GRIFFITH COLLEGE

Research dissertation presented in partial fulfilment of the requirements for the degree of MSc in International Procurement and Supply Chain Management – Griffith College, Dublin

Dissertation Supervisor: Mr. Ronan Gallagher

"An exploratory study on how modern Supply Chain can thrive on **ELASTIC LOGISTICS**"

By

Student Name: Sagar Dhage

Student Number: 3004043

Date of Submission: 28/08/2020

Candidate Declaration

Dissertation Title: 'An exploratory study on how modern Supply Chain can thrive on ELASTIC LOGISTICS.'

I hereby certify that I am the sole author of this dissertation and that neither any part of this dissertation nor the whole of the dissertation has been submitted for a degree to any other college or institution.

I certify that, to the best of my knowledge, my dissertation does not infringe upon anyone's copyright nor violate any proprietary rights and that any ideas, techniques, quotations, or any other material from the work of other people included in my dissertation, published or otherwise, are fully acknowledged in accordance with the standard referencing practices.

I declare that this is a true copy of my dissertation, including any final revisions, as approved by my dissertation review committee.

Date: 28/08/2020

Place: Griffith College Dublin, Ireland

Sagar Dhage – 3004043

Signature and name of student

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Abstract

Title of Dissertation - An exploratory study on how modern Supply Chain can thrive on ELASTIC LOGISTICS

By *Sagar Dhage (3004043)*

This study focuses on Elastic Logistics, an emerging concept in supply chain and potential driver of supply chain in coming times. It also focuses on major technologies that support and form a potential perfect model for Elastic Logistics.

The everyday logistics operations are defined by reciprocity of supply and demand. There are lot of uncertainties and disruptions experienced by logistics industry. Logistics organizations are transforming their operations to be flexible to plan the service capacity and tackle the changes in demand. With Amazon setting trend for same day delivery or next day delivery, the expectations of consumers have been increased from retailers and e-commerce companies. Rise in freight cost due to current pandemic situation, extreme weather conditions, climate change, delivering on time to avoid shortage and achieve cost savings are the challenges that need to be tackled by logistics industry.

The solution for logistics companies is being flexible, and expanding/contracting according to demand, i.e., Elastic Logistics. Elastic logistics concept includes outsourcing of logistics services, enabling automation in industries, digitalization, integration of various departments of organization and partners on a single platform and implementation of Transportation Management Services (TMS). More organizations will take help from third-party logistics (3PL) providers and utilize their fleet, IT capabilities and networking. This will enable companies to concentrate on their core competency, and deliver products and services on time, while doing cost savings at the same time.

This study puts forward the concept of Elastic logistics, its drivers, its benefits and how it can be potential solution for supply chain uncertainties in coming time.

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1. Introduction and Objectives

1.1 Purpose and Brief Description of the study

Supply Chain Management have witnessed many technological and non-technological trends from its journey of traditional to modern supply chain practices. Industry professionals have several options to select from lean practices to industry 4.0 and anything that is in between. There is no scarcity for supply chain and logistics professionals to select the perfect model for their business. With the Amazon setting the trend of expedited deliveries (within 24-48 hours) and variety of other shipping options, evolution of logistics has led to its new incarnation: **Elastic Logistics** ("What's Hot Now," 2018)**.** Elastic Logistics commonly refers to the 'flexibility to expand or reduce (logistics) capabilities to accommodate with the changing demands within the supply chain during a given time frame' (Choi, 2020). This has encouraged me to undertake a full-fledged research on the emerging topic "An exploratory study on how modern supply chain can thrive on ELASTIC LOGISTICS".

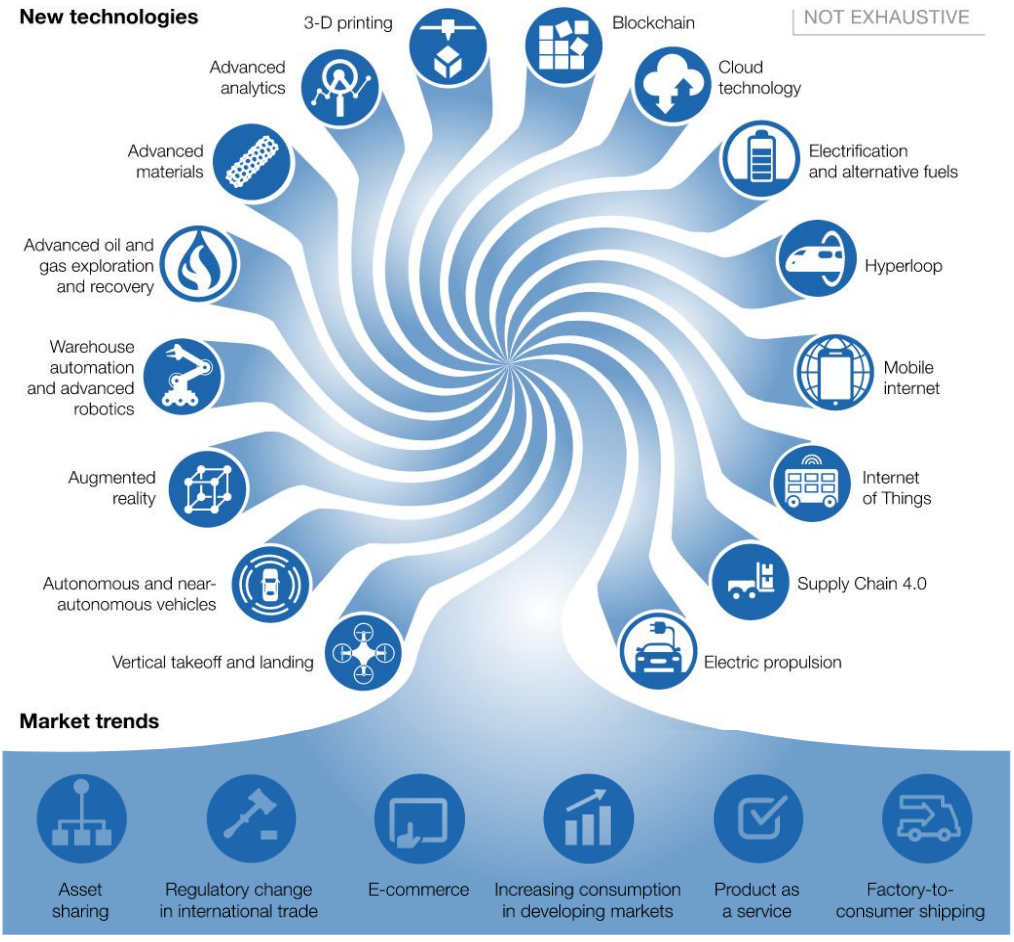


Figure 1: Market trends and new technologies ("Autonomous trucks disrupt US logistics | McKinsey," n.d.)

Figure 1.1 illustrates new technologies that are trending and that can disrupt the logistics industry. Digitalization and Automation in supply chain is making logistics eligible to align and accommodate its ability to stretch for peak demands. The use of data and data analytics is enabling shippers and logistics professionals to forecast the demand accurately and trim their inventories by up to 75 percent and reduce the warehouse costs by 15 to 30 percent. Several already-efficient third-party logistics (3PL) firms are exploring that data analytics and connectivity, powered by new routing, will lead to increase the efficiency by 25 percent ("Autonomous trucks disrupt US logistics | McKinsey," n.d.).

An efficient way to transform the traditional logistics into elastic logistics is by using TMS (Transportation Management system) into the business. Automation of warehouses can be done to streamline locating and packing of orders with less staffing, as there is fluctuation in demand throughout the year. To add up to this, there should be warehouses and storage facilities locally. For this purpose, 3PL (Third-party logistics can play a vital role). This will avoid the increase in company owned fleets during increase in demand and then experiencing decrease eventually, which may lead to waste of capacity. Partnering with 3PL service providers can play an imperative role in this scenario ("Elastic Logistics Explained," n.d.). 3PL service providers have expertise in integrated operations, transportation/fleet services and warehousing support. These services can be customized based on the requirements of customer and market condition. These services often go beyond the logistical support and include other value-added services as well (production/procurement of goods and various services, which help to integrate other parts of supply chain). This integration makes the provider to be eligible as third-party supply chain service provider. 3PL service providers are shifting towards utilization of automated freight payments and audit services to reduce the cost. With this, the 3PL market size is expected to grow. They are having competitive advantage by minimizing total capital expenditure (CAPEX), handling and

managing inventory, mitigating the risks, and pivoting towards the core competencies of their business. The lack of expertise and internal control by businesses has encouraged the rise in outsourcing these activities to avoid logistical challenges ("Third-Party Logistics (3PL) Market – Outlook On Emerging Application, Revolutionary Trends & Potential Growth Strategies 2026 – Jewish Market Reports," n.d.).

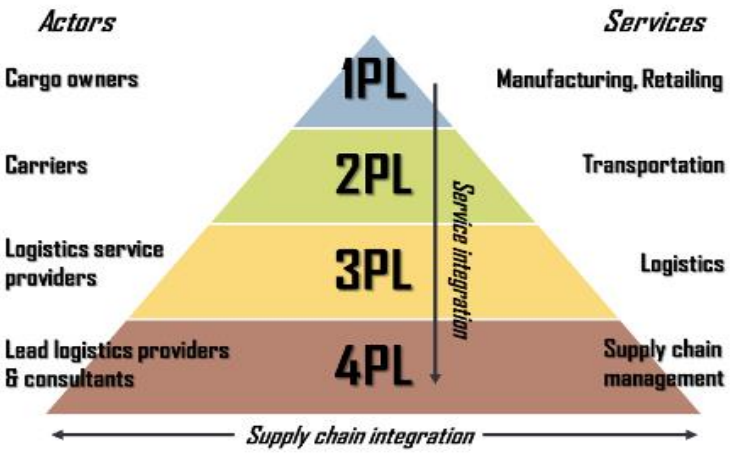


Figure 2: 3PL Integration ("Third-Party Logistics (3PL) Market – Outlook On Emerging Application, Revolutionary Trends & Potential Growth Strategies 2026 – Jewish Market Reports," n.d.)

Blockchain has also led to unparalleled level of transparency and tracking for logistics companies. It can prove to be helpful against shipment thefts. Graph 1.2 indicates rate of increase of blockchain business value from the year 2017 to 2030. Blockchain can help to implement full-proof deliveries, and even returns with the use of unique blockchain.

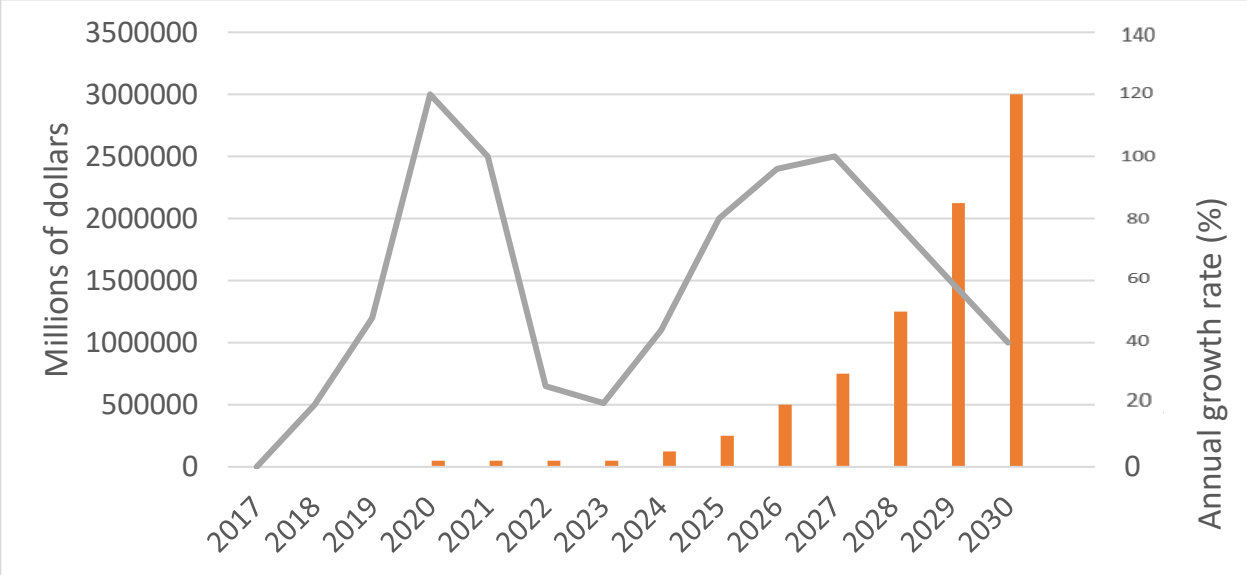


Figure 1.3 – Increase in Blockchain business value (“Blockchain,” 2017)

Although, blockchain was originally build for bitcoins as support system, it has found infinite applications in various fields. Availability of real-time data has been one of the problems for logistics industry. As blockchain is public ledger, all the related data is displayed for the involved parties. As a result, everyone knows what they need to know, and very little data tends to be lost or overlooked. It has ability to record all the transaction made on system which gives unparalleled level of transparency along with decentralization. Blockchain technology uses multiple locations to store information along with peer-to-peer network. These are supervised and monitored by computers which acts as ‘nodes’ that lookout for any suspicious activities and at the same time, keep information accessible. Fr8 network, a logistics solutions provider company, use a common platform known as Fr8 board, on which the carriers and suppliers can access all the related data in the operations. Their blockchain assist their suppliers and carriers to pair-up together so that they do not need to shift to other firms and their platform makes their logistics elastic helping them to tackle surges in demand (Heckstall, 2018).

Internet of Things (IOT) has predicted the growth in spend on Industry 4.0 from $119 B in 2020 to $310 B in 2023, which is 27.04 % of growth in Compound Annual Growth Rate (CAGR). This forecast is based on six core technology blocks, which are hardware, connectivity, cloud platform and analytics, applications, cybersecurity, and system integration. They are also supported by technologies like additive manufacturing (3D Printing), augmented and virtual reality, collaborative robots, connected machine vision, drones and self-driven vehicles. Below graph represents global Industry market size from year 2017 to 2023 (Columbus, n.d.).

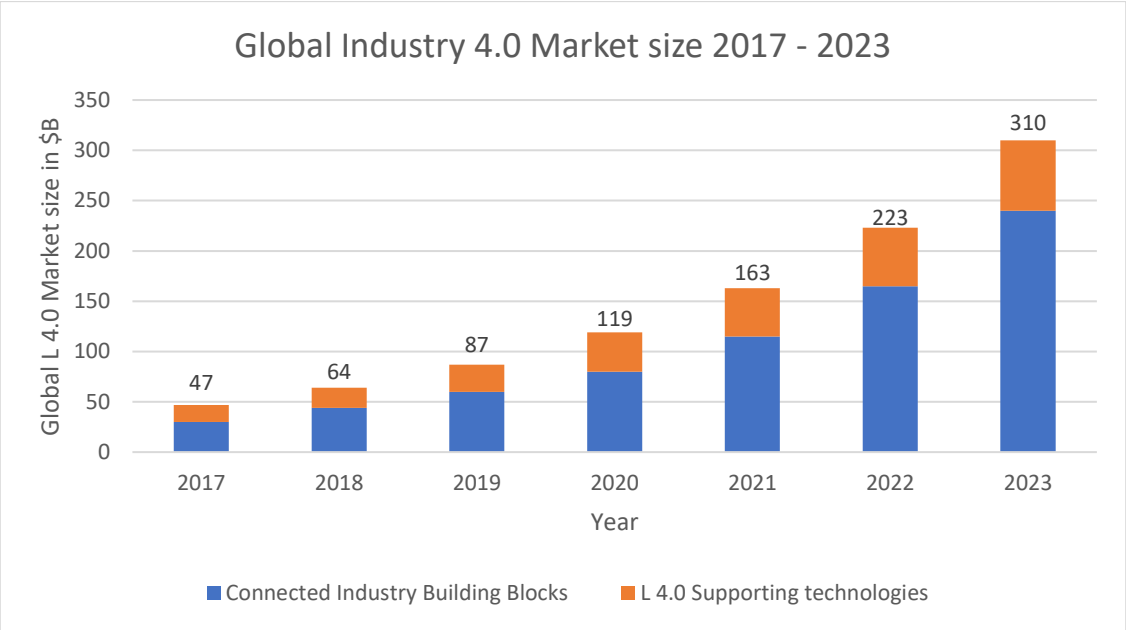


Figure 3: Global Industry 4.0 Market Size (Columbus, n.d.)

So, I propose the idea of Elastic Logistics is mainly supported by using 3PL, block-chain and the logistics 4.0. To withstand the disruptions and capitalize on growth opportunities that may arise, businesses will have to make their supply chains 'elastic'. With the rise of e-commerce in last decade, the importance of logistics has increased. With the rise in demand at a faster rate, new technologies are disrupting the market. With the use of elastic logistics practices comes efficiency, visibility, the ability to scale and optimize quickly, and increase overall customer satisfaction (LogiSYM October 2019).

1.2 Aim of the research

The aim of this research is to evaluate Elastic logistics (EL) and find out factors that lead to enable elastic logistics. **The core purpose of this study is to answer the question – How modern supply chain can sustain on the foundation of Elastic Logistics** and identify drivers enabling the same. At times of preseason situation, many e-commerce, food, and fashion clothing manufacturing industries must invest in extra force and working hours to meet the increasing demand. But the post-season, the extra force is underutilized, and companies end up paying extra wages to the hired extra employees. To tackle such issues, logistics operations need to be elastic at the times of high demand. According to the latest study by Dr. Tsan-Ming Choi (2020) who is currently a Professor of fashion Business at the Hong-Kong polytechnic university, demand is not limited to season, but also it depends on occurrence of market disruption. Many firms keep excess logistics

capacity for themselves to tackle uncertain events. But this also incurs cost. Keeping the logistics capacity tight may lead to inefficient logistics capacity and not meet demands when there is excess surge in demand. Logistics is evolving with modern technologies and support of several advancements, still logistics professionals experience demand pressure. So, for the modern supply chain in future, how to achieve the perfect fit? The answer is having a logistics capacity that can expand and contract, i.e. EL.

1.3 Significance and Justification of the research

After my graduation in 2015 with specialization in Supply Chain Management, I got the opportunity to work with one of the major OEM - "Flextronics". I was working as a senior analyst in Global Business Services (GBS) – Logistics and with this, my interest was driven towards logistics. This motivated me to take this research topic. During my tenure, I closely observed transportation arrangement activities and was engaged with several internal and external stakeholders globally. I witnessed the demand uncertainties, pull-ins and push-out scenarios, ripple effect and how these situations are increasing with market instability. The logistics professionals and service providers are under huge pressure at the time of pre-season. Logistics service providers need service providers with fast go-to-market distribution with total transparency in tracking and tracing. The aim is to decrease turn-around-time, increase the number of shipments to be moved, reduce lead-time, and serve the customer at a faster rate for optimum customer satisfaction. It is imperative for the logistics service provider to decide on perfect quantity of service capacity to preserve. Elastic logistics is proving revolutionary for logistics industry. A Pune (India) based start-up 'Elastic Run' has managed to raise $2 million **from two venture capital firms. Founded in 2015, ElasticRun has devised a disruptive business** operating model for efficient delivery of supply chain services to its customers. They are operating majorly in below methods (aparnamishra.06, 2016).

i. Support E-commerce companies for last mile operations.
ii. Primary and secondary distribution for pharma companies.

Big players such as FedEx, UPS and DHL are collaborating with local service providers to fulfill local and last-mile delivery demands. The complications in last-mile delivery often make it difficult to achieve perfect order delivery, but these companies are discovering that perfect order delivery is the key to customer satisfaction. Perfect order delivery refers to the delivery of right product, to the right place, in the right condition, at the right time, in the right quantity, with right

documentation, along with correct invoice. Elastic logistics is a merger of technology dependent idea and staffing optimization ("3 Emerging Trends in Elastic Supply Chains," 2018).

1.4 Research questions or Objectives

The research aims to answer the below questions –

Research Question 1 (Challenges) – What are the challenges faced by logistics professionals in today's date?

Research Question 2 (Upcoming trends and needs of logistics) – What are the upcoming trends in logistics and what are the possible solutions to tackle challenges in logistics?

Research Question 3 (Transformation) – How a traditional logistics can be transformed into Elastic Logistics? What are the major technologies and business practices (drivers) required to enable the Elastic logistics?

Research Question 4 (Benefits) – What kind of benefits can Elastic Logistic bring to Supply Chain?

By acknowledging the above questions, we can have numerous findings. But the main and primary insight would be - in the absence of Elastic Logistics, the service capacity of logistics would be static, whereas, in the presence of Elastic Logistics, it would be dynamic. The research will focus on the objective of knowing how modern supply chain will benefit largely on this concept of Elastic Logistics (EL).

1.5 Overview of the structure of Dissertation

This research is built on six chapters altogether with the effort to satisfy research objective and exploring the topic. Starting from first chapter, it is an overview of research topic and background on which the research will be formed. It also consists of Aim and purpose of the research, the research questions, and objectives of this study. The second chapter cover critical literature review on Elastic Logistics. It involves the detailed study of every concept related to Elastic logistics to understand research objectives. The third chapter cover conceptual framework. In this chapter, the research questions are answered, and concepts are connected through answering the research questions. The gaps in the literature review are filled in conceptual framework.

Research methodology and methods cover the fourth chapter describing the nature of research, ontology and epistemology used, the methodology approach and techniques to collect primary

and secondary data. The data analysis technique used is also explained in this chapter. Presentation and analysis of findings comprises of fifth chapter. It explains the research data analysis technique and findings derived from the analysis. They are designed to find out results of the research, and reliability of theory based on feedbacks on interviews.

The final chapter includes covers conclusion, limitations, and recommendations for future of this research. The conclusions which can be derived from analysis of research data are mentioned in this chapter. The next chapter highlights critical literature around the research topic for deep understanding of research objective.

1.6 Business Discipline and Academic Area

The core disciple which is covered in this research is the evolution of Elastic logistics. The topic is new and futuristic and have seen significant focus in last few years by major logistics forwarders and several other experts. In this fast-changing era of digitalization and technologies, expectation of customers has reached optimum standards and logistics professionals are bound to provide nothing but up-to the mark high standard service. Elastic Logistics will provide transparency, real-time information, collaboration, expansion, and technological adaption to allow flexibility in operations and overcome demand changes. Other important disciplines where the research will have relevant impact will be Stakeholder relationship management, Logistics 4.0 and Blockchain in logistics. The research will put emphasis on adaptation of business practices and operating models to help Supply Chain integration theories, Transport management, Inventory Management, Contingency theories, etc. for academics and researchers.

2. Literature Review

2.1 Overview

This section gives the brief overview of existing literature on Elastic Logistics. A significant amount of research has been carried out in the field of 3PL, blockchain and Logistics 4.0 in last few years, however, only limited amount of study is on Elastic Logistics, as the concept is evolving in coming time. A comprehensive study of Elastic Logistics has been provided by Prof. Tsan-Ming Choi who is Professor of Fashion Business, Business Division, Institute of Textiles and Clothing, The Hong Kong Polytechnic University. A detailed review of the literature which will be relevant for the current research paper is carried out. Initially, the history of logistics is discussed in brief and then the evolution of logistics till date. I have investigated some relevant issues and outlined contextual literature after that. Then, a significant amount of empirical literature is discussed. This review is based around the theories of 3PL, Blockchain and Logistics 4.0. The research questions identified in the objectives are answered through this literature review.

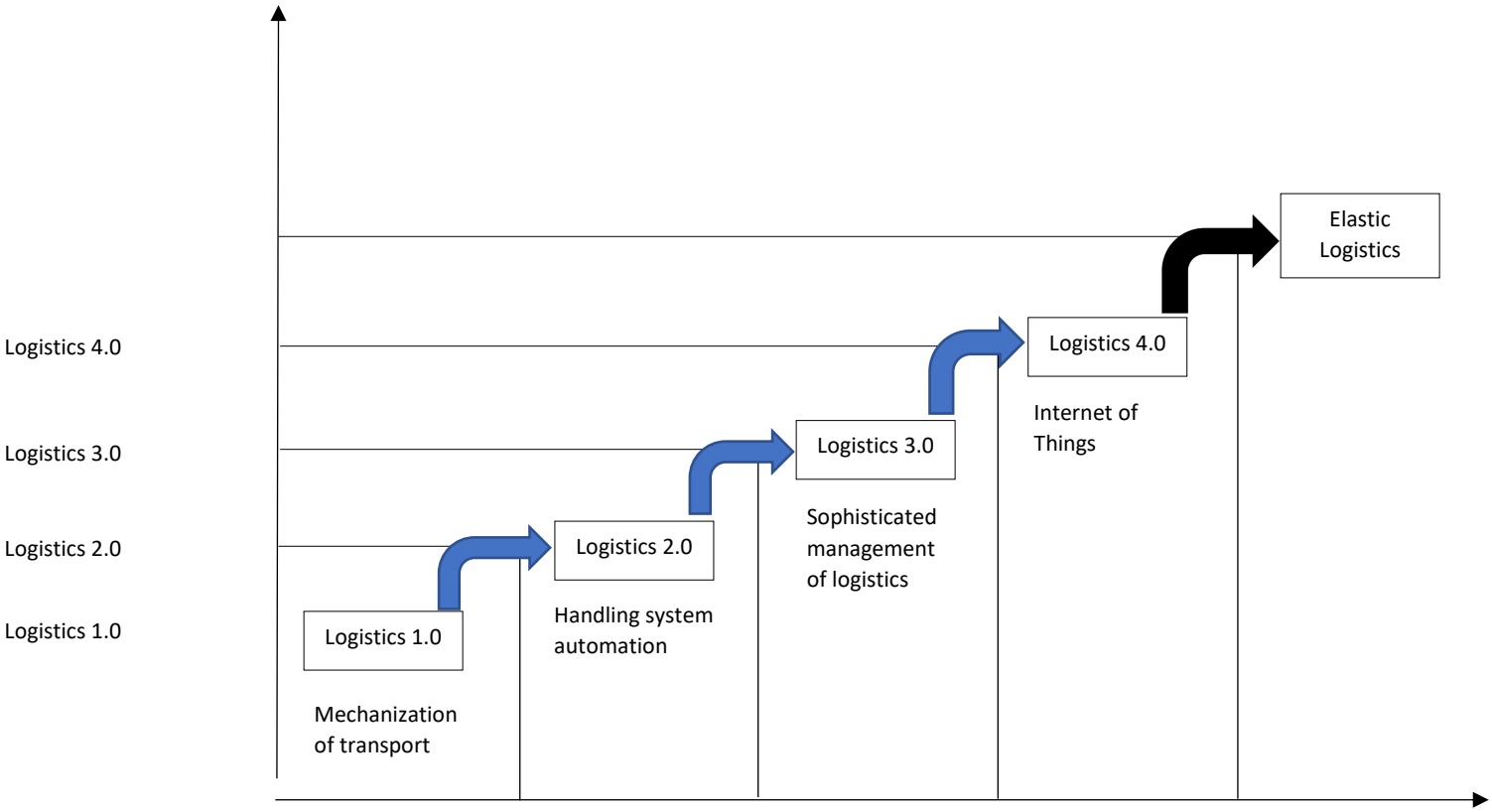
2.2 Introduction and background

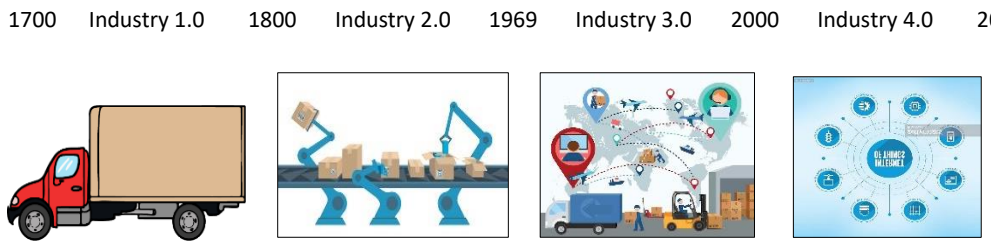
From the dawn of the age, people have always needed their things moved, stored, and delivered. As we evolved, we got better in getting things to where they are needed to go. With better use of equipment and resources, we could get more items to more locations with less efforts. With advancements in transportation and technology, it allowed the delivery of items even faster. Logistics connects the world. It will always be important to national and global economies. The beginning of logistics has very ancient root, it was witnessed back in Late bronze Age. During that time, it was observed that the very basics of logistics was originated from metrics system, the first of numerical systems. Egyptian and Mesopotamian numerical systems were practiced by Phoenicians for commercial purpose. Although, during that time, symbols were not used to represent numbers. They used pictures to display numbers and the meaning of the word 'logos' was to count. Hence, the word '**Logistics'** was derived from two words, the pictures used to know 'numerical skills through images' and the 'counting'. The prominent Pythagoras was the primary appointed logistician (Stojić, Tanackov, Tepic, n.d).

There are several definitions for logistics from different disciplines, which can be described as “an evolving, expanding academic discipline that does not appear to be approaching full maturity in the near term” (Karatas-Cetin and Denktas-Sakar, 2013). The views of supply chain and logistics have been emphasized by several other others as well (Bowersox and Closs, 1996; Christopher, 2000; Cox, 1999; Lambertet al., 1998; Lumsde ́net al., 1998; Tan, 2001). However, in simple words, it is a comprehensive organization and execution of a complex operation. Logistics has changed and evolved through history to align with industrial, social, technological, and political changes. With the digitalization and technological evolution of 21st century, logistics 4.0 has been created as the result of fourth industrial revolution. ICT (Information and Communication Technologies) has made way for new methods of horizontal and vertical integration of value chains and new business models, and new methods of data exchange (Radivojević and Milosavljević, n.d.).

2.3 Evolution of Logistics

Figure 4: Logistics has evolved over the years (Adapted from Kesheng Wang 2016, n.d.)





The 18th century cemented the first industrial revolution which started with invention of steam engine. Goods were transported massively, and the era set the trend of mechanization of logistics. At the end of 19th century and the beginning of 20th century, second industrial revolution took place. Several technological inventions as well as discoveries were made and hence this revolution is also known as technological revolution. Importance of logistics became more significant with new methods of transportation and automated handling systems for goods. Domestic logistics

practice was spread abroad, and it became global. Companies providing specialized logistics services started rising. The third industrial revolution led the development of application of computers and smart devices in production by the end of 20th century. Supplier relationship management, Customer relationship management were emphasized and cooperation with buyers, business partners, practice of new business models started rising. Logistics was getting the smooth management along with goods, services, information and money. The 4th industrial revolution started in Germany in the year 2011. In the same period, other merging industrial nations also started developing with smart tech devices, smart factories and use of Internet of Things (IoT). To explain in simple terms, industry 4.0 is connectivity between systems, products, machine, and people which allows to share information within themselves and manage each other at the same time (Radivojević and Milosavljević, n.d.).

2.4 Relevant issues and Contextual Literature

The present supply chain and logistics in immensely uncertain. In the last decade, the world has witnessed several non-predictable events like natural calamities, trade wars, economic crises, currency devaluation, strikes, cyber-attacks, etc. These disasters lead to prime disruptions. Supply chain professionals try to enhance their financial performance, grow their revenue (by new product introduction periodically, increase product variety), decrease cost (by reducing waste, reduce supply base, using Just-In-Time system (JIT), vendor managed inventory utilization), reduce their assets by outsourcing their production. These are some solutions which can be effective in stable environment, but they also increase the complexity of global supply chain. It is frequently observed that, most of the supply chains tend to break down in the event of major disruptions and are unable to recover. Hence, to withstand these issues, there should be robust business model and strategy. This will make the supply chain more resilient. One of this strategies is having flexible transportation (Tang, 2006). Multi-modal transportation can be used in case of natural calamities. There is also the option of having multi-carrier transportation. During the times of political disruptions, many air cargo companies like KLM cargo, Air France cargo, Korean Air cargo, etc. formed an alliance which was named Sky Team, which enabled switching carriers. This initiative allowed deliveries to 500 destinations in 110 counties. Having 3rd party logistics, can be crucial in this kind of situation (Tang, 2006).

Another major challenge faced by logistics industry in the times of uncertainties and turbulence is, deciding and saving logistics-service-capacity. During pre-season, the freight forwarding giants like

UPS and DHL reserve large amount of service capacity to satisfy the increase in demand (e.g., sign the agreement with airlines to prepare capacity). If there are stable demands as forecasted, these logistics providers can easily plan the service-capacity. But if there are any uncontrollable events, like the current COVID situation, reserving the capacity for logistics providers is not impossible, but surely is a difficult job. It not only affects the logistics sector, but the entire supply chain system(Choi, 2020). Logistics is the core of Supply chain and modern world supply chain have been exposed to several other uncertainties. If we look at uncertainties in transportation, below are main causes which logistics professionals must deal with –

- Demand uncertainties
- Delays
- Inventory issues
- Lack of coordination
- Constraints in delivery

Figure 5: Causes of uncertainties in Transportation (Sanchez-Rodrigues et al., 2010).

In logistics and supply chain, risks may occur from various sources. They can be categorized in 3 groups: (1) Operational Contingencies (2) Natural hazards (3) Political instability and terrorist attacks. They may lead to financial crises and contingencies in operation (S.M. Hatefi, F. Jolai, n.d.). There are lot of studies and research carried out to tackle these issues. There are various technologies and business practices altogether for different problems in logistics. This paper

proposes the perfect business model which can withstand any kind of disruptions and uncertainties. Logistics Professionals are under pressure of increasing customer expectations that are the part of 'new economy', where the products and services are delivered in an instant. The huge amount of deliveries done by logistics network are creating constant peak for all Supply chain and Logistics providers. Several businesses, particularly in Asia are buried in logistics and infrastucture challenges. They are finding it difficult to compete in areas of innovation, capacity and network.

Present day logistics is highly automated and driven by technologies. With the support of artificial intelligence, machine learning, cloud computing, data analytics, Internet of things and several other technologies, logistics has evolved at its best. But still, the major issue faced by logistics is uncertainty and it keeps growing. Logistics professionals are under huge pressure to meet the high demands and the growing frequent uncertainties due to same. The uncertainties are observed into four factors as shown is figure 3.3.1 –

a. Internal processes
b. Human factors
c. General trends
d. Customer demand and expectations

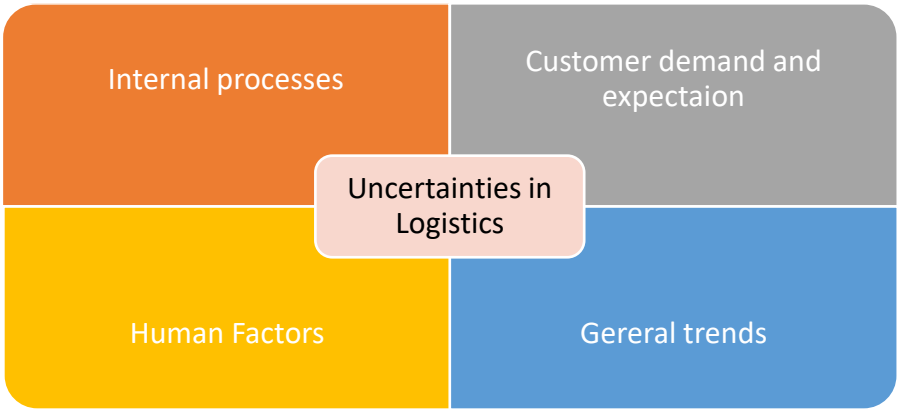


Figure 6: Logistics Uncertainty Dimensions (Fredrik Nilsson, n.d.)

The change as well as increase in demand from customers is impacting logistics on vast scale. The gap in communication between sales team and logistics team is the major source of uncertainty in

logistics. Human errors also create unwanted delays the daily logistics activities which must be avoided with the help of automation. Along with these factors, other components like natural calamities also affect the productivity of logistics and lead to uncontrolled uncertainties. General trends disrupting the industry with developing technologies and concepts are updating at a faster rate. But it is also necessary to select and implement correct technologies for a certain business model. For example, use of RFID (Radio Frequency Identification Code) can be useful for tracking of shipments and having real time info. It is possible to use the technology by leading logistics providers like DHL and giant e-commerce industries like Amazon as they have the capital to invest in the same. But the small-scale retail shops or startups cannot enable them due to high implementation cost (Fredrik Nilsson, n.d.).

Although logistics has undergone various revolutions, still there are many reasons of uncertainties which needs to be addressed by logistics service providers. According to authors, there are 3 major sources of uncertainties and shown below in figure 2.3.2 (Li and Schulze, 2011) –

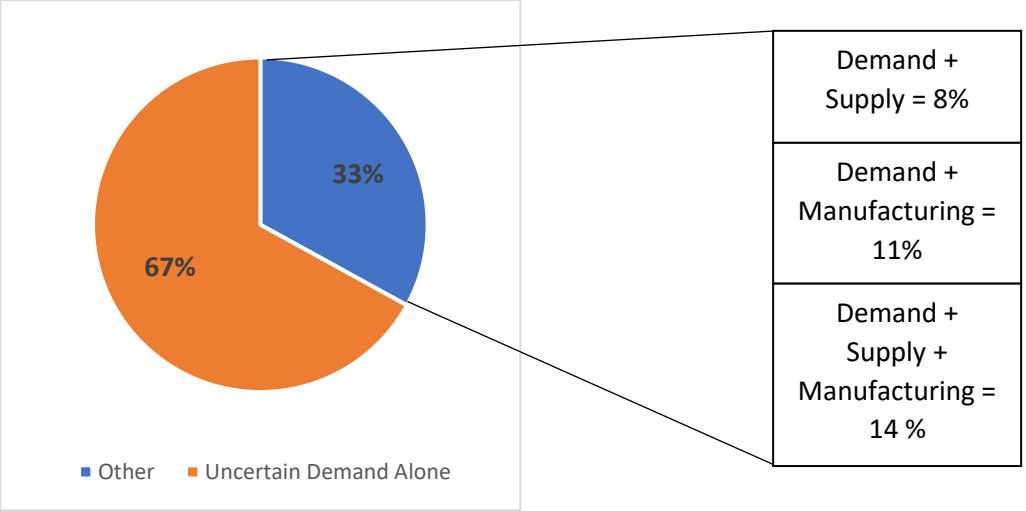


Figure 7: Sources of Uncertainty (Li and Schulze, 2011)

2.5 Third-Party Logistics (3PL)

With the help of third-party logistics, organizations can concentrate on their core business. They can save operational costs, and eventually increase the revenue. With the growth in e-commerce industry, freight transportation has opened the doors for many 3PL providers. These services add value to the overall supply chain and make it more enhanced as well as effective. With the fast deliveries and customer satisfaction, e-commerce sales are increasing and fueling customer demands. The last-mile, last-minute deliveries are thus becoming complex, as customers are

expecting more fast shipping and perfect order delivery. This has resulted in encouraging logistics providers to use 3PL services, to meet customer demands. E-commerce are also driving rail and road modes of transport usage in 3PL market. 25 % of global 3PL market was accounted by rail and road in 2019. They provide several advantages over air and sea transportation like high capacity, cost savings opportunities, etc. For example, rail transport for international trade and transport has been started between Europe and Asia Pacific, with the launch of rail freight services from Beijing to London. Moreover, rail and road mode of transport is majorly used for domestic services in 3PL. Road transport makes it possible to operate 24/7, as there is no involvement of port, airport schedule. The cargo is traced by using GPS services, and real-time info about cargo is available. It is forecasted that 3PL market size will grow by over 10% CAGR in Asia Pacific due to strong roadways and transit of high volume of goods in that region. Various countries are making this region as their manufacturing base due to steady economy. The next day delivery and tailored transportation arrangement from international industries with coordinated management is increasing the market value. All these factors are increasing the demand for third-party logistics. Even the governments in this region are reducing taxes. For example, 80% tax was reduced by Japan government on revenue by exported goods. There also some downsides, for instance, due to trade war between US-China, tariffs were raised by 25% from 10% on products from China. This has compelled china to focus on domestic consumers, rather than international consumers. As the market value is increasing for 3PL, the players from 3PL market are doing strategic alliance, acquisitions, mergers, and collaborations to enhance their service for the consumers. DSC logistics was acquired by CJ logistics to make its footprint in Asian Market, targeting the Vietnam, China, and Thailand. This acquisition let to the market growth of 44% (“Third-Party Logistics (3PL) Market – Outlook On Emerging Application, Revolutionary Trends & Potential Growth Strategies 2026 – Jewish Market Reports,” n.d.).

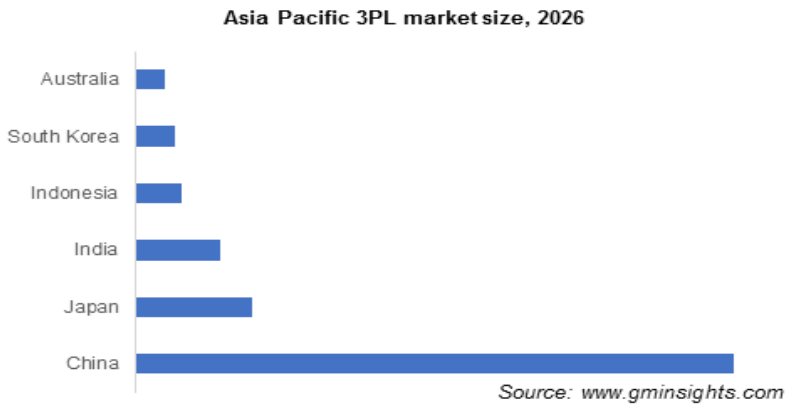


Figure 8: Asia Pacific market size prediction (Third-Party Logistics (3PL) Market.).

Third-party logistics providers are also well versed in coordinating economic resources. They can not only be lucrative in transportation services, but other activities as well. Nowadays, it is common to use multiple logistics activities from a 3PL provider. These service providers can be differentiated in following characteristics –

a. Multi-modal / Integrated logistics service providers
b. Consulting service providers
c. Contract-based service providers

There are lot of advantages of 3PL from economies of scale to economies of scope. This is the reason, 3PL has attracted substantial research attention. Along with transportation, IT related activities such as managing the database of warehouses and inventory also plays a crucial role in providing logistics services. These services require different skillset and make the service provider to stand out from others. In addition, 3PL service providers sometimes may nit be able to provide all the services, but they can themselves outsource it from other subcontractors. They have vast network of service providers and are skilled in coordinating with other service providers and subcontractors and manage the inter-flow of goods effectively. The shippers also outsource the activities themselves to the newly entered, not-so-known 3PL provider. As this service provider is new in the market, he tries to work effectively with accuracy to make its name well-known and prove the work. Hence, if the shippers share their benefits with 3PL providers, it is advantageous for both. To summarize, businesses and shippers could benefit from 3PL providers while facing uncertainties (Tezuka, 2011).

Overall, the advantages of 3PL are –

- Provide Flexibility in Technology – It is often the case that many firms does not have time, finances or expertise to keep updating their technologies. 3PL providers can help to meet the technology requirements in fast way possible with cost0effective method. Many times, there is a possibility that the 3PL logistics provider may have the capabilities to meet the demands of potential customer, allowing them to contact certain retailers.
- Various other flexibilities – There are other flexibilities that 3PL can offer like, increasing reach in geographic location where the supplier needs rapid replenishment, which may require local warehousing. The 3PL provider utilization for warehousing in this region may save the extra cost to buikd new warehouse. Flexibilities in service offerings from 3PL provider for variety of other sevices than transportation, utilization of resources, workforce, etc.
- By outsourcing logistics operations, a company can make savings on capital investment, which reduces the risk of financial risks. This risk can be futhur distributed by 3PL providers by outsoucing sub-contractor (" Advantage of Third Party Logistics in Supply Chain Management," n.d.)

With the set of these advantages, 3PL can be one of the prime pillars of Elastic Logistics to tackle demand uncertainties. Having a well-established 3PL partner with technical support and customer focused service can help logistics expand and contract its capacity when required. A 3PL partner with IT enabled applications shows a correlation between data collection (through barcode scanner, EDI, RFID) and transactional capabilities (Managing of Inventory, order management, reverse logistics management). This results in increasing the effectiveness , improve operations and lead to better customer service with flexibility (Evangelista et al., 2012).

2.6 Blockchain

The definition of blockchain states it as a database where the transactions between two parties is secured and safe. There are 3 elements in each block, which are, a hash, timestamped batches of recent transactions, and the previous block hash. The data that is given to the hash function is converted into an irregular value of definite length. With the timestamp, there is a proof of existence of that transaction of that specific time. These blocks are linked together by previous block hash and it prevents the alteration of any of these blocks, or any new block to enter in between of two blocks. This strengthens the previous block verification and hence it is known as

BLOCKCHAIN. The core aspect of blockchain which makes it competent is its immutability. For example, there are smart contracts which is a blockchain based system, that enforces the rules and regulations on stakeholders. The two prime features of blockchain are –

1) Security
2) Transparency

Blockchain helps to maintain temper-evident records, from conformable resources with accuracy. It is a convenient method from maintaining the respective copies of their contracts by stakeholders, which can be altered, leading to distrust and disputes. All the stakeholders get a controlled access to a shared contract and database, which creates a single source of reality. This avoids distrust and disputes between stakeholders and gives confidence as they are working on real-time and accurate, and most reliable dataset. Another advantage of blockchain is over traditional ledgers. Once these ledgers are breached, the access to all the records and information is compromised. This is not the case with blockchain-based system. Here, every transaction is encrypted and cryptographically sighed, making all the transaction secure individually. This is very imperative quality to tackle today's hacking threats, manipulation of data, frauds, and data compromise. Example – IBM food solutions, utilized blockchain based solutions to create transparency from the farmer, processor, retailer to consumer. This solution provided the stakeholders with shared view of entire food ecosystem information. It had below integrated modules –

- Trace module: With this module, the place of origin or the earliest known history of a product was available through access to end-to-end data. In addition, it showed real-time location and status of product, which helps to expedite any product if required.
- Fresh Insight module: This module connects incomparable product data, which gives understanding and visibility of inventory across the entire supply chain. It will show time from production of a product to its expiration. This makes it easier to quantify inventory at risk and help suppliers to identify inefficiencies, minimize product losses and improve freshness.
- Certification module – This module helps to digitize all the critical certificates and documents of inspection. This leads to efficient information management and authenticity assurance.

It was observed by IBM foods, that supply chain with blockchain functions efficiently. They explained advantage as “All data is stored on blockchain ledgers, protected with the highest level of commercially-available, tamper-resistant encryption." (Kawaguchi, 2019).The main factors of blockchain to consider while adopting it is explained in ‘attributes of innovation model’ –

Relative advantage Advantages of blockchain over current practice	Degree of interpretation about an idea, that how it is better than current practice. This can be decided on social and economic advantages, contentment, and comfort.
Compatibility Weather blockchain is compatible with current practice	The degree of innovation, that how it goes with alignment with current needs, practices, and past experiences.
Complexity Difficulty of use and understanding of blockchain	Seen trouble to get it and utilize the innovation. The less difficult to understand, the speedier it will be acknowledged and embraced.
Trialability If possible, to have a trial run before committing to use the blockchain?	Considering if the advancement can be tested with before implementation. Pre-testing is considered as chance decreasing and enables “learning-by-doing”.
Observability Are there any obvious outcomes about of blockchain that are visible?	Concerns the witnessing of outcomes about the development. Clear and concrete outcomes about diminish the vulnerability of implementation.

Table 1: Blockchain attributes of innovation, Source: adapted from Rogers (Rogers, 1983) and Bazdar (“Master_Blockchain_-_Amina_Badzar.pdf,” n.d.)

There is huge amount of transactions in logistics on daily basis and with these transactions, comes the responsibility of tracking these transactions. With blockchain, the requirement of any intermediaries for recording, verifying and ownership of transfer is eliminated. Instead, the transactions would be settles securely along with verification very fast, as every ledger is replicated in the database in large numbers. The principles of blockchain given below have the potential to remove the frictions in logistics and make it efficient. The application of this technology can help to have transparency in data which can be accessed amongst the stakeholders throughout the value chain, thereby facilitating ‘source of truth’. In addition, blockchain can also help in financial savings by permitting learner, error-prone and more automated process. Eventually, it not only provides transparency and security, but also influence the fast flow of goods.

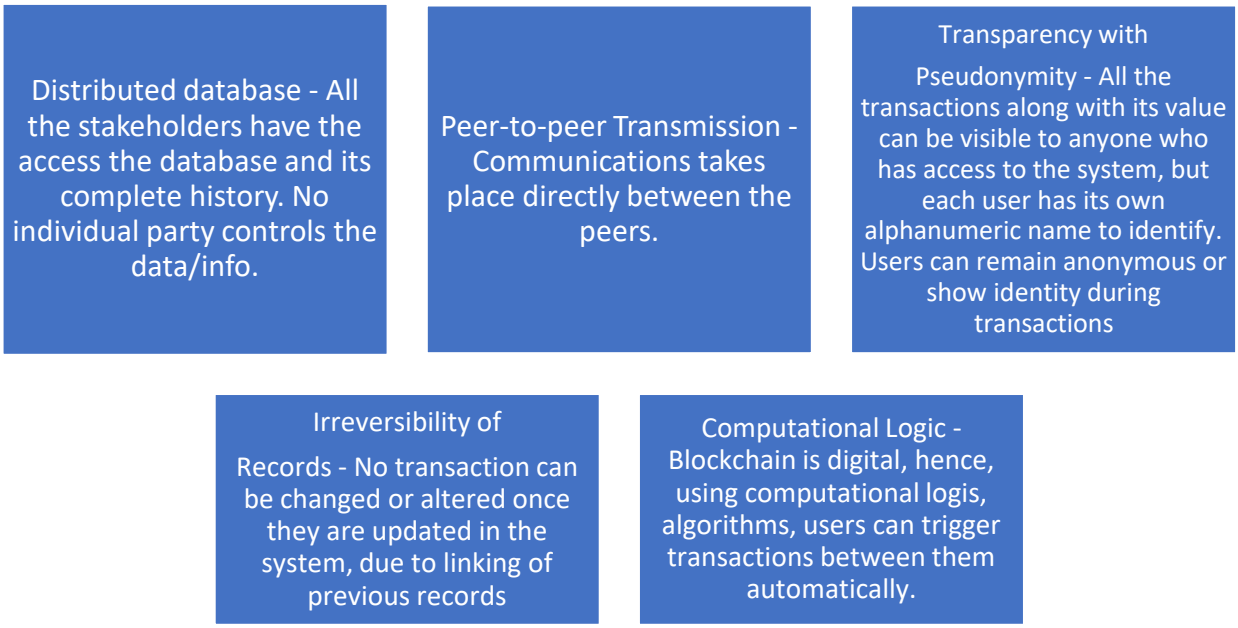


Figure 9: Principles of Blockchain (Dobrovnik et al., 2018)

Research studies show that, supply chain finance with blockchain technology, helped to support operation as compared to traditional practices. The demand for blockchain enabled supply chain is also higher than traditional supply chain (Choi, n.d.). Its application has more to offer to supply chain and logistics other than financial transactions. Its unique nature of having no intermediaries, transparency with pseudonymity and security has made logistics industry utilize it not only for security, international shipping, traceability and secured data, but also for smart contracts, anticorruption and humanitarian aid (Wang, 2019).

While blockchain is improving transparency and efficiency of logistics, its ability to perform as a ledger makes it and ideal technology to be utilized in shipment tracking, smart global contracts, and secure payment procedures along the logistics industry. It can help logistics companies, with the help of public ledger system which records the movement of every shipping container, become more efficient. With the help of latest technologies like AI and big-data, blockchain can boost the global GDP by 5% (“Making moves,” n.d.).

2.7 Logistics 4.0

The 4th revolution of industries has evolved many companies enhancing their flow of goods, material, and information, and digitalize some of the areas. Logistics 4.0 could be considered as a set of aimed at progressing logistics operations by dodging blunders and disturbances in transport

and capacity forms, with the help of data exchanged between logistics stakeholders continuously. It has not been limited to replacing humans. Artificial Intelligence is considered as prime force of Logistics 4.0. A change in market behaviour states that organizations which are delivering products, services or differentiators must change their viewpoint towards customer satisfaction as imperative in terms of delivering value. The logistics should focus on last-mile logistics and real-time transparency along with evidence showing cunsumer satisfaction is raising with supplier and consumer communicating digitally. To deliver this type of value requires competent partners with seamless connectivity, use of suitable technology and data quality. We can look upto the example of 'Dannon'. As a leader in food company, Dannon was experiencing growth in customer demand. They wanted a way to deliver products to customers instantly. There were 3 manufacturing plants, six distrubution centres with severeal trucks of 3PL carriers. There was a need of tracking huge amount of loads. It was a challenging task to coordinate everything to meet customer demand with on-time delivery and scheduling. Dannon partenered with BluJay, who heloed Dannon to upgrade from outdated processes and systems like using fax, telephone calls etc. BluJay implemented a management solution system for transportation (TMS). This system gave real-time visibility on movement of shipments, provided support for planning, scheduling and almost end-to end control on entire supply chain. In this example, we understand that optimizing your supply chain and logistics help makes tracking systems to uplift both the businesses and customers together. A collaboration between logistics partners based on data-driven technology helps to move goods efficiently. Instead of focusing on reducing on lean practices and reducing cost, logistics professionals should make a move towards flexible systems that can expand and reduce capacity according to changes in demand (Kloepper and Lim, n.d.). Logistics in industry 4.0 can be can be portrayed as correlational cyber-physical frameworks. Cyber-Physical system (CPS) is defined as "Systems, that directly link real (physical) objects and processes with information processing (virtual) objects and processes via open, partially global and always interconnected information networks", by the German Committee of Experts. The real-life operations are monitored and duplicated in virtual platform to enhance decision-making progress by CPS. With the help of sensors in IoT (Internet of things), CPS communicate with what is called as 'Things' and humans within the framework in real-time. It uses smart objects that transform all the traditional logistics into smart logistics. CPS is built with the integration of hardware systems (sensors, automated devices, robots, etc.) along with cloud computing systems which acts together as centralized data storage unit. This results in transforming the factory and its other units like products, components, services, and total logistics into smart ones. Logistics 4.0 elivates the degree of flexibility of logistics to satisfy the exceedingly fluctuating market demand. Due to this flexibility,

the customers are satisfied and come closer to the company, exposing the opprtunities in producting. Thus, logistics 4.0 refers to integration of current logistics concepts with technological innovations and applications like CPS. This advancement complells 3PL and 4PL providers to exceed their services ahead of traditional manufacturers and retailers, to the businesses that focus on total value chain. Logistics 4.0 is not about improving demand forecasting only, but it is more about how to forecast demand by keeping in mind, the needs of the market. The strategie and needs of business has always driven the revolution of logistics. According to the research by Sally S Kassem and Mohammad Amr Abd Elkader, Logistics 4.0, based on Indistry 4.0 can be defined as “A key mechanical course that coordinating diverse sorts of advances to extend both the proficiency and adequacy of the supply chain, moving the center of the organizations to value chains, maximizing the value conveyed to the shoppers as well as the clients by raising the levels of competitiveness. This can be accompolished by expanding the levels of transparency and decentralization among different parties through digitalization" (Amr et al., 2019). With the help of enough data, artificial intelligence (AI) has the ability to foresee even the difficult future occureneces. But, in logistics, AI and machine learning can be utilized to forecast the demand for products and service capacity, which makes it possible to manage entire supply chain easily. Thus, the effective the supply chain works, the less a disruption will affect it. Intrgating technologies with cloud based systems together with suppliers and buyers, organizations are getting exeptional visibility into supply chain and logistics. By moving forward your organisation's innovation now, and building out your distuption readiness plan, you can decrease the potential results of a disturbance before it indeed happens (“The important role of technology during supply chain disruption,” n.d.). There are more than 50 new technologies that could be used for automation in supply chain and mainly in logistics. Below graph illustrates the logistics technology development –

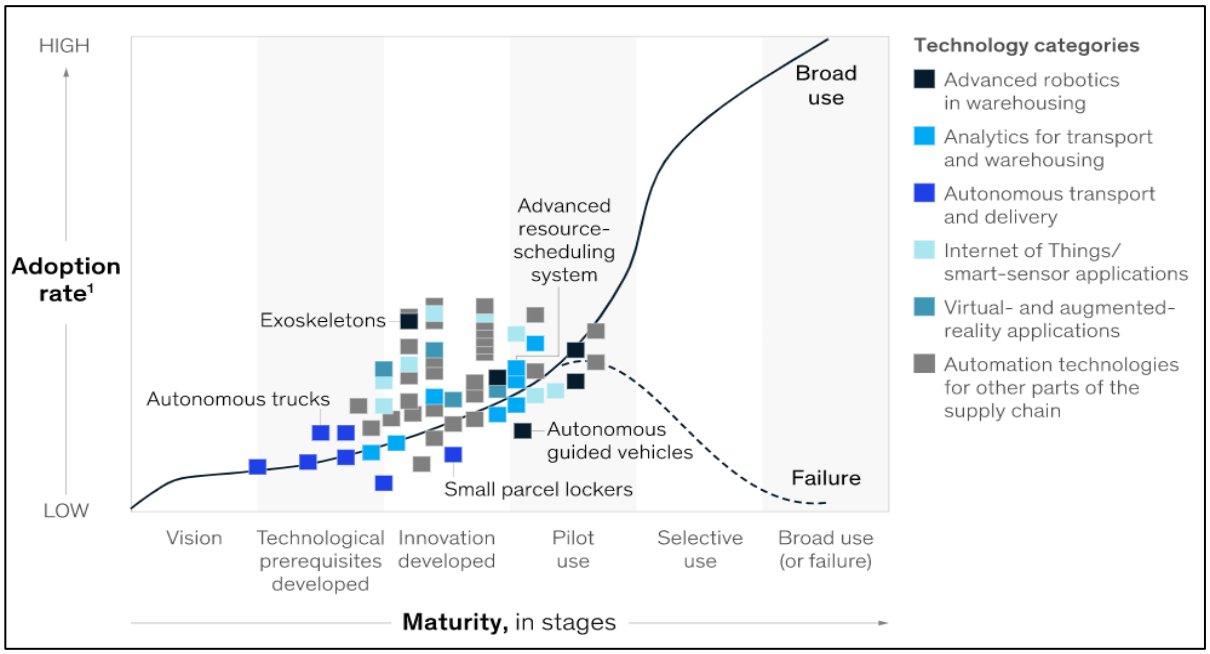


Figure 10: Development in logistics technology ("Logistics automation," n.d.).

With the growth of e-commerce, data is generated at a huge rate every second. Implementation of GPS devices, tablets, smart phones, and even social networks create large amount of disorganized data. The amount of data is growing every year as shown below in figure 3.4.1.

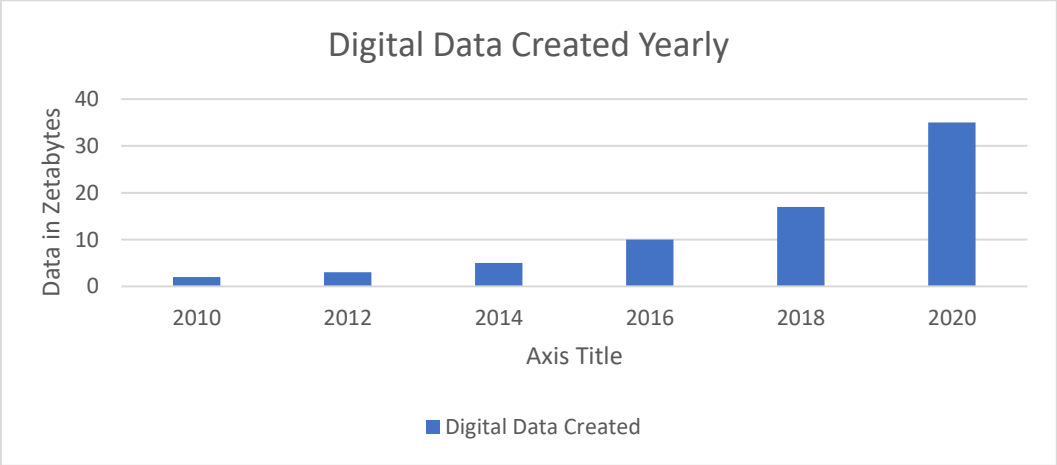


Figure 11: Growth in Digital Data during the decade ("Logistics Trend Radar. Delivering Insight Today. Creating Value Tomorrow.," n.d.)

This data can be very useful for the respective private companies and even government which contains important information. This data can help for data analysis to have transparency and help in forecasting the service capacity as well. The experts view is to have smart, fast, sustainable and

customer focused approach to raise the standard of logistics. Below are some sectors following logistics trend in present time –

1. Batch Size One – To match the increasing customer demand for customized and personalized goods which results in 'batch size one'. This includes customization of warehouses, inventory management and replenishment models, and managing single customized orders as production is brought closer to customer.
2. Connected life – Logistics have many opportunities for optimization in digital age, which is always connected by smart phones, wearable devices, smart home devices, etc. By offering a secured access to consumers real-time connected devices, it is possible to offer innovative pick-up and delivery services
3. Digital Work – With the automation of physical and intensive work, logistics industry will greatly transform in the future. Robots are collaborating with humans for working both physically and in software (virtual bots). It is estimated that 49% of activities for which people are paid for today, will be automated using current technologies. The Digital work and automation will be put in practice by Human-machine interface, flexible workforce models and training/upskilling.
4. Fresh Chains – Online shopping is not only limited to electronics and fashion ware. Everything from pharmaceuticals to groceries and temperature-controlled goods delivery is driving the growth through standard networks. To successfully develop this fresh chain of single order delivery, logistics companies need to use innovative cold-packaging, suitable optimized infrastructure, and fast networks
5. Grey Power Logistics – Logistics services for aging society group, specially focused on delivery of medicines at doorstep.
6. Omni-Channel Logistics – Logistics services tailored to fit for the needs of each single channel. This require continuous customer interaction, order fulfillment options and dynamic delivery options.
7. Servitization – It is the process of converting traditional manufacturing strategies to focus on product-enabled service models. It is shifting business model from product-based to service- based.
8. Smart Containerization – With the implementation of standard container, cargo shipping has improved immensely, and efficiency has been increased.

9. Tube logistics – Due to the growing concept of megacities, the new revolution of hyperloop could provide rapid cargo transportation.
10. Elastic Logistics – With proper use of relevant technologies for the suitable business models, Elastic logistics will help to tackle uncertainties, due to uncontrollable events and season demand increase, etc. (“Logistics Trend Radar. Delivering Insight Today. Creating Value Tomorrow.,” n.d.)

3. Conceptual Framework

In the conceptual framework, we will link together the literature used in the review and answer the research questions mentioned in objectives. This framework will fill-out the gaps in literature and bring forward relationship between the concepts.

Research Question 1 (Challenges) – *What are the challenges faced by logistics professionals?*

Achieving cost savings or cutting down logistics cost has been major challenges faced by logistics industry. The primary reason for this is rise in fuel cost. The cost of transportation and freight increases with the rise in cost of fuel. Due to the ongoing COVID pandemic situation, the airlines are not able to make profits from passenger aircrafts. To cover this, airline companies have increased freight and shipping charges. Passenger aircrafts transport relatively small amount of cargo in their under-carriage. As most of the flights are cancelled, there was shortage in supply. As the goods and products transported overseas increase the risk of spreading of COVID virus, the ports and airports are following strict safety guidelines. This results in holding of goods for longer time at ports than it used to be earlier. The border crossing, customs clearance is hectic and due to all this, on-time delivery is affected many a times. Some of the custom clearance issues are beyond the control of logistics professionals. It may be because of reasons like, paperwork filled incorrectly, overspending on duties and tariffs, shipments stuck in customs for weeks, etc. Many suppliers who have been in what are known as hot zones of COVID virus, apparently have to shut down. As the supply and demand have become limited, most of the companies have laying off their workforce in order to meet the operational costs.

In addition, the cost of implementing new technology is costly. The implementation over entire organization takes time and is requires training of employees. Sometimes, the employees are resistant to adapt to new technologies and prefer current method as they are comfortable with it. All these issues lead to shortage of material and not meeting customer demands. If the customer demands are not met, the customer starts losing the confidence and trust, which results in low customer retention rate. Extreme weather conditions such as cyclones/typhoons, cause the fleets to delay their voyage resulting in late arrivals at ports and eventually delaying in shipments. With the rise of e-commerce industry, customer expectations have been increased. Companies are working on their last-mile delivery, perfect order delivery capabilities. To achieve this, high degree transparency is required, and logistics have to keep up with the technological advancements to achieve customer satisfaction.

Research Question 2 (Upcoming trends and needs of logistics) – *What are the upcoming trends in logistics and what are the possible solutions to tackle challenges in logistics?*

Logistics is currently in its fourth revolution (Logistics 4.0). It is empowered with latest technologies like artificial intelligence (AI), Cyber-physical systems (CPS), Inter of things (IoT), cloud computing, etc. As logistics professionals are facing disruptions and uncertainties daily at their job, the upcoming new technologies like Blockchain, logistics 4.0 and outsourcing (3PL) can prove to be flexible. The digitalization has helped to enable the customized logistics network which can tackle unusual supply and demand. Majority organizations of all the sizes, outsource logistics services from 3PL providers and have on-site fleet ("The Evolution of Logistics/Supply Chain in the 21st Century," n.d.). Whether the company is domestic or international, 3PL services are proving to be helpful and flexible for them.

At the time of demand uncertainties, automation of warehouses can prove to be lucrative. Automation means fewer human interventions. Occurrence of errors is also minimized due to it. Once a certain process is highly automated, no matter the rise or fall in demand, the operations are carried out continuously and demand is satisfied without hiring or removing the workforce. Logistics need to be flexible for handling the uncertainties and disruptions. Elastic logistics has the ability to be flexible. Elastic logistics (EL) is planning of logistics capacity which depends on 'pull' of the customer, depending on which the delivery lead time and product replenishment is decided. It also refers to organization's ability to expand and contract their logistical abilities swiftly accommodating to change in demand. EL works along with forecasting and making an agile foundation which can minimize the expenses and increase overall efficiency on the basis of current requirement(Wilson, n.d.). It can be upcoming version of lean supply chain as well. With the digitalization and technology getting integrated with logistics, the organizations are focusing on perfect order delivery and help themselves to stay on top of the competition. The goal is to have just sufficient of everything on the shelves to be delivered to the customer with same day or next day and not having excess inventory in hand at the same time. For this, the workforce of company needs to adapt with new technology and utilize them well ("Logistics Tech Outlook," n.d.).

Research Question 3 (Transformation) – *How a traditional logistics can be transformed into Elastic Logistics? What are the major technologies and business practices required to enable the Elastic logistics?*

An efficient method to transform the traditional logistics into elastic logistics is by implementing Transportation Management System (TMS). It is like an ERP which is used for planning, executing, and shipping the goods. There are 3 main responsibilities of TMS user:

- Compare the freight rates and services to deliver a product according to lead time.
- Shipment booking with the reasonable price for required service
- Track the shipment until its delivery

The TMS software performs various tasks. Below figure illustrates the functions of TMS -

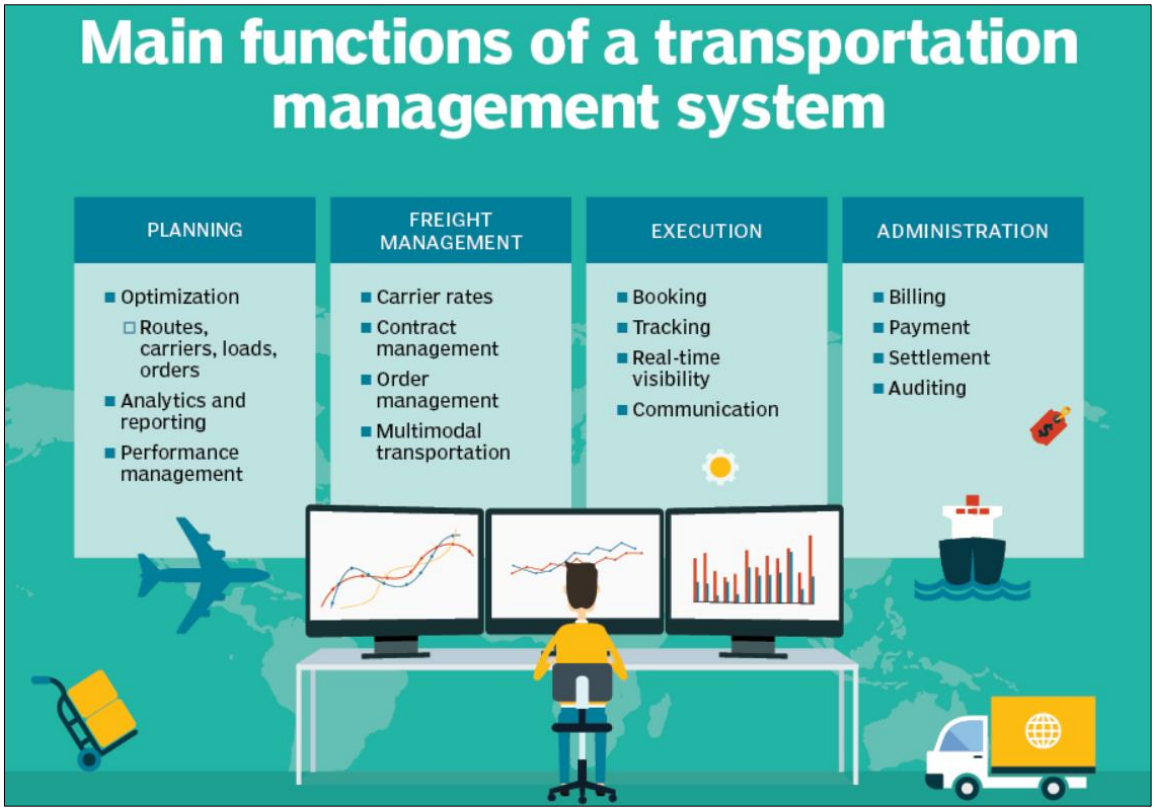


Figure 12: Functions of Transportation Management System (TMS) ("What is a Transportation Management System (TMS)," n.d.)

For well-organized warehousing activities like order packing and dispatching, automation can be an option rather than increasing the staff at the times of high demand an extra working hour. At the times of additional warehousing support locally or internationally, outsourcing logistics service (3PL/4PL) can come in handy ("How Elastic Logistics Is Contributing in Overall Industrial Growth?," 2020). A study on 3PL states that, 3PL providers and shippers have clear understanding of what they are working towards, and the methods in which data/information sharing and advanced

technology can assist them to achieve their goals. The data is increasing every day, and with the increasing data, 3PLs are making investment in technology to be able to analyze this data. This can help in effective forecasting, real-time shipment tracking, minimize overall transportation cost, better asset utilization, and improve overall service. Current year study states that 94% shippers prefer 3PL providers with IT capabilities for providing expertise ("third-party-logistics-study.pdf," n.d.). Third-Party logistics providers have excellent network vertically and horizontally in their process. Hence, partnering with a 3PL provider who can support with IT capabilities can help organization to focus on core competencies and let the 3PL providers deal with risks associated with Logistics. However, a 3PL partner well-equipped with technology and digitalization can tackle demand uncertainties and be flexible according to the needs.

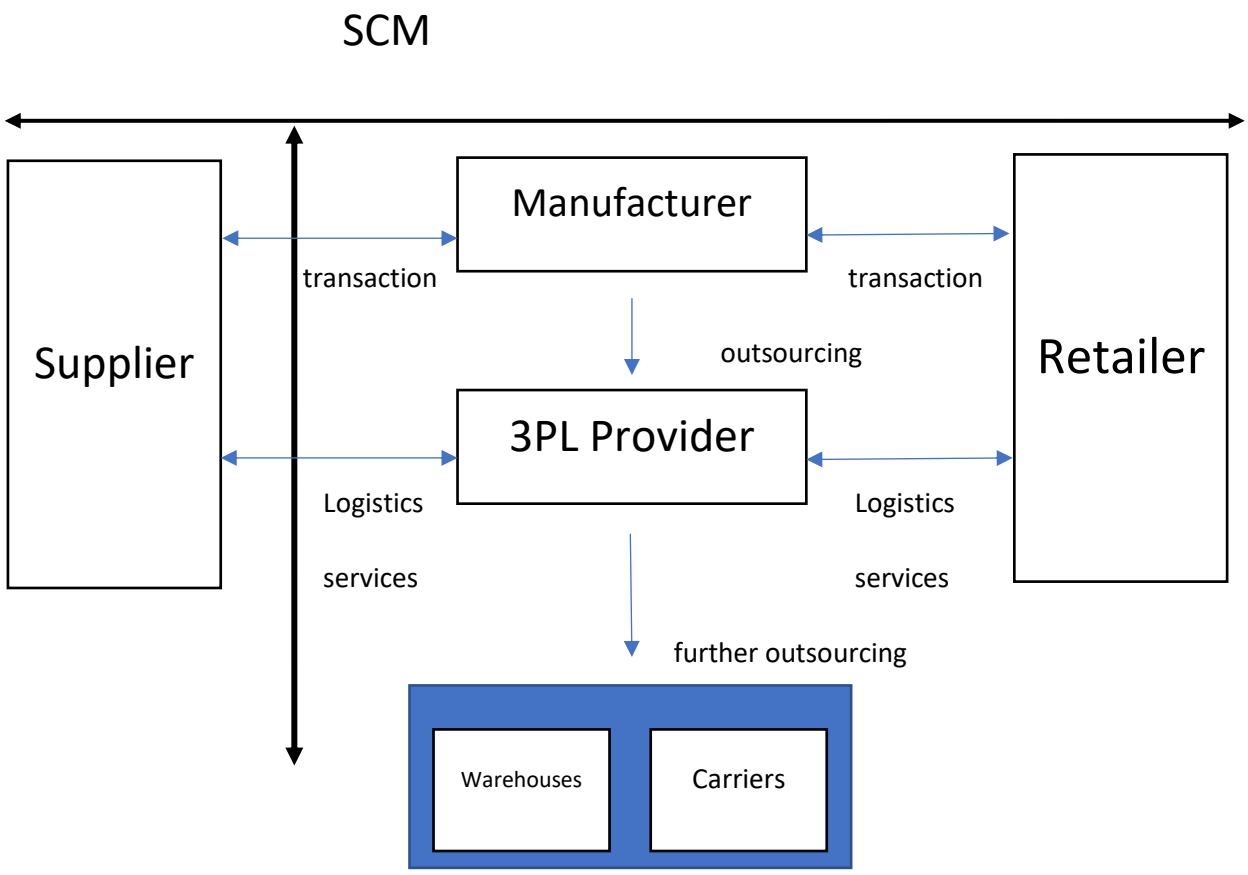


Figure 13: Horizontal and vertical network of Third-Party Logistics (Nemoto and Tezuka, n.d.)

Along with 3PL, Blockchain's characteristics like security, transparency, traceability, and authenticity of information along with smart contracts, crates an environment of trust and foretell a major redesign of supply chain administration. Supply chain globally consist of high value goods

and documents in the form of BOL (Bill of Lading), LOC (Letter of Credit) and other contracts which are moving through various stakeholders. These are exposed to risks like thefts and forgery. This can be avoided with the help of blockchain's security and all the stakeholders with appropriate access can have visibility of required process on one single shared platform. Also, the use of this technology can help to avoid hectic management paperwork, and time consumption of the same which is also exposed human error. Blockchain also enables the real-time tracking of shipment by integrating with organization's current tracking system on their homepage. With traditional tracking system, the information is timestamp restrictions, which reflects when the shipment logistics provider facility and the status is entered manually. With the help of blockchain, this information would be faster and more accurate. Below are the potential benefits of Blockchain in Logistics –

Relative advantage	- Facilitate origin tracking - Reduction of transaction costs - Exclusion of a centralized governmental institution - Open access to information concerning the activities within the supply chain - Provides actors with the choice of buying sustainable products and transport - Customers gain the ability to evaluate the product or supplier before deciding
Compatibility	- Provides customers with the information they want concerning product origins and the freight route - Reduces risk regarding fraud or counterfeit goods - Easier to execute transactions by using hashes instead of physical documents - Use IoT for vehicle to vehicle communication - Enables monitoring, tracking, and tracing transports - Better tracking, tracing, and recycling of the product lifecycle
Complexity	- Ease paperwork processing - Effective usage of QR-codes, RFID, NFC-tags, WIFI, or iBeacons - A network working on a platform in purpose of exchanging intangible and tangible resources - Make load boards more reliable - Multiple active platforms to just access both private and public
Trialability	- The extent of participation and information sharing is determined and regulated by the user - Active participation is not compulsory
Observability	- Effective tracking of fleet and vehicle performance history - Operate the internet of things - Simplifies exchange of goods and payment systems - Gradual increase of blockchain start-ups, and active platforms

Table 2: Potential Benefits of Blockchain in Logistics ("Master_Blockchain_-_Amina_Badzar.pdf," n.d.)

The typical definition of smart logistics comes with artificial intelligence, Internet of Things, cloud computing, etc. It also includes integration of decision-making machines, modern intelligence, and autonomy. The modern-day logistics has many options to select, but there are certain drawbacks as well. For example, a big giant in logistics can easily implement modern technologies, additional automation in warehouse and adapt to blockchain technology. But this might give financial strain to medium or small-scale companies. Hence, partnering up 3PLs having these abilities can prove to be beneficial. The increasing number of technologies and innovations will definitely have an impact on future of logitics. Data analytics, cloud computing, artificial intelligence, self-driven vehicles, drones and Internet of things (IOT) will have an imperative role in logitics which is ineveitable. The key success factor is to come up with networking where there will be trust in business and embracing technologies with a view of having return on investment according to the size and capacity of a particular organization and not to forget, being sustainable at the same time. Hence, Blockchain, hiring 3PL and utilizing certain technologies from logistics 4.0 will be an ideal model to establish and initiate Elastic Logistics.

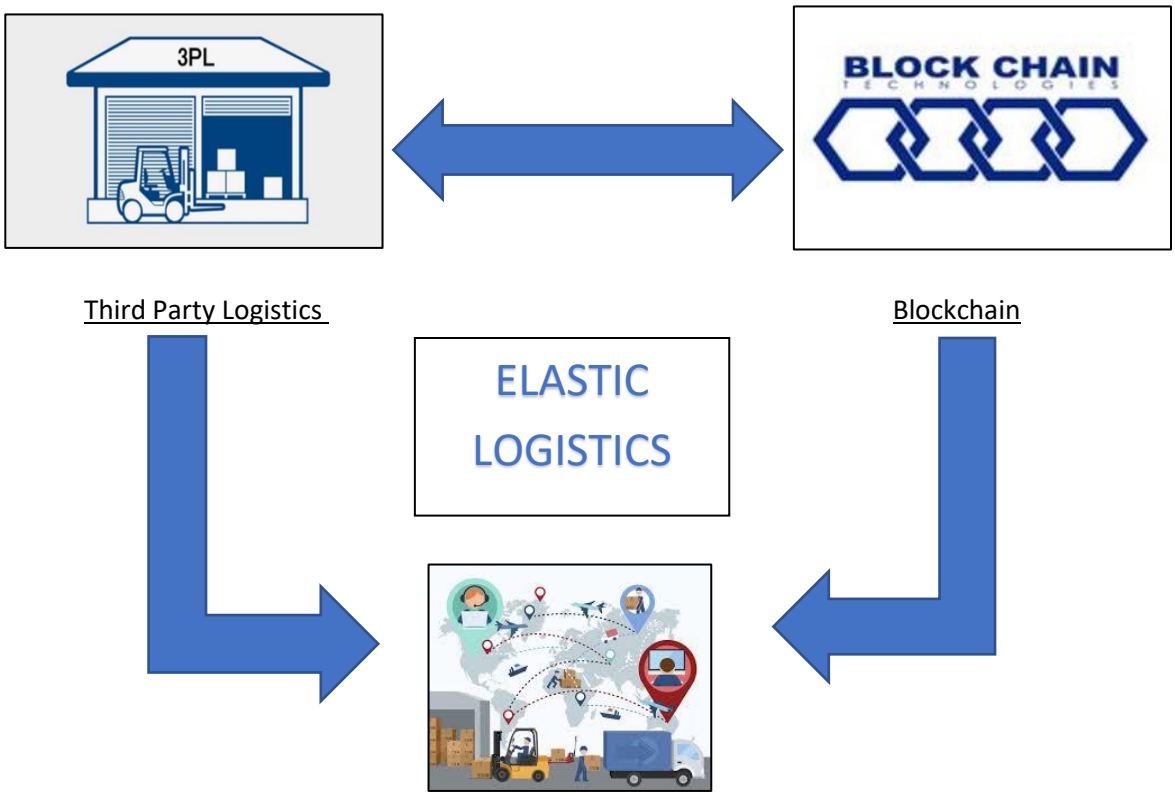


Figure 14: Elastic Technology Enablers

Research Question 4 (Benefits) – *What kind of benefits can Elastic Logistic bring to Supply Chain?*

Uncertainties and seasonal demands are the part of logistics. Logistics professionals have always been dealing with adjusting seasonal capacity. Elastic logistics with its abilities, bring following benefits to Supply Chain –

1. Automation – Elastic logistics bring automation into the company, to makes its scaling capabilities more flexible. EL minimizes can reduce human intervention on production line, thus minimizing errors and increasing productivity, that makes the company able to adjust according to change in demand.
2. Third-party outsourcing – With 3PL partnering, the risk of financial investment in logistics operations is reduced. Organizations can lease more warehouses regionally to adjust to short-term demand changes. Moreover, outsourcing transportation fleet from 3rd party provider, transfers the transportation risk to them and help you stay ahead of uncertainties in consumer demands.
3. Control and Visibility – All the inbound and outbound deliveries are managed on a single digitalized software or system. This automatically spikes up your productivity as the user do not have to work on multiple platforms. EL also enables efficient shipment tracking system. It smoothens planning of warehouse for incoming goods and prompt response to order status is possible.
4. Enhanced user experience – With all these benefits, the user can address any problem or issue quickly, irrespective of your transportation methods. Hence, it enhances customer experience and increases the degree of customer satisfaction.

4. Research Methodology and Methods

In this section, the research paradigm, i.e., research ontology and epistemology preferred considering the nature of research, Data gathering techniques consisting of methods and techniques and Data analysis approach used is discussed. A reference flow-chart for clear and structured approach is given below -

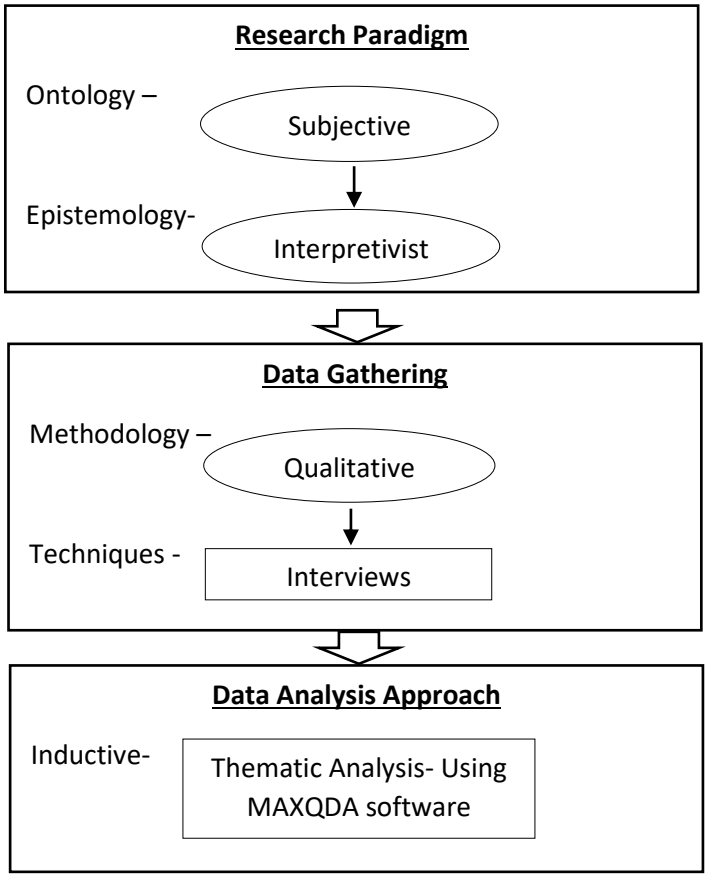


Figure 15: Research Methods Map (Adapted from - O'Gorman and MacIntosh, 2016)

4.1 Research Paradigm

The ontology used for this research is subjective. The term Ontology is defined as "the science of being", and depends on the views on which reality is based ("Ontology," n.d.). The reality is approached differently in subjective philosophy, i.e., in the sense that each person encounters their experiences in different perspective. Elastic Logistics in new and upcoming concept in the field of logistics. It is based on various technologies and business strategies that can be adapted. The key objectives of this research study are to find out the main elements of Elastic logistics and how it can help professionals tackle uncertainties in future under any condition. This dissertation

will focus on how an organization can enable EL or how a traditional logistics can be converted into Elastic Logistics. There are several modes of transportation in logistics (Air, Ocean, Road, Rail, etc.), and every logistics organization has its own distinctive strengths and capabilities. For this research, interactions have been done with industry professionals, from various logistics and supply chain companies. While interacting with experts from this field, the questions were subjective because each expert will have a specific point of view and perspective. The subjectivity has led to an interpretivist approach. Logistics is a vast topic and exploring Elastic logistics has an interpretivist epistemology rather than positivist, which will explain events and generate description of the topic. Qualitative analysis has been used to conclude on firm descriptive framework. Another reason to adapt qualitative approach is that the aim of the research is incline towards understanding the concept from various industry professional's perspective. Difference between positivist and interpretivist approach is given below for epistemology justification –

Positivist Paradigm	**Interpretivist Paradigm**
Concentrate on facts	Concentrate on meanings
Seeks causality and fundamental laws	Attempts to know what is happening
Reduce phenomena to simplest elements	Look at the totality of each situation
Formulate hypotheses and test them	Develop ideas through induction from the data
Operationalize concepts so that they can be measured	Use multiple methods to establish different views of phenomena
Take large samples	Small samples investigated in depth over time

Table 3: Difference between positivist and interpretivist approach ("Positivism - Research Methodology," n.d.)

The literature review illustrates set of technologies and business practices that can be adapted to enable Elastic logistics. The academic area is limited on this topic. Because of this, the research is focused on developing understanding, strategies, perceptions and most importantly interpretation related to Elastic logistics by studying current practices. This explains that an inductive approach is adapted rather than deductive. The purpose is to get to the base of logistical practices by evaluating challenges, explanation of problems, know the current situation in the industry and context. Although, for the literature review, there is limited data for analysis and research done before. This may be because Elastic logistics is still yet emerging topic and not many researchers have explored it. There is lot of scope for EL, a perfect business model which can fit to all the enterprises irrespective of size and standard, have not been developed yet. There is a need to study this topic deeply to study the challenges and understand the core competencies of proposed

framework. Hence, because of data limitation and literature available, using exploratory research approach is suitable before coming to any conclusion. The opinions from management level industry experts, logistics experts, supply chain executives/specialists and working professionals have ensured that the research is guided in appropriate direction.

To summarize, this study is a balance of descriptive as well as qualitative research as it will be establishing framework and theories, which justifies exploratory part, and qualitative because the growth of this concept in the industry currently or the present status of Elastic logistics will be described.

4.2 Research strategy

As mentioned in research paradigm, an exploratory and qualitative method will be used for my research strategy. Interviews with industry professionals is the source of data for qualitative analysis. After relevant data was obtained, the research is further narrowed down by an inductive approach. Supply Chain, Logistics industry experts were interviewed for the same. Already, there is lack of data on Elastic Logistics, and not many people in industry are aware of this concept being in practice. Inductive approach is suitable when there is not much data and theories available. Based on the objectives of the research, a questionnaire of structured interviews was designed to collect the primary data. My own experience as logistics professional in global logistics helped me to initiate a meaningful conversation and design informative questionnaire for interview. It helped me to obtain relevant input. The data collected helped me to analyze core competencies and how efficient is the model or if I must do any modifications in the model for Elastic Logistics. There are several Elastic Logistics based organizations, where I tried to contact any executive or expert to explore the company's model, but unfortunately could not contact any. However, I interviewed 15 industry professionals (logistics and supply chain), who had experience ranging from 3 years to even 40+ years. The participants were from various nationalities like India, Romania, UK, Ireland, USA, and Luxembourg. It was a good mixture of consultants, engineer, executives, and management level professionals. Thus, the data available was competitive and from variant geographical regions.

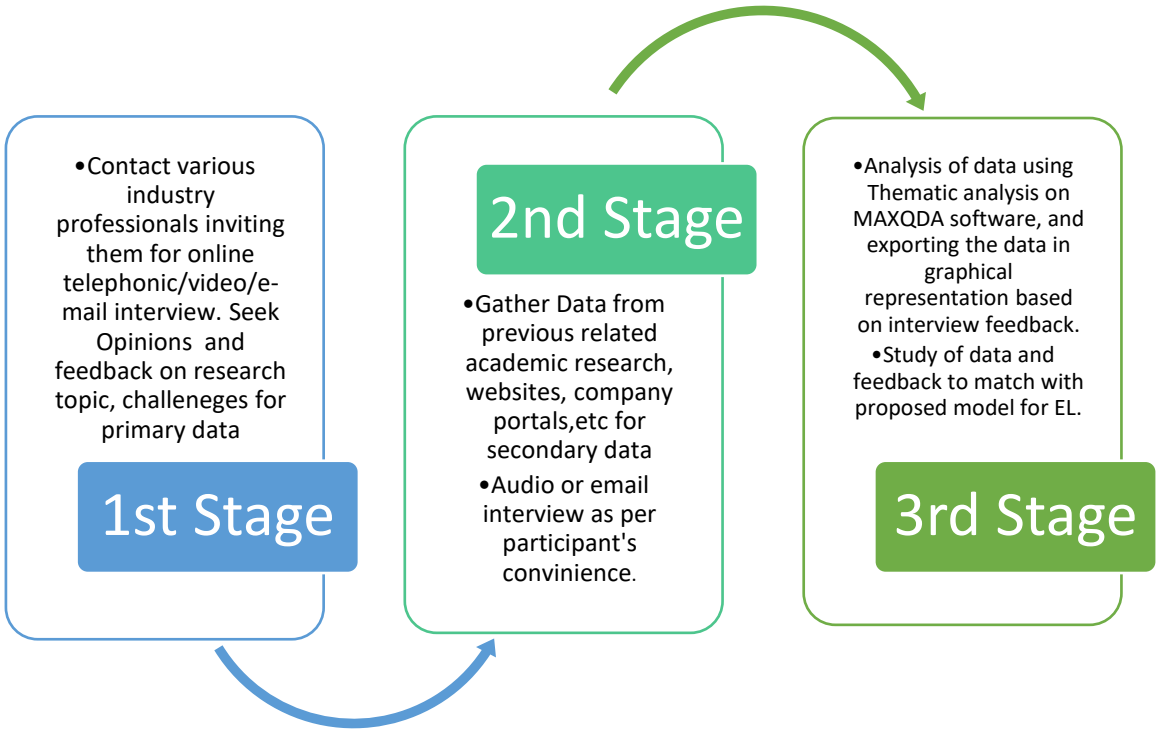


Figure 16: Research Strategy

4.3 Data collection methods

The research will use qualitative research strategy for overall approach. The data collection procedures in qualitative research are interviews, surveys, documents, observation, and audio/video material (Creswell, 2014). Audio and online (on e-mail) interviews were conducted according to convenience and availability of participant. The data was collected as mentioned below:

- Primary Data – I have worked as a logistics analyst for 3 years at a global level. In that tenure, I was dealing with various freight forwarders, 3PL providers, suppliers, and on-site logistics experts. I even visited Romania for transition of work and to address operational issues at work with these stakeholders by meeting them face-to-face. Having a broad international exposure, I used my network and contacts from previous job and invited participants for interview. I got a positive response from several of my contacts. I even invited many logistics and industry professionals on LinkedIn and received few participations from there as well. In all, I invited 60-70 professionals from various geographical regions, out of which, 23 agreed to participate in the interview. However, 15

professionals participated in the interview with their consent. With my knowledge and experience, and keeping the objectives in mind, I structured the interview for collecting primary data. The initial few interviews helped me to decide if the research questions and interview feedbacks were in alignment with each other and were guiding me in correct direction. The audio interviews were conducted on video conferencing app called 'Zoom', where the interviews were recorded, and transcripts were made with the consent of participant. As some participants were from non-English speaking region, they were not comfortable with audio/video interviews. In that case, I conducted the interview on e-mail, by sending the interview questionnaire and getting their feedback on the same. The analysis of these interview feedback is done for research findings.

- Secondary Data – For secondary data, which is used mainly in literature review and other sections of research, I have referred academic research papers of various experts. Important sections from books for logistics management, Innovation and Research design are referred as well. A broad range of academic articles, journal papers, previous research papers were used for secondary reading and data relevant to Elastic logistics (EL) and its drivers are used. In addition, various websites and online articles by industry experts is referred. The leading giants in logistics, who are already on practice of this emerging concept, have stated the advantages and concepts relating to EL on their web portal. This data was critically analyzed and used for secondary data, based on which, conceptual framework is built, and research questions are answered.

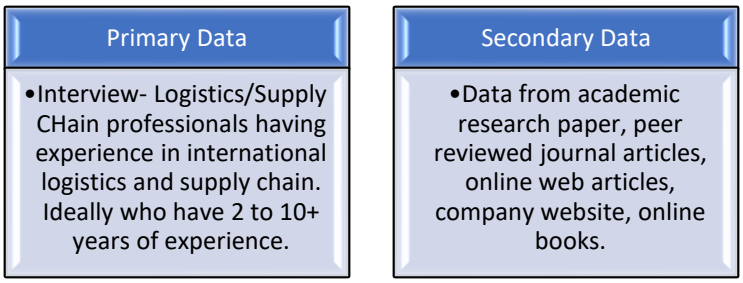


Figure 17: Data collection method

4.4 Sources of data

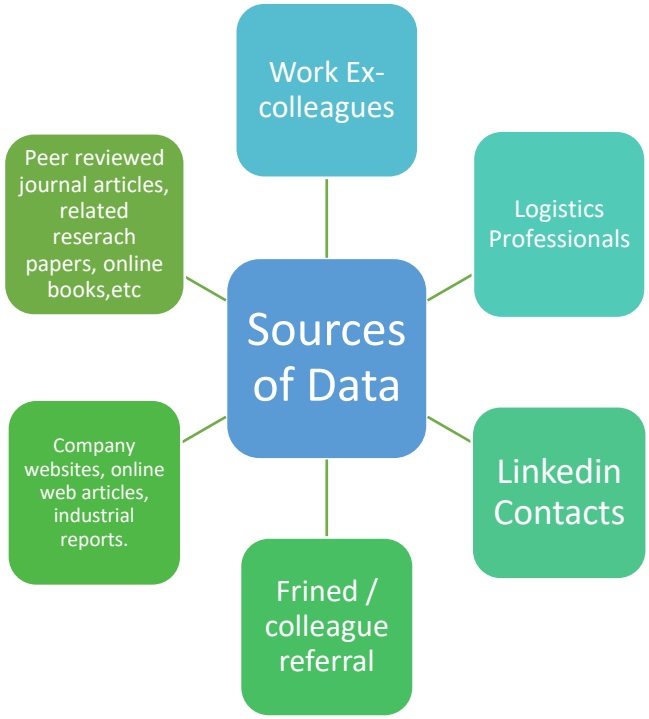


Figure 18: Various sources of data for research

To start with, the data for this research is collected by self-research. The **primary data** will come from logistics industry professionals that will be the part of interview process. The previous work experience in supply chain and logistics provided me with a wide network of executives and professionals. The participants for interview are selected from my professional network, most of them being my ex-colleagues. Other than this, the interviewees consist of professionals from my LinkedIn network, any other industrial expert referred by my colleague or friend, or a freight forwarder/shipper I have worked in my tenure. As shown in figure 4.4.1, the secondary data is extracted from initial self-study and research. For this **secondary data** I referred logistics, supply chain industry reports, annual reports of Elastic logistic based companies, peer reviewed journal articles and white papers related to 3PL, logistics 4.0 and blockchain. It is imperative to have dependable data sources for secondary research as it provided justification for facts and opinion related to research topic. It also helped to structure the interview or questionnaire. Secondary data also helps to answer the research questions put forward in aims and objectives. The

participants for collecting data for this study are selected carefully for having relevant feedback to conduct analysis.

4.5 Nature of Data

To achieve the aims and objectives of this research, analysis of various literature, documents and interview feedbacks is utilized to explain past and current technologies and business practices in logistics. As this is an exploratory research, the interviews will focus on explaining in depth knowledge and experience facing challenges in logistics. I also aimed to get the feedback on drivers and technologies for Elastic logistics from the professionals and compare them with the suggested business model of EL. After the interview, a set of feedbacks and data was available which could be analyzed and directed. This helped me to narrow down the research to the answer research question and justify suggested Elastic Logistics enablers. I focused on involving the participant in the process fully and generate interest in the conversation so that the participant is comfortable and share experience freely, provide valuable feedback. To maintain participant's interest in the conversation, I discussed a certain concept or business issue in dept but kept the focus on research. The types of questions asked were as follows –

i. How often do you face logistical challenges at you work?
ii. What are the challenges/uncertainties in the logistics or supply chain that your organization experiences?
iii. According to you, will the 3PL adjust to the logistics capacity according to the demand?
iv. According to you, how does block chain impact supply chain and logistics? Do you think it will add value to your business practice?
v. What are your thoughts on Elastic technology? If yes, what according to you are the drivers of Elastic Logistics?
vi. Is your organization adopting the emerging technologies in logistics? What are the factors encouraging the use for it?

While taking the interview, I focused on identifying the core competencies and key success factors for Elastic logistics such as views on blockchain, 3PL, updating the technology in firm, etc.

4.6 Access to research data and Ethics issues

As the source of the primary data is feedback from interviews, the access to the source of data should not have any issues. I received participation and data source from diverse regions and nature of work. My network with DSV road freight carrier who contracts 3rd party trucks for

operation from Timisoara, Romania and air expedite carrier from TNT Bucharest, Romania provided me with major related insights on this research. Due to the pandemic situation, I could not conduct any face-to face interviews, but interviews took place on web conferencing application and e-mail. I also invited industry professionals and experts with more than 15 years of experience, who are working at management level, from LinkedIn to participate in the interview by taking their consent. They were intrigued with the research topic and actively participated in the discussion by providing with their valuable insight. This is important for qualitative research.

Taking ethical issues in consideration, all the participants taking part in research have the right to remain anonymous as per their wish or step back from taking part in the research. The process of finding results in the research should not be the cause of uncomforting or uneasiness to the participant. Flowing guidelines were followed during the interview –

i. Act professional and be polite with the participant
ii. Do not ask questions on sensitive issues. Keep in mind that participation of interviewee is voluntary.
iii. Seek permission for time extension if the time of interview exceeds the decided time.
iv. Give the idea to interviewee about research, the reason for interview and the way data will be maintained.
v. Make sure that the data from feedback is not mispresented during the process of transcription.

4.7 Data Analysis

This research is based on qualitative research approach. The questions asked on audio and e-mail interview were structured and uniform. Thus, I used the codebook to data analysis. The patterns were recognized in data collected and codes were used for them. The description of these codes is given in memo for each code. Once I received the feedback, I noted the important words, concepts, technical terms which are decoding further in this study. During the interview, notes were made by identifying the keywords and they were considered as codes. These codes are categorized and labelled with themes further. The conducted the analysis on the software called 'MAXQDA'. This software is designed for qualitative, mixed methods data analysis. It made the analysis task easy and less time consuming and provided detailed graphical representation of feedback for every question. It also provided with code frequency matrix, which helped to identify the participants frequency of reply on all the codes and related themes.

Once the detailed analysis was complete on MAXQDA software, the list of participants, questions asked, codebook, code frequency with graphical representation, code frequency matrix was exported from MAXQDA and represented systematically in MS Excel sheet in separate tabs. With the help of MAXQDA and systematic representation in MS Excel, the clear picture for drafting the findings and conclusion for research is visible.

5. Presentation and Analysis of Findings

5.1 Overview

This research study has put forth two major findings related to research objectives. The first one is finding drivers for Elastic logistics and the view on Elastic logistics for future implication to solve logistical uncertainties. In this chapter, the empirical fact and analysis of findings is presented, which was generated through the interviews and observation of participants feedback. In-depth interviews were conducted of 15 logistics and supply chain professionals who worked from operational to management level. These professionals were of various nationalities from Asia, Europe, and America. The questionnaire was designed in such a way, that is was aligned with prime objectives of research, i.e., finding out drivers of elastic logistics and future scope of it. The data obtained from interviews has been analyzed on MAXQDA software, where the key words from participant feedbacks were identified and coded. Based on the codes, sub-codes were decided and labelled with the themes for the same. On every theme, frequency was recorded, which were further plotted on bar charts, pie charts and frequency graph. The interview questionnaire was decided in such a way that it answered research study's prime question and the title question, i.e., 'how modern supply chain can thrive on Elastic Logistics?'.

5.2 Nature of work and work experience of Participants

As mentioned above, 15 logistics and supply chain professionals were interviewed for this research. To have the broad idea about their nature of work and activities they are handling at job, a general question about their work nature was asked to start the interview questionnaire. The participants were invited based on their work profile (if were related to logistics or supply chain industry). Fortunately, professionals with 10+ years of experience also participated for expert feedback. Also, experts from global giants in freight and logistics like DHL Global Forwarding, Kuehne+Nagel, Ceva logistics, Premier Logistics, DSV solutions, and TNT gave their valuable feedback. These are the companies doing core logistics operations worldwide. That is the reason, when asked about the nature of work, maximum participants advised 'Transportation Arrangement' as their daily activity. Transportation arrangement refers to activity where products and goods are picked-up from origin and delivered to destination by various modes of transport (Air/Ocean/Road) as suggested by shipper/buyer. The establishments carrying out these activities are known as freight forwarders and they offer various other services like warehousing, customs

support, etc. (SICCODE.com, 2017). Transportation arrangement can be inbound or outbound or both. 80% (12 out of 15) of participants have transportation arrangement for customers as their prime activity in their feedback. Other than that, some of these participants are also involved in other activities. Warehousing activities was next prime activity which includes inventory management, order packing, materials processing, etc. Other than these, customs support, managing supply chain or supply chain consultancy, making analytical reports, and digitalizing the supply chain were other range of activities observed in the feedback. Amongst the 15 participants, 40% of participants had 0 to 5 years of experience, i.e., 6 executives. 5 other participants had 5 to 10 years of experience and 2 participants had 10-15 years of experience. These were 2 participants who had more than 15 years of experience in logistics industry, with one expert having 45 years of experience. These were the management level interviewees. Overall, I had participants ranging from operational to management level employees which provided insights from various point of views. The outcomes were very interesting and although, with a gap in work profile and total experience, there was uniformity in data obtained. Below is the table illustrating weightage of various activities performed by interview participants. The votes refer to number participant's opinion on each criterion related to their nature of work/activities they do on job. It was observed that several participants do multiple operations, like transportation arrangements along with warehousing, and supporting with customs. The votes were given based on keywords observed in the feedback of interview participants.

Nature of work	Votes	Percentage
Transportation arrangement	12	80.00
Warehousing - Inventory, Packaging, order processing, Materials	5	33.33
Customs Support	4	26.67
Manage supply chain for customers	4	26.67
Analytic Reports	2	13.33
Transform traditional to digital supply chain	1	6.67

Table 4: Weightage of activities performed by interview participants

5.3 Types of challenges and frequency

Every economy globally is running because of logistics. It is evident that if freight companies does get raw material from supplier to manufacturer and finished product from manufacturer to customer, the economies won't be able to survive("Connectteam.com," 2020). Customer's demand expectation keeps challenging online retailers and they need to stay competitive in their operations. Logistics and supply chain are exposed to challenges on almost daily basis and these challenges are endless. The challenges may lead to poor performance and ultimately to negative customer satisfaction ("Scurri.com," 2018). When asked about the frequency of challenges at work, 13 out of 15 participants suggested that they face uncertainties on daily basis. 2 participants suggested that they face uncertainties and challenges bi-weekly. One of the participants with more than 5 years of experience said, and I quote, "*Logistics itself is a challenging field. Every day when you wake up, you will have some new challenges."* There were several challenges faced by participants, as given in the graph below –

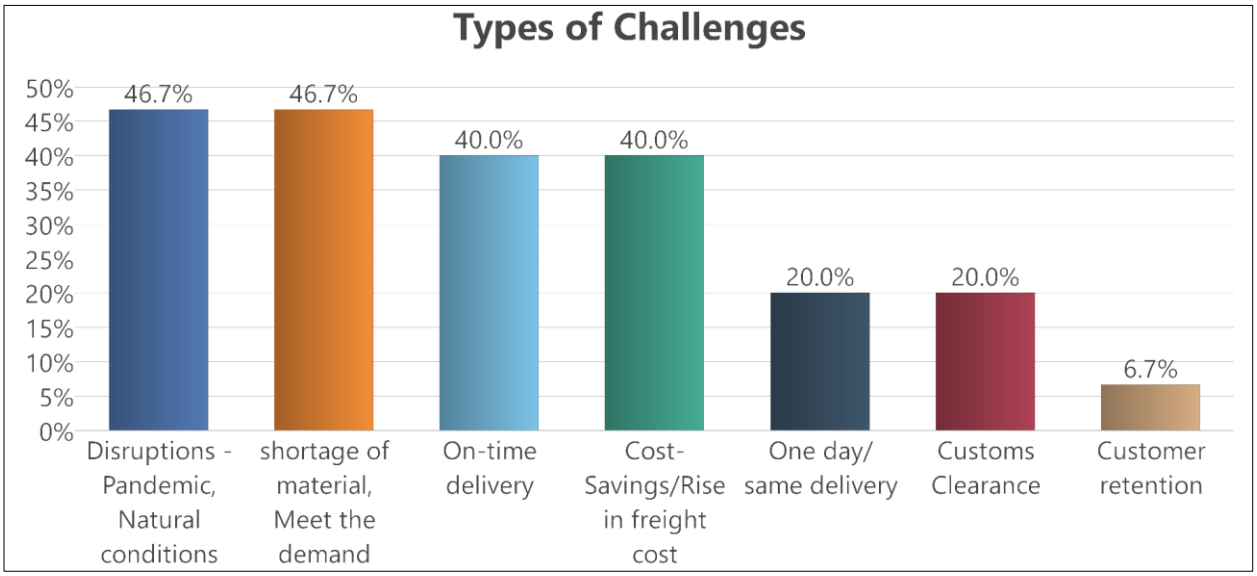


Figure 19: Types of challenges in logistics

Almost half of the participants suggested that, the current ongoing pandemic and natural calamities are becoming major challenge for them. Due to this, there is shortage of material, and with this, the customer demand is unable to get full filled. Demand uncertainties have been observed by logistics professionals from long time. For this, the logistic service providers reserve the capacity in advance. But due to current pandemic, the capacity of passenger aircrafts has been reduced. Due to this, the freight cost has skyrocketed. This was the next major challenge that

participants voted for. They were unable to do any cost savings, the freight cost by airline companies have been increased tremendously. With this, on-time delivery of material was equally noticed challenge. There may be lot of reasons of material not getting delivered on time like, natural calamities, decommit from service provider, fleet not available, etc. 40% participants said that on-time delivery and rise in freight cost are the frequently faced challenges. With the rising customer expectation, same-day or next-day delivery have been increased. Logistics companies must be ready with service capacity and extremely flexible for this. This was another major challenge observed along with custom clearance. The participants advised that, even though the material is ready and shipped on time, it may get stuck in customs inspection or customs clearance which delays the delivery of shipment. This may happen due to insufficient paperwork or lack of co-ordination, etc. All this leads to disappointing the customer and logistics professionals are facing difficult time for retaining the customers.

5.4 Necessity of change and Upcoming trends

After discussing the various challenges faced by participants, a question regarding if there is any change necessary in their current process was asked. The purpose behind asking this question was to know the views on potential solutions, from the professionals handling logistics, supply chain and experiencing challenges daily. All the participants suggested that there is a gap in operations, where lies the scope of improvement. 15 out of 15 participants voted for necessity of change and continuous improvement. Many organizations consist of independent vertical for learning and development who identify gaps in operations and make necessary improvements wherever possible. Continuous improvement impacts the bottom line of organization. Hence, logistics professionals include continuous improvement in their KPIs (Key Process Indicator). The major and most evident advantage of continuous improvement in logistics is the ability of company to do cost savings. There are various types of costs that increase over the time (for example energy, material, labor, administrative). These costs need to be kept in check, which is possible with continuous improvement. For example, implementing energy saving automations in manufacturing unit will save energy costs as well as reduce manual labor cost ("Small Business - Chron.com," n.d.). *"Logistics is continuing improvement process, implementation of changes are necessity of the business to sustain the cycle of supply chain which should be resilient to sustain from sudden internal and external changes",* commented a participant on continuous improvement and necessity of change. Several other participants suggested that, the technology and trends in logistics are getting updated, and if the organizations do not adapt to changing time,

they will be lagging their competition. They also suggested some alternative changes their organization can implement to tackle the challenges. Below table shows, possible alternative changes in process suggested by participants.

Change Necessity	Votes	Percentage
Need of change - Yes	15	100.00
Need of change - No	0	0.00
Increase 3PL, outsourcing	6	40.00
Technological/Digital	5	33.33
Cross-Functional Alignment	3	20.00

Table 5: Weightage for necessity of change in current process and potential alternatives

Many of the participants (40%) suggested that, for increasing on-time delivery and customer satisfaction, outsourcing logistical services like 3PL would be beneficial. They believe that 3PL providers are experts in their domain and aware of uncertainties. They have the expertise to take operational risks and give satisfactory service. Other than 3PL, 5 other participants (33%) believe that adapting modern technologies and automation, digitalization can be beneficial. It will help for real-time tracking if shipment and have accurate information. This will lead to accurate forecasting and planning. In addition, cross-functional alignment is also necessary according to 3 (20%) participants. Few challenges are faced due to gap in communication and working between various functions of organizations. If these functions work in alignment with each other, there would be chances of facing the issues collectively and having solutions by working as a team. A question was put forth to check what are the upcoming technologies that the participants are aware of related to logistics field. There were variety of feedbacks, with maximum participants voting for technological trends such as artificial intelligence (AI), Big data, Digitalization, etc. 60% participants voted for technology following with warehouse automation and last-mile delivery by 40%. In addition to this, 33% participants also advised Elastic logistics as upcoming trend. Some other suggestions were drone delivery, Blockchain, Leagile logistics. Below table illustrates participants views on upcoming trends in logistics –

Upcoming Trends	Votes	Percentage
Technological Trends - AI/RFID/Digitalization/Big Data	9	60.00
Autonomous warehouse, Last-mile delivery	6	40.00
Elastic Logistics	5	33.33
Drone Delivery	5	33.33
Blockchain	4	26.67
Leagile Logistics	1	6.67
Upgrading Graphical standards	1	6.67

Table 6: Participant's views on upcoming trends in logistics

5.5 3PL outsourcing and adjustment to Demand

The interview questionnaire is more articulated towards research study, after having general information on participant's organization and work profile. Participants were asked if their organization outsourced the logistic services from 3PL partners and the benefits of doing the same. The idea behind asking this question was to simply know if 3PL provides expertise and performance-based results. 53% participant's organization outsourced the logistics activities, whereas 27 % had their own logistics set-up. 3 of the participant's organization were 3PL providers themselves. When asked the 3PL provides expertise and performance-based results, 73 % participants agreed to that. They proposed that, all the approach brings all the partners together on single platform which delivers flexibility, cost competitiveness and visibility. One of the participants quoted, "*we prefer third party logistics, and we're already having their best services. And because of that we can deliver products to more and more customers. They are doing their best performance."* According to them, 3PL have strong advantage over certain geographical areas. However, 14% participant's opinion suggested that 3PL does not provide expertise and there needs to be better option than outsourcing 3PL.

Weather outsourcing 3PL or not, participant's view on 3PL's adjustment to change in demand was asked. As logistics face frequent demand uncertainties, views on 3PL's adjustment on changing demand was imperative. Below graphs represents participant's view on the same and features of 3PL due to which it can adjust according to demand –

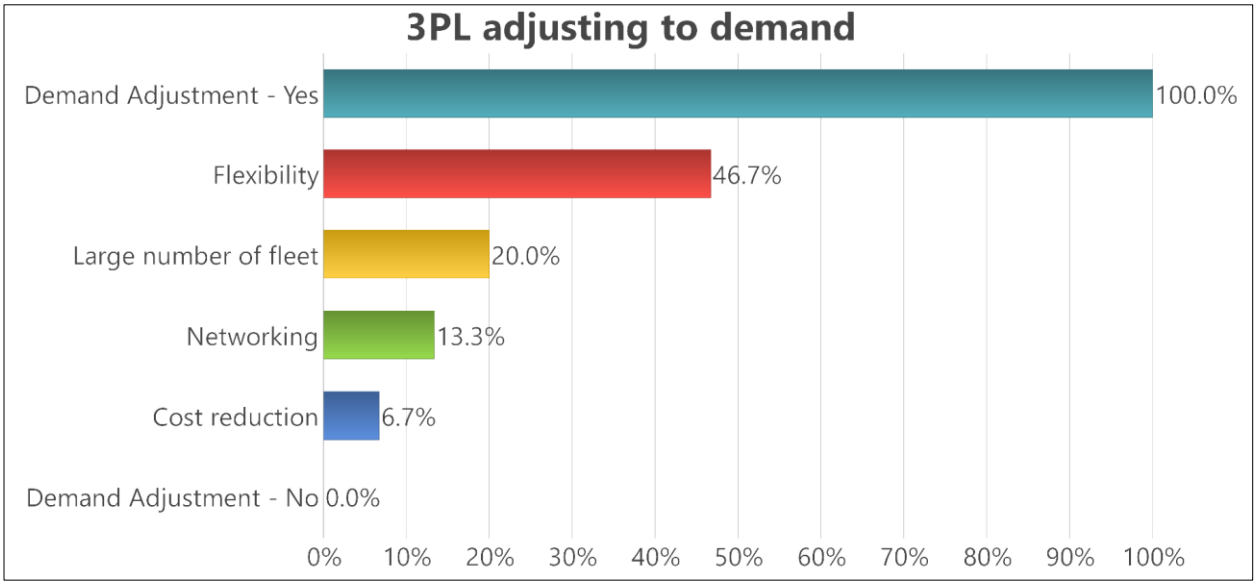


Figure 20: Degree of 3PL's adjustment to demand and factors responsible

All the participants agreed to the fact that 3PL can adjust to the market demands as shown in the figure 5.5.1. On being asked about the factors or aspects of 3PL which makes it adjust to demand uncertainties, 46.7 % (7) participants suggested that 3PL is flexible. It not only supports with transportation activities, but also provides regional warehouses for storage of goods, IT support, customized vehicles for ODC (over dimensional cargo), scalability, etc. Moreover, with company's own logistics set-up, there is need to hire more staff during seasonal demand. This excess staffing can be avoided as 3PL helps seasonal businesses smoothly have the transitions in their ups and downs. The cost of infrastructure is saved as well. When the logistics services are outsourced, the company can focus more on their core competencies and let 3PL worry about the logistics. 3PL can also give organization access to the markets where they have not established yet. 20% participants believed that, 3PL can adjust uncertainties, as they have large number of fleets to pick-up from all over the world, in any location. Which means, 3PL providers large amount of service capacity already reserved. Moreover, in case of any special transport like dangerous goods or temperature-controlled goods, 3PL partners have specialized containers as well. 3PL providers always ensure that the organization's needs are met. They have expertise and technology to eliminate the inefficiencies in supply chain and streamline the process. Other aspects such as networking in the market and cost reduction were also suggested by participants making 3PL a perfect practice for handling changing demands. A participant's feedback quoted, "*The business of 3PLs is to move products and make a profit and like any other business some do this much better than others. Most*

have the flexibility to react however they look to their customers to provide adequate information and instruction so they can adjust accordingly." The 3PLs provide wide range of technology access as well. They can help to avoid investment in costs related to technology required for process improvement. 3PLs share their technology with multiple customers, hence they can bare the investment cost and even handle maintenance cost, while the benefits are enjoyed by customers. Some of the technologies beneficial for logistics provided by 3PL are Freight audit and payment solutions, Freight data entry, Data analysis and reporting solutions, Real-time order tracking, and Transportation management system (TMS). There are lot of issues that take place on road, like truck breakdown accidents, weather interruptions, etc. A 3PL provider will deal with these concerns effectively by rebooking the truck and delivering the shipment first ("3PL Benefits," 2018).

5.6 Blockchain and its impact on logistics

The next topic to discuss with interview candidates related to this research was Blockchain. When asked casually to weather they know about blockchain and have they heard about it, all of them have known blockchain either through cryptocurrency like bitcoin, or they have known the potential application of blockchain in supply chain and logistics. As mentioned above in table 5.4.2 as well, 4 of the participants suggested blockchain as upcoming trend in logistics. It consists of cryptographically encrypted blocks, in which the data and information is stored. This information is highly encrypted which has hash maps that include the previous information, the timestamp and new information. Every block contains information about last block, thus forming a chain. Tesla is utilizing blockchain technology to assist its inbound logistics for Gigafactory Shanghai. They manufacture Model 3 vehicles for Chinese market there ("Blockchain Logistics," 2018). To tackle the growing demand in logistics, technological solutions are necessary. As technology in logistics increases, the challenge to manage data with connected devices is increasing. It requires high level of security which is offered by blockchain. The freight and shipping industry have large scope for improvement with the help of blockchain. It is lucrative for domestic as well international logistics (Blog, 2020). The participant's views for logistics is given in below bar chart –

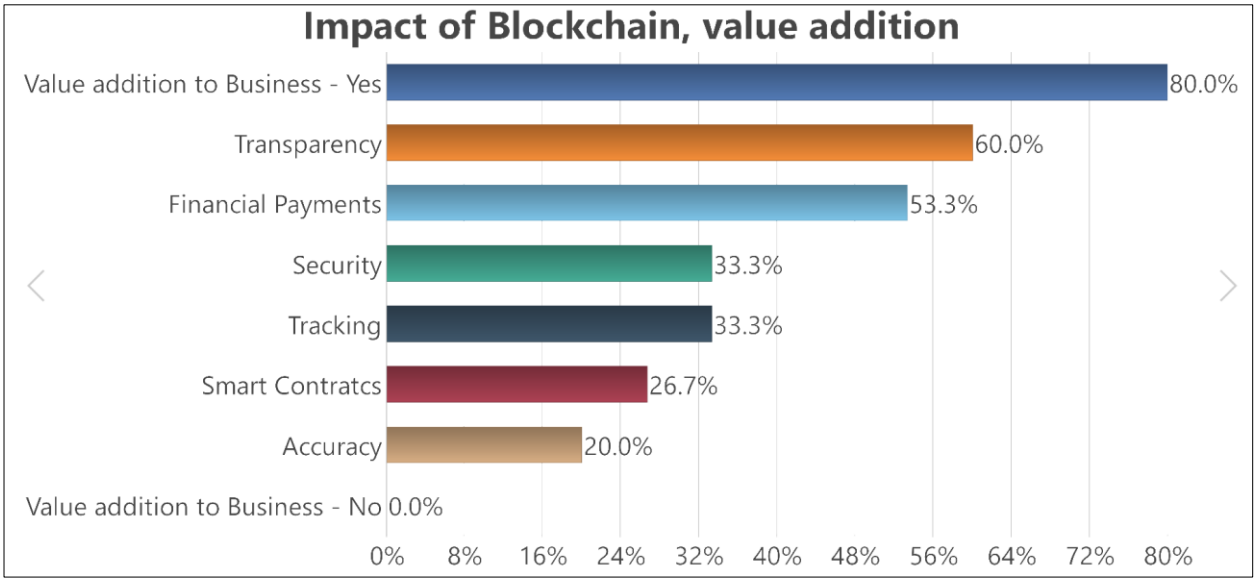


Figure 21: Interview participant's views on Blockchain technology

80% of participants believe that blockchain technology can be value addition to the business. As not many are aware with technicalities related to blockchain in detail, a discussion where some technical information about blockchain and its various applications were discussed with participants. When asked about why blockchain can be valuable for business, there were several features suggested with respect to application in logistics. The maximum participants (60%) agreed that blockchain provides transparency. Basically, blockchain is the ledger on which, various stakeholders are integrated together and can be inspected by everyone, but not any single entity can control it. Logistics is that part of supply chain where co-ordination between many partners is evident. There is lot of information and status exchange and it must be accurate. Blockchain enhances this ability of exchange of information with real-time accuracy. After transparency, the next aspect for which participants preferred blockchain for logistics was, financial payments (53%). Big organizations, shipping large volume of shipments everyday with agreed freight forwarder have to make frequent financial payments. There is always a third party or financial institution to process these payments that costs fees to be paid by the organization. These kinds of fees can be avoided with blockchain payments. Also, as there are no intermediaries involved, the payment is done faster. When funds are transferred through wire transfer, cheque, its untraceable. With blockchain, all these issues can be avoided, and the payments can be done with much confidence. Security and tracking feature of blockchain was suggested by 33% participants. Blockchain provides accessible and quick solutions for shipment tracking along with verification. It is very

imperative in food industry to have all the trail of each product from its source. Hence, Walmart, Nestle, etc., make use of blockchain to track their products. Talking about security, each block of is connected to other one, which provides remarkable amount of security. The information cannot be change by any third party as it is highly encrypted. Moreover, no single authority has the control over the entire system. IoT (Internet of Things) needs unbreakable security for connected devices and Blockchain is the best solution they have till date ("Cloud Credential Council," 2019). Other features such as smart contracts and accuracy were also preferred by 27% and 20% of the participants, respectively. The traditional contracting system has lot of paperwork involved which is hectic. This paperwork can be forged or mis-handled and there is possibility of theft and fraud as well. Smart contracts in blockchain allows logistics organizations to enter agreement and contracts hassle free. The agreement immediately dissolves of the terms and conditions are not met. All the parties are relieved as there is assurance to agreement of terms and conditions within the blockchain system. With accurate shipment tracking, the fleet efficiency of freight companies can be increased. It also provides information regarding damages, loss, and contamination occurrence accurately. When asked upon current implementation of blockchain application, 3 out 15 participants confirmed that blockchain is used within the organization. The major reason for this is financial constraints. Only giant companies use blockchain as it is an expensive technology to implement.

5.7 Elastic logistics drivers

In the final phase of interview, after having a brief discussion on various aspects of this research study, participant's views on Elastic logistics drivers was observed. The aim of this question was to check how compatible, is the proposed model for is EL in this research study. As the topic is emerging, however, 9 participants had confirmed views on the same as shown in table below –

Drivers of Elastic Logistics	Documents
3PL	7
Logistics 4.0 - AI, Big-data, Cloud Computing, etc.	7
Blockchain	4

Table 7: Participant's views on Elastic Logistics

As shown in table 5.4.2 above, 5 out of 15 (33.33%) interviewees already knew about EL. Some of them explored the elastic logistics and its various aspect in this interview. By having a brief

discussion on the same and their experience providing them with the rationale to answer this question, 9 participants had their views on potential drivers of EL. Remaining 6 participants had their views on EL and their its capabilities, however, did not have firm vote for drivers of EL. The below bar chart illustrates weightage of drivers of EL –

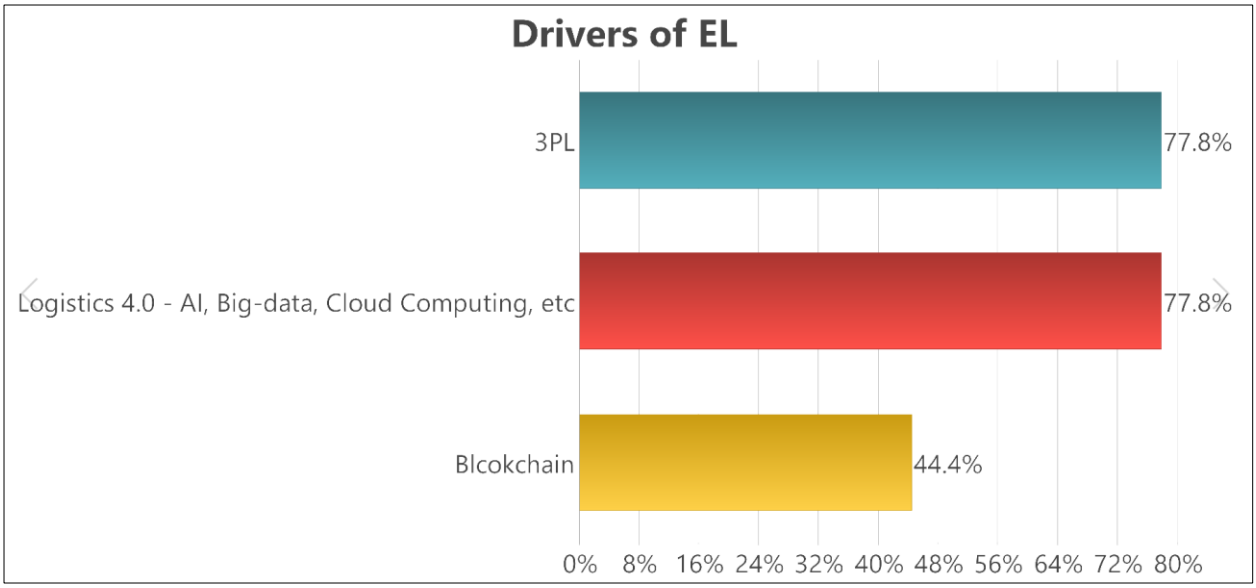


Figure 22: Participant's views on Elastic logistics drivers

As shown above, 77.8% interviewees believe that third-party logistics and Logistics 4.0 – AI, Big-data, Cloud computing, etc., are prime drivers of Elastic Logistics. This weightage is evident on the participant's view on 3PL's ability to adjust according to the demand. Majority of participants believing on this factor of 3PL voted 3PL as driver of EL as well. As Elastic Logistics refers to logistics ability to expand and contract according to the demand, 3PL being considered as one of the drivers can be explained. Along with that, technologies relating to logistics 4.0 were observed as equally important. Having technological advantage along with 3PL can be exceptionally beneficial. Logistics 4.0 mainly relates to automation of activity or process. There is negligible of no involvement of human interference. Hence, when a certain process is automated, whether the demand is more or less, the operation is to be performed by a set mechanism or software. There is no need to hire extra manpower or to increase the staff during rise in demand or to make the employees work for extra hours. This also explains logistics ability to expand and contract in any demand situation making logistics 4.0 technologies as one of the important drivers. Apart from

this, 44.4% interviewees think blockchain is also one of the driving forces for EL. The real-time tracking of shipments helps to optimize the fleet efficiency of freight forwarders. They can plan the capacity in advance and be ready increase in demand. When security and transparency build trust and confidence between related parties, there is a smooth flow of information and money, and everything is according to agreed terms of condition. The stakeholders concentrate on core operational responsibilities and overall performance is optimized. This makes blockchain a competitive driver for Elastic logistics. To comment on drivers of EL, one of the interview participant quoted, "*if you ask me about drivers so according to me, it could be new technologies, It be could blockchains, And it could be third party logistics*."

5.8 View on Elastic Logistics and expected market size growth

In the last phase of interview questionnaire, a question was pitched to know the participant's views on Elastic Logistics. As this research is to know the enablers of EL and its future in supply chain, this question was framed in the interview and interviewee's response was recorded. By the time this question was asked to participants, lot of discussions along with examples took place, specifically in audio interviews, and the participants were familiar with the topic. They had a broad understanding, and related the concepts and technologies discussed, to the Elastic Logistics. Below table highlights the participant's opinion on EL –

Elastic Logistics reviews	Documents	Percentage
Futuristic	8	53.33
Helpful	7	46.66
Promising	2	13.33
Transparent	1	6.66
Perfect Delivery	1	6.66

Table 8: Participant's opinion on Elastic Logistics

As it is seen above, more than half of interviewees think that Elastic logistics is futuristic. They believe that the solutions provided by EL have potential to be the future pillar of supply chain. Today's world is exposed to number of strategic business models and autonomous solutions for everything. But they cannot be adopted by every organization and firm. Every firm has its own ability to adapt to technology and business practice. The solution is to have a perfect business model that can be adapted by any size of organization, as per their needs. For example, a logistics set up of a middle scale company is very traditional and unable to upgrade due to financial

constraints. They cannot invest in automation and modern technologies. The solution is partnering up with a 3PL provider, with tech support who can take care of their logistics operations. The company will not have to invest heavily in technology or automation. They can just outsource the service and let the 3PL provider do the task. In this way, EL is considered as futuristic for supply chain. 7 participants believed it can be helpful in the coming times, while 2 participants believe it is a promising for supply chain. To tackle disruptions and uncertainties being challenge day by day, and current pandemic making logistics and supply chain professionals realize the need for change, the participant's believe that EL model based on 3PL, blockchain and logistics 4.0 is helpful and can prove to be promising in coming times. Other than these, EL can transparency and achieve perfect order delivery, suggested 1 participant each. Participants were asked to predict market size growth for EL as well. Their response is reflected in below chart –

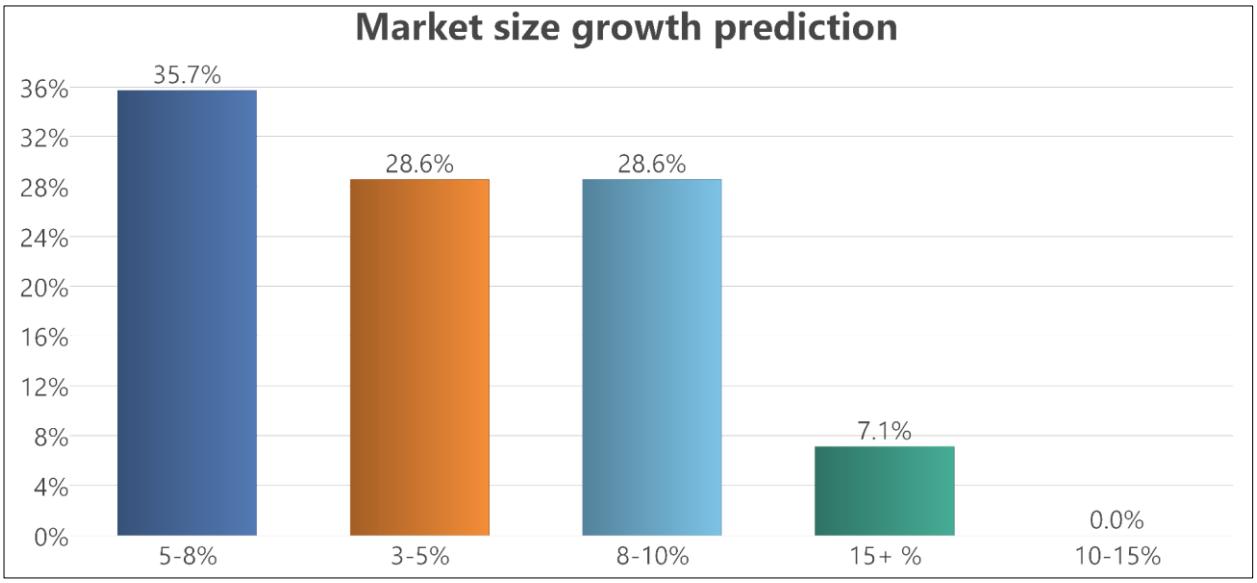


Figure 23: Elastic logistics market size growth prediction

As shown below, about 36% participants think that in EL will have market size growth of 5-8% as compared to current state. 28.6% believed that, looking at current pandemic situation, it will grow by 3-5%. However, the same number of participants believe that, as Elastic logistics could withstand uncertainties and disruptions, the market size growth of EL will by 8 to 10%. According to them, the current uncertain times will encourage the rise of this emerging technology it will be the future of supply chain. As there were no suggestions observed for the range of 10 to 15% growth in market size, however, 7.1% believed that EL market size will have the growth of more than 15%.

6. Conclusion and Recommendations

6.1 Conclusion

This research study has tried to show Elastic logistics will be benefiting supply chain in coming times. The fourth revolution of logistics has brought lot of advancements in the supply chain. The challenges and uncertainties will continue to grow, and the solution lies in being flexible to adapt according to changes. The critical literature review, interviews with industry professionals and the analysis of their feedback have concluded for following findings –

- Uncertainties and challenges are not new to logistics and logistics professionals will have to deal with them every day. Though there are many technological solutions available for logisticians today, the challenges continue to persist.
- Logistics has undergone evolution continuously with the time and it has evolved to the better version of it always. Starting from movement of goods to digitalization, logistics is looking for flexible solution to handle the challenges.
- There is necessity to update existing traditional models of logistics and adjoin flexibility to operations to tackle never-ending demand changes, decrease costs and ensure multichannel delivery.
- Elastic logistics is the ability of logistics to be flexible, i.e., expand and contract the logistics capabilities to adjust to the changing demands. At times of peak season and high demand, organizations hire extra staff or make the current staff work for extra hours. This expands the service providing capacity of the company, but after the season or fall in demand, the service capacity increased by hiring new staff is underutilized. Elastic logistics is the solution for these kinds of challenges. It is the readiness of logistics to operate the highly increase and decrease needs in manufacturing/production, warehousing, and transportation along with controlling costs, effectiveness, transparency, and customer satisfaction.
- Traditional logistics can be transformed into Elastic Logistics by outsourcing logistics services and application of modern technologies. EL can be enabled with the help of Third-party Logistics (3PL), Logistics 4.0 technologies and Blockchain.
- The solutions from EL can benefit transportation, as accurate tracking of shipment is possible with the help of blockchain. This information helps to plan capacity for incoming

freight and arrange the fleet accordingly. The warehousing activities can be streamlined and made to work smoothly with the help of automation. On-time delivery and perfect order delivery can be achieved with the help of last-mile delivery and perfect order delivery. For this, outsourcing from third-party logistics providers can play a crucial role.

- The firms utilizing 3PL services are satisfied with their logistics performance and believe to handle the tasks by the experts. Outsourcing from 3PL firms will take a toll in future.
- The 3PL providers are exposed to the risks mainly arising from pandemic and other uncertainties/disruptions. They are working towards adapting technological advancement like digitalization. The financial investment in such technologies is high, but looking at the benefits, this investment done by 3PL can give advantages to all its customers and suppliers. There is a win-win situation, as customer do not have to invest to build these technologies in their firm, and 3PL's technological capabilities will benefit many such customers and retain them over the time. Moreover, 3PL have excellent networking abilities, with their large number of fleets, they provide excellent service capacity to small as well as large scale companies. By committing a specific volume of shipments to the 3PL partner, they provide concession in their freight charges over a decided period of time.
- Blockchain is a competitive solution for logistics to support in many issues. It gives better visibility and transparency of operations which can help in planning and forecasting. The organizations can save costs as blockchain eliminate any intermediaries required for financial payments. The payments are done very quick with security. It has reduced the amount of paperwork and organizations are moving towards smart contracts with the help of blockchain.

However, it is observed that not many organizations are using this merging concept of EL, or the technologies related to it. Based on the interviews, it is observed that only fewer companies are adapting technologies like Blockchain, TMS, etc. It is because Elastic logistics is still an emerging concept and have recently started taking roots in supply chain. The adaption of technology and implementation throughout the various verticals of organization will be costly and time consuming. Moving towards digitalization and analyzing the data for planning and forecasting is practiced in most of the organization. This kind of analysis usually explore the root cause of issues. There are many organizations are trying to integrate all the departments in the organization on one platform, by introducing ERPs. Many leading

organizations and supply chains will adapt to this kind of logistics once they foresee the advantages it could bring to the logistics.

This topic can be explored more in detail. More number of logistics and supply chain experts can be interviewed to get their valuable feedback, to confirm the proposed model of EL. There are several companies started recently in last 5 years, working on the principles of Elastic logistics. The business model of those organizations can be studied and matched with the proposed model based on 3PL, Blockchain and Logistics 4.0. The feedback and guidance on adaptation of this kind of logistics solution from management level expert of EL based company can be extremely beneficial for this study.

6.2 Recommendation

The proposed model of Elastic Logistics can be utilized my any size of organization (small, medium, and large). The companies adapting to EL or technologies based on EL should also encourage their stakeholders to utilize the same. The stakeholders can be integrated on the technological platform, which will allow them to experience the benefits of the same and encourage to adapt to Elastic logistics. The large companies benefitting from EL can also help their suppliers and other stakeholders in terms of infrastructure and training to adapt to EL. This will strengthen the business relationships and help the suppliers to grow as well. When the performance of stakeholders and related parties is improved, the organization's performance is automatically improved. Elastic logistics can be explored further by academic individuals as there is not much literature available and the concept has yet to be explored. The business model can be applied, and its success can be then studied and made available to students and faculties as well.

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Appendices

Appendix 1: Research overview sent for participants

Master's Thesis – Elastic Logistics.

Name: Sagar Dhage

College: Griffith College Dublin

Dear Executive,

I am currently pursuing MSc in International Procurement and Supply Chain Management. I am conducting a dissertation on an emerging topic of SCM – Elastic Logistics. The purpose of this research is to learn more on factors influencing the capacity planning for logistics industry. I believe that the results of this study will be of great value to small and medium sized firms. Your opinions and answers are critical to the success of our study. This is a short summary on my research topic 'An exploratory study on how modern Supply Chain can thrive on Elastic Logistics.' Elastic Logistics commonly refers as the flexibility to expand or reduce (logistics) capabilities to accommodate with the changing demands within the supply chain during a given time frame. While logistics professionals work on strategies to mitigate the uncertainties, the technologies are growing at a fast pace and organizations need to optimize their logistics and supply chains to stay competitive.

Today's fast-moving world means that companies must be able to quickly expand or shrink their capabilities to meet the demand within the supply chain at any point in time. This flexibility is known as elastic logistics. Elastic Logistics (EL) is going to be the future of logistics with the help of big data, blockchain and automated logistical solutions working finely in coordination to optimize the supply chain. Blockchain is defined as a system in which a record of transactions are maintained across several computers that are linked peer-to-peer network. It is a distributed database existing on multiple computers at the same time. It is constantly growing as new sets of recordings, or 'blocks', are added to it. Each block contains a timestamp and a link to the previous block, so they form a chain. Blockchain's ability to act as a ledger makes it the perfect technology to facilitate shipment tracking, global contracts, and payment processing throughout the logistics industry. Blockchain offers an end-to-end solution for companies that want to run leaner, more organized and more efficient operations Elastic logistics also considers forecasting, which helps to build an acute infrastructure, which in return improves efficiency and reduces cost. Organizations and firms are unable to handle demand uncertainties or serve higher volume of demand. Logistics 4.0 and Automating are agile method to lift-up infrastructure of a firm cost effectively. You can deploy any machinery solutions as per the requirement. In this research, we will see how Elastic logistics will evolve in supply chain with the application of new technologies. With the rise in demand at a faster rate, new technologies are disrupting the market. With the use of elastic logistics practices comes efficiency, visibility, the ability to scale and optimize quickly, and increase overall customer satisfaction.

Example of Elastic Logistics (EL) –

A good example of EL is Dannon, a leading global food company that partnered with BluJay to address increasing customer demands and complexity in today's fast-changing marketplace. As customer-demand grew, Dannon needed a way to deliver products to supermarkets as quickly and efficiently as possible. This meant tracking hundreds of loads daily across three manufacturing plants, six distribution centers and liaising with numerous trucks from third-party carriers. The challenge was coordinating the above while meeting customer demands for better scheduling options and increasing on-time delivery windows. With BluJay's guidance, Dannon moved away from outdated processes and systems like communicating via faxes and phone calls between siloed departments to BluJay's unified transportation management solution (TMS) that allowed for real-time visibility between moving parts. Dannon leveraged the power of data captured in its TMS to support planning, execution, claims and appointment scheduling, enabling end-to-end control and visibility across the entire supply chain.

Appendix 2: Interview Questionnaire

Name: Sagar Dhage **Course:** MSPSM **Student no:** 3004043 **College:** Griffith College Dublin

Research topic: An exploratory study on how modern Supply Chain can thrive on ELASTIC LOGISTICS.

Questionnaire

1. How does your company perform logistics activities?

Ans:

2. Since how long have you been managing these Logistics and Freight Activities?

Ans:

3. How often do you face logistical challenges at you work?

Ans:

4. What are the challenges/uncertainties in the logistics or supply chain that your organization experiences? Can you share your experience with a major example that we might take as a learning?

Ans:

5. Due to the various challenges, do you feel need to implement changes for the improvement of the logistics process? How did you detect necessity of the changes?

Ans:

6. Are you aware of the next big wave in logistics technology? What are the latest trends that drive the logistics / Supply Chain?

Ans:

7. Does your organization outsource 3PL (Third-Party logistics services)? Can the 3PL provide expertise and performance-based results according to you?

Ans:

8. According to you, will the 3PL adjust to the logistics capacity according to the demand? If yes, how do you think it can help?

Ans:

9. According to you, how does block chain impact supply chain and logistics? Do you think it will add value to your business practice?

Ans:

10. Does your organization use any blockchain platform?

Ans:

11. Is your organization adopting the emerging technologies in logistics? What are the factors encouraging the use for it?

Ans:

12. What are your thoughts on Elastic technology? If yes, what according to you are the drivers of Elastic Logistics?

Ans:

13. Expected Market size for Elastic Logistics and growth rate?

Ans:

Appendix 3: List of participants contacted for interview

Interview Candidates	**Organization**	**Designation**	**Location**
Participant 1	Eaton India Pvt. Ltd	Associate Analyst	India

Participant 2	Flex India Pvt. Ltd.	Specialist - Logistics	India
Participant 3	WNS Global Services Pvt. Ltd	Senior Analyst	India
Participant 4	Entercoms	Consultant Supply Chain Solutions	India
Participant 5	Adani ports	Assistant Manager	India
Participant 6	Premier Logistics	Executive - Logistics	India
Participant 7	Darwish Cybertech	Executive - Supply Chain	India
Participant 8	Ceva Logistics	Logistics Coordinator	Ireland
Participant 9	Titan Solutions	Vice President	Ireland
Participant 10	Aramex Ireland Ltd.	Aerospace Logistics Manager	Ireland
Participant 11	DSV Solutions S.R.L.	International Road freight coordinator	Romania
Participant 12	TNT Romania SRL	Special Services Representative	Romania
Participant 13	Kuehne+Nagel	Supply chain design and network engineer	Luxembourg
Participant 14	DHL Global Forwarding	Station Manager	USA
Participant 15	Amazon Data Services UK	Specialist - Logistics	UK

Appendix 4: Codebook

Code	Sub-Code	Memo
Nature of work		What kind of logistics activities are performed?
	Warehousing - Inventory, Packaging, order processing, Materials	
	Manage supply chain for customers	
	Customs Support	
	Analytic Reports	
	Transform traditional to dogital supply chain	
Work Experience		
	0 to 5 Years	General question about total work experience in logistics/supply chain.
	10-15 years	
	15+ years	
	5-10 years	
Frequency of Challenges		
	Daily	
	Bi-weekly	
Types of Challenges		
	Cost-Savings/Rise in freight cost	Question regarding nature of challneges in logistics.
	Disruptions - Pandemic, Natural conditions	
	shortage of material, Meet the demand	
	On-time delivery	
	Customs Clearance	Delivering material on time
	One day/same delivery	
	Customer retention	
Necessity for Change		
	Need of change - Yes	Question regarding necessity of change in current prococess.
	Need of change - No	
	Increase 3PL, outsourcing	
	Technological/Digital	

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	Cross-Functional Allignment	
Upcoming Trends		
	Technological Trends - AI/RFID/Digitalization/Big Data	Question regarding upcoming trends in logistics that interviewee is aware of.
	Autonomous warehouse, Last-mile delivery	
	Elastic Logistics	
	Drone Delivery	
	Blockchain	
	Leagile Logistics	
	Upgrading Graphical standards	
3PL utilization and performance-based results		
	Outsourcing of 3PL - Yes	Question regarding, if the interviewee's company outsource 3PL and can 3PL provide expertise and performance based results.
	Outsourcing of 3PL - No	
	Expertise, performance-based results - Yes	
	Expertise, performance-based results - No	
3PL adjusting to demand		
	Demand Adjustment - Yes	If 3PL can adjust to changing demand and if yes, how?
	Demand Adjustment - No	
	Flexibility	
	Large number of fleets	
	Networking	
	Cost reduction	
Impact of Blockchain, value addition		

	Value addition to Business - Yes	How blockchain can impact on logistics and supply chain. Will it add value to the business?
	Value addition to Business - No	
	Transparency	
	Financial Payments	
	Security	
	Tracking	
	Smart Contracts	
	Accuracy	
Blockchain application in organization		
	Yes	Question regarding if Blockchain is implement in the interviewee's organization.
	No	
New developments in emerging technology		
	ERPs, APIs	What are the developments in participants organization?
	Analytics and Dashboards, Cloud based systems, etc.	
	Warehouse automation	
	Streamline the systems	
Views on EL		
	Futuristic	What does participant feel about Elastic Logistics (EL)?
	Helpful	
	Promising	
	Transparent	
	Perfect Delivery	
Drivers of EL		

	3PL	What are the main drivers that can enable Elastic Logistics?
	Blockchain	
	Logistics 4.0 - AI, Big-data, Cloud Computing, etc.	
Market size growth prediction		
	3-5%	
	5-8%	
	8-10%	
	10-15%	
	15+ %	