for considering offers and suppliers or whether there are any other motivations, such as innovation and quality standards due to the change of customer's trends and expectations. To examine the compliance and presence of the corporate social responsibility elements existing today and the utilization of traceability of environmental sustainability, to examine the deep intense and length of the contractual relationship between the buying organization and its key suppliers, to find how reactive/tactical or proactive/strategical the procurement is today, to inspect if 'Just-in-time' is lean and enhance resilience in the supply chain, especially during natural disasters and pandemics, and to question if 'just-in-case' inventory is otherwise an alternative approach to mitigate the risk. To examine if plenty of stock is a security or waste, to question if the plenty of suppliers is a security or lost opportunity, to inspect the integration of the systems between buying organizations and suppliers, and to search what are the practiced strategies to moderate risks post Covid-19, and to survey the role of procurement in organizations today, to find if organizations have a standalone defined supply chain strategy, and if it impacts the business performance. To examine during the pandemic whether offshore/onshore/near-market are re-evaluated and outsourcing retrieval/backsourcing is considered, if the negotiation is handled using digital tools or the traditional face-to-face is still taking a priority, to examine the motives for outsourcing, and if during the pandemic contracts had to be renegotiated or re-tendered and what are the reasons, the time length of requisition to order and the key performance criteria used in the supply chain. To search how digital the organizations are today and if it is adding value during this disruption, to seek if there is a genuine urge for transparency and traceability

utilizing the blockchain and decentralized ledger, if so, how widely spread in the business and to question if there is a defined digital strategy in the organizations.

The survey questionnaire contains 31 questions, and the objective is to gather data from 150 participants from different regions and use the resulting information in an attempt to find what supply chain approaches have been re-evaluated, reconsidered, modified or otherwise retained and reinforced as well as an attempt to provide an informed recommendation for the future. Survey questions are divided into four categories discussed and distributed in the four chapters:

### **Chapter 1: Introduction:**

<b>Survey Questions</b>	<b>Results</b>
1- From which country are you taking the survey??	Figure 1.1
2- Which industry do you work for??	Figure 1.2
3- What size of organization do you work for?	Figure 1.3

### **Chapter 2: Procurement objective and development:**

<b>Survey Questions</b>	<b>Results</b>
4- How deep is the traceability for environmental sustainability and social responsibility?	Figure 2.1
5- What are the practiced strategies to moderate the risks post Covid-19?	Figure 2.2
6- Are the buying organizations and suppliers have independent or integrated systems?	Figure 2.3
7- What is the length of the strategic contractual with key suppliers?	Figure 2.4
8- What are the communicated corporate social responsibility (CSR) elements?	Figure 2.5
9- How intense are the buying organisation's strategic relationships and key suppliers?	Figure 2.6
10- Procurement reactive/tactical or proactive/strategic in the organizations?	Figure 2.7
11- Is plenty of stock waste or security?	Figure 2.8
12- Are plenty of suppliers lost opportunity or security?	Figure 2.9
13- Encountered problems of suppliers and outsourcing are shared responsibility or the supplier's responsibility?	Figure 2.10
14- Does procurement contribute to the specification?	Figure 2.11

15- How intense is the shared information between the buying organization and suppliers?	Figure 2.12
16- Which is followed during Covid-19: Just in time or Just in case?	Figure 2.13

### Chapter 3: Strategic procurement and supply

Survey Questions	Results
17- How long does requisition to order time takes?	Figure 3.1
18- How best can you describe the role of the Procurement department?	Figure 3.2
19- Does your business have a supply chain strategy?	Figure 3.3
20- Do you think supply chain strategy impacts your business performance?	Figure 3.4
21- When selecting offers and suppliers, does the prioritization goes for innovation, cost drive, risk mitigation or adding values?	Figure 3.7
22- How lean have you found JIT (just in time) during disruptions such as Covid-19?	Figure 3.8

### Chapter 4: Outsourcing

Survey Questions	Results
23- Have you had to re-negotiate or re-tender two or more contracts?	Figure 4.1
24- What is the key motive for outsourcing?	Figure 4.2
25- What KPIs do you use in your supply chain (logistics)?	Figure 4.5
26- During the pandemic, have you re-evaluated offshore/onshore strategy?	Figure 4.6

### Chapter 5: Industry 4.0

Survey Questions	Results
27- Are you using blockchain in your organization?	Figure 5.2
28- Are you using digitalization for negotiation?	Figure 5.3
29- Do you have a digital strategy?	Figure 5.4
30- How digital is your organization?	Figure 5.5
31- How much does digitalization add value to your organization?	Figure 5.6

## **1.3 Research Design**

### **1.3.1 Methodology**

Obtaining data in this thesis is based on quantitative methodology and descriptive design thematic analysis. Research questions are raised within the survey questionnaire, and it is a theoretical basis where I collect the data and analyze them against the responders' answers compared to theories in the literature review section and within the relevant chapters.

### **1.3.2 Research goal**

To study, research and provide better visibility about the current global supply chain market as it stands in terms of strategic vs tactical supply, digital transformation, outsourcing and disruption during pandemics and natural disasters such as Covid-19.

### **1.3.3 Data collection procedures**

I formulated the initial questions, reviewed and revised a second version based on the feedback from participants; accordingly, I have eliminated the questions from the originally 36 to 31 questions, published the final survey in google forms and prepared an introduction email about the purpose of the survey and the expected output to motivate the participants.

### **1.3.4 Research questions online link**

<https://forms.gle/cXy25HbxA92kQNqM8>

### **1.3.5 Participants**

All participants are in the profession of Supply Chain managers, Supply chain specialists, Procurement professionals, and Logistics professionals from 29 countries in different regions of Europe, Asia, Africa, Latin America, and North America, represented in Figure 1.1, and 22 industry types represented in Figure 1.2. Most participants have contributed via personal messages I sent to them on LinkedIn and a few via personal emails sent to my professional network. This survey has achieved the target of 150 responses, 51% from large organizations, 38% from medium organizations, and 11% from small organizations Figure 1.3.

### 1- Number of participants in the survey by region (150 participants)

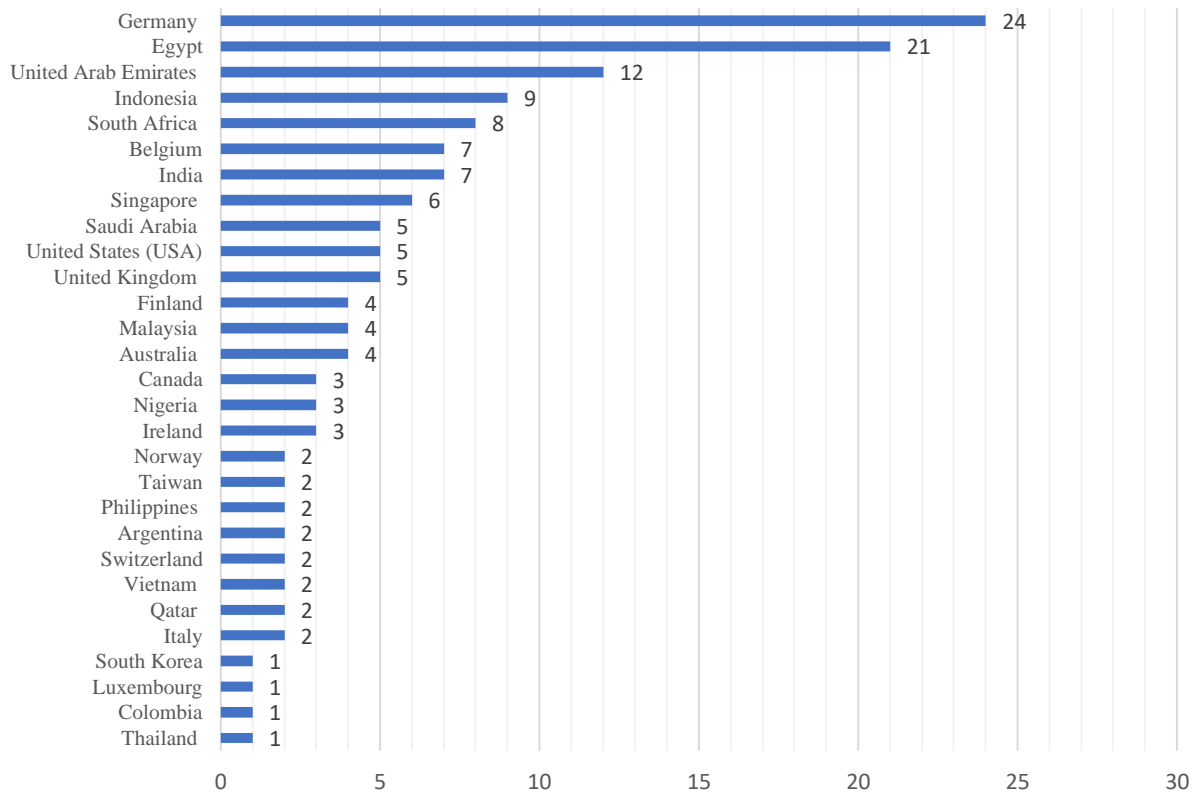


Figure 1.1: Participants in the survey by region

### 2- Industry types of participants

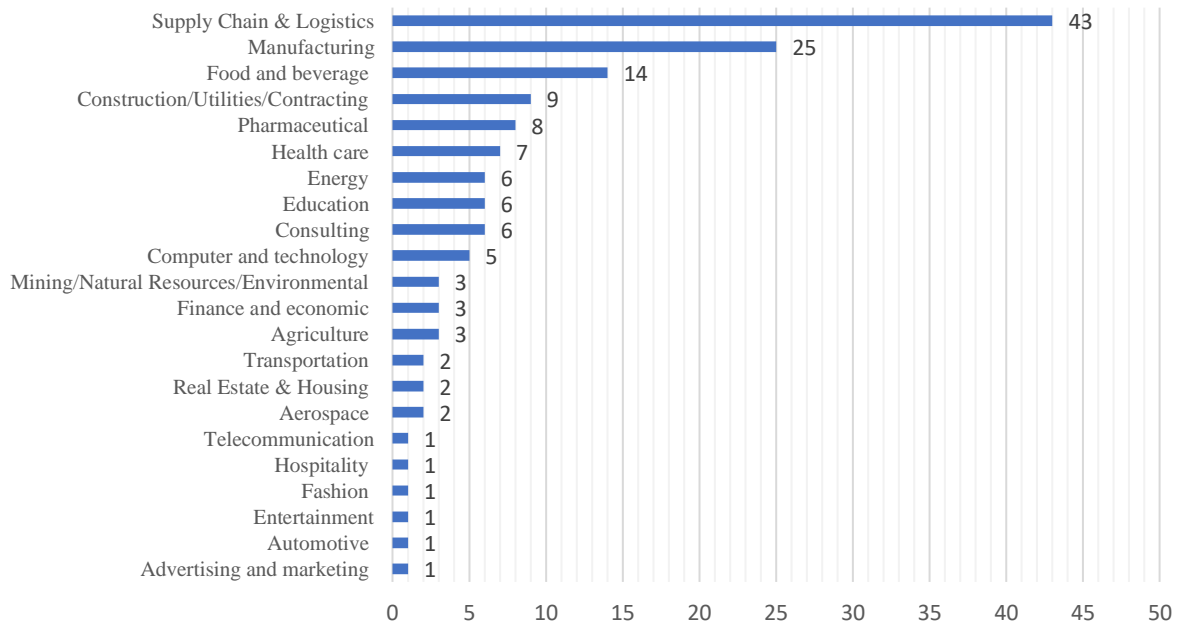
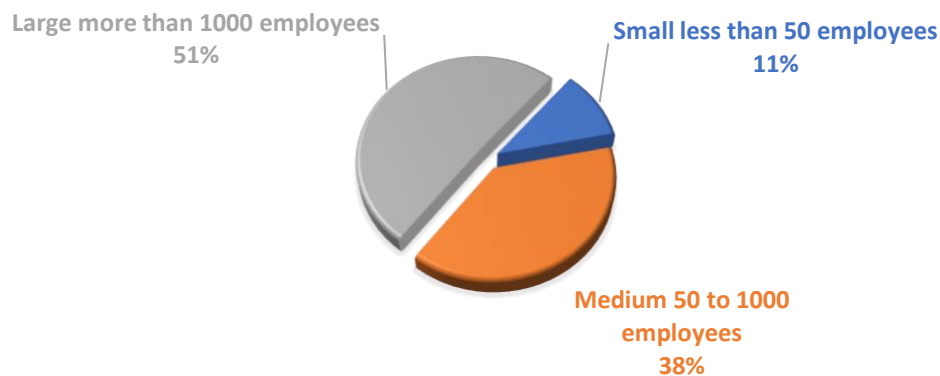


Figure 1.2: Industry types in the survey

### 3- Organization size of participants



*Figure 1.3: Organization size of the survey participants*

## 1.4 Structure of the thesis

The thesis is supported by the survey questions and business case studies. Discussions, key findings, and graph data are illustrated within the concerned chapters and sections. The structure of this thesis is focused on four core parts:

- Procurement objective and development: demonstrate the transition of the concept of purchasing to the concept of procurement, identify the scope of procurement, differentiate between direct and indirect procurement, understand sustainable procurement and sourcing, identify the risk associated with supply and risk mitigation, outline procurement processes, identify proactive procurement and segmentation, compare and contrast the strategic procurement versus tactical.
- Strategic procurement and supply: highlight the growing recognition of strategic procurement role and recognize the innovative adding value of procurement, to define the concept and development of strategy, outline levels of strategy, demonstrate the strategic objective of procurement, explore selecting a strategy, to view the impact of Covid-19 on the supply chain resilience.
- Outsourcing: to compare and contrast the strategic, tactical and operational Make/do or buy decisions, to identify the factors influence make/do or buy-in, to explore the

benefits and risks of outsourcing, to identify and mitigate outsourcing risks, to outline the strategic methodology of outsourcing, in contrary; explore the reasons for the outsourcing retrieval/backsourcing particularly as a result of Covid-19, to identify the motives to source internationally and the associated challenges.

- Industry 4.0: to demonstrate, particularly in the context of the supply chain; the digitalization technology, explore the applications and added values of the internet of things, view how digital twins benefit operations, to demonstrate blockchain and smart contracts' payback in the context of procurement and supply, to view Robotic Process Automation in operations, to provide an overview of Bots and virtual assistants in organization's daily business life with the merge of Artificial Intelligence, recognize the growth and the opportunities of big data, identify the pros and cons of digital infrastructure on-premise compared to cloud-based digital infrastructure, and to illustrate the use of analytics in forecasting and regulating data.



## **Chapter 2 Procurement objective and development**

### **2.1 Literature Review**

For organizations to be more sustainable, they need to be closer to their suppliers, including tier one, two and three. Most of the supply chain's emissions fall within Scope 3 (Blanco et al., 2016). The main obstacle is the find information gaps in the supply chain (Boström et al., 2015). Hence it is vital to question; to which extent organizations are performing traceability exercises today for environmental sustainability and product footprint analysis Figure 2.1.

(Easton & Quayle, 1990) compared the performance of single-sourcing and multiple-sourcing systems. They suggested that single-sourcing networks would be more robust due to intensive trade flows as they would be more straightforward to maintain. On the other hand, multi-sourcing is more agile in responding to environmental changes through switching suppliers and innovation opportunities. (Puto et al., 1985) promoted multi-sourcing as an essential method for organisations seeking to decrease supply uncertainty. Before the Covid-19 period, increasing stock was considered a sign of inefficiency; nevertheless, after the Covid-19 era, reserves are likely to be regarded as a sign of a wise and highly intelligent strategy (Brakman et al., 2020), meanwhile, (Jüttner, 2005) emphasis and stress the importance of visibility beyond tier one supplier to mitigate the risk of the supply, in this thesis I try to question what approaches have been prioritized during Covid-19, such as agility in switching suppliers and multi-sourcing, improving visibility into tier two and three suppliers and increasing inventory “just-in-case” approach Figure 2.2.

Many organizations are developing their systems based on integration to extend their connection with suppliers rather than isolated systems from the market (Hobday et al., 2005); meanwhile, (Pavitt, 2003) debates that the ongoing specialization and the advancement of information and technologies are two forces to increase the chance of disintegration, however, (Burt, 1984) emphasizes the need of establishing integrated design systems. Furthermore, to accelerate the order to requisition time, reduce order errors, and to keep purchase orders, delivery time, and process supplier's payment on the fast track, there is a need for digitalization and systems integrations between the buying organizations and suppliers (Min & Galle, 2003),

here is the result of the surveyed question of whether buying organizations and suppliers have independent or integrated systems Figure 2.3.

A purchasing strategy model suggests retaining suppliers at arm's length, in other words, avoiding long-term commitment with suppliers, which means adversarial transactional cost-driven, best offer relationship (Dyer et al., 1998). Another theory proposes that the aggregate contractual control reduces the cooperative relationship and negotiation approaches and increases opportunistic behaviour as buyers and suppliers rely on governance criteria to manage and reduce risk (Carey et al., 2011), (Lumineau & Quélin, 2012), (Tangpong et al., 2010) many of these cooperatives' strategies end with disputes (Dant & Schul, 1992), (Jap & Anderson, 2003), however, in the sample take in the survey here; there is a tendency on long term contractual relationship, at least 54% have five years or more strategic contractual relationships with their key suppliers Figure 2.4.

Businesses face immense risks if they fail to address environmental and social responsibility (S. P. Sethi et al., 2017). Improper addressing of environmental and social responsibility may result in long-term investment threats for the present and future, however developing and maintaining them may result in positive implications (Adams & Evans, 2004; Cook & Schilke, 2010; Newburry et al., 2006), there is an increasing necessity for reporting CSR for investment groups, these reports will be collected and evaluated by agencies and institutional investors who rank the organizations accordingly for their growth and profitability (Dhaliwal et al., 2012), in addition, to gain community trust and reliability, large organizations have a continuous pressure to disclose their footprint for the environment and society (Caron & Turcotte, 2009; Tate et al., 2010), but what kind and elements of corporate social responsibility policies are communicated with stakeholders in the organizations today? Figure 2.5

Organizations with strategic procurement functionality are more likely to develop supplier evaluation systems. Buying organizations looking to create long-term relationships with their suppliers must focus more on strategic procurement and supplier assessment systems; accordingly, these organizations have visibility over suppliers' performance. Maintaining long-term relationships with key suppliers may maximize organizations' financial performance, and procurement becomes a value-added functionality (Carr & Pearson, 1999). At Honda America, 80% of the components and materials are purchased from suppliers (Cusumano & Takeishi,

1991); emphasize that strategic relationships with these suppliers are critical as they reflect the company image and reputation to their final customers. Many studies have focused on strategic purchasing (Carr & Smeltzer, 1997; Carter & Narasimhan, 1996), while other researches focused on the great significance of the collaboration between buying organizations and suppliers (J. Richardson, 1993). However, the survey I conducted here is attempting to understand the intensity of the strategic relationship between the buying organization and their key suppliers Figure 2.6

The complexity of supply chain management has resulted in greater recognition of the role of procurement (Andersen & Rask, 2003); accordingly, the functionality of the purchasing has changed over the years from a transactional just buying reactive tactical role to proactive strategic functionality (Ellram & Carr, 1994), purchasing now is acknowledged as a crucial driving factor in supply chain strategic management (Ellram & Liu, 2002). Several authors have illustrated the development of purchasing to a strategic level, (Spekman & Hill, 1980) found from his survey mail questionnaire that managerial level is not performing any strategic activities in their daily work, (Farmer, 1981) using empirical case studies identified four obstacles in engaging purchasing in corporate strategy: purchase knowledge, skills, unwilling to change, and perception of being part of corporate strategy, (van Weele, 1984) conducted a survey interview and discovered that management views purchasing as a spectrum ranging from level of procedural level to high strategic level function, (Spekman, 1985), again utilized conceptual method found that corporate executives must evaluate purchasing strategies in terms of strategic resources planning and strategic procurement planning in order to enhance their current and future competitive position, (Pearson & Gritzmacher, 1990) also utilized conceptual technique to discover that incorporating the buying function into corporate strategy increases the organization's competitiveness and many organizations have already utilized their purchasing functionality as strategic, (Monczka, 1992) as well with conceptual method, discovered that the relationship between purchasing strategy and organization strategy is critical in the long term success of the U.S. firms. Recently (Peter J H Baily et al., 2021) have distinguished between reactive tactical purchasing and proactive strategic procurement through some characteristics illustrated in Table 2-1, therefore in this thesis, I have taken it deeper through the survey to examine some of these characteristics with the organizations described their procurement as a strategic function. Figure 2.7, Figure 2.8, Figure 2.9, Figure 2.10, Figure 2.11, Figure 2.12.

Before the Covid-19 world, the increased stock was seen as a symptom of inefficiency and poor management; however, during the Covid-19 era, buffers are likely to be regarded as a sign of a smart and highly clever approach (Brakman et al., 2020), the economic contraction caused by Covid-19 will be a direct result to the uncertainty, affecting the operation and spending plans (Baker et al., 2020). The consequences are difficult to forecast because they are more distinctive, immediate, unregulated, and unpredictable (Baldwin, 2019). A long supply chain has various effects on economics; the longer it is, the longer it takes to recover from a disruption such as the 2008 financial crisis (Brakman & van Marrewijk, 2019), similarly to the Covid-19 disruption. In this thesis, I examine how organizations reacted and responded to just-in-case during the pandemic and whether it has been implemented or at least considered; Figure 2.13, Figure 3.8.

## 2.2 The scope of purchasing and supply

Procurement has significant challenges in terms of cost savings, cost reduction, and cost avoidance, either in sourcing or delivery. However, strategic areas such as digitization, sustainability, diversity risk management, and innovation are projected to add value.

Purchasing has transformed into a subcategory of procurement, including objectives and processes of the procurement cycle.

**Purchasing:** can be defined in various ways, depending on the perspective:

- “To obtain materials of the right quality, in the right quantity, delivered to the right place at the right time, at the right price,”. (Baily Farmer David H. Crocker Barry Jessop David, 2022). This is acknowledged as the five rights.
- Acquisition of supplies or inputs, such as components, raw materials, commodities and services, to the organization to process such as transformation, consumption or resale.
- The purchasing process is a series of steps or series of events that must occur to make a purchase or acquisition. For example, the standard purchase process may include receiving purchase requisition (PR), searching the market, receiving information via Rfx (request for information, quotation, proposal), negotiating with suppliers, placing an order (PO or LPO), receiving the ordered goods via delivery note (DN), receive the

invoice, and finally process the payment for the suppliers, all are common steps in the purchasing process.

**Supply:** the act or process of providing or making an item available, usually in reaction to buyers' or customers' requirements. It engages the transfer or flow of goods, services, and information from one party, such as a supplier, to another, such as a customer. Supply usually happens in a lengthier chain of action by which the output or products of one provider become inputs of its customer, for example, when raw materials are supplied to the manufacturer who finishes them into components and provides them to a sub assembler and the finished sub-assemblies are provided to manufacture of equipment, the complete equipment is provided to the wholesales who provide retailers who finally provide the end user or customer the finished equipment.

**Purchasing and Supply:** Purchasing function has a responsibility not just to buy the items but rather 'Securing Supply', ensuring constant, reliable, cost-effective flow of commodities or services to the organization from the supply chain. In the supply chain's "upstream" level, suppliers are considered a significant factor in the quality of making and delivering products or services, while at the 'downstream' end, customers' requirements are the motivation for the organization's activities.

In other words, purchasing and supply objectives are to plan, secure, transfer, store and distribute inputs from suppliers into outputs that will fulfil customers' requirements. Lysons and Farrington (Purchasing & Supply Chain Management) debated that Purchasing and supply are:

- Reactive: acquire items in reaction to receiving requests
- Transactional: handling orders based on best deal and case by case
- Tactical: based on short-term goals
- Buying: simple processes, primarily; buying in return for payment

Lysons and Farrington reserved the term 'purchasing' but proposed a more sophisticated definition which may be applied to the term 'Procurement':

“Procurement is the process undertaken by the organization unit that, either as a function or as part of the supply chain, is responsible for procuring or assisting users to procure in the most efficient manner required supplies at the right time, quality, quantity and price, and the management of suppliers, thereby contributing to the competitive of the advantage of the enterprise and the achievement of its corporate strategy” (Lysons & Farrington, 2006) (Lysons & Farrington, 2010)

**Procurement:** is a wider term than purchasing; procurement is the practice of acquiring goods or services in any way, including hiring, leasing and transferring. It is a broader process that reflects the more proactive, relational, strategic, and integrated role of the function in the modern organization.

## **2.3 Procurement scope**

- Monitoring the supply market and finding prospective sources of supply
- Evaluation and selection of suppliers
- Processing requests for purchase or stock replenishment
- Contributing to the development of standards for new purchases
- Contract negotiation, acquisition and development
- Contract management and expediting
- Administrative and clerical duties

### **2.3.1 Direct and indirect procurement**

Any materials, commodities, raw materials, semi-finished, and finished goods which will be transformed, manufactured or resold by the organization to the customers are direct procurement; however, any other materials which will be used to aid the functionality and support the activities of the organization such as tools, desks, laptops and will not be sold or transferred to the customers; are indirect procurement.

### **2.3.2 Manufacturing direct and indirect procurement**

- Manufacturing businesses continually need resources such as raw materials, parts, components, and subassemblies. Without a sufficient supply of these materials when required, the production processes may be disrupted, resulting in high-priced

implications. Therefore, the direct inputs to the production activities are categorized as direct procurement.

- Manufacture businesses also require consumable office supplies and maintenance, repair and operating (MRO) supplies. All businesses spend money on general operating expenses such as stationery, travel, and telecommunication. The procurement of these items is often categorized as indirect procurement.

## **2.4 Sustainable Procurement**

A process by which procurement fulfils organization demands for products and services in a way that produces value for money over the long term by producing advantages not only for the organization but also for the economy and society while reducing the impact on the environment. (Baily Farmer David H. Crocker Barry Jessop David, 2022). Procurement has been concerned with providing value and maintaining constant supply, but now it is concerned with risks such as modern slavery, sustainability, diversity and innovation.

### **2.4.1 The objectives of sustainable procurement:**

- 1- To reduce the negative consequences of goods, work and services throughout their life cycle and supply chain;
- 2- Reduce demand for nonrenewable resources;
- 3- Ensuring reasonable contracts rates and terms are pertained to and followed;
- 4- To encourage equality and diversity across the supply chain.

### **2.4.2 The sustainable specification**

- 1- Items to comply with environmental, social and economic objectives indicated in the organization's sustainable policy;
- 2- A genuine need for the items and an accurate forecasting method for demand;
- 3- Wise purchasing, alternatives available items in the stock rather than purchasing;
- 4- Reducing specification without compromising performance and functionality;
- 5- Effective use of the purchased items.

### 2.4.3 Sustainable sourcing

- 1- Product waste management, known as the 3Rs, reduction, reuse, recycle;
- 2- Design products which environmentally friendly;
- 3- Reduce greenhouse gas emission (GHG) or the carbon footprint of organization activities;
- 4- Modify and adjust manufacturing processes to be ecologically clean, resource-efficient, with a safe work effect;
- 5- Reduce pollution, harm and deterioration caused by industrial activities;
- 6- Reduce usage of nonrenewable materials and resources;
- 7- Reduce the adverse effect of the organization's activities on the social communities;
- 8- Design and build sustainable operation processes;
- 9- Healthy, safety, security & environmental (HSSE) work conditions;
- 10- Ethical labour and supply network, fair, ethical and responsible community.

#### Survey Question:

- 4- We perform a traceability exercise for environmental sustainability and social responsibility (including scope 3 greenhouse gas emissions and product footprint analyses) over:

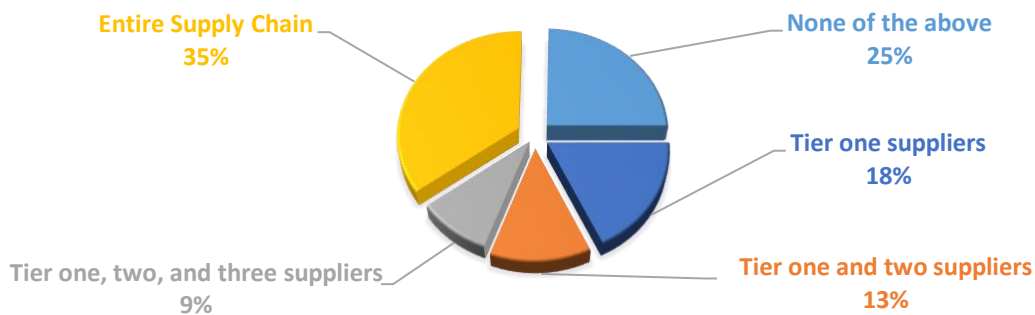


Figure 2.1: Traceability for environmental sustainability and social responsibility

#### Findings:

In the conducted survey question, which is illustrated in Figure 2.1, 35% indicated that they perform traceability exercises for the environmental sustainability and social responsibility for the entire supply chain, compared to 9% over tier one, two and three, 13% over tier one and two suppliers, 18% over tier one supplier, while 25% are not performing any traceability exercise for environmental sustainability, which indicates that although the exercise is widely



performed, nevertheless 23% is still a large number and accordingly affects the environment. Since organizations need to be more sustainable, they need to be closer to their suppliers. As scope 3 emissions are the largest part of the supply chain (Blanco et al., 2016), the key challenge is identifying information gaps across the supply chain (Boström et al., 2015), therefore:

- 1- More awareness efforts have to take place to improve the understanding of sustainability and understand the impact of industrial activities on social community and the environment;
- 2- A sustainable strategy has to be implemented and monitored;
- 3- New designs of products and fair-trade practices to maximize profitability while prioritizing sustainability.

## 2.5 Risk Management

The risk can be classified as follow:

- **Strategic Risk:** originated from commercial weaknesses in terms of intellectual property loss or theft, threatening market share and place.
- **Compliance Risk:** With the growing maturity of morals and ethics of the society and the tighter restrictions for the environment, accordingly procurement is exposed to high legal involvement and reputation risk with further cost.
- **Operational Risk:** The suppliers' failure to provide the organisation's backbone operation materials causes delay and interruption in the flow of output products and results in potential income loss.
- **Quality Risk:** low-cost sources have added a challenge to the procurement to deal with new suppliers whose perception of quality and compliance to standards may vary from customers' point of view and from suppliers' tiers with which procurement has no contact.

## 2.6 Risk Mitigation

Procurement must recognize, investigate and mitigate these risks and prepare a contingency plan. A risk management strategy must be established to observe and assess exposure to risks and possible additional costs, and an effective risk strategy should be continuously maintained

through supplier relationship management and key performance indicators. Risk mitigation may include:

- Proactive monitoring, detection and continuous evaluation of supply chain, suppliers and supply market risk;
- Enhancing end-to-end supply chain data exchange, transparency and visibility for identifying early warning risks;
- Improved visibility into tier two and three suppliers and closer collaboration; (surveyed Figure 2.2)
- Supplier relation management considers transparency and trustworthiness;
- Robust selection and long-term strategy with the suppliers, goals sharing, and early involvement;
- Agility in switching suppliers and multi-sourcing; (surveyed Figure 2.2)
- Increase inventory reserve, “just-in-case” approach; (surveyed Figure 2.2)
- Contract management and supplier key performance indicators must be monitored and maintained to reduce the risk of additional cost and reputation loss;
- Enhance systems integrations between clients and suppliers for instant data exchange and to reduce complexity and coordination concerns; (surveyed Figure 2.3)
- Promote supply chain mapping to identify risks;
- Monitoring the whole supply chain to enhance CSR (corporate social responsibility), sustainability and diversity.

### Survey Question:

5- The following strategies have been practiced post-Covid-19 in order to moderate risks:

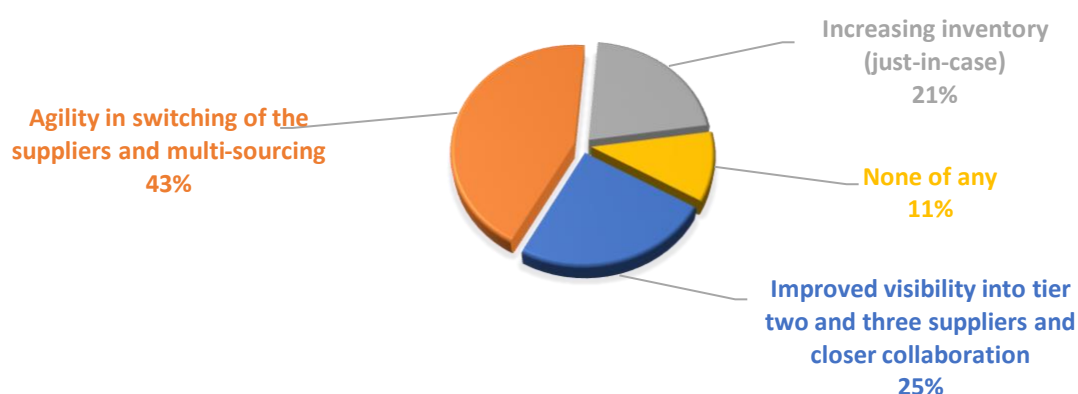


Figure 2.2: Practiced strategies to moderate risks post Covid-19

## Findings:

The surveyed question illustrated in Figure 2.2 is an attempt to find the prioritized strategy approaches post-Covid-19 to moderate the risks. (Easton & Quayle, 1990) suggest that single-sourcing networks would be more resilient since they would be easier to maintain, while (Puto et al., 1985) highlighted multi-sourcing as a critical strategy for organisations aiming to reduce supply uncertainties. (Brakman et al., 2020) indicates increasing stock as a sign of wise strategy, particularly during Covid-19 (Jüttner, 2005) emphasizing the importance of visibility beyond tier-one suppliers. In the sampled organizations, the majority of participants forming 43% cited 'agility in switching suppliers and multi-sourcing strategy approach, compared to 25% cited 'improved visibility into tier two and three suppliers and closer collaboration', and 21% for 'increasing inventory', apparently the majority of the participants have mentioned agility in switching suppliers and multi-sourcing as most flexible and rapid strategy approach during the Covid-19 event. The other two strategies of increasing inventory and improving visibility beyond tier one suppliers may require an early long-term plan.

## Survey Question:

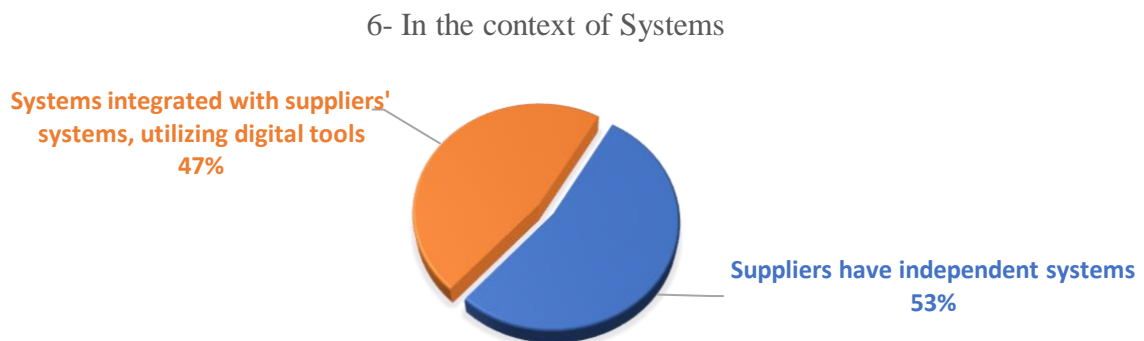


Figure 2.3: Systems integration with suppliers

## Findings:

In the survey question illustrated in Figure 2.3 regarding systems integration with suppliers, 47% of the participants mentioned that they have systems integration with their suppliers using digital tools, compared to 53% who cited that they and their suppliers have independent systems, which means that nearly half of the taken sample in this survey; still have complexity in data exchange, visibility concerns and sharing information speed and time issues. (Pavitt, 2003) argue that increased specialization and technical advances in information technology are two causes that raise the probability of disintegration, while many other authors such as (Burt,

1984) and (Min & Galle, 2003) emphasize the need to develop integrated design systems, recommendations may include:

- Shared software licenses between clients and suppliers may enormously reduce the cost, provided that client-supplier have long-term relationships and goals are shared;
- Enhance the development of plugs or connectors which provide data exchange between different platforms, applications and databases, such as connectors between Microsoft SQL servers and Oracle database servers;
- Utilization of applications with highly customizable options for specific business models;
- Encourage bundle apps, in other words, primary applications for the client with supplementary connections for the supplier;
- Encourage low-cost cloud-shared applications for SMEs such as Salesforce to secure and maximize profitability.

### Survey Question:

7- How long has your strategic contractual / partnership relationship with one or more of your key suppliers been in place?

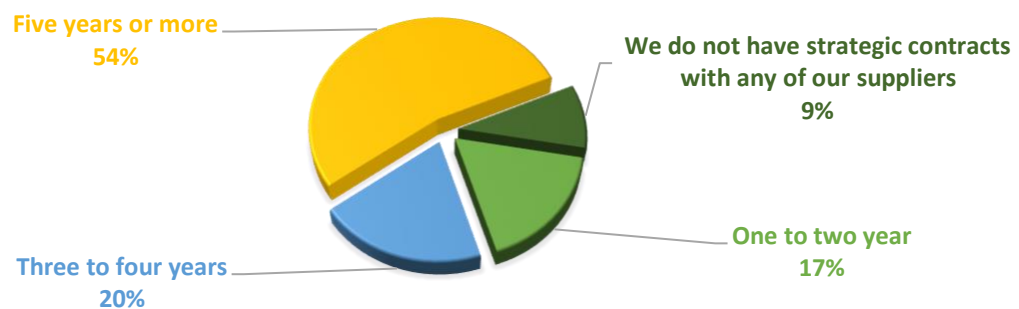


Figure 2.4: Relationship between organizations and key suppliers

### Findings:

The survey question regarding the length of strategic relationships with suppliers is illustrated in Figure 2.4. 54% of the participants mentioned that they have five years or more contractual relationships with their suppliers, while 20% cited three to four years, and 17% one to two years compared to 9% minority has a transactional relationship with their suppliers. (Dyer et al., 1998) suggests avoiding long-term commitments with suppliers, which implies an

adversarial transactional cost-driven, best offer relationship, while (Carey et al., 2011; Lumineau & Qu  lin, 2012) propose that the aggregate contractual control reduces the cooperative relationship and negotiation approaches and increases the opportunistic behaviour. However, according to the survey conducted in this thesis, numbers may indicate a large portion of 91% have long-term contractual relationships with their suppliers varying from one year up to five years, which may indicate the realization of the importance of sharing information, long-term shared goals and visibility.

### Survey Question:

8- The following corporate social responsibility (CSR) policy elements have been communicated with stakeholders and we continuously monitoring them:

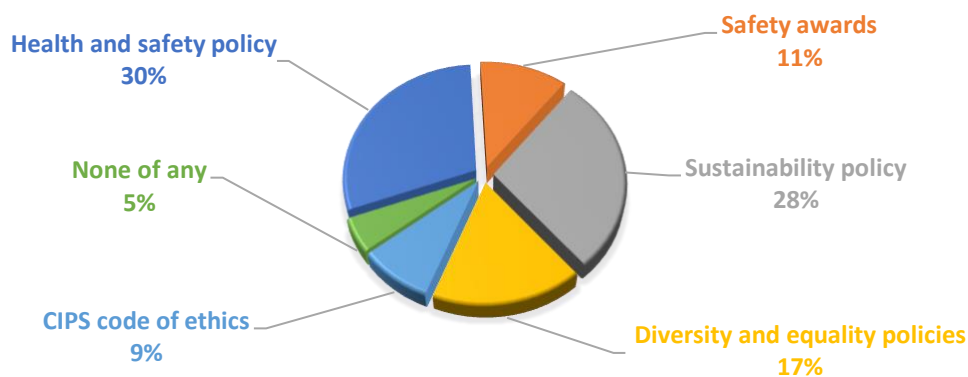


Figure 2.5: Communicated corporate social responsibility (CSR) elements

### Findings:

Improperly addressing environmental and social reasonability may result in long-term investment threats (Adams & Evans, 2004; Cook & Schilke, 2010; Newburry et al., 2006). CSR reports will be collected and evaluated by agencies and institutional investors who rank the organizations accordingly to their growth and profitability (Dhaliwal et al., 2012). In addition, to gain community trust and reliability, large organizations are pressured to disclose their footprint on the environment and society (Caron & Turcotte, 2009). In the survey question illustrated in Figure 2.5, I attempt to address what kind and elements of corporate social responsibility policies are communicated with stakeholders in the organizations. 30% cited health and safety policy, while 28% for sustainability policy, 17% for diversity and equality

policies, 11% for safety awards, 9% for CIPS (Chartered Institute of Procurement and Supply) code and ethics compared to 5% not using any. The following business case describes a strategic procurement approach:

### **Business Case Study – Kraft Heinz (KH)**

The strategic plan for KH is to spare \$1.2 billion in four years using procurement by shifting from cost-cutting to continuous improvement, digitalization and developing long-term supplier relationships using the following approaches:

- Procurement function: Indirect cost has over 20,000 suppliers; thus, KH centralizes this spending to provide sufficient visibility and control to encourage consolidation of spend with contracts (economies of scale), utilising automation to deliver price reductions. The same material was purchased across the organization at a higher price of 20% to 30%.
- Value engineering: improving design to cut costs and add value facilitated by key research & development suppliers.
- Sourcing: to mitigate expenditure risks and enhance efficiency by empowering key suppliers' relationships through digitalization.
- External manufacturing: changing from transactional tactics to cooperation relationships to improve innovation. (Charlie Hart, 2020)

## **2.7 The Procurement processes**

A common procurement process deals with all of the procurement actions that often occur in a simplified sequential order from the initial identification of a need through final satisfaction with that need.

**Pre-contract award:** Identification and description of need, sourcing planning, assessment of sourcing and bidding options, contract creation, market survey, appraisal and selection of suppliers, receiving and evaluating proposals; all together represent the sourcing process.

**Post-contract award:** contract or supplier management, supplier development, continuous asset management, and post-contract learned lessons; these processes comprise the purchase-to-pay, or P2P, cycle.

The procurement process may add value by assessing the possibilities for adding value at each stage of the process:

### **2.7.1 Identifying and defining the need**

Before Procurement can initiate any action or transaction, there must be a need, which must be alerted to the procurement function. The procedure starts with submitting a purchase requisition (PR) or Bill of Material (BOM) if the organization uses Materials Requirements Planning (MRP). PR or BOM will include the details of the required items in a standard form, and this is a potential area of added value in the procurement process since it is their objective to minimize waste by removing unnecessary variants, features, service levels and any associated additional costs. The next step will be communicating a detailed description of the requirements with the potential suppliers with the following methods:

- Performance or conformance specifications
  - Where the specifications are the declaration of the requirements that must meet the provision of a product or service
  - Performance specification: where the buyers describe what part of the material can achieve.
  - Conformance specification: where the buyers describe precisely what part or material it consists of.
- Service Level agreements (SLA) or specifications of services
- Contract terms contain the obligations and fulfillments of the buyer and seller.

### **2.7.2 ESI (Early supplier involvement)**

The process involves the suppliers in the product or service development process at an early stage. The primary goal of ESI is to allow pre-qualified suppliers with proven technical and supply skills to offer technical expertise to the buying organization to provide innovative ideas, improve the product or the service design and lower the manufacturing cost.

## Survey Question:

9- How would you describe the relationship between your organization and your key suppliers?

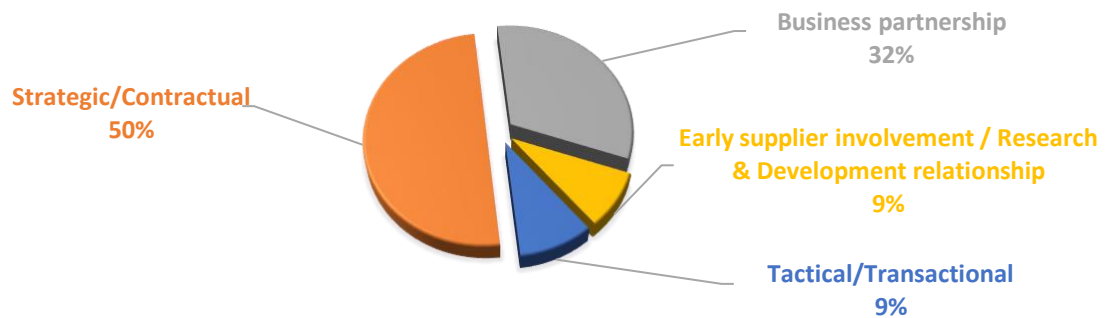


Figure 2.6: The intensity of the strategic client-supplier relationship

## Findings:

Many studies emphasized that a strategic relationship with suppliers is critical (Carr & Smeltzer, 1997; Carter & Narasimhan, 1996), while other research focused on the great significance of the collaboration between buying organizations and suppliers (J. Richardson, 1993). In this thesis, I examine the intensity of the strategic relationship between the buying organization and their key suppliers, illustrated in Figure 2.6. I divided the intensity into three levels, Strategic/Contractual, Business Partnership, and then finally, Early Supplier Involvement and R&D relationship, which is likely to be the most intensive client-supplier relationship. In the survey, 50% cited Strategic/Contractual, 32% cited Business partnerships, and 9% for Early supplier involvement and R&D relationship, compared to the 9% minority with Tactical/Transactional relationships with their suppliers. While a big portion of the sample taken has positive answers regarding Strategic/Contractual, the most challenging relationship is the “Early supplier involvement and R&D” relationship, which requires intensive communication, coordination, shared information, shared goals, and integration from both sides. While this is a very challenging mission; however, the earned values, if well planned, are outstanding.



### **2.7.3 Developing contract terms**

The objective of the contract is to define the roles, rights, and duties of both parties in a transaction or relationship. The contract involves the desire to engage in a legal relationship; in other words, both parties accept to be legally bound by the duties and obligations defined. Many organizations prefer to use standard terms for repetitive items rather than establishing new contracts every time.

**Service Level Agreement (SLA)** may describe a specific performance type and amount of service to be supplied by a service provider. SLA principle aims to specify the buyer's service level demands and ensure the supplier's commitment to the customer's expectations.

### **2.7.4 Supplier selection**

Start with surveying the market and identifying the suppliers who may be able to meet the need. A structured, systematic method to obtain information on the supplier may be necessary, such as introduction forms containing company profile information. Supplier selection may also be referred to as supplier appraisal, evaluation, or pre-qualification.

Once potential suppliers are shortlisted, the buying organization use a more intensive approach to qualify them, such as questioners, site visits and financial status reports. These methods may qualify the suppliers to be officially registered with the buying organization; therefore, they are eligible for an invitation to quote or to tender.

### **2.7.5 Contract award**

Buying organizations may send Rfx (request for information, quotation, proposal, etc.) to one or more suppliers. The Rfx will detail the requirements; accordingly, suppliers will reply with proposals for the contract. In addition, buying organisations may select competitive bidding or tender, in which preapproved suppliers are invited to tender (ITT) or bid for a contract; the two primary approaches are:

- Selective tendering: shortlisted pre-qualified suppliers are invited for tender.
- Open tendering: an invitation to tender which is widely published and open to any bidder.

The public sector in the EU is obliged to have open competitive tendering for contracts above a certain amount to represent fair and open competition. The general rule is that the successful offer will be the lowest price or best value for money; alternatively, the "most economically advantageous tender (MEAT)" based on value measures.

### **2.7.6 Contract or supplier management**

Upon awarding the contract, a new process will initiate, which is purchase-to-pay or P2P. First, negotiation may take place if needed, and then a purchase order will be issued to the selected supplier; accordingly, upon delivery of the goods, an invoice will be issued to the buyer and then a request for payment to the buying organization. Contract management is the process of assuring that both parties satisfy their responsibility and that the contract's desired objectives are delivered. It also implicates developing and maintaining the relationship between the buying organization and the supplier across the contract duration. The key processes in contract management include the following:

- Contract formulation.
- Development of the procedures of the buying organization and the supplier to secure the fulfilment of the contractual commitments.
- Manage the contract performance through KPIs and SLAs.
- Contract evaluation
- Supplier Relation Management (SRM)
- Contract renewal or termination.

#### **Business Case Study – Inmarsat**

Inmarsat, telecommunication cooperation planned to re-develop its contract team and hire procurement and category management experts. Procurement and early involved technical suppliers could save over \$100 Million in only three years. (Buist, 2018)

## **2.8 Proactive Procurement**

The role of procurement and supply is becoming more significant; the function tends to be more strategic, focusing on long-term strategic relationships, sustainability, social values, diversity, supplier management and development, and best value for money, rather than

ordering and refilling. The procurement serves as a consultant while adhering to quality, risk mitigation, innovation, cost analysis, control demand and specification, assuring supplier continuity and reducing the risk of supply limitation, access to new investments and innovation. Table 2-1 compares reactive purchasing and proactive procurement. (Peter J H Baily et al., 2021).

Reactive Purchasing	Proactive Procurement
Purchasing demand and gather specification	Procurement add values
Reject faulty materials	Avoid inferior sources
Reporting to the Finance department or production	Centralized or decentralized managerial function
React to market conditions	Create market opportunities
The abundance of inventory means security (surveyed Figure 2.8)	The abundance of inventory means waste (surveyed Figure 2.8)
Many suppliers mean security (surveyed Figure 2.9)	Many suppliers mean lost opportunities (surveyed Figure 2.9)
Suppliers are responsible for problems (surveyed Figure 2.10)	Problems are a joint responsibility (surveyed Figure 2.10)
The price is the key factor	Best value for money is critical
Suppliers have independent systems (surveyed)	Procurement and suppliers are connected via digital tools (surveyed)
Buying organization receive the specification (surveyed Figure 2.11)	Suppliers assist procurement in defining specifications (surveyed Figure 2.11)
Negotiation is win or lose case	Negotiation win-win case or add values
Withholding information is power (surveyed Figure 2.12)	Sharing information is beneficial (surveyed Figure 2.12)
Limited use of analytics and forecasting	Advanced analytics are applied
Less consideration for sustainability, diversity and community values	Sustainability, diversity and community values are objectives
Purchasing is not affiliated with the organization's strategy due to short-term goals.	Procurement objectives are consistent with organizational strategy
Short term vision	Long term strategy

*Table 2-1: Reactive Purchasing vs, Proactive Procurement*

Some of the above reactive vs. proactive comparison elements have been surveyed and discussed in the next section.

### 2.8.1 Survey Questions: Reactive vs. Proactive

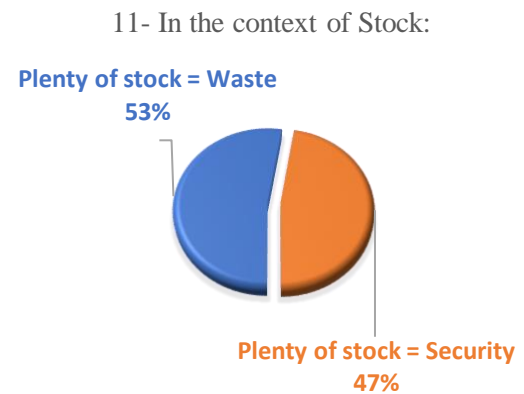
#### Findings:

The complexity of supply chain management has resulted in greater recognition of the role of procurement (Andersen & Rask, 2003). The purchasing functionality has changed over the years from a transactional just buying reactive tactical role to proactive strategic functionality (Ellram & Carr, 1994). Purchasing is now acknowledged as a crucial driving factor in supply chain strategic management (Ellram & Liu, 2002), and several authors have illustrated the development of purchasing to a strategic level (Spekman & Hill, 1980).

In the surveyed question regarding procurement department description Figure 2.7, 65% of the participants cited that procurement in their organization is proactive strategic compared to 35% described their procurement as reactive tactical, which suggests that the role of the procurement is progressively recognized and changing to be a future planning functionality rather than the traditional purchasing transactional role. (Peter J H Baily et al., 2021) have distinguished between tactical reactive purchasing and proactive strategic procurement through some characteristics illustrated in Table 2-1, which I will examine five of them in the following survey questions, with the 65% who have described their procurement as strategic functionality.

In Figure 2.8, 53% cited that they perceive plenty of stock as waste compared to 47% consider it as security, which indicates in terms of inventory that nearly half of the sampled organizations are still considering the tactical purchasing method, according to Peter Baily, rather than the strategic procurement approach for stock.

In the context of the suppliers, the question surveyed and illustrated in Figure 2.9, 66% cited that plenty of suppliers means security, compared to 34% cited lost opportunities. In general, many suppliers indicate little concentration with an adversarial relationship based on the lowest price as a key factor rather than the best value for money and sharing long-term goals; however, a modest number of suppliers, if carefully chosen, may offer mutual benefits, shared long-term goals, vision,



ideally early supplier involvement which means opportunities such as low design cost, reduction in manufacture cost, elimination of non-adding values specification, use of supplier expertise and innovation.

In the context of suppliers and outsourcing problems Figure 2.10, 82% cited that the encountered problems are shared responsibility between the buying organization and the suppliers, while 18% cited that it is only the suppliers' concern, which may indicate that one of the key elements of strategic procurement characteristics as per Peter Baily; are being followed by the majority of the sampled organization in this survey. Shared responsibility means that both buying organizations and suppliers are seeking together for solutions and alternatives to solve the problems; this means not only adding value but also means business continuity for both.

In the context of receiving specifications illustrated in Figure 2.11, 50% cited the procurement function only receives specifications from their clients, 26% cited specifications do not change, compared to 15% cited that both suppliers and procurement function contribute together to the specifications and 9% cited that procurement function contributes to specifications in cooperation with their clients, the last two 15% and the 9% may indicate a strategic procurement functionality, together represents 24% which is a small portion for an organization described their procurement function as strategic according to Peter's Table 2-1.

In the product launch and development context, the surveyed question illustrated in Figure 2.12, 57% cited that they have full integration with suppliers, and 26% partially share information with their suppliers, compared to 17% asking their suppliers to provide what they require without collaboration.

Finally, as per the sample taken in this survey, organizations that described their procurement function as strategic have a strong to mild correlation with Table 2-1 in Figure 2.10 and Figure 2.12; however, it has a weak correlation with Figure 2.8, Figure 2.9, and Figure 2.11.

13- In the context of encountering suppliers and outsourcing problems

**Problems are a shared responsibility**  
82%



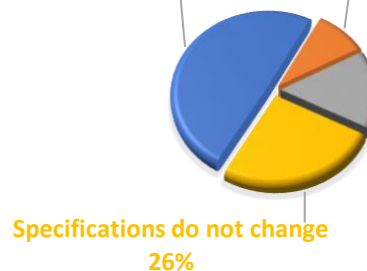
**Problems are suppliers' responsibility**  
18%

Figure 2.10: Problems sharing responsibility

14- Procurement Department:

**Receives specifications**  
50%

**Contributes to specifications**  
9%



**Suppliers and Procurement contribute in specifications**  
15%

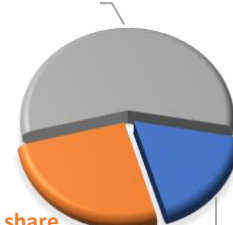
**Specifications do not change**  
26%

Figure 2.11: Procurement stands for specification

15- In case of product launch or product development:

**We have full integration with supplier/s, business partners with non-disclosure agreement**

57%



**We partially share information with supplier/s about our planned and prototype product**  
26%

**We only ask supplier/s to provide what we need**  
17%

Figure 2.12: Shared information with suppliers

## **2.9 Procurement Segmentation**

The process of categorizing the procurement portfolio for buying commodities or suppliers will be according to their priority, value or importance to the buying organization, known as segmentation. The allocated segments will determine each situation's procurement resources and approaches.

Inventory and supplier management have become priorities for buying organizations. As a result, most procurement functions have increased pressure to maintain and expand savings, avoiding and cutting costs while ensuring supply flow and sustainability. The segmentation enables the procurement to concentrate on cost-effectiveness and reduce supply chain risk exposure. The segmentation, however, will vary from one organization to another; whatever approach will be utilized, it is critical to make a clear relationship between the segmentation analysis and the organization's objectives, such as cost and risk reduction. Pareto analysis, which is regarded as ABC analysis and the Kraljic procurement portfolio matrix can be utilized to illustrate the procurement segmentation.

### **2.9.1 Pareto ABC analysis**

The Italian economist Vilfredo Pareto expressed that in every sequence of components to be regulated, a selected 20% of elements often accounts for a significant factor in terms of 80% of work (Tanabe, 2018). The Pareto principle, rule of 80/20, is a great strategy for determining the activities that the buying organization will maximize in terms of time, efforts and resources, a common method of prioritizing and distinguishing activities and areas of emphasis.

In the procurement context, the Pareto principle considers 80% of spend going to only 20% of suppliers, this kind of segmentation is used to distinguish the crucial few suppliers who offer vital high-value commodities that can only be procured from a narrow supply market and the insignificant low value which can be easily purchased from a variety of sources, procurement attention and efforts should be toward the organization backbone suppliers and the items obtained from them. The Pareto or ABC segmentation method is based on the value and volume of the business with the supplier; however, this is not the only element that a procurement or supply chain function should consider when segmenting suppliers.

## 2.9.2 The Kraljic matrix

Peter Kraljic created an analytic method that attempts to map two elements:

- The relevance of the item acquired to the organization is based on considerations such as the organization's spending budget on the item and its revenue potential.
- The supply market complexity is related to factors such as the exertion of sourcing the item, the buying organization's urge to supply or supplier, and the relative power of the organization and the supplier in the market. (Kraljic, 1983)

The four quadrants are illustrated in Table 2-2. On the strategic level, the Kraljic matrix examines an organization's procurement portfolio, its exposure to risk and supply market disruption, and it can also be seen as a tool for assessing procurement approaches and the most appropriate types of supplier relationships and how procurement function can add value by leveraging the potential of each.

		Risk / Complexity of supply market			
		Low		High	
Item Importance / Profit Impact	High	Emphasis	Time span	Emphasis	Time span
		<b>Leverage</b> / High-profit impact	Various	<b>Strategic</b> / High-profit impact	Long-term - Strategic
		KPI	Item type	KPI	Item type
		Cost / Price	Mix of commodities	Long-term accessibility	Scarce / high value
		Source	Supply	Source	Supply
		Multi-source	Low supply risk / Abundant	Developed global suppliers	High supply risk / Natural scarcity
	Low	Emphasis	Time span	Emphasis	Time span
		<b>Non-Critical</b> / Low-profit impact	Limited	<b>Bottleneck</b> / Low-profit impact	Variable / short-term
		KPI	Item type	KPI	Item type
		Functional effectiveness	Some specific commodities	Cost control / Short-term sourcing	Mainly specific commodities
	Low	Source	Supply	Source	Supply
		Developed local suppliers	Low supply risk / Abundant	Global	Low supply risk / Production scarcity

Table 2-2: Kraljic Matrix | Chartered Institute of Procurement & Supply, n.d.)

	Item	Strategies/tactics approaches
Leverage	Have minimal risk but significant profit potential, often common standard items, purchased in bulk and widely available from various sources, buying organizations probably to be strong in negotiation, high expenditure from competing suppliers, best for 'economies of scale to maximize leverage.	The objective is to maximize the organization's economic advantage; hence, the best is to utilize the insights to empower the control. Competitive bids may be obtained through multi-sourcing, agility in switching suppliers, ideally supplier-managed inventory and just in time, item standardization and, when feasible, switch to industry standards, buying consortia to empower negotiation and best deals.
Strategic	These have a high level of risk and high profitability, are critical to run the business, usually are high in value, and provide the majority of the profit through well-planned procurement approaches. In addition, crucial factors are related to the strategic items that must be maintained, such as supply consistency and quality level, which affect the organisation's reputation.	The strategy is to build tight ties and collaborate with reliable suppliers to reduce the supply risk and maximize the potential profit. Possible strategies may include ESI (early supplier involvement), direct negotiation, and establishing mutual benefit partnerships.
Non-critical	Routine items have low risk and low potential for profit. These items are often low in value, homogenous, obtained with blanket orders, and vendor-managed inventory can be ordered online and involve minor negotiation. Therefore, buying organizations should routinely monitor with efficiency.	Risks are limited; therefore, the strategy should use basic, cost-effective approaches such as e-procurement, automated ordering via, for example, IoT, direct ordering from users using blanket ordering, outsourcing and supplier-managed inventory.
Bottleneck	High risk with low-profit potential, as with the strategic items, are critical to running the business; however, they have limited potential sources, reducing the negotiation options. Dealing with one or very few numbers of suppliers results in a bottleneck situation. The buying organization should loosen the specifications and create new sources to move these items to another category.	The risk of non-availability is a primary concern; hence the strategic objective is to ensure supply continuity. The supply risk may be mitigated through negotiating medium-term or long-term contracts, involving incentives and penalties in the contracts to ensure reliability, well understating of the market, demand forecasting, maintaining close contact with the existing supplier, establishing alternatives sources, preserving safety stock, and reduce specification to increase supplier's competition.

Table 2-3: Strategic & tactical approaches for items



### Survey Question:

16- During the Covid-19 pandemic the following approaches have been taken:

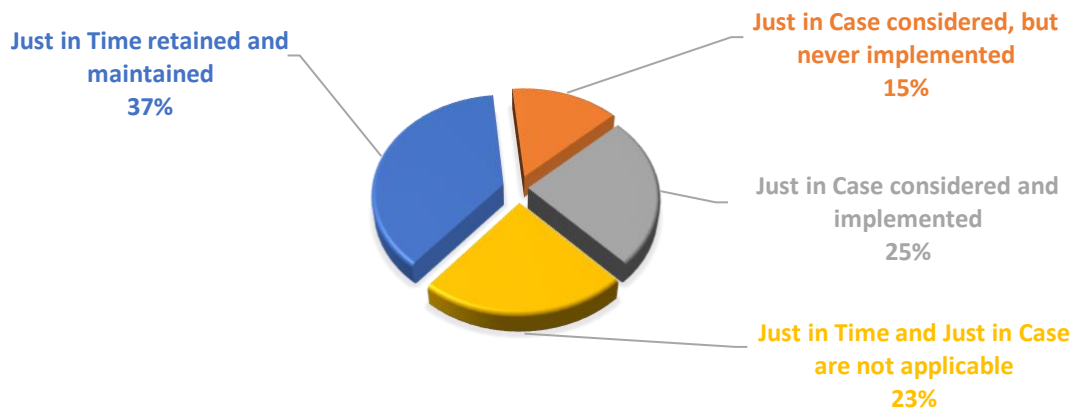


Figure 2.13: Just in time / Just in case during Covid-19

### Findings:

Before the Covid-19 world, the increased stock was seen as a symptom of inefficiency and poor management; however, during the Covid-19 time, buffers are likely to be regarded as a sign of a smart and highly clever approach (Brakman et al., 2020). In the surveyed question illustrated in Figure 2.13, 37% cited that “Just-in-time” has been retained and maintained, 15% cited “Just-in-case” has been considered but never implemented, compared to 25% have considered and implemented “Just-in-case”, while 23% cited that both approaches are not applicable. As per (Baldwin, 2019), the consequences are difficult to forecast because they are more distinctive, immediate, unregulated, and unpredictable. Therefore, in the sampled organizations in this survey, I find the correlation between the utilization of “Just-in-case” and the event of Covid-19 is moderate, reasons may vary from one organization to another, and further research may be required to investigate the obstacles and the challenges.

## **Chapter 3 Strategic procurement and supply**

### **3.1 Literature Review**

Procurement is considered now a critical function in many organizations and recognized to be crucial in terms of strategy (Humphreys, 2001; Paulraj et al., 2006), nevertheless others are debating that procurement remains mainly a support function and acting as a tactical role, primarily conducts low-value-added operations (Cox et al., 2005; Kaufmann & Carter, 2004). A case study conducted by (Harrington, 2018) found that Emirates Airlines developed their procurement department into a strategic adding value functionality; they focused on improving sourcing transparency, developing human resources through recruiting talents and continuous training, monitoring and controlling processes, utilizing technological advancement by moving away from rubber-stamped contracts. The outcomes of this transition were savings of AED85 million, enhanced expenditure transparency, on-time payment, compliance, and a reduction in request to order time from 35.1 days to 4.1 days by leveraging P2P (Procure to Pay). In this thesis, I am trying to take one possible added value element a little deeper and question the organizations who have described their procurement function as strategic about 'requisition to order time' Figure 3.1.

Although proactive supply management is an often-used word, there is little consensus on its specific meaning (Smeltzer & Siferd, 1998). Several risks were identified by (Heinritz, 1991), including supply certainty, poor supplier selection, environmental substantiality constraints, organization liability and lead time uncertainty. (Burt & Pinkerton, 1996a) emphasizes the significance of building integrated systems for design, procurement, quality, inventory management, and manufacturing. They stated that for the procurement function to be effective and add value, it should be able to identify what to buy, identify and develop proper suppliers' relationship, achieve the lowest total cost of acquisition, ensure that the necessary material or service is obtained on time and that future supplies are secured. Purchase strategy research contained responses from 739 purchasing managers (Carr, 1996) found a significant connection between the degree of strategic purchasing and proactive purchasing; however, the connection is modest. During the pandemic of Covid-19 and recent geopolitical events, I attempt to find the most significant, specific and frequent role of procurement illustrated in Figure 3.2.

Using survey-based information gathered from 174 US firms (Kristal et al., 2010) found a versatile supply chain strategy correlates with combinative competitive capacities and company success. A well-developed supply chain strategy has a direct and beneficial impact on combinatorial competitive capacities, improving business performance, particularly market share and profitability. The capacity of an organisation to accomplish low cost, high flexibility, reliability, and quality is reflected in its combined core competencies (Menor et al., 2001; Rosenzweig et al., 2003). From this perspective, particularly post Covid-19, how supply chain strategy has been realized and implemented today in an organization, and how far does management believes supply chain strategy could impact business performance, an attempt to answer this question in Figure 3.3 and Figure 3.4.

Typically, the pricing criteria is the main drive in supplier evaluation and selection without considering any additional expenses that this supplier may introduce into the product life cycle, the costs associated with an unreliable supplier's delivery service, transportation costs, ordering costs, low quality of items delivered, poor communication and inspection costs, all are not included in the selection process, if criteria other than price are considered at all, it is generally done in a biased or occasional manner (C. A. Weber et al., 1991), the teams in procurement, quality, production and sales communicate their views on suppliers' performance based on factors that are essential to them, they will try to end with the conclusion of whether the supplier is good or bad, this strategy is relatively straightforward, lacks objective criteria, and seldom results in performance improvements. Therefore, suppliers with the most tempting pricing are not necessarily the cheapest when all the additional costs connected with the supplier are considered. Furthermore, major cost structure variations exist for certain products or services, and none of the suppliers can continuously offer the lowest prices for all types of cost structures. Furthermore, some suppliers provide a higher level of service than others. These services mostly consist of technical assistance, training, and maintenance. When suppliers do not provide these services, the life cycle of the product or service involves additional expenses. (Degraeve & Roodhooft, 1999). In this thesis, I'll attempt to identify what organizations prioritize when selecting offers or suppliers Figure 3.7.

## 3.2 Strategic procurement

All strategies start with new visions, which means transformation. During the transition stage, stakeholders receive and provide data based on their concerns as a point of view, which they define as what they perceive; accordingly, organization leaders should be able to drive various stakeholder perspectives into a new vision which delivers values in a new method.

As procurement grows into a strategic function, it must be aligned with the organization's strategy, which is a preparation for the future. It involves the creation of guidelines to facilitate the processes of the strategy. Once the strategic objectives have been decided, tactics may be developed, all organization activities, including procurement, must be involved in these processes, and all should be aligned with the organization's strategy.

Strategy originated from the Greek term 'strategia', which means "generalship", essentially a military notion that has been applied later in the business world. A business strategy, in a nutshell, is a competitive advantage. The main objective of strategic planning is to facilitate organizations to obtain and sustain an advantage over their competitors; therefore, organization strategy denotes an endeavour to change a company's strength concerning its rivals in the most effective way possible. (Ohmae, 1982).

The primary reasons for the increased engagement of the procurement into the organization's strategy can be referred to:

- 1- The growing recognition of procurement as adding value functionality.
- 2- The growing awareness that supplier participation may enhance efficiency and effectiveness.
- 3- Innovation demands management integration rather than functional orientation.
- 4- The wide recognition of procurement profit potential.
- 5- Procurement's constructive role in mitigating risks.
- 6- The positive procurement role in minimizing supply disruption during natural disasters such as pandemics and wars.
- 7- Integrating material and information flow has given procurement a strategic point associated with e-commerce, supply flow, and lean and agile supply. It is preferable to establish good techniques and principles throughout the supply chain by spreading these concepts both upstream and downstream. This will necessitate inter-

organizational collaboration and may include elements such as cross-functional teams, acknowledgement of the need to satisfy internal and external customers, more dynamic management structures, and successful partnerships. This development will save costs and provide value to the supply chain. (Baily et al., 2015)

**Strategic and innovative value-adding examples may include:**

- Value-adding negotiations and relationships: working cooperatively and constructively with suppliers to discover methods to constantly improve and add value that benefits all parties.
- Lean supply means working closely with the supply chain to remove or reduce waste (non-value-added items) in all operations and processes, reduce waiting time, excess inventory, excessive procedures, unnecessary transfers and excessive expenses.
- Value engineering analyzes the value and potential added value of goods throughout the design and development process, which frequently involves cross-functional teams and early engagement of external suppliers.
- Agile supply: working closely with the supply chain to increase the speed and flexibility of responding to changing customer demands, with shorter idea-to-market cycles, delivery lead times, and, if necessary, holding some stock of work in progress to support responsive processes such as late customization or assembly to order.
- Tiering suppliers: involves the identification of the supplier or group of suppliers into tiers. Tier one has direct communication with the buying organization, while tier two is controlled by tier one and so on hierarchically. This will reduce transaction costs, search for information, reduce time, negotiation and re-negotiation and allow effective early supplier involvement.

### Case Study – Emirates Airlines (Procurement adding values)

Emirates Airlines has developed and transformed its buying department into a procurement strategy adding value functionality to the organization chart. They have focused on enhancing sourcing transparency and human assets through recruiting talents and training, monitoring and control processes, advancement technology through moving from rubber-stamped (surveyed in Chapter 5 Industry 4.0 Figure 5.5), results in such transformation were AED85 million in savings, improved spend transparency, on-time payment, compliance, and improved requisition to order time from 35.1 days to 4.1 by utilizing P2P (Procure to Pay). (surveyed below Figure 5.6) (Harrington, 2018).

### Survey Question:

17- Requisition to order time takes:

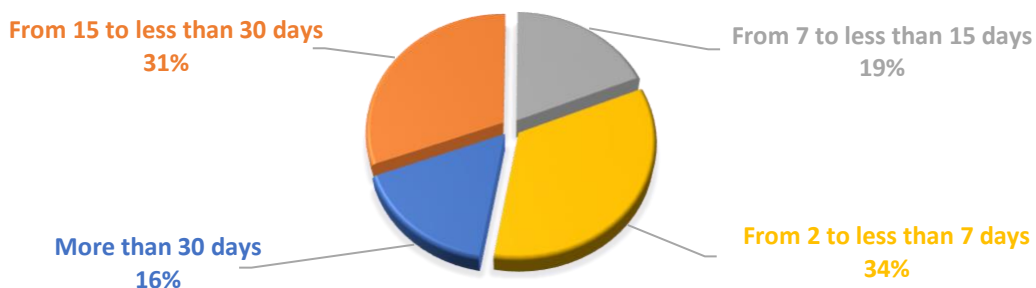


Figure 3.1: Requisition to order time

### Findings:

Procurement is now recognised as a critical function in many organisations and is critical in terms of strategy (Humphreys, 2001; Paulraj et al., 2006). However, others argue that procurement is still primarily a support function with a tactical role and primarily conducts low-value-added operations (Cox et al., 2005; Kaufmann & Carter, 2004). The case study above (Harrington, 2018) found that if procurement is transformed into a strategic function, it may add values such as reducing “requisition to order time”, hence the survey question

illustrated in Figure 3.1 is an attempt to examine this element, therefore, in the 65% of the organizations who have described their procurement function as strategic Figure 2.7; 34% cited 'From 2 to less than 7 days', 19% 'From 7 to less than 15 days', 31% 'From 15 to less than 30 days', and 16% "More than 30 days", hence within the sampled organizations in this survey I find the correlation is low as 34% compared to (Harrington, 2018) outcomes.

### Survey Question:

18- In your organization; how best can you describe the role of the Procurement department?

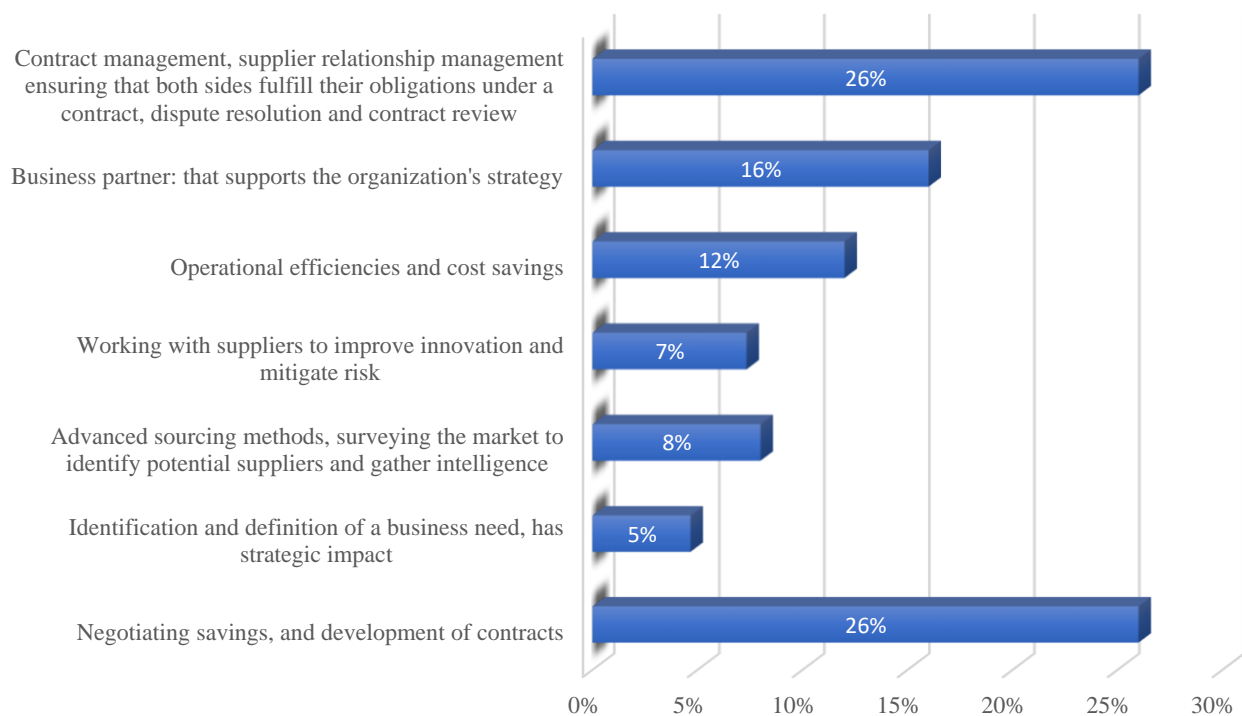


Figure 3.2: The role of procurement in organizations

### Findings:

A purchase strategy study involving 739 purchasing managers found a significant relationship between the degree of strategic purchasing and proactive purchasing; however, the relationship is modest (Carr, 1996). (Burt & Pinkerton, 1996b) explained that for the procurement function to be effective and add value, it should be able to identify what to buy, identify and develop proper supplier relationships, achieve the lowest total cost of acquisition, and ensure that the necessary material or service is obtained on time and that future supplies are secured.

Therefore, the survey question illustrated in Figure 3.2 is an attempt to find the most significant, specific and frequent role of the procurement function during the Covid-19 pandemic and post the recent geopolitical events, what I found is 26% cited for 'Contract management, supplier relationship management' and another 26% for 'Negotiating savings, and development of contracts', 16% cited for 'Business partner: that supports the organization's strategy', 12% for 'Operational efficiencies and cost savings', 8% cited for 'Advanced sourcing methods', 7% cited for 'Working with suppliers to improve innovation and mitigate risk', finally 5% cited for 'Working with suppliers to improve innovation and mitigate risk'. This also may indicate that the procurement function within the sampled organizations is broadly recognized as a strategic function.

### Survey Question:

19- Does your business have a supply chain strategy?

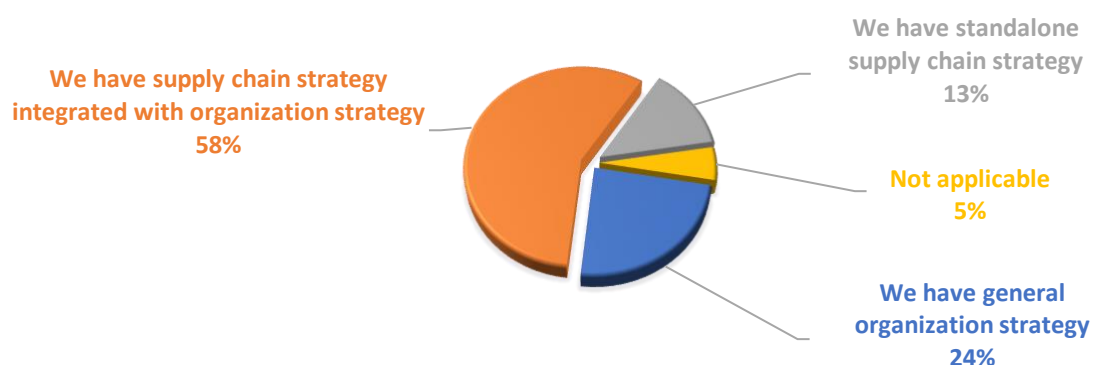


Figure 3.3: Supply Chain strategy presence

### Findings:

Using survey-based data from 174 US enterprises, (Kristal et al., 2010) discovered that a flexible supply chain strategy connects with combinative competitive capabilities and corporate performance. A well-planned supply chain strategy has a direct and positive influence on competitive combinatorial capacity, which promotes business performance, specifically market share and profitability. In the survey question illustrated in Figure 3.3, I attempt to find how a supply chain strategy has been established in a company today, particularly during the Covid-19 pandemic. 58% cited they have a supply chain strategy



integrated with the organization's strategy, and 24% cited they have a general organization strategy. In comparison, only 13% cited they have a standalone supply chain strategy, and 5% not applicable, which indicates that the majority of the sampled organizations 58% plus 13% forming 71% have established a supply chain strategy, meanwhile as low as 13% forming the minority, has established a dedicated supply chain strategy in the sampled organizations.

### 3.3 The concept of strategy

Strategy is the configuration or plan that combines an organization's key objectives, guidelines, policies and activity into a unified sequence. Well, planned strategy facilitates organizing and allocating resources into a recognizable and practical activity to maintain competence in the market while anticipating and considering the changes in the environment and learning lessons internally from competitors. (Lampel et al., 2013)

#### Survey Question:

20- Do you think supply chain strategy impacts your business performance?

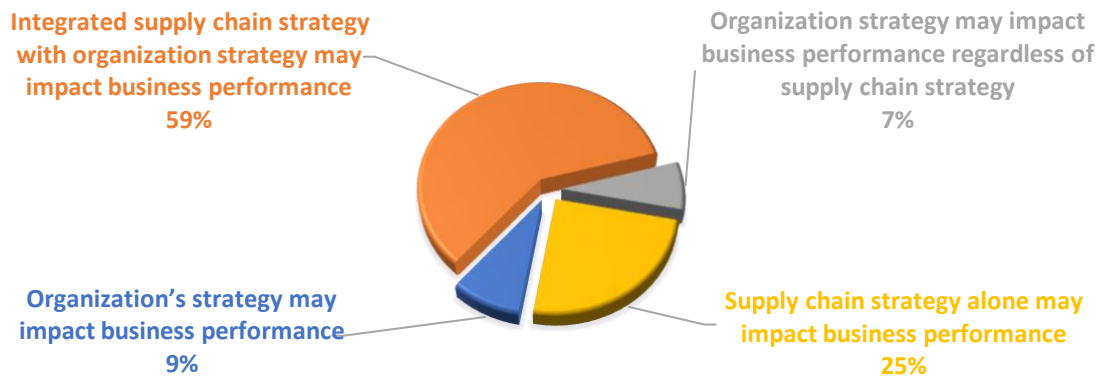


Figure 3.4: The supply chain strategy impacts business performance

#### Findings:

A well-planned supply chain strategy has a direct and positive influence on competitive combinatorial capacity, which promotes business performance, specifically market share and profitability. Moreover, the combined core skills of an organisation indicate its ability to achieve low cost, great flexibility, reliability, and quality (Menor et al., 2001; Rosenzweig et al., 2003). However, to what extent does management perceive supply chain strategy may affect business performance, particularly during Covid-19? In an attempt to answer this

question illustrated in Figure 3.4, 59% of the participants in this survey cited ‘Integrated supply chain strategy with organization strategy may impact business performance’, 25% cited ‘Supply chain strategy alone may impact business performance’. In comparison, 9% cited ‘Organization’s strategy may impact business performance’, and 7% of the participants cited ‘Organization strategy may impact business performance regardless of supply chain strategy’. Hence, the sampled organizations in this survey indicate a strong correlation between supply chain strategy and business performance.

### **3.4 Developing strategy**

The classic perspective school of strategy creation based on (Mintzberg et al., 2020) perspective schools are included in the rational strategic development; it is anticipated that a reasonable economist person should:

- Make decisions to maximize profits
- All alternatives to be considered
- Understand the cost and the effects of all alternatives
- Allow a single person to make decisions
- Rank impacts based on a set of selections.

Typically, such planning consists of two stages:

- 1- Establishing goals or objectives that may be transformed into quantifiable targets by summarizing external and internal strengths, weaknesses, opportunities, and threats (SWOT analysis).
- 2- Determining how such goals may be attained and developing relevant plans.

According to (Lawrence, 1999), traditional conceptions of strategic planning have been criticized since they are based on already agreed strategic goals and the strategies to decide how the organization is to be organized and resources allocated to realize these objectives. (Fahey & Prusak, 1998) consider this tendency to focus on the past and present rather than the future is one of the fatal sins of knowledge management.

Other critiques include:

- Planning with over-analysis and projection as opposed to creativity and innovation.

- All alternative options are unlikely to be known, hence, limitations in processing information.
- Rational planning implies a stable environment; nevertheless, the environment always changes, and accordingly, the strategic goals.

According to (Lysons & Farrington, 2016, p. 34), the following factors need to be addressed while developing a strategy:

- Goal objectives
- The implementation of goal objectives

The strategy may include the following:

- The identification of ongoing approaches and actions
- Accounting for risk and innovation
- The activities being planned
- Performing the appropriate things at the appropriate times
- Deciding amongst alternatives

Typical signs of strategic drift include:

- Unwilling to change
- Unsatisfactory performance
- An abundance of present culture/model
- An absence of exterior focus

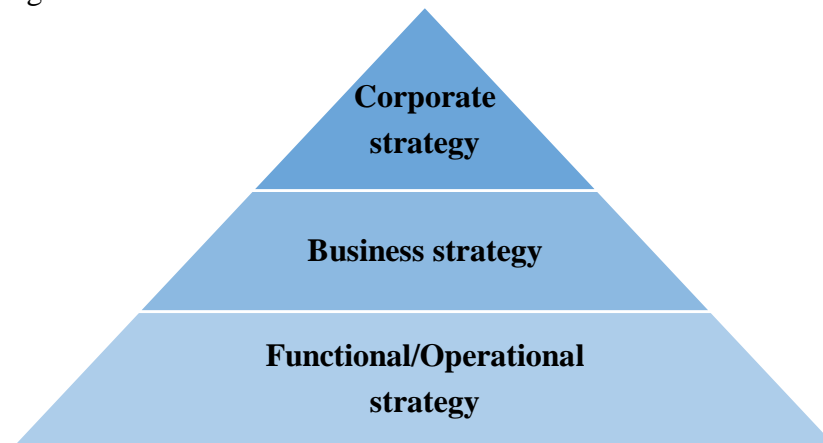
### **3.5 Levels of strategy**

Strategies are targeted at different levels in the organization. If an organization has effectively decided tactics at several levels, the strategies should be communicated and collaborated with all stakeholders and have their full engagement and commitment.

#### **IBM – Procurement strategy statement**

To be the best-in-class procurement organization, both within and outside of IBM, and to provide our clients with a Top-Notch supplier network.

Strategies are developed, assessed, and executed at three levels in a typical organization, as illustrated in Figure 3.5



*Figure 3.5: Levels of strategy*

### **3.5.1 Corporate strategy**

Planned for the long term; therefore, they rarely change; they are major and usually less specific; thus, they are challenging to evaluate. Corporate strategies are often focused with:

- 1- Identifying the business, the company should maximize the profit for;
- 2- Determining the holistic strategies;
- 3- Allocating key resources and ties within the organization based on the market, competitors, and environmental factors;
- 4- Identifying the organization's values and how they will be governed;
- 5- Determining commercial sites and compositions.

### **3.5.2 Business Strategy**

A business strategy is an operation or planning that combines a specific collection of products or services provided to a consistent set of consumers while competing against rivals (Hax & Majluf, 1999, p. 416). Developing a business strategy should consider how to compete in a specific market area. Business strategies are often focused on the following:

- 1- Collaborating and combining unit strategies to ensure alignment with corporate strategies;
- 2- Analyzing the market to ensure that plans meet the demands;
- 3- Recognizing product market segments and developing competitive strategies for each;
- 4- Enhancing each unit's particular competencies and competitive advantages.

### 3.5.3 Functional strategy

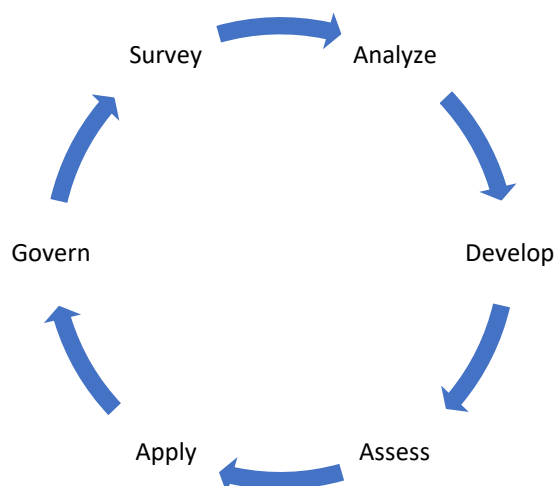
Focused on developing strategies related to the primary areas or functions that comprise a business, such as procurement, logistics, distribution, production, manufacturing, research and development, marketing, human resources, and finance, they should be derived from and aligned with corporate and business strategies.

The development of functional strategies should consider the best utilization of functional knowledge to satisfy business needs. Functional strategy is often focused on the following:

- 1- The effective use of experts and functional talents;
- 2- Offering knowledge and experience that may be used to develop corporate and business strategies;
- 3- Embedding and aligning functional activities such as information technology and procurement for effective performance.

### 3.6 Strategic management

- 1- **Survey:** the organization's current position internally and externally.
- 2- **Strategic analysis:** resources, environment, vision, mission and objectives.
- 3- **Strategic development:** rational selection, achievable options.
- 4- **Strategic assessment:** evaluation of the planned strategy.
- 5- **Strategic implementation:** determining how the chosen strategy will be implemented.
- 6- **Strategic governing:** monitor and control.



*Figure 3.6: Strategic management cycle*

The cycle elements of strategic management Figure 3.6 will interact based on the vision of the strategic developers and the organization's perception.

### **3.7 The strategic objectives for procurement**

The common procurement methods and techniques to contribute to the organization's strategic growth are:

- 1- Cost dominance: cost saving, cost avoiding, cost cutting, consolidated buying, global buying and best value for money.
- 2- Early supplier involvement: in product design and innovation, value analysis, total quality management and substitute materials.
- 3- Source identifying: encourage buying from local suppliers, buy or lease decisions, sub-contracting, outsourcing and identifying specialized suppliers.
- 4- Adaption: switching to standard and generic materials and components.
- 5- Market penetration: competitors' information gathering, a survey of the market, price fluctuation, maximizing supplier's capacity, negotiation of the contracts, and supplier inventory management.
- 6- Product innovation: collaboration between design and manufacturing, partnership sourcing, supplier performance evaluation, Material Requirements Planning (MRP) and value engineering.
- 7- Market development: packing specification, partnership sourcing, shipping identification and instruction, and identifying supply value chain nodes.
- 8- Internal development: staff retention and training, recruiting and developing of buying personnel, buying wisely understanding, environmental awareness, contribution to corporate social responsibility.
- 9- Diversification: setup cost, purchasing in bulk and promotion buying development.
- 10- Ethical sourcing: elimination of modern slavery, community support, and support of social values.
- 11- Environmental conservative and sustainability: carbon footprint reduction, improved recycling, elimination of plastic bags and materials, reduction in energy usage, sourcing from sustainable sources and charitable donations.
- 12- Compliance and traceability: verify compliance with sourcing ethics and morals, fair trade, compliance with the Ethical Trading Initiatives, International Labour

Organization (ILO), Modern Slavery act, Fairtrade, social accountability standards, prevention of human trafficking, forced labour and debt bondage.

13- Risk mitigation: monitor price fluctuation, supply disruption, and traceability over suppliers' tiers.

### Survey Question:

21- In the context of selecting offers and suppliers, we prioritize:

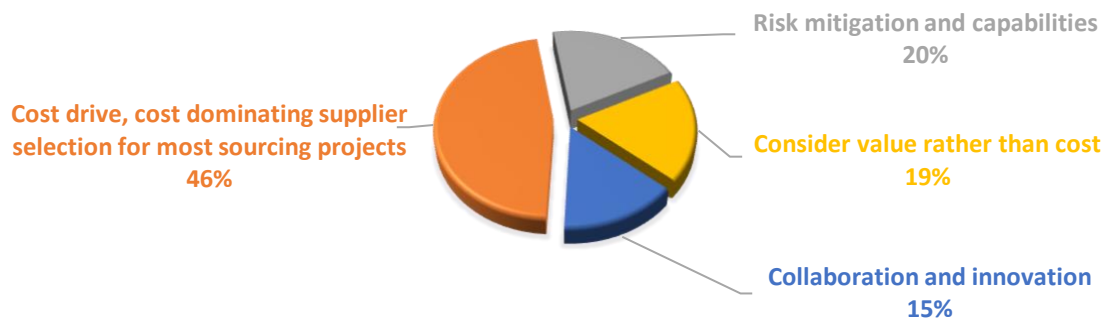


Figure 3.7: Prioritization in selecting offers and suppliers

### Findings:

Suppliers with the most appealing pricing are not necessarily the cheapest when all of the additional costs associated are considered; additionally, major cost structure variations exist for specific products or services, and no supplier can consistently offer the lowest prices for all types of the cost structure. In addition, some suppliers offer a higher level of service than others. These services mostly include technical support, training, and maintenance. When suppliers do not deliver these services, the product or service's life cycle incurs additional costs (Degraeve & Roodhooft, 1999). Figure 3.7 attempts to find what organizations prioritize when selecting offers or suppliers. 46% cited 'Cost drive, cost dominating supplier selection', 20% cited 'Risk mitigation and capabilities', 19% cited 'Consider value rather than cost', and 15% cited 'Collaboration and innovation'. The result of this survey question and within the sampled organizations suggest that cost drive is the dominant choice for most buying organizations. A small portion, however, goes for strategic and long-term goals such as collaboration, innovation, value and risk mitigation.

### **3.8 Selecting a strategy**

Several aspects impact the strategy selection and development; factors may include:

- The position of the organization, the market share and the number of existing competitors;
- The abundance or limitation of the sources in the supply market;
- The fluctuation and instability of the market and end market;
- The rate of technological advancement in the supply market;
- Technological advancement rate in the organization, availability of electronics solutions to penetrate the market such as e-procurement, e-sourcing and e-commerce;
- Local regulations, policies and government engagement in the market;
- The buying organization's capability to manage an existing strategy compared to and applied in similar industries;
- The supply chain visibility, reliability and trustworthiness;
- Risk rate and potential mitigation.

### **3.9 Supply chain resilience**

Supply chain resilience is the adaptive capacity to plan for unexpected events, respond to disruption, and recover from the disruption while preserving operational continuity at the required level. (Peter J H Baily et al., 2021). The impact of Covid-19 has increased the understanding of supply chain resilience. However, Procurement is reconsidering global supply networks to avoid supply chain disruption risks, considering near markets, onshore manufacturing, and automation for cost-cutting and enhancing resilience. Developing shorter supply chain plans mean more flexibility in switching to an alternative sourcing strategy and more agility. For risks to be identified, the supply chain network must be analyzed to find any potential weak points, including suppliers beyond tier one. Perhaps it can be more expensive; however, it can mitigate disruptive circumstances.

Digitalization is critical to providing real-time data across the supply chain; digitalization may enhance the supply chain agility and resilience in the following ways:

- End-to-end process traceability;
- Enhance versatility and reactivity;
- Transaction cost reduction and supply disruption mitigation;



- Insights data utilization, predictive data analytics, scenario planning and forecasting algorithms;
- Effective communication.

Many buying organizations could not locate their tier two suppliers and beyond during the bidding stage, a process which significantly can spare a potential disruption risk. (Peter J H Baily et al., 2021). To enhance risk management, organizations need to have total visibility across all data at different supply chain stages. In addition, having real-time collaboration and the capability to recognize sooner and coordinate in real-time will allow procurement to move among other suppliers to ensure supply continuity. On the other hand, digitalization and predictive data analytics may aid the buying organization in discovering, analyzing and reducing risks; therefore, it is important to consider the following in the supply chain:

- Talent acquisition and training: train the existing staff to work in an advanced digital environment and attract new talents to be part of the organization team.
- Enhance digitalization: improving information technology infrastructure, cloud-powered technology, artificial intelligence, automation, the utilization of insights and predictive data analytics to identify risk and find opportunities
- Diversity supply chain: involve organizations and suppliers from different races, gender and minorities.
- Resilience: a good balance is essential, as increased resilience and sustainability could result in a less lean supply chain and increased inventory.
- Multi sourcing: consideration of onshore, near markets, offshore, multi shore for the reduction of risk.
- Develop highly agile, reactive processes.

Resilience may result in the supply chains being shorter and closer to the client, providing greater flexibility, agility, and traceability, motivating procurement to seek out alternative sources and decreasing supply risk; however, several challenges need to be considered as well such as global natural disasters, unexpected wars, foreign reliance on crucial component suppliers, lack of visibility, control on the large extended supply chain and over later tiers.

### Survey Question:

A report has been published and highlighted that in the context of supply chain disruptions such as the Covid-19 pandemic and natural disasters, long, lean supply chains relying on "just in time" delivery has proved to be far "less feasible" and where they do remain, will be together with a localisation/decentralised strategy to spread supply risk and increase control. (Peter J H Baily et al., 2021, p. 84)

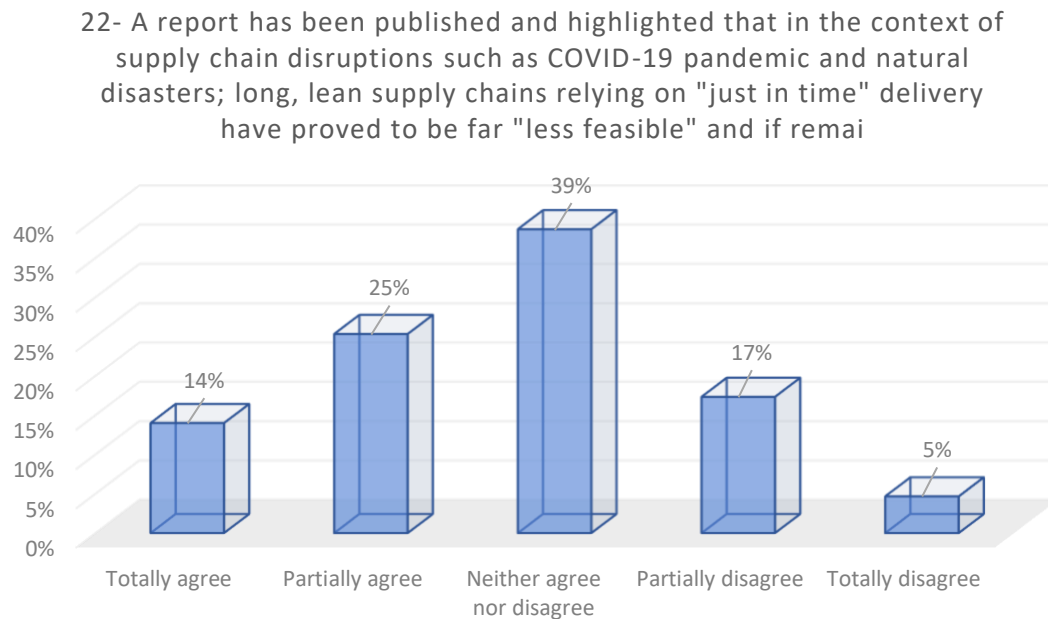


Figure 3.8: Just in Time feasibility post Covid-19

### Findings:

Long supply chains have diverse economic impacts; the longer they are, the longer it takes to recover from an interruption like the 2008 financial crisis (Brakman et al., 2020; Brakman & van Marrewijk, 2019), which is comparable to the Covid-19 as disruption; hence the surveyed question illustrated in Figure 3.8 is an attempt to examine how organizations reacted and responded to the feasibility of 'just-in-time' during the pandemic. I found that the majority of participants forming 39% remained neutral, while 25% partially agreed, 14% agreed to form together 39%, 17% partially disagreed, and 5% disagreed; forming together 22%, which may indicate within the sampled organization that the majority perceive that just-in-time proved to be far less feasible during the disruptions such as Covid-19 pandemic and other natural disasters. This may lead organizations to consider different approaches such as agility in switching suppliers, multi-sourcing, inventory buffering (just-in-case), near market and onshore sourcing, improved visibility into tier two and three suppliers and closer collaboration.

# Chapter 4 Outsourcing

## 4.1 Literature Review

When a contract expires or circumstances result from unforeseen market conditions or technological change, contracts need to be renegotiated and retendered (Williamson, 1988), (Trebilcock, 1994). According to a worldwide assessment of water Public Private Partnerships conducted between 1991 and 2007, around 10% of projects were cancelled, and another 10% reverted to the public sector once the contract ended. However, this was not always due to unpleasant experiences. Conflicts between parties are more likely to require renegotiations (Marin, 2009). On the other hand, renegotiations do not always result in welfare losses (Aivazian et al., 1984) debate that flexible contract modification procedures may result in inefficient results because they promote opportunism and the redeployment of previously effectively assigned risks. Furthermore, they allow partners to lower compliance or jury contractual rearrangement transaction costs. Renegotiation drivers fall into four categories: excessively aggressive bids by operators, opportunism; lower-than-expected demand; and economic disruption (Aivazian et al., 1984). Recently, both Covid-19 and the Russian-Ukraine war caused worldwide supply chain disruption; hence in this thesis, I attempt to find the reasons for renegotiation or retendering Figure 4.1.

According to theory, firms would not outsource an entity if a core competency were compromised; furthermore, the key motives for an organization to outsource, for example; information technology, are: to change limits, change the structure, mitigate technological risk and uncertainty, access innovative technology, effectively manage the Information system department, and connect business and IT strategy (McLellan et al., 1995). A substantial number of studies have examined the drivers of outsourcing from both a theoretical and empirical point of view, some referred key drivers due to economic factors such as cost reduction (Trunick, 1989), (H. L. Richardson, 1990), (Gonzalez et al., 2005), cost saving (Claver et al., 2002), asset investment reduction and allocation for core investment (Lynch, 2004), strategic aspects such as obtaining competitive advantage, enhance business focus, make use of the organization's expertise and resources (Weerakkody et al., 2003), (Clott, 2004), Increased adaptability (Lynch, 2004), environmental aspects such as globalization (Clott, 2004), and use of supplier's expertise (D. Jennings, 2002), same authors and others have demonstrated the obstacles of

outsourcing such as loss of key competence, loss of control, loss and migration of the customers (Blumberg, 1998), (Lonsdale & Cox, 2000), loss of strategic advantage, increased number of competitors, compromised market share, decreased flexibility in responding, the risks of marginalization (Beaumont & Sohal, 2004), (D. Jennings, 2002), escalating operating expenses (Gonzalez et al., 2005), relatively low return on investment (R. T. McIvor & Humphreys, 2000), threat of losing job (Embleton & Wright, 1998), According to UNIDO (United Nations Industrial Development Organization), in a number of developed countries, major government politicians have called for a reconsidering of their companies' approaches to international outsourcing in order to prevent future supply bottlenecks while increasing supply chain resilience (Verbeke, 2020), hence I attempt in this thesis to survey and question during the pandemic the key motives for outsourcing in organizations today Figure 4.2.

According to (Stewart, 1995), organizations that exceed their competitors; excel in four key core processes: delivery effectiveness, adaptability and responsiveness, the cost of logistics, and asset management. Based on a survey of supply chain systems of 22 organizations conducted by (Spekman et al., 1998); stakeholders in the supply chain do not have a common conception of or interact with the same metrics criteria; they argue that buying organizations still value the cost-cutting aspects of the supply chain more than the revenue-boosting benefits. (Beamon, 1999) has concentrated on the major metrics such as time, resource optimization, outcome, and versatility. (Neely et al., 1995) provide performance measure criteria such as time, quality, flexibility, and cost. (M. M. Weber, 2002) suggests a model for measuring both the need for agility and an organisation's agility by evaluating causes of variability in the supply chain systems. (Mattila et al., 2002) suggested a list of performance measures for the retailing of seasonal fashion products; these include quality of service, lost market share, alternate product percentage, revenue growth, inventory turnover, and return on the stock. (Bolstorff, 2003) recommended a list of key performance measures and metrics in supply chain systems, including order fulfilment time, delivery reliability, and total supply chain management expenditures. However, unlike other surveys, in this thesis, I attempt to name and specify eight key performance measures and question what KPIs organizations prioritize today in their logistics supply chain during the Covid-19 Figure 4.5.

Organizations select their sourcing strategy after careful consideration, basing their make-or-buy decision on various internal and external attributes (Leiblein et al., 2002). Backsourcing is

sometimes simply a failure of outsourcing (Kavčič, 2017; Law, 2018). However, in some cases, it can indicate agility (Kavčič, 2017; Nicholas-Donald & Osei-Bryson, 2017). Backsourcing is the process of bringing back operations or business activities from third-party suppliers to in-house (Kern et al., 2001), (Thakur-Wernz, 2019). In backsourcing, the buying organization is less prepared to handle the knowledge transferred from the supplier. Therefore, backsourcing poses unique challenges in terms of know-how transition (Ejodame & Oshri, 2018). (Thakur-Wernz, 2019) revealed that the drivers of backsourcing can be broadly classified as follows: outsourcing contracts are not performing as expected (Akoka & Comyn-Wattiau, 2006) and changes in the organization's internal and external environments following outsourcing (Kotlarsky & Bogner, 2012), however in this thesis I attempt to question whether the Covid-19 pandemic is a motive for backsourcing, or is it too challenging despite the restrictions resulted from the pandemic to bring the business back onshore or near market Figure 4.6.

## **4.2 Definition**

The outsourcing institute defines outsourcing as 'The strategic utilization of external resources to undertake tasks previously handled by internal personnel and supplies.' (Isaksson & Lantz, 2015).

## **4.3 Outsourcing**

The capacity of an organization to penetrate the market will depend on the ability to recognize and operate its core competencies. The corporate strategy will be developed based on the answer to the foundation questions of what kind of activity we do? and what sort of activity we intend to engage in. Identifying the business scope will be based on the decisions of which categories of products and services to outsource or insource and if partial outsourcing is undertaken, what the proportions should be. Major concerns of investment, location, planning, and direction are heavily influenced by the make/do/buy decision. (Prahalad & Hamel, 2009)

### **4.3.1 Make/do or buy decisions**

The nature of the make/do or buy decision may be expressed on one side; a firm could manufacture its products or develop its services entirely in-house and buy only raw materials; the value of the final product would have been created almost entirely from the organization's

work. On the other side; an organization could minimize its activities and buy almost everything from external suppliers, who would therefore add almost all of the value to the finished product or service.

Most organizations will stand somewhere in the centre, between these two sides. The core of the make/do or buy decision depend on where the organization should place itself precisely along this range of possibilities, depend on where are the organization's boundaries, and if the organizations willing to manufacture in-house, invest in machinery and/or technology and/or labour, and if necessary to control the operation internally since it is vital to the business if the organization has the capabilities to manufacture items or provide services in-house, or bring in outside materials, resources, talents, and expertise. Many factors will influence these strategic decisions, including:

- **Strategic make/do or buy decisions:** reflect the organization's long-term activities, capabilities, resources, and boundaries based on what products the organization produces; what resources will be invested in; what capabilities and know-how it keeps in-house for future business development; and how it will develop its supply chain.
- **Tactical make/do or buy decisions:** represent the organization's reaction to temporary or periodic variations in demand for its products or services so it can optimally use existing production capacity.
- **Operational make/do or buy decisions:** based on product design and production considerations, addressing whether a certain module of a product should be produced in-house or sourced from an external supplier.

Make/do or buy decisions depend on a variety of strategic and operational considerations:

- If the product or service is an organization's core competency.
- The implication of the total cost of production and the absorbing cost.
- The availability of internal competencies and manufacturing capacity.
- The availability and stability of supply chain sources and suppliers.
- The risk associated with delegating the activities to external suppliers.
- The impact on manpower redundancy/retention.

Economic criteria to consider Make/do or buy based on cost and profit; in other words, if the organization can develop and utilize resources to produce the item or deliver service in-house, or whether it would be more economically beneficial to outsource production or facilities, hence it is vital to:

- Perform a comparison of the cost of buying, including supplier price and total costs of acquisition with the cost of make/do in-house;
- Find the opportunity cost of employing in-house production capacity to make/do a service or product rather than another possibly more profitable item or activity.

Factors influence make/do or buy decisions: (“A Make-or-Buy Decision - Supply Management,” 2008) illustrated in Table 4-1.

Make/do	Buy in
Intellectual property and confidentiality concerns	Obtain and invest in the supplier’s expertise/patent/technology
Lead time reduction possibility	Cost avoidance of machinery and labour
Supply risk is minimized	Supply risk is compromised
Manpower retention during sales declination	Manpower retention during sales rising
The cost model is known	Increasing production capacity
Possibility of generating revenue from capacity and resources	Inventory cost reduced
The desire for direct control / QA/QC on the production	The demanded quantity is not economically beneficial for the manufacture

*Table 4-1: (“A Make-or-Buy Decision - Supply Management,” 2008)*

Consternate on core competence or “Sticking to the knitting” (Peters & Waterman, 2006), which means focusing on what you can excel in, what you are good at and what you can compete on. This has motivated many organizations to buy products previously manufactured in-house and outsource various functional areas such as security services, maintenance, cleaning, warehousing, transport and catering, recruitment, training and even crucial activities such as procurement, customer service and sales.

### **4.3.2 Benefits of outsourcing**

- Enabling the organization to focus on what it does best, core competence, human resources, other resources and competitive skills;
- Increasing the responsiveness of production capacity and fluctuating demand;
- Transfer the risk to the supplier in specific activities through negotiation;
- Increased levels of service performance resulting in higher levels of client satisfaction;
- To use suppliers' expertise, gaining access to top-class technology, resources and economies of scale to increase value while reducing cost compared to what an organization could achieve on its own for non-core operations.

### **4.3.3 Risks of outsourcing**

- To identify and select suitable suppliers and suppliers inflexibly;
- If the organization has unreasonable expectations from outsourcing suppliers;
- The scope of work and key performance metrics are not well defined;
- If the outsourcing contract terms and conditions are inadequate or unsuitable;
- Differentiation between what are core and non-core tasks;
- The absence of management skills to monitor the supplier performance;
- Overdependence on the suppliers and when the organization progressively reduces monitor and control over the supplier's performance.

Nevertheless, another major issue for outsourcing is the potential of losing the competitive strategic advantage through losing human skills, resources and transferring knowledge and competence to the supplier (Reilly & Tamkin, 1996). Outsourcing may not work well also, according to (Lacity & Hirschheim, 1995), in the case of:

- When services are customized;
- Different cultures between the buying organizations and suppliers;
- Contradictory interests between the buying organizations and suppliers;
- Shortage of dedication to the buying organizations or the industry.



## Survey Question:

23- We had to re-negotiate or re-tender two or more contracts due to:

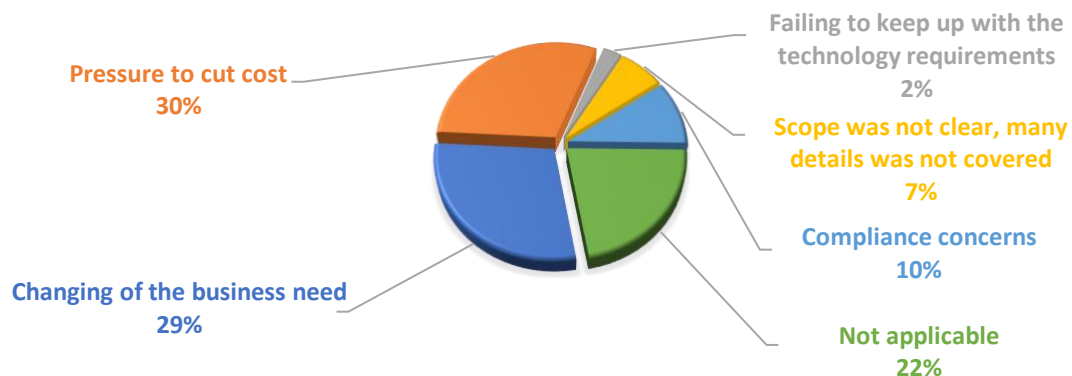


Figure 4.1: Reasons for re-negotiate or re-tender

## Findings:

When a contract ends or circumstances change due to unpredictable market conditions or technical development, arrangements must be renegotiated and retendered (Trebilcock, 1994; Williamson, 1988). Renegotiation drivers are classified into four types: excessively aggressive bids by operators, opportunism, lower-than-expected demand, and economic disruption (Aivazian et al., 1984). Recently, both Covid-19 and the Russian-Ukraine war caused worldwide supply chain disruption; thus, in the survey question illustrated in Figure 4.1, I attempt to identify the reasons for renegotiation or retendering. 30% cited 'Pressure to cut cost', 29% cited due to 'Changing of the business need', 10% cited "Compliance concerns", 7% cited 'Scope was not clear', and 2% cited 'Failing to keep with technology requirements', finally 22% not applicable. Hereafter I find a strong correlation between the pressure to cut costs and the changing business need as the main drivers to re-negotiate or retender the outsourcing contract, which means that there must be a capacity to adjust or change the outsourcing contract considered earlier while developing and signing off the outsourcing contract, meanwhile additional cost and performance factors also must be recognized associated with that change.

#### 4.3.4 How to avoid risks

Outsourcing contracts sometimes fail due to miscommunication between the buying organizations and the suppliers, which is why a well-defined scope of work needs to be outlined at an early stage. Both need to agree on the breakdown of the scope of work, what the supplier will produce, values to generate, and objectives to fulfil, which means clear service level agreements with key performance criteria. Buying organizations need to be precise about the advantages they expect and the potential risk for each element. Likewise, they need to be aware of what level of service their customers expect through their outsourced suppliers.

Instead of traditional cost and time-based outsourcing contracting, there has been a trend toward more outcome-based outsourcing, which will mitigate risks and incentivize outsourced providers through incentive sharing. This means incentives agreements based on performance and delivery keys, so when the suppliers meet the expectation, they will be paid the agreed amount; moreover, if they exceed the expectations, they will be paid the agreed amount plus a bonus as follow: (*Chartered Institute of Procurement and Supply*, n.d.)

- A cost-plus fixed fee (CPFF) contract with payment of the agreed amount plus a fixed amount as the fee for performing the task.
- A cost-plus incentive fee (CPIF) contracts with the payment of the agreed amount plus a higher price for achieving and exceeding the performance and target KPIs.
- A cost-plus award fee (CPAF) contract with payment of the agreed amount of the contractor's allowable expenses and a bonus based on performance.

Outsourcing negotiations are more likely to succeed when the buying organization collaborates closely with the outsourced supplier to establish mutually beneficial KPIs. Once the KPIs are established, continuous communication must be maintained between the buying organization and suppliers, through monthly reviews, with agreed delivery deadlines and what-if procedures. It is the supplier's obligation not only to satisfy the contract's conditions but also to report the performance achieved and quantify KPIs to the buying organisation. A collaborative approach and day-to-day monitoring should pay off in this regard, and learned lessons are mutually gained, the supplier obtains knowledge of the client organization, and the buyer learns how outsourcing works. Other issues to consider to avoid and mitigate risk:

- Define objectives and measurable advantages, as well as a cost-benefit analysis.
- Long-term mutual benefits, for the supplier, it is a secured business for the length of the contract, and for the buying organization, it is a gained value and advantage; hence, careful supplier selection is required not just based on cost comparisons but also on quality, reliability, collaboration readiness, ethics, and CSR as the performance of the supplier will reflect on the reputation of the buying organization.
- Precise supplier contracting, such that risks, expenses, and obligations are handled evenly and fairly, and required service levels are clearly stated.
- Key performance indicators, standards, and service level agreements must be clearly defined and agreed upon, with proper incentives and penalties to encourage compliance and conformity.
- Continuous monitoring and control over the service level agreements and key performance criteria.
- Continuous review of the contract and supplier management to ensure compliance and cost improvements will avoid the buying organization's overdependency on the supplier and avoid progressively handling the performance and control and hence the supplier's reputation.
- Lessons learned from the contract's performance to determine if the contract should be extended, altered or terminated in favour of another supplier or bring the service or product back in-house.

## Survey Question:

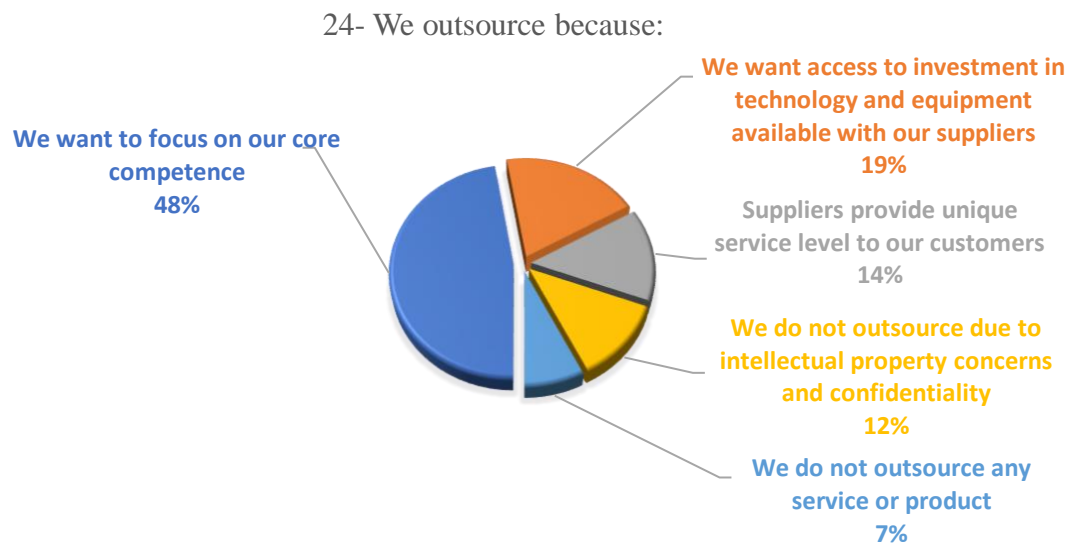


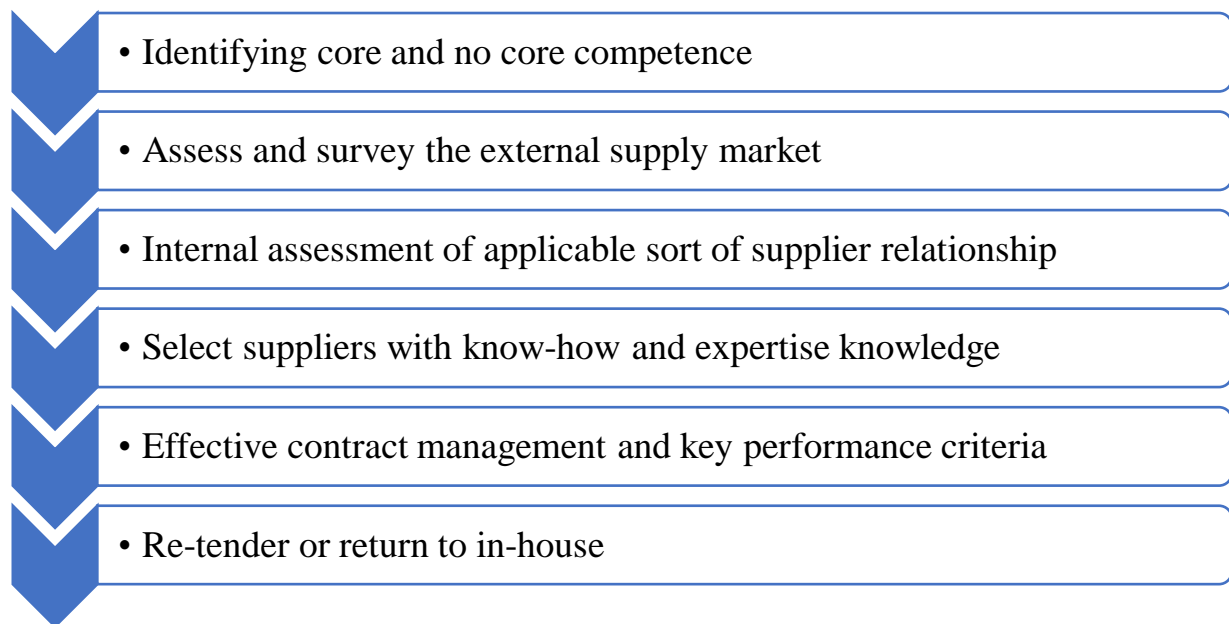
Figure 4.2: Why do we outsource?

## Findings:

According to theory, firms would not outsource an entity if a core competency would be compromised; additionally, key motivations for an organisation to outsource may vary; they may include changing limits, changing the structure, mitigating technological risk and uncertainty, and accessing innovative technology (McLellan et al., 1995). The survey question illustrated in Figure 4.2 is an attempt to find the key motives for organizations to outsource; 48% cited 'We want to focus on our core competence', 19% cited 'We want access to investment in technology', 14% cited 'Suppliers provide unique service level to our customers', 12% cited 'We do not outsource due to intellectual property concerns and confidentiality', 7% cited 'We do not outsource any service or product'. As a result, I find a significant association between focusing on core competencies and a willingness to outsource and a moderate to low correlation with the other possible reasons. Possible risks, however, need to be observed, such as over-dependence on the suppliers, absence of management skills to monitor supplier's performance, quality concerns due to customer expectations change, losing talents, and the difficulty of transferring the knowledge back in-house due to unforeseen circumstances such as supply chain disruptions.

## 4.4 Outsourcing methodologies

Many organizations lack a defined outsourcing strategy and make short-term decisions focused on reducing employee count and expenses rather than managing risks, obtaining added value, and continuously improving. (Lonsdale & Cox, 2019) presented techniques for effective outsourcing strategies, all of which use a decision tree approach to examine risks at each stage of the process, allowing businesses to assess the entire ramifications of their decisions.



*Figure 4.3: Outsourcing Techniques (Lonsdale & Cox, 2019)*

(R. McIvor, 2000) provides a second outsourcing structure, this time also in the form of a decision tree with four essential steps:

**Step 1: Define core activities:** Differentiate between core and non-core operations, particularly the activities that give value to the customers, represent the organization's goodwill and hence serve as significant sources of competitive advantage.

**Step 2: Assess key value chain:** Assess activities for which the organization can add value with external suppliers considering the total cost of acquisition; the activities with no strategic need or particular competencies can be outsourced to more capable suppliers with a lower cost basis.

**Step 3: Total cost analysis:** After analyzing overall expenses, the organization need to evaluate if itself is more capable than external suppliers and maintain in-house competence; otherwise, if there are several applicable reliable suppliers can proceed to the final step.

**Step 4: Partnership analysis:** Organizations are seeking to identify suppliers in the supply market that have the potential to establish and develop appropriate partnerships that will add value and bring continual improvements.

## **4.5 Outsourcing Retrieval / Backsourcing**

Backsourcing is described as the process of returning formerly outsourced manufacturing and activities in-house (Hart, 2021), contrary to re-shoring, in which the organization shifts operations back to the place of origin but not necessarily in-house. To improve supply chain resilience and agility, especially during natural disasters and global pandemics such as Covid-19, organizations are considering insourcing either entirely or partially for their services or products, which is perhaps regarded as ‘backsourcing’. However, it does not come without strains; backsourcing presents the following possible challenges:

- Shortage of production capability;
- Scarcity of suppliers;
- Scarcity of skilled workers;
- Increased cost for implementation and deployment.

## **4.6 Sourcing Strategies and relationships**

The American General Services Administration (GSA) explain sourcing as an organized approach for optimizing the government's supplier base while decreasing Total Cost of Ownership (TCO) and increasing mission delivery. Strategic Sourcing solutions are built on a careful examination of buying patterns, a precise description of business objectives and requirements, and the alignment of government requirements with supplier market capabilities and commercial lessons learned (Lysons & Farrington, 2016, p. 339).

### **4.6.1 Tactical sourcing**

Tactical sourcing deal with minimum interference of Procurement, and tactical and operational sourcing deal with low-risk and non-critical commodities and services; it deals with short-term decisions, as an example; Amazon Germany is using their Human Resources department for strategic employment, however on high peak times such as the year's end, Christmas, and the new year they use tactical sourcing option; manpower supplier to cover the need on the temporary periodic time of the year.

Likewise, buying organizations may use a strategic five years contract for a specific product or service; however, they may use tactical sourcing to cover their periodic customers' demand during emergencies caused by natural disasters, force majeure conditions, unexpected circumstances like wars, or even high seasons. Tactical sourcing is unplanned capital expenditure and reactive to the business requirements, which cannot be anticipated in advance, they are unforeseen demand, low risk, and low value, but they are given within the strategic sourcing structure. All requirements are aggregated and controlled proactively with resources and methods, such as blanket ordering which can be managed and ordered by the end user.

### **4.6.2 Strategic sourcing**

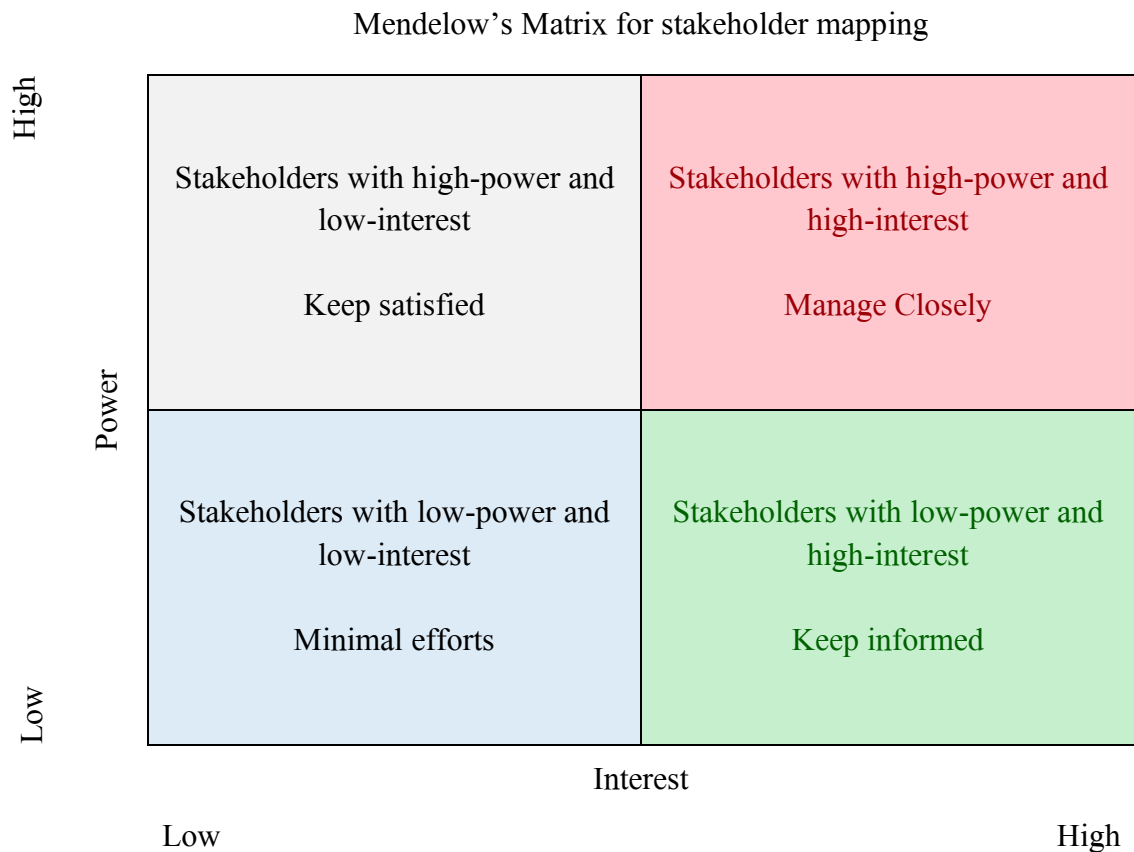
Strategic sourcing is a crucial component of purchasing and supply management, and it is a sophisticated business procedure that needs substantial knowledge and expertise. It is explained as satisfying business demands from markets through strategic and planned assessment of supply markets and supplier selection to provide solutions to fulfil established and agreed strategical objectives (Baily et al., 2015). Creating a strategic sourcing plan is an essential step in the purchasing and supply management process. Strategic sourcing is a methodical process that requires tools by professional, qualified, and informed individuals; nevertheless, planning and implementing strategic sourcing is a functional process. It involves maintaining communication with existing approved suppliers and possible suppliers who are still in the business and occasionally transacting with the buying organization through sharing business orders to keep them close and active in fluctuation times. In addition, strategic sourcing requires a market survey and understating to function well and assess the existing and potential capable sources, market trends and sustainable supply forecasts. Fortunately, digital tools and advanced technology provide that need, such as data analytics and big data.

### 4.6.3 Factors of strategic sourcing

The strategic sourcing activity as one aspect of procurement and supply management has strategic factors to be considered in the planning as follows:

- Understand the market and supplier's capability, the reliability of the supply chain, assessment of the individual marketplace, cost analysis and the appropriate type of sourcing strategy, global, regional or local; several analytic tools are beneficial at this stage, such as PEST ("political, economic, social and technological") also SWOT ("strengths, weaknesses, opportunities and threats");
- Obtain qualified, authorized, competent professionals and senior management individuals to sustain resources and influence the strategic sourcing plan;
- For the Procurement and supply management function to perform the strategic sourcing, it needs:
  - To be placed in the organization chart as strategic and planning function reporting to the board;
  - Define and describe the role and scope of procurement and supply management to serve the purpose of planning
- Digitalisation tools and advanced analytics to help with strategy execution.
- Motivate suppliers through long-term mutual benefit relationships, share information, share goals and early supplier involvement;
- Investment in supplier's innovation, patent and advancement technology;
- Stakeholders mapping and involvement, using the Mendelow matrix (Mendelow, 1981) Figure 4.4 is very useful at this stage to position and allocate the power and the impact of stakeholders.
- Establish cross functions team based on the stakeholders mapping such as legal, information technology, project management, human resources and strategic functions.
- Develop key performance criteria, metrics, reporting methods and tools for monitoring and control.
- Compliance with corporate social responsibility, sustainability and diversity;
- Continues review and improvement.





*Figure 4.4: The Mendelow's Matrix for stakeholder mapping*

## 4.7 Global sourcing / International Procurement

Global sourcing is a worldwide combination of upstream engineering, operation, and procurement centers within an organization's supply chain. (Trent & Monczka, 2003).

International Procurement is the acquisition of products or services from another country for the buying organization; alternatively, it is the importing. Therefore, global procurement involves a globally located buying organization and global physical supplier and involves coordination, collaboration and exchange of information.

### 4.7.1 Motives to source internationally

If one region has a competitive advantage as an economical producer of one item for some reason, and perhaps another country has a competitive advantage in another, it is in their best interests to trade. The exchange of these items improves both parties' efficiency. Moreover,

global commerce has more than doubled in the previous 20 years, reaching £13 trillion in 2019 before the negative impact and consequences of Covid-19. (Peter J H Baily et al., 2021). In addition, there are solid attempts to improve international sourcing. Factors for the increase in overseas sourcing include:

- Strategic reasons such as multi-sourcing and improving supply security by having a second source in another country;
- Some regions are rich in raw materials, while other countries have the advantage of machinery, manufacturing and integrative industries, which is an ideal state of trading;
- Local capacity may not be sufficient to fulfil demand; hence the shortfall must be supplied from overseas.
- Technological and innovation provides characteristics not accessible on comparable locally made items such as the Taiwan manufacture TSMC, a unique producer in the semiconductor innovation;
- Labour cost and lower wages play vital roles in services and products cost rate, accordingly an advantage for overseas sourcing;
- Economies of scale and bulk buying, therefore, an advantage of lower price;
- Rate of currency reduction as many countries tend to decrease the rate of their currency to increase exports and support the economy.
- Countertrade might require an equivalent import order to secure an export order.

#### **4.7.2 Challenges of international sourcing**

There are challenges when sourcing internationally; compared to buying locally, it is often more complicated, including contract negotiation, management policies, corporate social responsibility, production and operation. (Waller & quoted by Lascelles, 2001). The main challenges associated with international sourcing can be illustrated as follow:

- Communication: not only with language barriers but also in understating the meaning attached to trading terminology and technical vocabularies, the variation of familiarity with the language may lead to different meanings attached to the contract terms.
- Nonverbal communication: facial expressions, greetings, dress conservatively, gestures, physical contact and time punctuality.

- Culture: three layers to culture (Hampden-Turner et al., 2012):
  - Behaviour: variation of traditions, values, attitudes, conduct standards, and regulations of the behaviour;
  - Artefacts: cultural items such as artwork, paintings, narratives and icons;
  - Rituals: behavioural patterns with cultural meaning such as feasts, social formalities and local celebrations.
  
- Compliance with environmental and sustainability directives and acts, corporate social responsibility, ethics variations, ethical trading initiatives (ETI), and prevention of the use of child labour;
  
- Extended lead time: involving the regular leading time for order plus shipping, possible intermodal logistics, paperwork and customs clearance; (surveyed question for logistics KPIs Figure 4.5 (O'Byrne, 2012))
  
- Various legal systems: the law of the contract whether to consider jurisdiction and legal system of the buying organization's country or the supplier's one in case of dispute, the issues of jurisdiction and applicable legislation might be pretty complicated;
  
- Transferring payments: transferring funds overseas has its challenges, and a third party which is usually the bank, is needed to aid the transaction, and this service is often costly. International transactions are settled by letter of credit or bill of exchange, and conflicts sometimes happen between the seller and the buyer regarding which should come first; receiving the payment or the goods;
  
- Supply disruption: due to natural disasters, unexpected wars, political issues and pandemics such as Covid-19;
  
- Quality variation and standard expectations;
  
- Fluctuation with foreign exchange rates.

## Survey Question:

25- What KPIs do you use in your supply chain (logistics)?

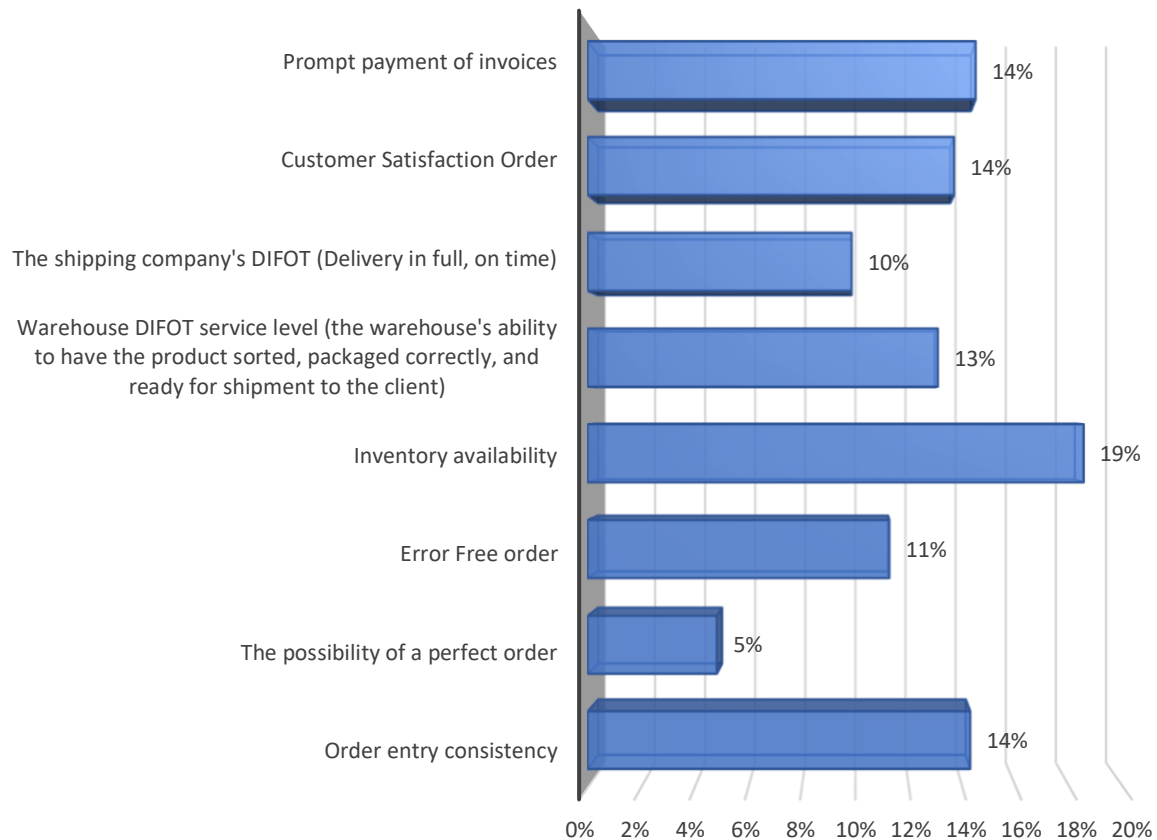


Figure 4.5: KPIs for logistics

## Findings:

(Bolstorff, 2003) proposed a list of key performance indicators, including order fulfilment time, delivery reliability, and total supply chain management expenditures. (Stewart, 1995) suggests that organizations exceed their competitors; excel in four key core processes: delivery effectiveness, flexibility and reactivity, logistics cost, and asset management. I attempt in the survey question illustrated in Figure 4.5 to name and specify eight key performance measures (O'Byrne, 2012) and question what KPIs organizations prioritize today in their logistics supply chain during the Covid-19. 19% cited 'Inventory availability', 14% cited 'Order entry consistency', 'Customer Satisfaction Order' and 'Order entry consistency' each, 13% cited 'Warehouse DIFOT service level', 11% cited 'Error Free order', 10% cited 'The shipping company's DIFOT (Delivery in full, on time)', 5% 'The possibility of a perfect order'. This may indicate that almost all KPIs in this survey question have relative importance to the supply chain; nevertheless, inventory availability has been chosen mostly. This may address,

particularly during the Covid-19 time, the importance of approaches such as ‘just-in-case’, accordingly multi-sourcing, and improving visibility into tier two and three suppliers as an essential tactic for organisations seeking to decrease supply uncertainty. (Brakman et al., 2020) considers raising stock to be a sensible move, particularly during Covid-19.

### Survey Question:

26- In the context of sourcing offshore strategy, the traditional view is now being reviewed and re-evaluated post COVID-19 pandemic

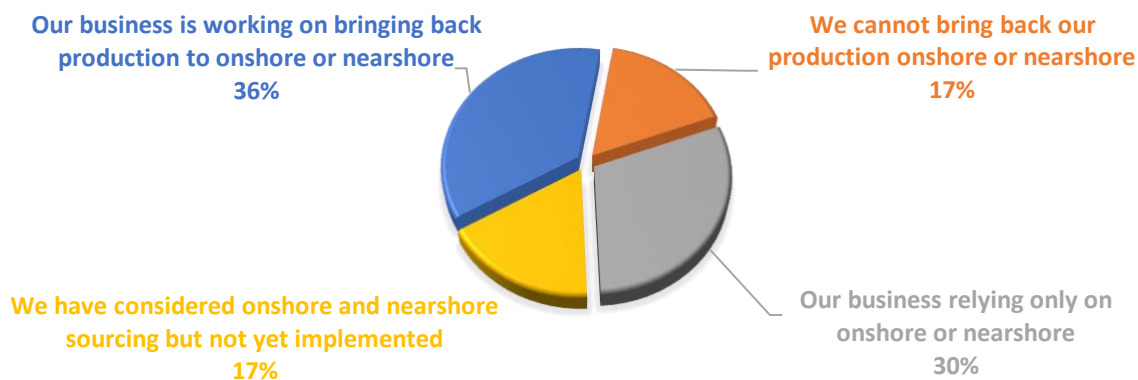


Figure 4.6: Sourcing offshore strategy

### Findings:

Backsourcing is sometimes just a failure of outsourcing (Kavčič, 2017; Law, 2018); however, in some circumstances, it might suggest agility (Kavčič, 2017; Nicholas-Donald & Osei-Bryson, 2017). The survey question illustrated in Figure 4.6 questions whether Covid-19 is a reason for backsourcing/onshoring or whether it is too challenging, notwithstanding the limits imposed by the pandemic, to bring the business back in-house, onshore or near market. 36% cited ‘Our business is working on bringing back production to onshore or nearshore’, 30% cited ‘Our business relying only on onshore or nearshore’, 17% cited ‘We cannot bring back our production onshore or nearshore’, 17% cited ‘We have considered onshore and nearshore sourcing but not yet implemented’, this indicates that more than half the participants in this survey question either working on or considered backsourcing/onshoring; hence I find there is a strong correlation between backsourcing/onshoring and Covid-19 pandemic circumstances; nevertheless, this doesn’t come without a challenge in terms of know-how transition; therefore, organizations need to consider such a challenge ahead as part of their risk mitigation plan.

## Chapter 5 Industry 4.0

### 5.1 Literature Review

Although the utilization of blockchain has grown over the years due to the advantages of distributed digital ledger technology, which facilitates immutability, transparency, traceability, and security, it has, like any other technology, a possibility of disruption. Blockchain confronts several challenges in terms of adaptability and implementation. Various challenges arise from cognitive, institutional, technical, or policy-related aspects (Crosby et al., 2016; Lemieux, 2016). Blockchain security and transparency promote material and information movement along the supply chain due to their automated regulatory characteristics. This transition may lead to switching from an industrial, commodity and product economy to an information-based economy. Production will rely increasingly on knowledge, communication, and information rather than material properties (Pazaitis et al., 2017). Other barriers may include senior management support, which is the key factor for successful implementation. Hence, a lack of long-term commitment and support by management may hinder the sustainability practices throughout the supply chain (Govindan & Hasanagic, 2018), absence of knowledge and adherence in the supply chain would put resource allocations at risk (Fawcett et al., 2006), the other challenges blockchain facing are the investing in new infrastructure and software implementation for all stakeholders, in addition to the limitation in technical competence and developers (Mougayar, 2016), lack of policies and the possibility of change or shift of current organizational culture, new roles and skills (Mendling et al., 2018), the hesitation and resistance to change (Jharkharia & Shankar, 2005). Despite all the benefits and the challenges, I attempt to survey how widely blockchain technology is utilized today in organizations and, if not, has been the blockchain proposed and if there is any near plan for implementation. Figure 5.2

Negotiation is an important part of business communications; negotiations in the digital era involve new digital processes, digital skills of negotiators, and, most importantly, dedicated system support. They vary from basic chat systems to complex negotiation systems that support all negotiating procedures, at least the two most important aspects of negotiations, particularly communication and decision-making (Schoop, 2021). While traditional face-to-face negotiation was historically utilized, additional tools such as phone calls and video conferences

have been used earlier. Business negotiations are now being conducted digitally using specialist negotiation support tools (Kersten & Lai, 2010), (Thiessen & Soberg, 2003), (Schoop, 2010). The quantitative school supported by (N. R. Jennings et al., 2001; Sycara & Dai, 2010) assume that the negotiating goods (e.g., a product or service) are structured, standardized, and easily described, while (Kersten & Lai, 2010; Schoop, 2010) opposing the objective of automating negotiation, rather, they seek to empower human negotiators as much as possible while leaving the decision-making to the negotiator control. In this thesis, I attempt to survey and examine whether Covid-19 is a strong motive for digital negotiation, apparently due to restrictions on travel and movement and how widely used in organizations today Figure 5.3.

Organizations are always dealing with new technology and incorporating them into their strategic goals, the most major transition affecting all organizations is definitely digitalization (Ghosh et al., 2021; Setia et al., 2013), this impose new demands and provide new opportunities (Wessel et al., 2021), as a result, organisations are progressively incorporating digital functionalities into their strategy and planning (Bharadwaj et al., 2013; Mithas et al., 2013), organizations are required to create digital value propositions by developing digital strategies (Krotov, 2017), a digital strategy is an organizational plan that is developed and implemented by utilising digital resources to produce distinct value (Bharadwaj et al., 2013), however digitalization's success or failure is frequently determined by employee talents, skills, and mentality (Zimmer et al., 2020), consequently, it is still ambiguous what are the characteristics of personnel that are crucial to achieving digital strategy objectives and successfully implementing digital strategy, this is possibly the single most difficult obstacle in turning top management motivation for digitization into organizational capabilities to accomplish so (Ceipek et al., 2021). Furthermore, although recent studies explored the aspect of digital strategy execution (Marabelli & Galliers, 2017; Ross et al., 2017), limited information is known about how stakeholder orientations support or hinder the achievement of digital strategy objectives (Ritala et al., 2021). Meanwhile, according to multiple recent types of research, the Covid-19 situation has considerably pushed digitalization across various industries (Klein & Todesco, 2021; Kraus et al., 2020). In this thesis, I attempt to survey during Covid-19 the presence of digital strategy, how digital the organizations are and examine the possibility of added value Figure 5.4, Figure 5.5, Figure 5.6.

## 5.2 Digitalisation Technology

There is tremendous effective implementation of industry 4.0, including e-procurement, analytics and digitalization, which dynamically involve all stakeholders that can optimistically contribute not only to lower the total cost of ownership but also an enhancement in customer service, readiness, accessibility, and development planning. Therefore, it is vital to sustain a competitive advantage. Nevertheless, industry 4.0 encounters challenges which have obstacles to responding to the rapid change in market demand, such as process inflexibility, analytic performance issues and the actual reflectiveness of data. Bulk data hinder access to real-time information; therefore, end-to-end digital connections are necessary. On the contrary, manual processing within the supply chain and lack of elasticity can cause a negative impact in terms of responding to the rapid changes and market demand and, therefore, resilience. Digital transformation, including the Internet of Things (IoT), Blockchain and Smart Contracts, can radically change supply chains into more sustainable, agile, cost-effective, efficient and transparent. The more digitalized the supply chain, the broader capability for identifying, evaluating and mitigating the risks. Industry 4.0 characteristics signify the connection between e-procurement, information knowledge, and machine autonomy, including cognitive computing and artificial intelligence. They examine defects and continuously learn and allowing the supply chain to make prompt decisions with the support of data on the Cloud.

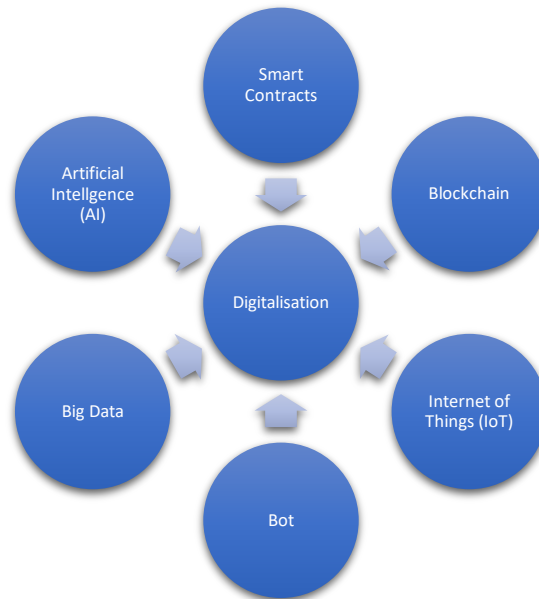
Digitalisation is defined as redefining models, operations, processes, functions and activities via technological innovation to create an efficient digital commercial environment, one in which profitability in both financial and operational are maximized while expenditure and risk are minimized. (Seyedghorban & Samson, 2020). A survey conducted by Coresight Research found that 85% of the suppliers and the retailers indicated that collaboration between the two parties has increased over the last two years resulting in greater customer satisfaction and business growth. However, more than half of the respondents cited a lack of trust and communication, a limited product range and a lack of trusted data throughout the supply chain were significant barriers to enhancing collaboration, even though digitalization and advanced analytics are presented in retail (Wells, 2020).

The fast pace of digitisation is enhancing, adding and delivering value to the supply chain; nevertheless, as the previous research illustrated, the availability of technology is not enough. Procurement must keep into consideration the following:



- How to collect data to support decisions making;
- What analytics and how will be used;
- How to encounter and mitigate risks;
- Recognize opportunities and prevent threats;

The digitalization of the supply chain is the output of end-to-end applied technology in every phase, as illustrated in Figure 5.1. More details of digitalization aspects are covered in the next section.



*Figure 5.1: Digitalisation*

### **Business Case Study – John Lewis Partnership (JLP)**

To ensure flawless order management and customer satisfaction, John Lewis has boosted investment in IT infrastructure by 400%. A significant improvement has utilized live data to rebuild its supply chain and operative and customer feedback to guide investment in essential areas such as delivery and performance innovations. In addition, having comprehensive stock visibility in actual time allows orders to be fulfilled in the best time-efficient and cost-effective manner possible. (Heywood, 2015).

### **5.3 Internet of Things (IoT)**

The most recent internet innovation is the Internet of Things (IoT) which involves billions of devices, mechanical and digital such as cameras, smartphones, wearable devices, autonomous vehicles, manufacturing machines, RFID, environmental sensing tags, GPS and sensors which track and trace physical objects, coordinated and controlled over the internet, all owned by different organizations and consequently a variety of platforms, these devices include microprocessors and modules that facilitate internet connectivity and data exchange to provide information to the IoT platforms without human to human or human to computers contact. Prominent industry leaders anticipated that the number of IoT devices and sensors in 2025 would reach somewhere between 50 Billion (Cisco's IBSG) to 200 Billion (Intel) and expected to generate data of 79.4 zettabytes (ZB) (Georgakopoulos et al., 2020). IoT has an outstanding ability to provide valuable information, observe the physical world, and provide live data in a way that until recently was impossible. However, it doesn't come without a challenge which can be summarized as follow:

- 1- The deployment and maintenance of the IoT devices;
- 2- The variation, integration and compatibility of the application the IoT devices need to communicate with;
- 3- The procuring, deploying and maintaining IoT devices often exceed the short-term benefits.

Effective reuse of the devices and cost-sharing can be used to maximize the cost/benefit ratio positively. A good example is the IoT sensors for farmers, which monitor the crop performance and at the same time provide critical information about climate change in this region; however, the challenge of providing sensor-client data to different parties with the same sensors remains due to client applications compatibility with IoT sensors providers. One of the other key challenges in achieving sensor sharing/reuse and encouraging the deployment of more sensors is the cost-sharing between providers and clients, also the validation of the pay-as-you-go model. As the name suggests, in such a model, a set of IoT devices should provide the client with a set of data, and when one or more of the devices fail to provide the desired data to the client and no alternative devices are available, the payment should be aborted. Such transactions should be securely stored in a decentralized distributed ledger, ideally in a blockchain database.

According to a Forbes report, the IoT is the most significant technology, even more than Artificial Intelligence and robotics, due to the existing and expected added values. It is also anticipated that IoT can help reduce the carbon footprint by 3% in digital agriculture (*Intelligent World: The State of the IoT*, n.d.).

## **IoT in the Supply Chain**

The first step toward sustainability is traceability, which was previously unreachable due to technological limitations. IoT is one of the digitalization tools that contribute to increased traceability and continual quality improvement. There are immense benefits of IoT applications and an unlimited number of possibilities where the IoT can be applied, particularly in the context of the supply chain flow. There is added value in every aspect across the supply chain, including procurements, logistics, and reverse logistics, from raw material sources through production until distributors end on display shelves or warehouses and customer possession. Below are some benefits for IoT applications and examples of data collection, ideally in a blockchain database:

- Support procurement by reducing the complexity of the data gathered via sensors, such as the materials used by production lines. Procurement can compare the balance with the requirements and time interval for replenishment of materials based on actual production performance.
- Monitoring inventory levels and movements of stocks based on IoT data gathered from weight-operated warehouse sensors, which communicate with Inventory management systems to ensure adequate stock levels and permit automatic smart reordering.
- Asset tracking and location movement authentication.
- Temperature and humidity data: across the entire supply chain for food, frozen food, crops, medicines and every other product, which requires a certain range of temperature and humidity to be maintained.
- Improve visibility and support sustainability for mining and scarce material, and protect forests that are either not ethically sourced or have an oppressive observation.
- Verify compliance with sourcing ethics and standards, sourcing products from areas that comply with the Ethical Trading Initiatives, International Labour Organization (ILO), Modern Slavery act, Fairtrade, and social accountability standards. Identify and trace products sourced from areas concerned about human trafficking, forced labour

and debt bondage. Many products, such as cobalt, are produced by minors under unethical conditions (Cassidy, 2020).

- Support resilience and sustainability for switching sources, faster and more effective components and raw materials traceability.
- Shared real-time data ensure the authenticity of all goods within the procurement cycle with verifiable audit trails of suppliers' goods, empower traceability, replace manual processes, reduce traceability mapping, and reduce IT costs.
- Risk mitigation through traceability past tier one suppliers, monitoring the workforce's well-being and maintaining ethical and sustainable sources will result in a shorter distance and closer to the customers.

IoT supports effective supplier relationships, forecasting, linked logistics and collaborated inventory through the supply chain. Procurement can empower IoT devices to gain vital insights and ensure quality control, goods forecasting and on-time delivery; however, leveraging the IoT may increase the temptation for overseas products, so a good balance needs to be maintained.

## **5.4 Digital Twins**

A virtual or digital simulation replica of a physical asset is called a "digital twin", a product, process or service; Dr Michael Grieves originally initiated the term in 2002. It ties the physical and virtual worlds together; it collects real-time data from mounted sensors. The data collected is stored either locally, decentralized or centrally in a cloud, allowing these data to be simulated and evaluated in the virtual model. The results are applied in the physical model upon receiving the information from the simulation. The integration of the collected data in the real and the simulated item; aids in optimizing the performance of the real process, improving working conditions, preventing problems before they happen, optimizing energy consumption, lowering error rate, preventing downtime, predicting maintenance, revealing opportunities, learn lessons and plan for the future. Digital Twins can be applied in automotive, manufacturing, digital agriculture, construction, healthcare and utilities. NASA was among the first to deploy Digital Twins for space mission studies. Organizations can take proactive decisions in real-time by having a vision of the entire supply chain flow, reducing lead time and traceability. Digital Twin probably is the next big step in Industry 4.0 to develop new processes and products.

### **Business Case Study – Siemens**

Siemens' digital twins approach has increased productivity and operational efficiency. Data collection has enabled them to create customer profiles and forecast orders, allowing for better decisions making in order processing, warehousing supply, and transportation. It enables the utilization of process life cycle data, for example, reducing maintenance costs by forecasting failure issues before they happen and so prevent downtime. The usage of digital twins has allowed Siemens to adapt rapidly to short-term client modifications, market trends and optimal availability. (Hunhevicz et al., 2022) (*The Digital Twin / Industry / Siemens Global*, n.d.)

### **“What if” scenarios**

There is an enormous gained value from applying “what if” scenarios; the digital twins' ultimate value is closing the loop connection between the simulated and production processes in the physical world through monitoring the performance on both sides. This connection provides actionable knowledge to support decision-making based on the lifespan of goods and manufacturing activities.

## **5.5 Blockchain**

Blockchain is blocks of data stored in public decentralized online with shared ledger technology database mirrored among many computers. Every added new entry to the database forms a new block shared and cross-checked with all stakeholders to ensure integrity. The shared ledger is allocated and synced among all network participants to ensure no point of weakness, enabling the features of permanent, immutable, consensus, provenance, and certain. For the supply chain's purposes, Blockchain is used to record certification of origin, transfer locations, rates and quality enhancing traceability, improving the supply material flow's vision, verifying compliance, reducing paperwork, and reducing risk and fraud. Consequently, less time may be spent on validating data and more can be focused on delivering services and goods, improving the quality and reducing cost. One of the primary advantages, in addition to transparency, would be eliminating the time-consuming records reconciliation. Furthermore,

the decentralization model in the Blockchain makes it impossible to hide data and trades on one side of the relationship between shippers, buyers, sellers, manufacturers and banks since the transactions are managed in a single distributed immutable shared database in which no single party can control and alter.

### **Benefiting from Blockchain, advantages and paybacks**

- 1- Blockchain ensures the validity and traceability of all commodities throughout the procurement cycle by establishing verifiable audit trails of suppliers' goods.
- 2- The ledger is distributed and synchronized across all network members through Blockchain, ensuring no single point of failure exists.

#### **Business Case Study – GS1 Standard Body**

GS1 US Information standard body has investigated how platform food traceability data may be transferred across a supply chain. It has simulated a seafood supply chain to see if products can be monitored and their positions communicated as they move down the chain. The platform engaged Blockchain and Cloud to demonstrate that items could be traced, which led to a faster and more efficient food recall. (Allen, 2020)

- 3- Ensure contractual commitments are met consistently across the supply chain.
- 4- Blockchain technology enables greater transparency in supply chain mapping.
- 5- The blockchain ledger is synchronized among all network participants, providing trust and developing good business relationships.
- 6- Blockchain can play a vital role in fighting Modern Slavery by empowering procurement to monitor the source of commodities and services across several tiers. Coca-Cola, as an example, has stated it is examining Blockchain in its sugarcane supply chain to prevent enslavement (Vu et al., 2021)
- 7- Blockchain has innovative mineral traceability and conservation solution for scarce earth materials.

Rare earth materials are a collection of seventeen elements valued for their distinct magnetic electrochemical characteristics. These elements, such as gadolinium, lanthanum, cerium, and

promethium, are essential in developing cancer treatment medications, cell phones, and renewable energy technology. China is considered the world's greatest producer of scarce earth material and accounts for 70% of worldwide production; furthermore, it has 37% of the world reserve. Rare earth mines were also discovered in Malaysia, Canada, Brazil, Australia, Estonia, India, South Africa, and Brazil. "Pensana Rare Earth" stated it will establish the "world's first sustainable magnet metal supply chain" for the three earth metals dysprosium, neodymium, and praseodymium, which are frequently used to make magnets for lithium-ion batteries and wind turbine energy producers (Makortoff, 2019).

#### **Business Case Study – Rwanda Government**

Rwanda's government intends to utilize the Blockchain to track the source of the tantalum mined locally since the shared ledger would allow organizations to identify and trace the metal as it moves through the supply chain. Tantalum is one of four controversial minerals generally found in central Africa, along with tin, tungsten and gold. Rwanda is the world's second-largest producer of metal used in tantalum capacitors for cell phones, which are often utilized in electronics because of their low corrosion rate. Blockchain has increased traceability, making it more difficult for unethically sourced materials to pass across the supply chain (Daniel, 2018).

The traceability and visibility advantages enable all stakeholders within the supply chain, from growers, shippers, packers and retailers, to securely review and update the trusted decentralized ledger while tracking the changes. (Haswell, 2017). There is a broad consensus that Blockchain can enhance traceability and lessen IT costs and eliminate manual procedures; however, because the technology is novel, there are certain challenges to widespread implementation, including the following:

- Concerns about data confidentiality and security;
- Resistance and aversion to share data through the supply chain;
- Compatibility issues in various IT platforms and systems;
- Cost sharing / payment model variation (pay-as-you-go or one-time payment).

### Survey Question:

27- In the context of Blockchain which aimed to trace ethically sourced products, sharing, information and cross-checking:

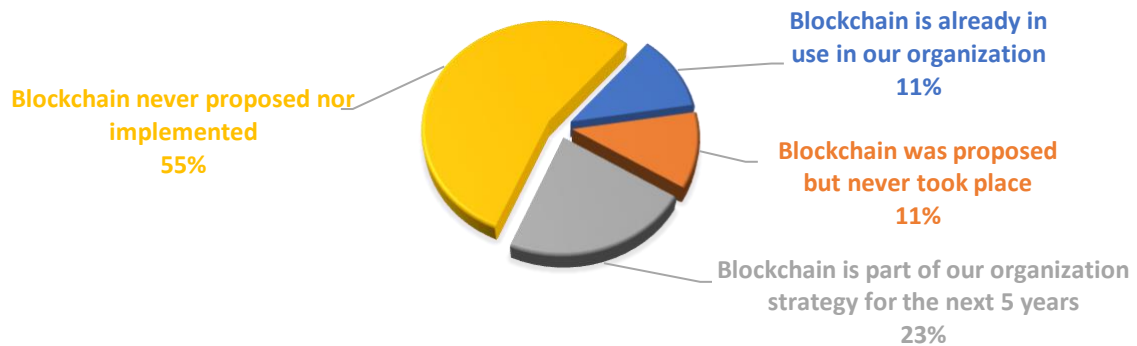


Figure 5.2: Blockchain presence

### Findings:

Although the utilization of Blockchain has increased over time, like any other technology, it has challenges. Blockchain also faces various barriers in terms of flexibility and implementation. Various challenges arise from cognitive, institutional, technological, and policy-related issues (Crosby et al., 2016; Lemieux, 2016). In addition, barriers may include senior management support, which is critical for effective adoption; hence, a lack of long-term commitment and management support may limit sustainable practices across the supply chain (Govindan & Hasanagic, 2018). According to my finding in the survey question illustrated in Figure 5.2. regarding blockchain utilization; 55% responded that Blockchain was never proposed nor implemented, representing more than half of the participants, in addition to another 11% have proposed Blockchain; meanwhile, 23% have it in the organization's future strategy, which represents a total of 89% of the participants are not using the blockchain technology at the moment in their organization compared to only 11% are using it currently, the explanation may be because the adoption of Blockchain is extremely challenging across the whole supply chain, resulting in resistance to change and a lack of motivation to invest in such a technology; nevertheless, additional indicators may include:

- 1- There is a huge number of possible Blockchain customers available in the market;
- 2- Blockchain leads are still in an early stage.
- 3- There is a big chance for many startups to begin Blockchain business;
- 4- Traditional supply chains are still widely existing with the risk possibility of less visibility, less traceability, trust issues, transparency concerns and provenance issues.



## 5.6 Smart Contracts

Although digitalization is widely spread and an abundance of technological tools exists, the traditional agreements and processes have broadly remained the same. Agreements and contracts are discussed, negotiated, corresponded and settled at a great length of time and cost before they eventually get stored in a hard copy or a soft copy and inspected just if controversy occurs (Morgan, 2020a). The traditional notion of the contract is a commitment between two or more parties to achieve an assignment; each signatory must trust the other party to fulfil their share of responsibility, and this agreement is legally enforced.

Technology advancements have empowered smart legal contracts (SLCs), which are defined as “self-executing software programs that automatically fulfil a function such as processing payments, release certificates, and transfer ownership” (Morgan, 2020b). Smart Legal Contracts (SLCs) can act as digitalized agreements and aid the processing of purchase orders, replenishing and change orders, shipping notices, stock data and other commercial certifications through the supply chain. Smart Legal Contracts (SLCs) are cryptographically signed agreements, and the contractual terms are encoded. They are self-executed across the nodes and automatically performed by code software embedded in the Blockchain. The code gets triggered and activates a process, such as releasing payments when certain conditions are satisfied. Stakeholders may interact with one another without relying on a third party to establish and manage transaction regulations. Similarly, smart contracts facilitate self-governance between members, which means that after initiating a contract, the parties do not need to communicate further, and the investment is secured since the terms code is immutable and protected. The obligations are determined for performance; no individuals have the dominance to modify it, nor any corporation or authority can revise or control the contracts; in this regard, it is often stated that ‘code is law’.

### **Research area: authored by the University of Nottingham**

In a report by the University of Nottingham, when surveyed about what values organizations hope to achieve from supply chain digitalization, 54% cited enhanced visibility and transparency. In comparison, 49% stated cost reduction, and 43% cited improving customer service and enhancing agile business models (Marinos et al., 2020).

Smart contracts are written in certain algorithms forming a sequence of commands that execute to the next step. A Series of steps will be moving forward until the transaction cycle is completed, algorithms require input values, and they only work when a specific value is attained. The smart contract executes the established algorithms and generates a record on the Blockchain, which in other words, the required commitments are satisfied. SLC can encrypt and secure all transactions from the performance actions through contract settlement. Furthermore, because of the presence of Blockchain, the contract data is secured on every computer node in the network.

The parties may submit their cryptographic signature or digital signature on the smart contract; once they have agreed on the contract's coded conditions, it gets registered automatically in the distributed ledger, and when the terms are accomplished, the code will trigger the subsequent action. The final action for the blockchain smart contract will be the final evaluation by the service provider and the regulator, then the closure of that contract stage and finally, the release of the related payment. It is impossible to dispute the existence of a smart contract once initiated; as a result, SLCs have two unique characteristics traditional contracts do not apply, logged transactions and automated Decentralized Ledger Technology (DLT).

In conclusion, SLCs may encompass transactions between parties across the entire supply chain, guaranteeing that the terms and conditions of the entire transaction are completely transparent to stakeholders, with each stage of the process being recorded in the ledger and when the requirements are fulfilled. Moreover, commodities can be in end-to-end processes digitally tracked from the source to customer possession. SLCs have a promising potential to enhance the sustainability of the supply chain and minimize the obstacles for small and medium enterprises to penetrate the market. Industries that use SLCs will be able to aggregate data and eventually conduct data analytics across their total contract portfolio and therefore build risk mitigation models, reveal potentials and drive more accurate decisions. (Morgan, 2020a). On the other hand, it has been argued that smart contracts solutions systems are incapable of fulfilling supply chain principles and customer satisfaction concerning the quality of products and their components from numerous measures such as labour and environmental standards in addition to quality management, the supply chain is counting solely on the information provided by suppliers rather than monitoring the supply chain various stages.

### **Business Case Study: (ADNOC) “Smart procurement”:**

Abu Dhabi National Oil Company has declared an award of \$3.6 billion in smart procurement contracts, these contracts will provide flexibility to adapt to the fluctuating energy landscape, and they aim to evolve their drilling activities and achieve their 2030 strategy. ADNOC's objective is to create long-term value by encouraging foreign investment in the private sector. The smart contract awards are the outcome of a rigorous bidding procedure that involves a detailed assessment of how far the contract value will contribute to the UAE economy's development and diversification, promoting socioeconomic growth and creating job opportunities for UAE nationals. (Allen, 2019)

### **Smart Contracts transaction cost:**

Oliver Eaton Williamson and Roland Harry Coase are the two minds behind the transaction cost theory. The theory states that the organization's goal is to lower the cost of trading resources in the environment and the cost of managing these within the firm. (Williamson, 1975) (Williamson, 2007) (Coase, 1937). Williamson explained that all types of governance are divided mainly into three types of contracts: Classical contracts, Neoclassical contracts and Relational contracts. As per Roland Coase, transaction cost only occurs when more than one person is involved in a transaction. According to Coase, the size of a business is measured by (how many contractual interactions are internal and how many external) is the outcome of establishing an ideal balance between conflicting inclinations and costs. Transaction costs are:

- Search and information cost
- Negotiation and decision cost
- Governance cost

Some businesses are implementing strategic improvement programs with their suppliers. Such arrangements highlight several areas where procurement organizations would want to see significant changes, ultimately leading to the removal of numerous issues; such a strategy may include nil transaction costs, nil administrative errors, and nil disputes. As a result, SLCs may thrive in the following areas:

- SLCs in the Blockchain enhance the declaration of a single source of truth via consensus systems, therefore replacing the need for human intervention and human

trust, which affect all transactional exchange relationships (Zhao et al., 2016) (Williamson, 1983).

- Transaction cost is recognized with Supply Chain Management, operation, procurement and supply management, accordingly an aggregation reduction of the transaction cost in each aspect.
- The transparency and traceability of SLCs under the Blockchain digital ledger reduce the cost of authenticating trading stakeholders, negotiation and re-negotiation. (Catalini & Gans, 2020).
- SLCs enhance the exchange of information, reducing the time for collecting the information and cost decision accordingly, reducing the transaction cost (G. W. Peters & Panayi, 2016).
- Smart contracts automatically examine the agreements, reducing the uncertainty of contract enforcement, such as human error. (Catalini & Gans, 2020).
- The development of smart contracts changes the nature of agency fees since contractual obligations are carried out automatically. (Levinthal, 1988).

#### **Business Case Study - The Brooklyn Microgrid Project**

The Brooklyn Microgrid Project cut transaction costs by automatically transferring funds between suppliers and purchasers. It makes transactions more transparent by storing data in distributed ledgers. Smart meters may store real-time electric power transactions and production data in blocks and then automatically transact the data among neighbours. (Hacioğlu, n.d., p. 312)

In conclusion, SLCs influence digitalization in the supply chain, and when it comes to procurement, SLCs notably reduce transaction and governance costs of the transactions, in particular; search and information costs, negotiation and re-negotiation and agreement costs.

## Survey Question:

28- In our organization we prefer to negotiate mostly:

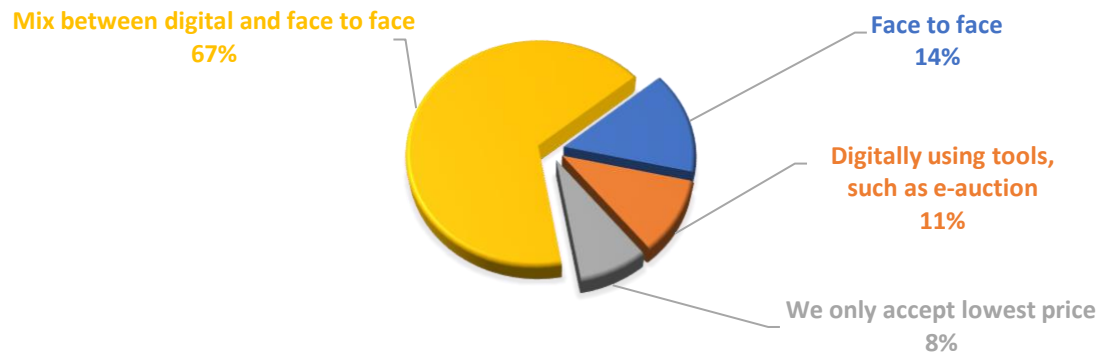


Figure 5.3: Negotiation methods in organizations

## Findings:

While conventional face-to-face negotiation has been used in the past, additional tools such as phone calls and video conferences have been employed. Commercial negotiation is now being performed digitally utilising professional negotiation support technologies (Kersten & Lai, 2010; Schoop, 2010; Thiessen & Soberg, 2003). The quantitative school regarding automating negotiation supported by (D. Jennings, 2002; Sycara & Dai, 2010) assume that the negotiating goods (products or services) are structured, standardized, and easily described, while (Kersten & Lai, 2010; Schoop, 2010) opposes the goal of automating negotiation in favour of empowering human negotiators as much as feasible while leaving decision-making to negotiator control. I attempt in the survey question illustrated in Figure 5.3 to investigate if Covid-19 is a powerful motivator for digital negotiation, especially during travel and mobility constraints, and how extensively employed in enterprises today. As per the survey, 67% of the participants have indicated that they prefer to negotiate with their suppliers in a mixed method between digital and traditional face-to-face, and 14% have mentioned face-to-face while only 11% in full digital techniques, 8% still go for lowest price regardless of the method, which highlights that mixed methods together with the traditional methods are widely used in the sampled organizations. Moreover, many organizations are not fully counting on digitalization tools despite their abundance and availability. Generally, although the theory of traditional school support giving more power and control to the negotiator, the more traditional negotiation and less digital one may raise possible concerns such as:

- 1- It gives a space for personal bias to interfere;
- 2- It leaves little chance for the new players in the market to penetrate the business;
- 3- Less possibility for diversity.

## **5.7 Robotic Process Automation**

Automation and data are driving significant changes in our everyday lives and organizations' practice; in this context modernizing business processes necessitate the use of emerging technology such as robotic process, which is today a measure for organizations' business model in the digital era. The objective is to turn progress into opportunity by developing business models and human recourses for this perspective. The notion of Robotic Process Automation (RPA) which is widely used today, was introduced by Blue Prism, an automation consultant, in 2012 for financial sectors. The primary objective for Robotic Process Automation development has been recently focused on building a digital workforce for industries. It is a type of software which creates a group of processes to accomplish a certain task. Robots are instructed to do tasks swifter, more precisely, and in a fluid, repetitive and continuous manner than humans. While robots are engaged with repetitive tasks and data processing undertakings, humans will perform more complicated value-added duties and analyses to take decisions and action. Customers expect complete responsibility from companies and demand accessibility to resolve their issues. In other words, customers want to get and accomplish their services whenever and wherever they demand. They expect prompt actions for their problems and answers to their questions; this is known as the on-demand economy (Hacioğlu, n.d., p. 13). Processes can be automated by emerging artificial intelligence with RPA (Robotic Process Automation) into these activities which need modest judgements such as:

- 1- Gathering emails and spreadsheets and posting them in the general ledger;
- 2- Order entry procedure including order receiving, customer credit, stock balance monitoring and checking, fulfilling orders, replenishment and price calculation;
- 3- Indexing invoices and posting to accounts payable system records for the settlement process;
- 4- Listing and indexing the suppliers according to their vendor master files for trade license expiry dates and outdated documents.

As a result, these development and technology-intensive processes will enable more reliable and efficient low-cost operations. Advantages of bots in procurement include:

- 1- Enhance reliability, eliminating human error;
- 2- Reduce cost to serve by eliminating human duties; thus, reduction in transaction cost;
- 3- Removal of human bias;
- 4- Cycle time reduction: bots work around the clock 24/7;
- 5- Allocation of the resources can be oriented to more strategic activities that increase procurements value-adding support.

## **5.8 Virtual Assistants:**

A virtual assistant remodels the human force experience by empowering access to complex enterprise systems. A virtual assistant can be integrated with the daily used applications to boost productivity and give timely solutions to employees' daily challenges (Searle, 2018) as follow:

- 1- Information Collection: build information assets and present learned lessons for the employee's daily activities;
- 2- With the integration of virtual assistance along with daily used applications, a virtual assistant can perform tasks such as meeting planning and suggestions, password renewal on behalf of humans;
- 3- Meeting invitations and room booking for meetings can be achieved by virtual assistants;
- 4- In the context of procurement, virtual assistants create cross-function tickets and follow up on employee requests to other departments, such as purchase requests to procurements, IT and HR.

Meanwhile, automation deeply affects our daily business processes, and employee skills need to be developed in this context as many jobs have been replaced by artificial intelligence and robots; they can do plenty of jobs of today's human work.

### **Business Case Study – United States Internal Revenue Service (IRS)**

The IRS was requested to augment security language to over a thousand contracts, and it was projected that it might take a year to alter all of them, with an average of two hours for every single contract to complete the revision, feed the data and upload the document. The team acquired to find a faster solution. Previously they had utilized robotic process automation, often recognized as a bot, to fix data errors in another process. They realized that the bot could revise the system in seconds but did not know if they could make these changes in a mass volume. Procurement was certain that the bot had a great chance of completing the assignment on time. Instead of one year, the mission was completed in three days, and work that would normally take procurement two hours per contract was completed in little over three minutes on average with no additional cost. (V. Sethi et al., 2020).

## **5.9 Big Data**

The definition of big data has been developed over time from 3Vs to 6Vs as per (Peter J H Baily et al., 2021) (Gandomi & Haider, 2015), while it has been argued that the term big data originated in mid-1990 (Diebold, 2012) in lunch table discussion at Silicon Graphic Inc (SGI). Big data is a term used to describe a collection of technologies that enable the utilization of a large volume of data in various ways, including processing the data precisely in a short period. Big Data can be defined as information with high-pitched volume, velocity and variety, which require specific tools and methods to transform it into usable values. The Six Vs:

- 1- Volume: the bulk of data, the sources are immense and are increasing enormously, which contributes to expanding the volume.
- 2- Velocity: The amount increases as a result of the speed of streaming and tracking, e.g. the speed at which information produced by e-commerce ordering requests implies there is require for immediate processing and actions.
- 3- Variety: different data types and construction such as text, audio, videos, images and unstructured sources, which implies the name and the description of Big Data.
- 4- Veracity: is the genuineness and trustworthiness of Big Data.
- 5- Value: the economic value can add to the business, customer and social benefits.
- 6- Variability: how the data can be conducted and used in different formats.



The annual volume of the Big Data generated is reaching zettabytes (Tiwari et al., 2018); therefore, data is considered a critical resource for the performance of organizations based on their ability to utilize it and maximize the benefit of it. (Chen et al., 2015). Organizations should apply complicated analytic approaches since the generated data is enormous and featured as high velocity, variety and variability. In this context, big data is attaining popularity due to the enormous volume of the data it collects from a hefty variety of sources in different formats such as RFID, GPS, social media, enterprise resources planning (ERP), cell phone devices and ultimately converts them into a structured format to generate insights (Hofmann, 2017). The analytics of Big Data enables the decision makers to detect hidden patterns such as ‘what happened’ and predict future trends such as ‘what is likely to happen’ and influence these occurrences by taking relevant measures (Gravili et al., 2018). Accordingly, utilising Big Data analytics boosts financial performance, supply chain proficiency and innovation competencies. Big data analytics can be applied in plentiful supply chain operations and logistics activities, including strategic sourcing, demand planning, supply chain network architecture, and inventory management. For example, Big Data analytics can calculate the best number and locations of distribution facilities to ensure minimal handling and transit expenses.

#### **Business Case Study: Twitter Big Data utilization**

In today’s digital environment, people are active on social media and willingly share their opinions, thoughts and views about a product. For example, a typical 45,000 tweets on beef products are sent out daily to communicate people's likes and dislikes. These tweet data are huge in volume and unstructured in character. Retailers use Twitter big data analytics to generate waste elimination methods by retracing the supply chain. As a result, a waste minimization approach was established when the UK beef supply chain compared to the Argentine match. In addition, Twitter's big data is also used to find the bottlenecks in the supply chain networks. The disclosed concerns of the consumers through tweets aid in identifying the core causes of food waste in the supply chain, accordingly, mitigation of various concerns according to users' influence (Mishra & Singh, 2018).

Examples of the utilization of Big Data:

- Big data is utilized to find the ideal number and locations of distribution centers to ensure minimal handling and transportation expenses. (Wang et al., 2018)
- UPS's (United Parcel Service) analytic technology uses big data to assist cargo delivery handlers in determining the best routes. (Sanders, 2016)
- Andersson and Jonsson use the product in-use data to improve the efficiency of spare parts planning and forecasting. (Andersson & Jonsson, 2018)

## 5.10 Artificial Intelligence (AI)

**Artificial Intelligence** terminology has first introduced by John McCarthy, known commonly as the father of AI, for the first time at a conference in 1956. From there, researches and studies started on the possibility of machine thinking and developing knowledge.

"The science and engineering of making intelligent machines, especially intelligent computer programs. Although it is connected to the same objective of utilizing computers to study human intelligence, AI should not be limited to techniques that may be seen in biological methods" (McCarthy, 1998).

AI is the machine's ability to process external information or data, learn from it and apply what it has learned to accomplish specific goals and tasks through elastic modification (Haenlein & Kaplan, 2019). There are levels of AI:

- 1- **Aided intelligence:** This refers to the automation of basic tasks such as assembly production and semi-finished production lines.
- 2- **Enhanced Intelligence:** this is a group of inputs and outputs with sophisticated intelligence as it gathers from humans and accordingly reacts and takes decisions based on the algorithms.
- 3- **Independent intelligence:** self-determining intelligence without human intervention, such as autonomous cars and robots.

**Machine learning:** Machine learning is a data analysis approach that allows machines to learn from practice and experiments, adapt to new inputs, and perform human-like jobs. Machine

learning is a data analysis technique that systematizes the building of analytic replicas. It is a subfield of artificial intelligence built on the foundation of learning from fed data and establishing patterns to make evaluations and judgments without human interference. There are different forms of artificial intelligence along with algorithms and how they interact with human life over time, such as supervised learning; ideally, speech recognition, unsupervised learning, typically weather forecasting, reinforcement learning like engine recommendations, robotics and autonomous, all are examples of AI thriving.

**Deep Learning** is the next stage forward in machine learning. Artificial intelligence is now in the stage of deep learning, a sophisticated level of machine learning that learns human cognitive tasks such as image understating, identification and predicting. Instead of processing the given data using equations, it establishes the basic parameters of the data and teaches the machine its methods by identifying patterns using numerous processing layers. Deep learning is used to categorize photos, recognize conversations, and classify objects and contents; driverless vehicles are a typical example. Deep learning Artificial intelligence will take decisions based on identifying the objects on the road and people crossing the streets. The deployment of artificial intelligence in organization results in a vast reduction in long working hours, which would eventually lead to reduced labour cost, finding new simulations of industrial algorithms and forecasting models which drives decision making. Artificial intelligence systems now provide various solutions in various industries, including medical care, financial institutes, logistics, transportation, automotive, customer service and security. Thus, all organizations must develop a strategy to compete and maintain market share. Many well-known organizations have disappeared from the market in the past decade. We have learned enough lessons from history to inform us that convoying with the trend, especially in technology, is not optional; customers will always follow the trend, and so must organizations.

## Survey Question:

29- In the context of digital strategy including some or all of Artificial Intelligence (AI), bots, Predictive Analytics, Blockchain, Smart Contracts, Internet of Things (IoT) and Big Data.

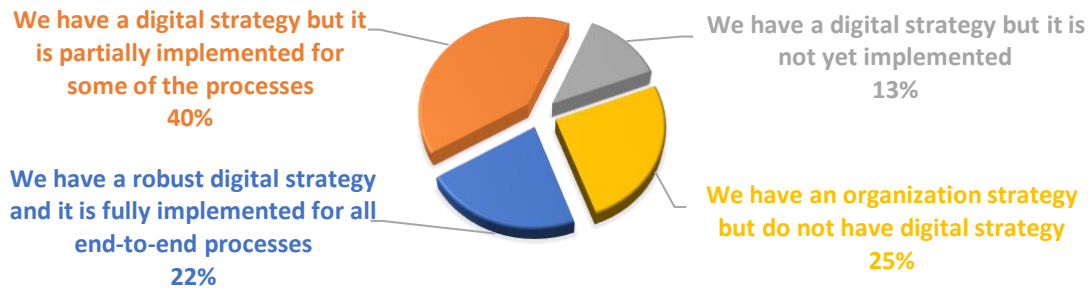


Figure 5.4: Digital Strategy

## Findings:

Although recent studies explored the aspect of digital strategy execution (Marabelli & Galliers, 2017; Ross et al., 2017), there is little knowledge of how stakeholder orientations support or resist the achievement of digital strategy goals (Ritala et al., 2021). Meanwhile, according to recent studies, the Covid-19 circumstance has significantly accelerated digitization across a broad range of industries (Klein & Todesco, 2021; Kraus et al., 2020). In the survey question illustrated in Figure 5.4 I attempt to survey during Covid-19 the presence of digital strategy. 22% of participants have a robust implemented digital strategy for all end-to-end processes, while 40% have partially implemented a digital strategy, 13% have a digital strategy but not yet implemented, and 25% have an organization strategy only without a digital strategy. Hence, I find a mild to strong correlation between the presence of digital strategy and the pandemic; nevertheless, this digital strategy implementation doesn't come without a challenge; it may include but is not limited to; management vision and willingness to change, change employee mindset, soft skills such as problem-solving skills, listening, error cause removal, analysis of the factors in favour of and against the change, and risk management, moreover, the digital investment. For the organizations to remain competitive and maintain market dominance, a digital strategy must be developed and deployed, ideally, end-to-end processes. Possible key milestones to be adopted in the digital strategy may include developing and deploying gathering information networks, cost-effective IT infrastructure, cloud solutions, integrated process connectivity (GPS, RFID, IoT sensors, Etc.) and sophisticated algorithms (deep learning, digital twins, simulators).

## **Artificial Intelligence in Logistics**

AI has emerged as a crucial competitive factor for the world's leading shipping organization in commercial logistics and the maritime world. Although the deployment of artificial intelligence demand significant investment in the short term, it provides long-term profitability by reducing costs. IMO (International Maritime Organization) are driving environmental regulations to force maritime to reduce sulfur content in the fuel by 0.5%. In this regard, AI plays a vital role in reducing ship carbon emissions by implementing environmentally friendly applications. Moreover, the profitability of the ports increases as well via the utilization of technology that aids in precise forecasting of empty and full containers as well as their allocations. Furthermore, utilizing AI supports preventing ship-related accidents by anticipating future occurrences using pinpoint calculations. Applying technological advancements such as AI is a prerequisite for achieving sustainable development and maintaining competition. Marine and logistics organizations are moving toward full digitalization; meanwhile, AI has emerged as a critical competitive factor for maritime firms and nations. Machine learning and autonomous applications are expected to replace humans within the next decade in marine logistics, as in all other fields.

### **Business Case study: Hitachi Europe Ltd. and Stena Line's partnership**

The collaboration aims to lower fuel costs and mitigate environmental pollution. Stena Line aims to be a frontrunner in the sustainable shipping and maritime sector. Hitachi will utilize machine learning technology to identify the causes of excessive fuel usage and propose more efficient operations. Furthermore, Hitachi will assist fleet operations on land by delivering safer travels, improved operational efficiency, and improved ship performance (Ceyhun, 2020).

Human-free ports supported by machine learning have already been implemented in the maritime supply chain networks, and the obtained information from AI technology provides shipping firms with a competitive advantage by giving weather forecasts, marine traffic, port traffic and other know-how; furthermore, the machine learning has the potential to increase shipping business effectiveness and reduce cost by reducing fuel consumption. One of the main objectives of AI utilization in maritime logistics is to decrease accidents by providing pinpoint data across the shipping process. AI significant advantages in the Maritime industry:

- **Proactive maintenance:** One of the most expensive issues confronting the marine sector is maintenance cost and downtime. Machine learning algorithms can analyze data received by sensors and can learn statistical markers that are most anticipated correctly when the vehicle needs to be fixed and which parts are reaching their limit or end of their lifetime. AI may forecast potential issues and proactively address them, reducing downtime and meeting stakeholders' expectations.
- **Advanced disruption management:** AI is a fit technology for wider operations such as disruption management. When intended seaports are congested or blocked, machine learning relies on algorithms to identify the most suitable port. Air Company, an IBM subsidiary, have created the 'Deep Thunder' project, a machine learning model designed to assist marine organizations in obtaining detailed information on weather forecasts, hurricanes, storms, and typhoons, which are critical in the shipping sectors. (Mathew et al., 2011)
- **CO<sub>2</sub> Emissions reduction:** using AI in the marine sector gives a competitive benefit in terms of fuel economy and lowering shipping-related CO<sub>2</sub> emissions, both of which are the most significant concern in the maritime sector. Nearly more than 2.6 billion USD is being spent on fuel expenses by large maritime firms. Therefore, it is necessary to specify the correct calculation for the impacts of the waves and the wind on the vessel's speed to reduce CO<sub>2</sub> emissions and fuel consumption. Existing technology for these calculations relies on physics experiments or simulations; however, they do not account for dynamic wind interactions or sea currents that affect the ship's movement in the sea. Therefore, AI has a great potential to maximize profitability by reducing CO<sub>2</sub> emissions and fuel consumption (Anan et al., 2017).
- **Best routes:** AI assists maritime organizations in planning for potential oil prices. Shipping firms can use advanced GPS-related AI systems to determine the most effective shipping routes based on oil prices.

#### **Business Case study: A.P. Moller-Maersk**

A.P. Moller-Maersk utilizes an AI-driven conditions recognition system. They agreed to use AI to create tracking services, object recognition, and sea conditions. The sensors receive continuous information from a ship's environmental ambience and recognize estimated concerns. The objective is to implement an autonomous collision avoidance system to deliver efficient and safe working conditions to maritime operations (Hacioğlu, n.d., p. 350).

Nowadays, the global maritime sector is undergoing a series of changes. AI applications may provide solutions to many other issues, such as fuel consumption, security, safety, risks, hazards, collisions, human-related errors, maritime cost-effectiveness operations, environmental pollution and variations of new regulations.

#### Survey area:

Digitalization is transforming business functions, including Procurement. End-to-end processes are automated, resulting in accuracy, cost efficiency and time reduction. However, according to a recent digital technology supplier Jagger study, 20% of organizations still rely on paper globally. In comparison, only 50% have digital expertise, granting that firms with digitalized processes might have up to a 29% reduction in full-time personnel expenses (Hogg, 2019).

#### Survey Question:

30- In the context of paper and rubber stamps:

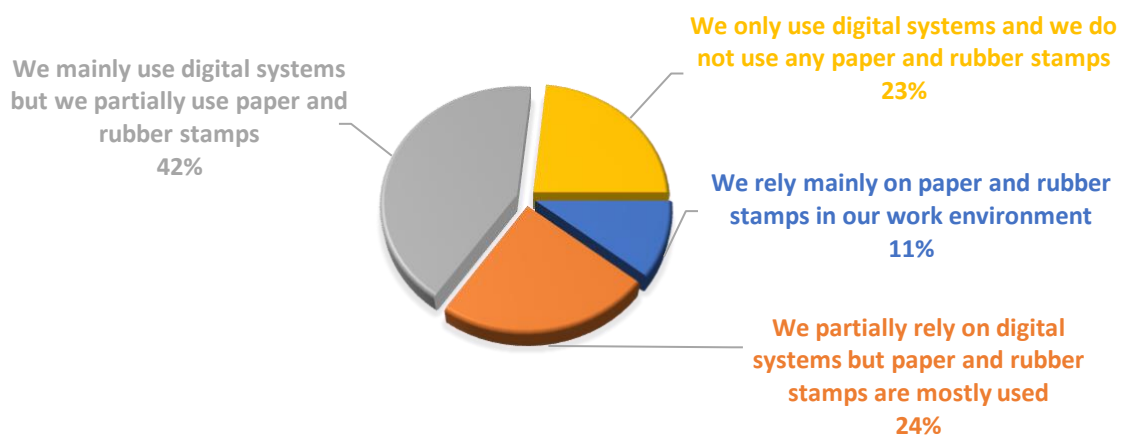


Figure 5.5: Digital transformation status

#### Findings:

The survey question illustrated in Figure 5.5 is an additional attempt to examine the presence and intensity of digitalization during Covid-19. 42% mainly use digital systems but partially use paper and rubber stamps. In comparison, 24% partially use digital systems and mostly paper and rubber stamps; nevertheless, 23% rely only on digital systems, compared to 11% of the respondents who rely mainly on paper and rubber stamps in day-to-day jobs in their work environment, which indicates that end-to-end digitization is not yet widely spread. Although

traditional methods are still in place within the sampled organizations in this survey, waste management approaches may consider digitalization as a tool for elimination; moreover, organizational leaders and decision-makers may need to consider a digital strategy to be integrated with corporate strategy. Nonetheless, the survey results may also indicate opportunities for transforming potential customers in the market to digitalization methods.

## **5.11 Cloud computing**

Cloud computing is a concept that offers network access from anywhere to customizable data processing supplies (mainframes, network, data centers) in distributed common pool. This model offers the least administration work, and service providers may promptly engage with the systems and clients to make changes. Cloud computing offers processing, utilization and storage for massive amounts of data. Moreover, it reduces the need for hardware and software expenditure in information technology infrastructure. The demand for storing, process, and analyzing massive amounts of data increases the orientation for cloud computing. (Bocek et al., 2017). Today's major business concerns are safe data storage, consistent internet speed, and standardization; however, cloud computing seems to offer a viable answer to these issues. Cloud computing offers many advantages for organizations: an obvious cost reduction, infrastructure elimination, expansion of work environment, cost efficiency and ability to work remotely from anywhere in the globe. Cloud computing is linked nodes of computer systems that consist of several interconnected computing resources (Arunarani et al., 2019). Cloud computing has evolved as standard technology, drawing the attention of enterprises and people worldwide. Even though cloud computing is an old technology, it gained more temptation after the 2000s, particularly with Web 2.0 and social media. The notion of cloud computing has gained popularity for various technological and institutional reasons and has generated multiple services and deployment models originating from the meaning of the internet.



### **5.11.1 Should digitalization infrastructure be outsourced?**

Now more than ever Cloud is positioned as a key factor in digital transformation for organizations across all industries. Cloud is no longer a trend; it has become an essential component of the digitalization strategy. The challenge now is for the firms to identify which capacity to migrate from on-premise to Cloud, when to migrate and which platform to handle the cloud migration. Cloud innovation is a key to digitalization cost reduction, capital expenditures reduction, increasing customer satisfaction and penetrating the market rapidly; Cloud solutions in their varied techniques are vital for existence.

### **5.11.2 Challenges for cloud migration**

Own or lease decisions may vary from one firm to another in terms of software and hardware licenses and assets, overhead costs, uptime necessarily, intellectual property, and data security; nevertheless, the core questions that drive the choice of migration to a cloud-based environment remain the same:

- The feasibility decision of Cloud migration
- The availability of skills and expertise to drive the migration
- What are the costs and the ROI (return on investment)
- Transition time to go live
- What are the risks, and which can be mitigated

Yet, many other unforeseen challenges and questions may arise before and during the implementation, such as scheming the overall impact on the budget. It is a critical decision to choose between cloud-based or on-premise architecture. While it seems like a binary choice, several factors must be considered. The first consideration is how critical uptime is for the organization; for certain firms, the benefit significantly exceeds the price. For example, an online company that relies on web-based transactions will value uptime tremendously, and they are prepared to pay extra for cloud-based solutions that guarantee a particular degree of uptime, while other firms that are not relying on online business may be better suited for on-premise setup.

### 5.11.3 The Pros & Cons of digitalization infrastructure On-Premise

Pros.	Cons.
Realistic investment for large organizations	Significant investment for small and medium firms
No third-party access	Dedicated and properly prepared space for network /equipment/firefighting/backup/access control/UPS (Uninterruptible Power Supply)
Accessibility does not require an internet connection	Vulnerability to data loss during a crisis
Physical control	Recovery/data retrieval/uptime not certain
High upload and download speed	Continuous maintenance/backups required
Security	Constant upgrade/update required/risk of obsolete parts and compatible parts
Setup control	Dedicated staff/administrative cost

Table 5-1: Pros & Cons of digitalization infrastructure on-premise

### 5.11.4 The Pros & Cons of cloud-based digitalization infrastructure

Pros.	Cons.
Elimination of high-cost hardware infrastructure, electricity, HVAC	The risk of losing internet connection at the client side or service provider side
Elimination of bulk software licenses	Full data recovery may consume quite a long time
Pay-as-go or need for storage space and users' number	Intellectual property (IP) and confidentiality concerns since the data are stored with third party/service provider
Uptime, redundancy, backup/restore/retrieval from anywhere/any device	Bandwidth limitation by service providers can be a concern.
Backup intervals are minimized, reducing the possibility of data losses in disaster situations	Data encryption and data security depend on the service provider
The cost and the task of software updates and hardware upgrades are shifted to the service provider	It may not be the best model for non-web-based transactional firms.
Less workforce needed	Expertise and problem-solving rely entirely on the service provider's side
Flexibility in choosing suppliers and service providers based on performance and reputation	Hardware modernity and efficiency, risk management, and disaster recovery depend entirely on the service provider

Table 5-2: The Pros & Cons of cloud-based digitalization infrastructure

Each configuration has several advantages and disadvantages; organizations that do not count mainly on the internet for business or have Intellectual property (IP) and confidentiality concerns may prefer the on-premise model, while the organizations which rely primarily on internet transactions may benefit from the cloud-based model allowing flexibility, remote accessibility and high level of uptime. Cloud computing is typically described in terms of its type or service. There are many types of clouds, such as:

- Public Cloud
- Private Cloud
- Hybrid Cloud
- Community cloud

In terms of services it provides:

- IaaS (Infrastructure-as-a-service)
- PaaS (Platform-as-a-Service)
- SaaS (Service-as-a-Service)
- DBaaS (Database-as-Service)

A combination of technological resources will drive industry 4.0 transformation. Cloud computing, however, is a crucial enabler of industry 4.0 for managing and integrating platforms. In addition, it can combine automation, robots, and IoT, all of which contribute to long-term state-of-the-art development.

**Research area:**

According to the survey, 62% of Chief Procurement Officers have a completely integrated strategic procurement vision. In addition, the research established a correlation between the degree of procurement strategy alignment and stakeholder penetration, arguing that this is the KPI and how much value it generates. Digitization is an important performance indicator, yet, it is not without challenges: while 83% of CPOs have used digital technology, 43% are not experiencing any further benefits (Small, 2020).

Below is further for the above research to reflect the present views:

### Survey Question:

31- Digitization is perceived as a key performance indicator, but is not without its challenges: 83% of CPOs have implemented digital tools but, of these, 43% are not seeing added value (Small, 2020).

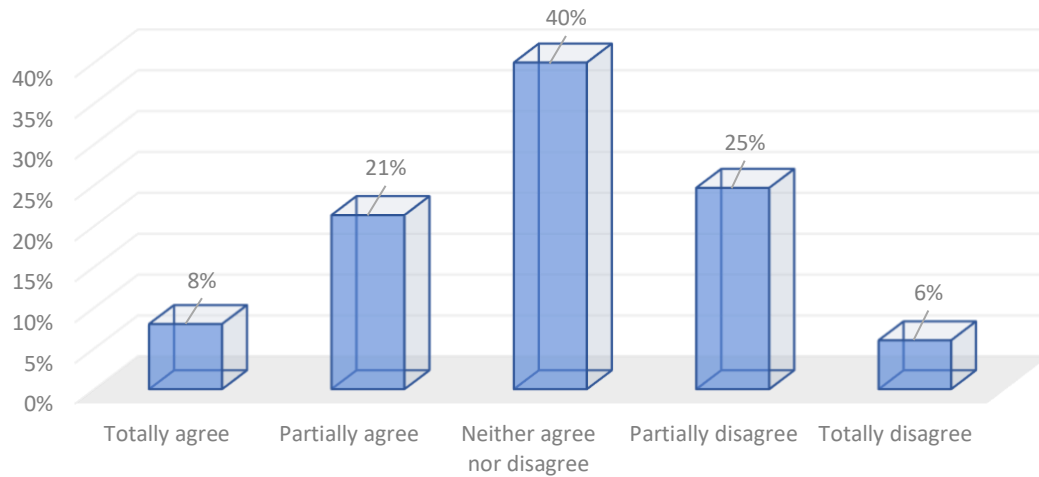


Figure 5.6: Digitalization as KPI

### Findings:

The question illustrated in Figure 5.6 is a further attempt to examine the possible added value recognition of digitalization in organizations during Covid-19. According to this question survey results, 8% agreed, and 21% partially agreed of not seeing an additional benefit for adapting digital technology. In comparison, 40% responded neutrally with the statement, which may indicate that not all digitalization models fit certain business types within the sampled organizations in this survey and accordingly, added values are not recognized. Another possibility is that before and after digitalization comparison was not acknowledged in terms of performance and profitability. Meanwhile, 25% responded partially disagreed, and only 6% disagreed, indicating in total 31% are seeing additional value in digitalization, which may indicate a mild correlation between digitalization and adding values recognition.

## **5.12 Analytics**

### **5.12.1 Forecasting Analytics**

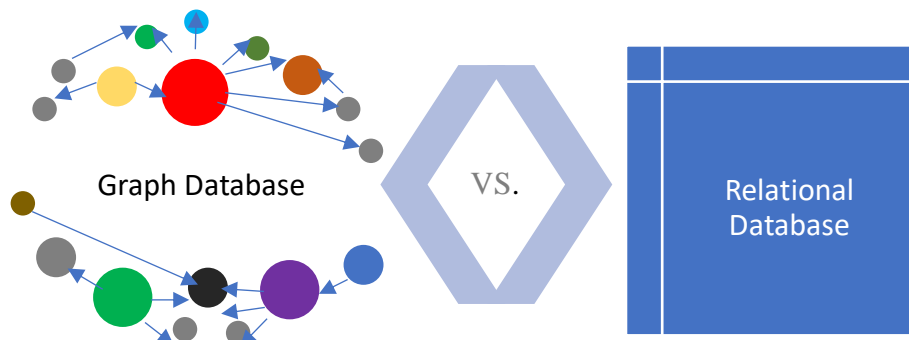
Forecasting analytics, defined as data mining that can predict future events, employs past data to forecast future events. It employs data mining, statistics, text analytics, machine learning, and artificial intelligence to generate models capable of interpreting Big Data and forecasting likely future outcomes.

### **5.12.2 Governing and regulating Data**

Bringing all financial data, customer demand data, real-time supplier data, and third-party external feeds such as climate change, harbour shut-downs, and natural disasters into a single central data repository are critical for analytics. To effectively mitigate risk, AI can scan for correlation patterns, stress test all parts of the supply chain, and conduct 'what-if?' planning. Investing in data analytics and intelligence tools allows procurement to gain visibility into the supply chain and support real-time decision-making. Analytics will also be used to track and predict third-party risk, such as a cyber security breach, assess vulnerabilities and enable better decision making.

### **5.12.3 Graph Nodes**

Graph Nodes is an analytical tool used by social media such as Facebook that organizes data inversely than traditional databases Figure 5.7. Graph node organizes data in a more conjectural way than tabular form/spreadsheets, allowing data models based on real-life relationships between node objects. The Graph Nodes basic model is a set of data described as nodes, and the link between them is the relationship between them. In the Supply Chain context, these relations could expose that group of suppliers depending on the same source or company for a scarce material or critical components; accordingly, it will reveal any possible risk in my Supply Chain. When applied to the Supply Chain, such algorithms will reveal the supply stream, bottleneck items, actual costs, compliance, weaknesses and any contractual disputes. (Reeve, 2020).



*Figure 5.7: Graph database vs Relational Database*

### **Business Case Study – U.S. Army**

The U.S. Army uses Graph Nodes to manage one of the world's largest supply chains, which purchases and deploys equipment worldwide and provides millions of components and spare parts to maintain them. Equipment maintenance, operations, logistics and support costs accounted for 80% of the equipment's life cycle cost, so the goal was to collect data on every element as well as the associated cost, what equipment it is connected to, and the life spans it. As a result, a decision has been made to migrate to the Graph Node database model, which today operates 2.1 billion nodes and 5.9 billion relationships. What used to take 60 working hours for data packaging for analysis on the old mainframe now takes only 7 hours. e.g. One file for tank parts contained 10 million parts, resulting in over 15 million potential relationships between the components. The Graph Nodes database model has enabled the U.S. Army to better forecast spare part demand and settles orders, resulting in an improved ordering process and more anticipated costs (Zagalsky, 2021).

## **Chapter 6 Conclusion**

### **6.1 The answers of the research questions**

In this section I summarize the answers to the survey questions of this thesis divided into the following four chapters:

#### **Chapter 2: Procurement objective and development:**

4- How deep is the traceability for environmental sustainability and social responsibility?

Within my research in this thesis and regarding the questions of traceability for environmental sustainability and social responsibility including scope 3 greenhouse gas emissions and based on the survey analysis I can conclude that there is a positive correlation between sustainability and visibility beyond tier-one suppliers, the result indicates that the majority of the organization are performing the exercise of traceability which may indicate the awareness of the majority of the supply chain toward the importance of sustainability through being close to the suppliers, nevertheless, a sustainable strategy needs to be continuously monitored in addition to new sustainable designs of products while maintaining fair trade practices to maximize profitability whilst prioritizing sustainability.

5- What are the practiced strategies to moderate the risks post Covid-19?

This research question is aimed to identify the strategies which have been practiced post Covid-19 to moderate the risk, the results indicate that Agility in the switching of suppliers and multi-sourcing is the most common strategy within the sampled organizations, (Puto et al., 1985) highlighted multi-sourcing as a critical strategy for organisations aiming to reduce supply uncertainties. The results also indicate that one-fourth of participants used the strategy of improving the visibility beyond tier one suppliers and closer collaboration, and more than one-fifth for increasing inventory. I can conclude based on the results that applying and switching between several strategies can enhance organizations mitigate risks. While results indicate agility in switching suppliers and multi-sourcing as the most flexible and rapid strategy approach during the Covid-19 event, I can conclude that the other two strategies of increasing inventory and improving visibility beyond tier one suppliers may require an early long-term plan.

6- Are the buying organizations and suppliers have independent or integrated systems?

This research question is aimed to recognize the integrations in client-supplier systems, the result indicates that less than half of the sampled organizations in this survey have independent systems, I can therefore conclude that the organizations which have an independent system from suppliers may confront complexity in data exchange, visibility concerns and sharing information speed and time issues. Additionally, there is a need for digitization and system connections between the purchasing organizations and suppliers to speed up the order to requisition time, decrease order mistakes, and maintain the timeliness of purchase orders, delivery times, and supplier payment processing.

7- What is the length of the strategic contractual with key suppliers?

In this question I am to examine the duration of strategic contracts with key suppliers, the results indicate realization of the importance of strategic long-term relationships, hence 91% of the participants have a contractual business relationship varying from one year up to five years, I also can conclude that the minimizing commitments with suppliers may implies an adversarial transaction cost driven and best offer relationship. I can conclude that there is a strong correlation between contractual relations and long-term shared goals, and additionally, reduced negotiation and transaction costs.

8- What are the communicated corporate social responsibility (CSR) elements?

This research question is aimed to find the communicated corporate social responsibility elements, I may conclude based on the results that 95% of the sampled organization are using one or more policies varying from Health and safety, safety awards, CIPS code of ethics, sustainability policies and diversity. Agencies and institutional investors collect and evaluate the CSR reports that rank the organizations, and since profitability is the main objective for any business hence I find a positive correlation between CSR elements and growth and profitability strategies.

9- How intense are the buying organisation's strategic relationships and key suppliers?

In this question I examine the intensity of the strategic relationship between the buying organization and their key suppliers, I may conclude that the intensity increases from first: Strategic/Contractual, second: Business Partnership, and then finally, Early Supplier



Involvement and R&D relationship indicating to be the most challenging relationship which requires intensive communication, coordination, shared information, shared goals, and integration from both sides, while it is a very challenging mission; however, the earned values, if well planned, are outstanding.

#### 10- Procurement reactive/tactical or proactive/strategic in the organizations?

This is a primary question for this research, I aim to distinguish reactive/tactical vs proactive/strategic within the sampled organization, I aim to differentiate in the following five questions (11 to 15) the characteristics of each. The results indicate that 65% of the participants have described their procurement as proactive/strategic, I can conclude that the purchasing function has changed over the years from a transactional just buying reactive tactical role to proactive strategic functionality. The following five questions are examined based on the previous results of question 10, these questions aimed to examine the characteristics of proactive procurement described by (Peter J H Baily et al., 2021) Table 2-1:

#### 11- Is plenty of stock waste or security?

#### 12- Are plenty of suppliers lost opportunity or security?

In these two questions, I can conclude based on the results that I find a weak correlation between the proactive/strategic function of the procurement and the relevant characteristics described in Table 2-1 as nearly half of the firms consider plenty of stock as security and more than half consider plenty of suppliers are security. I can conclude based on the results the presence of adversarial relationship based on the lowest price as a key factor rather than the best value for money and sharing long-term goals; however, a modest number of suppliers, if carefully chosen, may offer mutual benefits, shared long-term goals, vision.

#### 13- Encountered problems of suppliers and outsourcing are shared responsibility or the supplier's responsibility?

#### 14- How intense is the shared information between the buying organization and suppliers?

I can conclude based on the result that there is a strong to a mild positive correlation between the characteristics of proactive/strategic function and sharing the responsibility of encountered problems as well as the intensity of the information shared between the client and suppliers. The results indicate that two of the key elements of strategic procurement characteristics as per

Peter Baily; are being followed by the majority of the sampled organization in this survey. I can conclude that shared responsibility means that both buying organizations and suppliers are seeking together for solutions and alternatives to solve the problems; I can conclude that this means not only adding value but also means business continuity for both.

15- Regarding the fifth question in the same context: Does procurement contribute to the specification?

Based on the result I can conclude that there is a weak correlation between being proactive/strategic and contribution in the specification as less as 15% where procurement contributes with their suppliers and 9% procurement with their customers. It can be concluded that although the characteristics of proactive/strategic procurement function are well described by Peter in Table 2-1, however, some, as per the results not well practiced.

16- Which is followed during Covid-19: Just in time or Just in case?

In this question I aim to find if the increased stock is seen as a symptom of inefficiency and poor management or during the Covid-19 time, buffers are likely to be regarded as a sign of a smart and highly clever approach, based on the results I can conclude that the correlation between the utilization of “Just-in-case” and the event of Covid-19 is moderate, this, therefore, may indicate that switching from Just-in-time to Just-in-case has distinctive consequences despite the urge to change due to Covid-19 restrictions, I also can conclude that switching from just-in-time to just-in-case may for some organizations require a long-term plan.

### **Chapter 3: Strategic procurement and supply**

17- How long does requisition to order time takes?

In this research question, I aim to measure ‘requisition to order time’ for the 65% of organizations that have described their procurement function as strategic against the business case study by (Harrington, 2018) on Emirates Airlines. Harrington found that transforming purchasing functionality to a strategic procurement functionality has resulted in reducing ‘requisition to order time’ from 35.1 days to 4.1 days, hence I can conclude based on the results in this thesis that there is as low correlation as 34%, this may indicate in this regard that reducing the ‘requisition to order time’ may not be the most beneficial added value for strategic procurement within the sampled organizations in this survey.

18- How best can you describe the role of the Procurement department?

In this research question, I aim to find the most significant added value for the procurement department. (Burt & Pinkerton, 1996b) concluded that for a strategic procurement to add value it should be able to identify what to buy, identify and develop proper supplier relationships, achieve the lowest total cost of acquisition, and ensure that the necessary material or service is obtained on time and that future supplies are secured, however, I can conclude based on the results in this thesis that procurement is moving toward more strategic added values over the time as negotiation savings, development and managing contracts, supplier relationship management are the most significant added values by strategic procurement.

19- Does your business have a supply chain strategy?

20- Do you think supply chain strategy impacts your business performance?

In these two questions, I aim to find the existence of the supply chain strategy and whether it impacts the business performance, based on the results I can conclude that there is a strong positive correlation between having a stand-alone or integrated supply chain strategy with the business performance. Based on the results 71% have a supply chain strategy either stand-alone or integrated and 84% consider it as an impact on the business performance. I also can conclude that a well-planned supply chain strategy has a direct and positive influence on competitive combinatorial capacity, which promotes business performance, specifically market share and profitability. Moreover, the combined core skills of an organisation indicate its ability to achieve low cost, great flexibility, reliability and quality.

21- When selecting offers and suppliers, does the prioritization goes for innovation, cost drive, risk mitigation or adding values?

In this research question, I aim to find the main driver for selecting suppliers and offers, although suppliers with the most appealing pricing are not necessarily the cheapest when all of the additional costs associated are considered; however, based on the results I can conclude that the cost is the main driver for selecting offers and dominating selecting supplier as much as 46% from the sampled organizations. I can conclude that unless the offers are not well structured down into elements and unless the total cost ownership is well recognized; the cost will always dominate the selection.

22- How lean have you found JIT (just-in-time) during disruptions such as Covid-19?

I aim in this question to find the feasibility of Just-in-Time as an agile approach during the pandemic of Covid-19, the results indicate that JIT is found to be a less feasible approach during the disruptions, I can conclude that long supply chains have diverse economic impacts, meanwhile, this may lead organizations to consider different approaches such as agility in switching suppliers, multi-sourcing, inventory buffering (just-in-case), near market and onshore sourcing, improved visibility into tier two and three suppliers and closer collaboration.

#### **Chapter 4: Outsourcing**

23- Have you had to re-negotiate or re-tender two or more contracts?

In this research question I aim to investigate the motives for re-negotiate or re-tender during the disruptions, the results indicate a strong correlation between the pressure to cut costs and the changing business need as the main drivers to re-negotiate or retender the outsourcing contract, therefore, I can conclude that the capability to adjust or change the outsourcing contract need to be considered earlier while developing and signing off the outsourcing contract, meanwhile, additional cost and performance factors also must be recognized associated with that change.

24- What is the key motive for outsourcing?

I aim in this question to find the key motives for outsourcing, the results indicate a significant association between the desire to focus on core competencies and a willingness to outsource, however, other moderate to low correlation motives also exist including the need to invest in technology and equipment available with suppliers and the distinctive service level provided by the suppliers. However, there are potential risks to be aware of, such as excessive reliance on suppliers, a lack of management capabilities to oversee suppliers' performance, quality issues brought on by shifting customer expectations to the suppliers, the loss of talent, and the challenge of transferring knowledge internally in the event of unforeseen events like supply chain disruptions.

#### 25- What KPIs do you use in your supply chain (logistics)?

In this research question, I aim to examine what KPIs organizations prioritize in their logistics supply chain during disruptions. (Stewart, 1995) suggests that organizations exceed their competitors; excel in four key core processes: delivery effectiveness, flexibility and reactivity, logistics cost, and asset management. However, based on the results I can conclude that the “Inventory availability” has been prioritized by participants, I can conclude that this may address, particularly during the Covid-19 time, the importance of approaches such as ‘just-in-case’, accordingly multi-sourcing, and improving visibility beyond tier one suppliers as an essential tactic for organisations seeking to decrease supply uncertainty. Raising stock may therefore be a wise decision, especially during Covid-19.

#### 26- During the pandemic, have you re-evaluated offshore/onshore strategy?

I aim in this research question to examine whether Covid-19 is a justification for back sourcing/onshoring or whether it would be too challenging, despite the pandemic's restrictions, to bring the business back in-house, onshore, or close to the market. The results indicate that 36% of the sampled organizations are working on bringing back production to onshore or nearshore, while 30% rely only on onshore or nearshore, which I can conclude that there is a strong correlation between back sourcing/onshoring and the Covid-19 pandemic circumstances. However, this is not without its challenges, particularly in terms of know-how transition, so businesses should take this into account when developing their risk mitigation strategy.

### **Chapter 5: Industry 4.0**

#### 27- Are you using blockchain in your organization?

In this research question, I attempt to examine to which extent firms are now utilizing blockchain technology. The results indicate that only 11% of the sampled organizations are utilizing such technology, I can conclude that this may be referred to that blockchain is a relatively new technology and still in an early stage, also adopting Blockchain across the whole supply chain is very challenging which may discourage the interest in investing in such a new technology, in addition to the resistance to change.

### 28- Are you using digitalization for negotiation?

In this survey question, I try to find out if Covid-19 is a strong motivation for digital negotiation, especially during travel and mobility restrictions, and how widely it is used in businesses now. The results indicate that the majority of the sampled organizations are using mix approaches between digital and face-to-face negotiation, hence I can conclude that despite the pandemic and the abundance of digital tools, many businesses do not completely rely on them, I also can conclude that restrictions and regulations may vary from one country to another, nevertheless while face-to-face negotiations may give power to the negotiators, but it also gives a space for personal bias to interfere, it leaves little chance for the new players in the market to penetrate the business and less possibility for diversity.

### 29- Do you have a digital strategy?

I attempt in this survey question to survey the presence of digital strategy during Covid-19. The results indicate a mild to strong correlation between the presence of a digital strategy and the pandemic; however, nearly one-third did not implement or do not have a digital strategy. I can conclude based on the results that implementing a digital strategy has several challenges which may include but are not limited to: stakeholder orientations to support or hinder the achievement of digital strategy objectives (Ritala et al., 2021), management vision and willingness to change; changing employee mindset, and developing soft skills like problem-solving skills, listening, eliminating error causes and risk management, moreover, the digital investment.

### 30- How digital is your organization?

I aim in this research question to compare and distinguish my results to the study of digital technology supplier Jagger (Hogg, 2019). The study of Jagger shows that 20% of organizations still rely on paper globally compared to more elaboration in the results of this thesis which indicate 11% of the sampled organizations mainly use paper and rubber stamps, nevertheless 42% partially use paper and rubber stamps, 24% partially rely on digital systems but mostly rubber and stamps and finally 23% use digital systems exclusively. I can conclude based on the results that end-to-end digitization has not yet broadly spread, although several studies indicate that the Covid-19 circumstance has significantly accelerated the digitization process in a variety of businesses (Klein & Todesco, 2021; Kraus et al., 2020), I can also conclude that

management vision, staff abilities, skills, and mindset are typically deciding the success or failure of digitalization.

### 31- How much does digitalization add value to your organization?

In the survey question, I aim to examine the added value of digitalization, according to (Small, 2020) 42% of the CPOs are not recognizing the added value of digitalization. Based on the results in this thesis indicates a mild correlation between digitalization and adding values recognition as one-third of participants can recognize adding values while 40% remained neutral, I can conclude that among the sampled organizations in this study; not all digitalization approaches are appropriate for all business models, and as a result, new benefits are not acknowledged. I can conclude another possibility is that key performance indicators and profitability comparisons between before and after digitization were not considered.

## **6.2 Recommendations**

These days, we require more adaptable organizations that can adapt to change. No matter how skilled the managers are, a weak organizational structure may prevent excellence in performance. In order for the procurement to function strategically, it needs to be positioned in the organization chart as a strategic function and report directory to the board members. Organizational structures should be modified to fulfill specific needs while considering the surrounding environment, the established goals and strategies. While the procurement function can focus on strategic goals, end users may be given control over regular purchasing tasks and no core competence activities can be outsourced. A well-defined, communicated, continuously monitored and controlled service level agreement should support the client and supplier relationship and contribute to delivering the anticipated quality of service, provided that objectives are clearly articulated.

Subcontracting and make/do or buy choices are being made increasingly and frequently as organizations focus more on their own specialized skills and leave supplemental tasks to other experts in those industries, nevertheless, the right selection of suppliers is essential for the success of the buying organisation, meanwhile, procurement can focus on the crucial specialized role and work on building an analytical framework that will support decision-making process to achieve the organization's objectives. It is crucial that the suppliers and

buying organizations have a tight working connection and identify each party's obligations and responsibilities. Continuous evaluation is required since the supplier serves as an extension of the resources of the buying organization.

The visibility beyond tier one suppliers is not only used for monitoring sustainability but also used as a strategy to moderate risk during disruption; nevertheless, organizations need to be agile in switching suppliers and adopt multi-sourcing as the most significant strategies to respond to the environmental changes and moderate risk during a disruption. To maintain growth, and profitability and to gain the trust and reliability of the community; organizations need to disclose their footprint on the environment and society and design products which are sustainable and environmentally friendly.

Switching between several strategies can enhance organizations to mitigate risks including agility in switching suppliers, a multi-sourcing approach, increasing inventory and improving visibility beyond tier one suppliers. The recommended characteristics for a strategic procurement may include but are not limited to: client-supplier contribution in specifications, long-term contractual business relationships, integrated systems, shared long-term goals, early supplier involvement in product development and shared responsibility for encountered problems. Meanwhile, the lowest price is not usually the best offer, particularly if logistics and distance have been considered rather best values for money, the total cost of ownership and shared long-term goals.

Disruptions underlined the importance of inventory availability to maintain business continuity; therefore, the inventory buffer approach represented by 'just-in-case' is highly recommended. The disruptions have intimated localization through reshoring, onshoring, near-market and even back sourcing if applicable. Outsourcing needs to be implemented with careful consideration to avoid the challenges of transferring back the knowledge and know-how; therefore, the terms and conditions need to consider these situations in the outsourcing contracts.

The disruptions revealed the importance of forecasting facilitated by big data, data analysis and analytics. In addition, it revealed the position of digital negotiations and digital buying tools, which may not just support diversity but also enhance removing of personal bias. Meanwhile,



Cloud provides low-cost digital infrastructure enabling more players in the market to penetrate the business. For the added values of digitalization to be acknowledged, key performance indicators need to be monitored and controlled continuously and periodically.

To implement a successful digital transformation, managers need to take a proactive approach and establish a culture that supports this process. Senior management members need to create customer-focused organizational cultures that exhibit strong performance and manage risks, to accomplish the speed and agility they require in their digital transformation, it is necessary to create an ecosystem that encourages development, experimentation, and learning. When organizations plan ahead and set clear goals during the digital transformation process, they may leverage their digital culture identities as a substantial competitive advantage. Organizational models with open system characteristics nowadays cannot avoid the change. As a result, business organizations can only be certain to survive and grow if they successfully integrate change. The fast development in information technologies and the influence of globalization on many dimensions, including global norms for quality, management, product, service, process, and technology, forcing senior management in organizations to develop new strategies in response. The need to transition to digitalization is unavoidable and the organization gains a significant competitive advantage as a result of this transformation. A culture that values technology is essential for the success of digital transformation, therefore, it is important to carry out this procedure with motivated staff.

The combination of smart contracts based on blockchain and digital twins is promising, they provide solutions to overcome the limitation of visibility and trust in the supply chain; meanwhile, digital twins provide vision to the supply chain and enhance proactive decisions through ‘what if’ scenarios which can be taken in real-time reducing lead time and traceability.

A successful deployment of Industry 4.0, which includes e-procurement, digitalization, and analytics with active engagement from all stakeholders, may lessen total costs of ownership while also enhancing customer service, therefore, it is crucial to maintaining competitive advantage. End-to-end digital connections are necessary because it is obvious that data warehouses are preventing access to real-time data. Additionally, manual supply chain processes and a lack of flexibility can seriously affect a supply chain's resilience by making it difficult to adjust to rapidly changing demands. As a result, digitalization, including

Blockchain and the Internet of Things (IoT), has the potential to drastically transform procurement and supply chains, making them more robust, sustainable, transparent, cost-effective, capable of operating in real-time, flexible, and decision-making efficient. Finally, having a less-than-ideal system that stakeholders understand and willing to make it operate is preferable than having a highly complex system without commitment.

## **6.3 Outlook**

In the digital era consumer expectations change and chances for cost optimization increase, Organizations are certainly modifying their business models, they are obligated to adapt in many areas, from internal operations to consumer processes and the areas that require a transformation to get a competitive edge and adjust to this evolution.

Traditionally, the organizations used to consider the best price offers, today the emphasis is shifting toward the total cost of ownership through the collaboration with the stakeholder in the supply chain, the goal is often cost elimination rather than cost allocation. It is possible to improve services at a lower total cost when supply chain strategy and processes are harmonized across stakeholders while still retaining the supplier's margin, creating a mutual benefit.

Although automation and artificial intelligence lessen the need for humans in operational occupations, the demand for knowledge workers will continue due to the need for new skills and professions. Only the transformation of talents can enable the change of organizations. However, critical changes require new business models, and organizations which cannot build new models will confront the threat of extinction. Although digitalization is changing most organizations, there are still several challenges to overcome, including the speed at which customer expectations and trends are changing, cultural shifts, outdated regulations, and identifying and utilizing the right skills.

Disruptions cannot be fully avoided and will continue to happen no matter what. The impact of the disruptions is severe on the economy and business; however, they can be studied and researched; therefore, the risk can be mitigated, resulting in a smart and agile supply chain. What was seen as agile and smart approaches before, now after the recent and continuous varied disruptions such as Covid-19, the Ukraine-Russian war, Brexit, and the US-China trade

war; many of the supply chain's approaches have been and will be revisited, reevaluated, reconsidered, modified or otherwise retained and reinforced.

Disruptions in the digital era proved that engaging digital and supply chain strategies are no longer optional in the corporate strategy. What is vital is to have the agility to switch from one approach to another, have fast and wise decision making and develop the learned lessons into an organization's information asset; the further progress, the more to learn and adapt.

## **6.4 Limitation**

Although the data gathered in this survey from professional participants of the supply chain, procurement and logistics from many regions around the world and many business activities, nevertheless every region has its own geographic and geopolitical challenges, and every business has its unique, distinctive supply chain which may all affect the perspective and decision making, therefore this study here is limited and affected by generalizability.

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