
# EXAMINING THE SKILLS GAP TO EFFECTIVELY MANAGE E-LOGISTICS IN SUPPLY CHAIN MANAGEMENT

**LUKHONA LENI**

**STUDENT NUMBER: 3329528**

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**Supervisor: Dr. Carolien van den Berg**

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**Declaration**

I hereby declare that the work titled Examining the skills requirements to manage e-Logistics in supply chain management effectively." is original to me, that it has not been submitted for consideration for any degree or examination at any other university, and that all sources cited or used in work have been appropriately cited and acknowledged.

Date: 05/06/2023 Signature: L.Leni

**Abstract**

The South African economy faces several obstacles, including political unpredictability that may deter investment, a high unemployment rate, inflation, crime, a trade imbalance, and a volatile exchange rate. However, one of the biggest obstacles is a lack of skills. In the globalised era, having access to knowledge and skills is essential for any nation to succeed. Those without the required abilities are left behind. Logistics service providers are converting their conventional logistics system into an e-Logistics system, given how drastically the internet's phenomenal expansion is altering how organisations conduct business. This thesis explains how the supply chain management sector has evolved significantly as a result of the advancements in information systems technology. An essential requirement for effective logistics management is the integration of Information Technology. Disintermediation will give the logistics function great leverage opportunities and boost its flexibility. As a result, the advancement of e-Logistics becomes crucial for the success of international operations. The study aims to determine the skills required by the e-Logistics industry and to inform on the need to develop a qualification to effectively address the skills gaps to manage e-Logistics in the supply chain management sector.

This was accomplished by focusing on two distinct objectives: first, to develop a conceptual framework to assess the skills required by the supply chain sector to manage e-Logistics. Then, inform on the need for qualification to effectively address the skills gap in managing e-Logistics, by accomplishing these objectives and proposing a conceptual framework of e-logistics skills in South Africa, which was developed after a thorough analysis of the literature related to the skills gaps in the supply chain management sector.

The study employed a case study methodology within a qualitative, interpretive research paradigm. The research subjects were 12 e-Logistics professionals in the Western Cape, South Africa. Data was gathered through purposive sampling; the research instruments abundantly provided qualitative data. Five findings indicated that e-logistics skills combine traditional and digital technology skills. The study also recommends qualifications in e-logistics, including a partnership between Higher Education Institutions and Industry to produce highly skilled e-Logistics professionals.

This study contributes to the knowledge of Information Systems by adding contemporary literature on e-logistics skill sets for e-logistics professionals, which currently seems insufficient. This study will benefit senior-level managers in the Supply Chain Management Sector by enabling them to identify skills they can enhance. Higher Education Institutions can

use the findings from the study to establish curricula that will facilitate the skills required for the e-logistics workforce.

Areas for further research might examine the effectiveness of the current e-Logistics qualifications introduced in universities not more than five years ago in equipping graduates with the e-Logistics skills and competencies that emerged in the present study. Another area of research is determining how the skills shortages affect the South African economy. This may push the nation to make the necessary changes to this dire situation. Another area of research is on the skills and competencies required to manage logistics 4.0, as Logistics 4.0 results from digital transformation.

**Keywords**

e-Logistics

Skills gap

Information Technology

Logistics

Information Systems

e-Commerce

Supply Chain Management

Digital Skills

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To my Husband, Olwethu Sokhaya, whom I met during the first year of my undergraduate studies at the University of the Western Cape, thank you for continually serving as a reservoir of strength and inspiration during my academic journey.

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**Dedication**

Mamawamu, this is for you.

You have worked tremendously hard to provide me with the opportunities you were never afforded when growing up. For this, I will be forever grateful.

Nolakhe Leni, as a symbol of my gratitude for all you have done and continue to do for me, I dedicate this master's thesis to you.

Table of Contents

## LIST OF FIGURES



## LIST OF TABLES

## List of abbreviations

| *Abbreviation* | *Full term* |
|---|---|
| ***3PL*** | Third-party logistics |
| ***B2B*** | Business to Business |
| ***B2C*** | Business to consumer |
| ***e-Commerce*** | Electronic Commerce |
| ***e-SCM*** | Electronic Supply Chain Management |
| ***FET*** | Further Education Training |
| ***HEI*** | Higher Education Institution |
| ***ICT*** | Information and Communications Technology |
| ***ICT*** | Information and Communication Technology |
| ***IoT*** | Internet of Things |
| ***IS*** | Information Systems |
| ***IT*** | Information Technology |
| ***JIT*** | Just in Time |
| ***SA*** | South Africa |
| ***SAPICS*** | South African Production and Inventory Control Society |
| ***SCM*** | Supply Chain Management |
| ***LSP*** | Logistics service provider |
| ***E-Procurement*** | Eletronic procurement |
| ***E-fulfilment*** | e-commerce fulfilment |
| ***CSCMP*** | Council of Supply Chain Management Professionals |
| ***ASEAN*** | Association of Southeast Asian Nations |
| ***WWW*** | World Wide Web |

**Definitions of key concepts used**

All of the chapters' discussions use the concepts and definitions listed below.

| *Concept* | *Description* | *Source* |
|---|---|---|
| ***Logistics*** | The chain of distribution is in charge of planning, implementing, and managing the efficient and productive movement of commodities, activities, and corresponding information from the initial stages of production until the consumption to satisfy consumer needs ( Lambert, Cooper and Pagh, 1998) | (Lambert, Cooper, and Pagh, 1998) |
| ***e-Logistics*** | Electronic logistics (e-Logistics) is written in numerous ways, and its widespread acceptance is unclear, for example, e-Logistics, e-Logistics, eLogistics, and e-logistics. This study uses the term "e-Logistics" throughout the study. Understanding e-Logistics better is vital to comprehend the skills required to manage e-Logistics in the supply chain management sector. | (Sarkis, Meade, and Talluri, 2017; Miscevic, Tijan, Žgaljić, and Jardas, 2018; Gunasekaran, Ngai, and Cheng, 2007) |
| ***Skills*** | Knowing how to do something properly requires knowledge and competence, both skills. | (Young, 1992; Boucher, 2020) |
| ***Competence*** | Competency is described as the capacity to apply or use the collection of linked information, skills, and abilities needed to complete "essential job functions" or tasks in a specific work | (Le Deist, and Winterton, 2005; Horváth, 2019; Long and Magerko, 2020) |

| | | |
|---|---|---|
| | environment. | |
| ***Supply Chain Management*** | Supply chain management includes all processes that turn raw resources into final goods and manages the movement of goods and services. | (Fan and Stevenson, 2018; Farooque, Sweeney, Grant, and Mangan, 2018; Zhang, A Thürer, Qu, and Huisingh, 2019) |
| ***e-Commerce*** | Conducting business electronically through the internet. | (Laudon and Traver, 2013; Bhatti, Akram, Basit, Khan, Raza and Naqvi, 2020; (Taher, 2021) |
| ***Information Technology*** | All aspects of electronic data creation, processing, storage, transmission, and interchange fall under the umbrella of information technology (IT). Computers, networking, storage, and other tangible objects are all part of IT. | (Lee, Yun, Pyka, Won, Kodama, Schiuma, Park, Jeon, Park, Jung, and Yan, 2018) |
| ***Information Systems*** | Technically speaking, an information system (IS) is a collection of interconnected parts that gather, process, store and distribute data to assist decision-making and control inside an organisation. Information systems combine hardware, software, and other components. and communication networks that people design and use to gather, create, and disseminate meaningful data, generally in corporate settings. Information systems are interconnected parts that collaborate to gather, analyse, store, and disseminate data to assist organisational decision- | (Rainer and Prince, 2021; Stair and Reynolds, 2020) |

| | | |
|---|---|---|
| | making, coordination, control, analysis, and visualisation | |
| ***Conceptual Framework*** | One or more formal theories, in whole or in part, as well as additional ideas and empirical data from the literature, are all included in a conceptual framework. It demonstrates the connections between these concepts and how they relate to the research topic. In qualitative research in the social and behavioural sciences, for instance, conceptual frameworks are frequently used because it is frequently the case that one theory cannot adequately explain the phenomenon under study. | Kivunja, 2018; Regoniel 2020;Varpio, Paradis, Uijtdehaage and Young, 2020) |
| ***e-Supply chain management*** | Electronic supply chain management (e-SCM) is the cooperative application of technology to enhance the administration and operations of supply networks. | (Min, Zacharia, and Smith, 2019; Alzoubi, 2018) |
| ***Globalisation*** | The process through which companies or other institutions start operating internationally or gain global influence. | Kulczyk,Perevosova,Syniavska and Davydova, 2019) |
| ***Industry 4.0*** | Introducing new technology transforms industrial manufacturing and production systems, often called the fourth industrial revolution.<br>The previous industrial revolution, founded on combining robotics and process automation, aimed to go further. This new revolution | (Piccarozzi, Aquilani and Gatti, 2018; Culot, Nassimbeni, Orzes, and Sartor 2020; Oztemel and Gursev, 2020) |

| | | |
|---|---|---|
| | intends to build intelligent factories that can more easily adapt to the demands and procedures of manufacturing. | |

# CHAPTER 1: THESIS INTRODUCTION

## 1.1 Background and Rational of the study

The logistics discipline has transformed drastically since the 1990s, as logistics is currently part of supply chain management and not a standalone subject area (Radivojević and Milosavljević, 2019). Information Technology has changed the logistics industry, making knowledge management vital (Winkelhaus and Grosse, 2020). Global competition in the twenty-first century is propelling businesses worldwide to re-examine their logistics operations and systems to decrease costs and improve the quality of service (Bawack, Wamba, Carillo, and Akter, 2022.). Logistics have become a crucial way to enhance material flow efficiency, decreasing distribution costs in different businesses, and establishing e-commerce have increased the logistics industry (Yu, Wang, Zhong and Huang 2016).

Semerádová and Weinlich (2022) define e-Commerce broadly as any economic activity performed through electronic connections; even though this is a broad definition, they argue that it highlights two crucial aspects: economic activity and electronic relationships. E-commerce has increased the logistics market and promoted the establishment of logistics-related technologies (Yu, Jing & Quang, 2016). The activity of performing e-Logistics electronically, internally, or through e-commerce is called e-Logistics (Imraan et al., 2019).

The rapid expansion of the internet is shifting the business landscape, encouraging companies that provide logistics services to anticipate a shift to electronic logistics systems (Büyüközkan, Feyzioğlu, and Nebol, 2008). When traditional logistics are performed electronically, internally, or through e-commerce, it is called e-Logistics (Imraan, Hamid, Aziz & Hameed, 2019). Without an effective and efficient logistics system, the benefits of e-commerce, whether focusing on business-to-business (B2B) or Business consumer (B2C), would not be realised (Xianglian & Hua, 2013). Therefore, efficient e-Logistics is required to remain competitive (Sarkis, Meade & Talluri 2020). To stay competitive, organisations should establish innovative ways for recruiting, upskilling, and training the current and future workforce (Chung, Gesing, Chaturvedi, and Bodenbenner, 2018).

Technology has been driving a revolution in logistics. Businesses with solid digital skills that can conduct online transactions and give cargo visibility and traceability are better positioned. Investments in technology, including cloud computing, automation, the Internet of Things (IoT), and data analytics, would be required for this. Robotics, drones, and autonomous vehicles may eventually lessen the risk of labour shortages for providers of logistical services.

The world's social and economic systems have been devastated by the COVID-19 epidemic. The effects of this pandemic, or "great shock," have affected global supply networks and manufacturing systems (Urgan and Kurubacak, 2021). There are several uncertainties and hazards worldwide because of globalisation, which accelerates the process of supply chain interdependence and poses challenges for both individuals and the global supply chain (Gultekin, Demir, Gunduz, Cura and Ozer, 2022).

Considering the recent World Economic Forum 2021, consumer e-commerce deliveries climbed by 25% in 2020, with part of the increased demand anticipated to persist well after the epidemic. Last-mile vaccination delivery is a persistent issue for nations and logistics companies; critical solutions like data integration and centralized management can guarantee efficient delivery. In 2021 COVID-19 changed how individuals purchase items, causing an increase in internet shopping and e-commerce deliveries (Choi, 2021).

Industry 4.0, which builds on the digitisation theme, is anticipated to impact supply chains' functioning. The Word Economic Forum highlights the increased importance of lifelong learning and the expansion of industry 4.0-capable occupations. While some roles are anticipated to go, others are predicted to evolve, and some new roles will be formed (WEF, 2018). Focusing on people management becomes even more crucial if the future of work entails change and calls for ongoing learning. Executives must make failure safe and generate learning chances (van Hoek, Gibson, and Johnson, 2020).

Industry 4.0 may have gotten more traction because of COVID-19. Technology augmentation has grown more valuable due to the shift to remote working and social isolation, and managers may have "jumped" the learning curve. The critical question is whether managers would be enticed to go back to "old ways" or if they will find themselves advancing the transformation by utilising new competencies and skills (Chen, Feng, and Shen, 2022).

Therefore, there is a need in the supply chain management sector to attract Information Technology (IT) or Digital Technology professionals, as their role in logistics is vital to the successful operation of logistics businesses. Those who rely on data analytics, data handling, and further technology developments (DHL, 2018). PWC (2018) claims that critical challenge management will face the shortage of qualified supply chain managers and that substantial transformation in logistics and supply chain curricula is required to meet these challenges. Although there are initiatives from the large logistics business in training and skills development, South Africa still requires an innovative approach that will help grow the labour force and facilitate skills development and transfer (Havenga, De Bod, Simpson, Viljoen, King, 2016)

## 1.2 Description of the Problem

Creating a robust logistical value chain and forming strategic relationships are essential for success in the dynamic world of e-commerce and logistics (Winkelhaus and Grosse, 2020). Nevertheless, the rapid development of e-Logistics and related technological advances pose serious administrative difficulties (Bawack, Wamba, Carillo, and Akter, 2022). The abilities e-Logistics experts need to manage these developments successfully become a major worry as the sector continues to expand dramatically (Semerádová and Weinlich, 2022). Building strategic alliances based on core skills while creating a logistical value chain presents various managerial problems for e-Logistics (Lai, Feng, and Zhu, 2023). Future e-Logistics growth will be exponential, and this change will significantly impact the industry's skills requirements (Qurtubi, Janari and Febrianti, 2021). This presents a problem regarding the skills required by e-Logistics professionals to manage the technological changes impacting the supply chain management sector. An examination of the literature reveals skills needed for senior logistics managers and digital skills; however, there is limited research on the requirements to effectively address the skills gap to manage e-Logistics in supply chain management in South Africa. The present paper seeks to solve the issue of e-logistics skill requirements, emphasising the South African supply chain management industry.

## 1.3 Aims and Objectives of the Study



The study had one aim which are formulated on evidence of the skills gaps in e-Logistics that are described in the problem statement in Section 1.2**:**

- To inform on the need for developing a qualification to effectively address the skills gaps to manage e-Logistics in the supply chain management sector.

The study focused on two main objectives: identifying and measuring the initiatives and benchmarks related to e-logistics skills.

1. To develop a conceptual framework to assess the skills required by the supply chain sector to manage e-Logistics.
2. To determine the qualification needed to effectively address the skills gap in managing e-Logistics.

### 1.4 Main Research Question and Sub Question

The research question for this study is:

**What are the requirements to address the skills gap in managing e-Logistics in supply chain management?**

The following two sub-questions are included to support answering the primary research question.

1. What skills are required to manage e-Logistics in the supply chain management sector?
2. Is there a need for a qualification that will address the skills gap to manage e-Logistics effectively?

### 1.5 Research Methodology

The study is positioned within an interpretive qualitative research paradigm. The interpretive research paradigm will allow the researcher to see the world through the perceptions and experiences of the participants (Thanh, Thi, and Thanh, 2015). Examinations of information systems are increasingly using qualitative research methods (Paré, 2004). By examining the opinions, actions, and context of the people involved in these situations, qualitative research aims to understand issues or specific conditions (Marshall et al., 2013). Qualitative research uses data in words rather than figures and is carried out realistically (Chen and Hirschheim 2004).



Observations, interviews, and documents are the primary qualitative data sources, which are then examined using a range of systematic procedures (Myers, 2019). Within the information systems community, qualitative research has gained legitimacy because there is no relevant source. Researchers have historically consulted the social sciences for their information (Kaplan and Maxwell, 2005). Qualitative research methods have advantages in that they are used to comprehend the significance and context of the case under study and the specific events and processes that shape them across time in natural environments (Goldkuhl, 2012).

Contextual considerations are considered when evaluating computer information systems. These considerations include social, cultural, organisational, and political concerns related to information technology and the processes involved in developing, installing, and using (or not using) information systems (Myers and Avison, 2002). Earlier research on this matter has established logisticians' skills using quantitative methods. The abilities required for e-Logistics in the supply chain management industry are not well covered in prior studies (Dubey et al., 2018; McKinnon et al.,2017; Kovacs et al.,2012; Thai et al.,2011; Rahman and Yang, 2009;

Murphy and Poist 2006; 2007; 1991; Myers et al.,2004; Gammelgaard and Larson 2001). Consequently, this study seeks to advance knowledge by using qualitative methods. The qualitative research strategy is described in Chapter 3.

### 1.5.1 Research Design

There are six standard qualitative research designs phenomenological, ethnographic, grounded theory, historical, case study, and action research (Maxwell, 2012). This study used a case study design, as case studies are usually qualitative and aim to give a thorough account of a few made use of case study design, as case studies are usually qualitative and aim to give a thorough account of a little number of cases, less than 50 (Mouton, 2002).

A case study strategy can use various research methods and is integral to an Information Systems (IS) research methodology. It is an acceptable alternative to the more conventional paths of inquiry; this scientific research method has gained appeal in the field of Information Systems. Studies of businesses or organisations are often the focus of case study research (Irani et al., 1999). Numerous pieces of evidence enable the researcher to offer a strong argument in response to the questions. It is not crucial to the validity of the case study research design that a case study should be generalisable. An analysis of a case is more pertinent and significant than how generalisable it is (Lubbe, 2013). Typically, how and why are used in case study research questions.

Case study research questions ought to address the essence of what (case) the study is about (Yin, 2003). Using these justifications for this study, the researcher could comprehend the skills needed for e-Logistics. A comprehensive analysis of the case study design and its drawbacks is provided in Chapter 3.



### 1.5.2 Research Site

Twelve (12) e-Logistics professionals in the Western Cape Province were used as the research for this study. These professionals have been selected based on their career profiles and their organisation. The participants are at different levels of their careers and roles in their respective e-Logistics companies in the supply chain management sector.

### 1.5.3 Research Participants

For a qualitative researcher, gathering specific cases, events, or acts that can further or clarify their understanding of the phenomena under study is the primary goal of sampling. Their main

objective is to identify instances or analytical units that will add to other researchers' knowledge of a specific aspect of social life or phenomenon (Kothari, 2004). The sampling method that is more suitable for qualitative research is purposeful or judgemental, especially when participants are chosen for specific conditions (Ishak and Bakar, 2014). When choosing examples for this sample process, an expert's opinion is used, or the researcher chooses cases with a particular goal in mind (Rai and Thapa, 2015). In three different case study scenarios, purposeful sampling is helpful: (1) when a researcher wants to choose particularly instructive cases; (2) when a researcher wants to choose members of a hard-to-reach, specialised population; and (3) when a researcher wants to pinpoint specific case types for in-depth investigation (Etikan, Musa and Alkassim, 2016). Purposive sampling was deemed most suitable because the study, as the researcher, targeted specifically e-Logistics professionals in South Africa who have experience in e-Logistics in the supply chain sector.

### 1.5.4 Data Collection Instrument

According to Yin (2003), qualitative data sources consist of participant observation and observation, interviews, surveys, papers, and writings. If one distinguishes humanity from the rest of nature, it is our capacity for communication (Gill et al., 2008). This observation is the driving force for qualitative study instead of quantitative research. Researchers can better comprehend people and the social and cultural circumstances in which they live by using qualitative research methodologies (Kaplan and Maxwell, 1994). The data collection instrument fitting for the study is online interviews with e-Logistics professionals. Further detail is presented in Chapter 3.



### 1.5.5 Data Analysis Process

Thematic analysis, a qualitative analysis, was used to categorise emerging themes from the quantitative analysis and explore certain vital concepts. Thematic Analysis is deemed the most fitting for this study as it tries to discover answers through interpretations (Alhojailan, 2012). It was used to analyse groupings and place them into patterns aligned with the data. It offers an organised component element to data analysis, enabling the researcher to analyse the occurrence of a theme within the content. This added accuracy and validity to the research. To analyse qualitative data, the researcher used ATLAS. Ti software. A thorough explanation of the data analysis is presented in Chapter 3.

### 1.6 Significance of this research

Given that Higher Education Institutions (HEI) are the primary source of trained graduates. It makes sense for academic institutions to understand what skills the supply chain industry requires. To manage e-Logistics and maximise potential graduate professionals' employment opportunities, particularly in a rapidly evolving field like ICT. Research studies e-Logistics skills are incredibly uncommon. As a result, this research is vital since it tries to figure out the required skills for e-Logistics professionals and whether there is a need for a qualification to address the skills gap. This research is intended to help reduce the skills gap in the supply chain management sector, at least in e-Logistics skills.

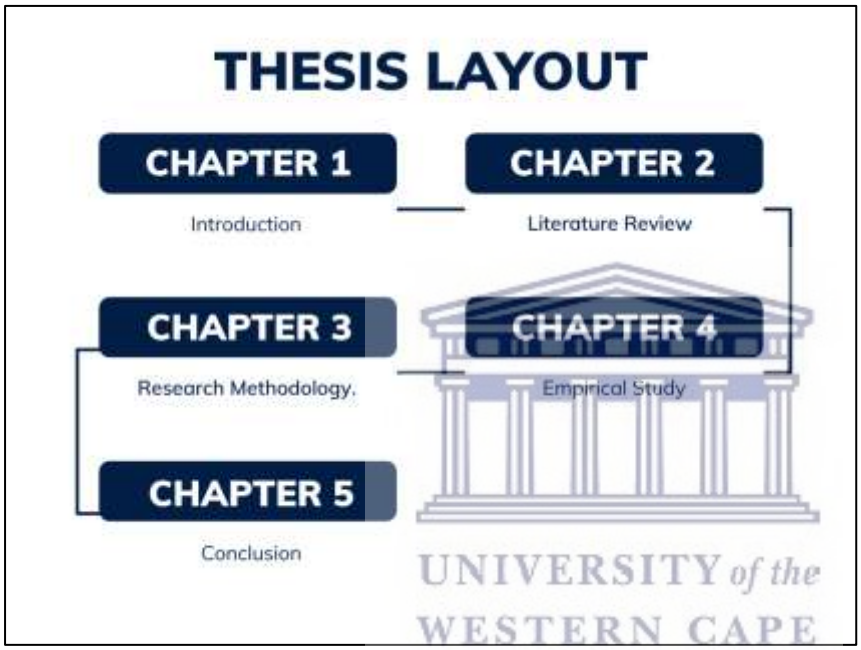


*Figure 1: Thesis Layout*

### 1.7 Thesis Layout

The chapters in this study are as follows:

**Chapter 1: Thesis Introduction**

The research's objectives and purpose are introduced in Chapter 1. This chapter explains the driving force for the study.

**Chapter 2: Literature Review**

A literature review is offered in this chapter to comprehend the origin of e-logistics, the skills requirements to manage e-logistics and to determine if there is a need for an e-Logistics qualification. A conceptual framework is presented.

**Chapter 3 Methodology**

This chapter discusses research methodologies, including research paradigms, approaches and methodologies. In this chapter, the selected strategy is defended and motivated. This study's research strategy and technique application are described.

**Chapter 4 Empirical Study**

The methodology used to interview participants and gather and analyse data using a qualitative approach is covered in Chapter 5. It provides an explanation of the research methodology used.

**Chapter 5 Conclusion**

The study's executive summary is presented in Chapter 5. This chapter presents the recommendations based on the gathered and analysed data. Qualitative is the methodology in the study, and its principles are used to assess the research's rigour. The study's limitations are acknowledged, along with suggestions for future research.

### 1.8 Chapter Summary

This chapter introduces the study and provides a general overview e-Logistics. Both the problem statement and the study's background were presented. In order to address the issue of the study, the research questions and objectives were also prepared. The chapter also offers a reason and rationale for the study. A summary of essential theories and earlier research on the subject is given in the following chapter.



## Chapter 2: Literature Review

## 2.1 Introduction

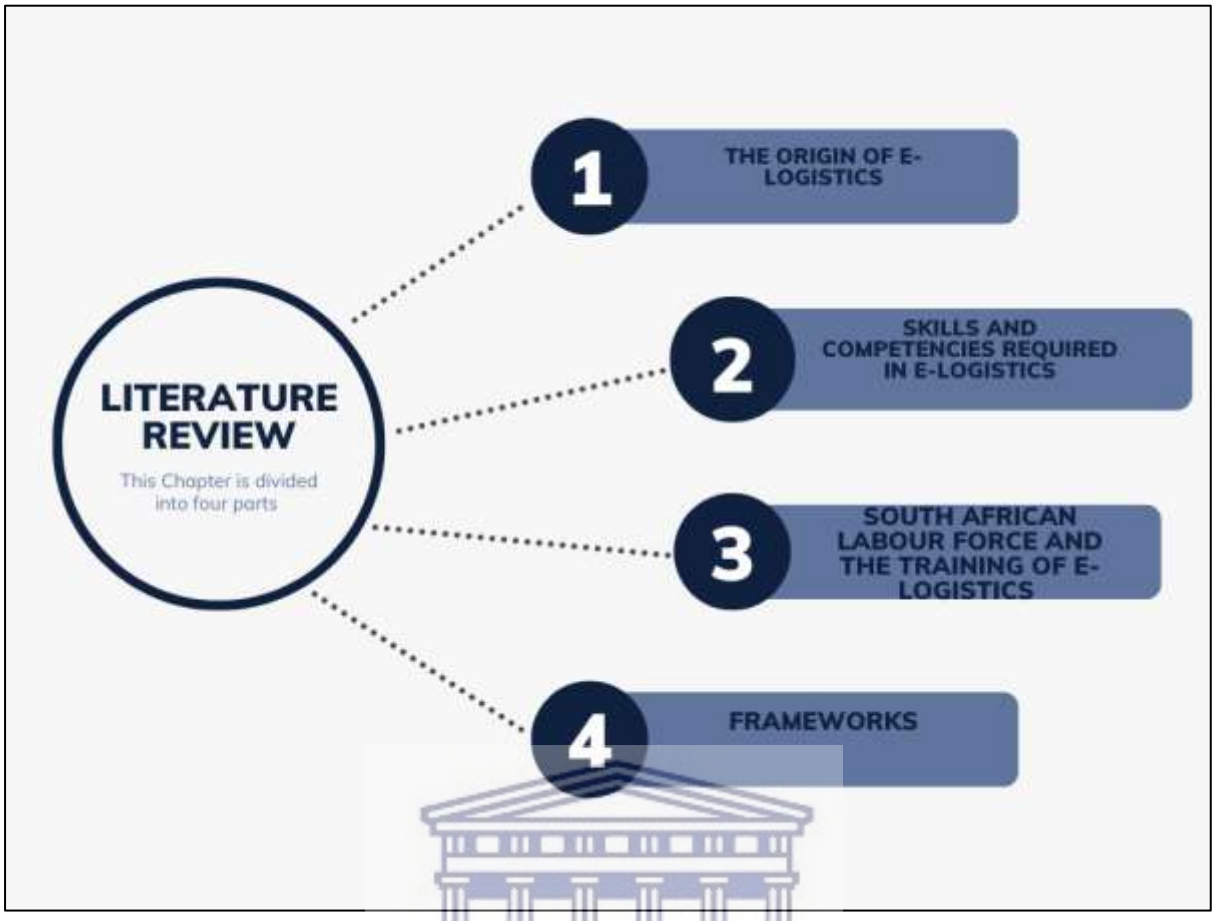


*Figure 2: Chapter 2 Structure*

There are four sections to the literature review done for this study. This first part discusses the history of e-Logistics, defining e-Logistics and its impact on the digital economy. After that, the skills and competencies required in e-Logistics are discussed, which aided in achieving research objective 1. Part 3 of this chapter discussed the South African Labour force and training in e-logistics skills. It also evaluates whether a qualification is required to manage e-logistics. Several are evaluated in the last part of this chapter to determine which logistics skill framework is most appropriate for this study. The chapter closes by presenting a theoretical framework based on literature.



## 2.2 Part 1: The Origin of e-Logistics

Part one of the literature review focuses on the origin of e-logistics. It starts with the history and functions of logistics. After that, it examines the effects of the digital economy on the logistics industry. The impact of globalisation is discussed as the difference between

traditional and electronic logistics. The history of e-logistics is critically examined and then defined, and the logistic process is analysed.

### 2.2.1 The History of Logistics

Managers and scholars have shown great interest in Supply Chain Management (SCM), which is increasingly viewed as a controlling factor in strategy and a successful technique for delivering consumer value (Houlihan, 1985; Cox, 1999; Simchi-Levi and Kaminsky, 1999; Croxton, Garcia-Dastugue and Lambert, 2001; Stadtler, 2008; Min, Zachatia and Smith, 2019). To obtain raw materials, transform these raw materials into finished products, and distribute these finished products to clients, a network of suppliers, production facilities, warehouses, and distribution networks is known as a supply chain (Zhou and Matin, 2008). A supply chain's network of individual firms' and organisations' logistics systems and associated operations is known as the supply chain management (SCM) network (Kanagavalli and Azeez, 2019). This dates to the 1980s, although high-level business management did not start paying attention to it until the 1990s. One of the crucial aspects of planning operations in a manufacturing company is the effective design and operation of supply chains (Dumanska and Matviiets, 2021). Determining the design of the network, or the quantity, location, capacity, and technology of the facilities, is a part of supply chain planning at the strategic level ( Ilchenko, Freiuk, 2020). Choosing the overall quantities and material flows for product purchase, processing, and distribution is part of tactical-level supply chain planning (Dębkowska, 2017). The strategic design of the supply chain has a long-lasting effect on the company because it is a significant determinant of effective tactical operations (Mutisiya, 2016).



A supply chain is a collection of companies connected through upstream and downstream links to the many processes and activities that produce value in goods and services that end users can purchase (Frederico, Garza-Reyes, Anosike, and Kumar, 2019).

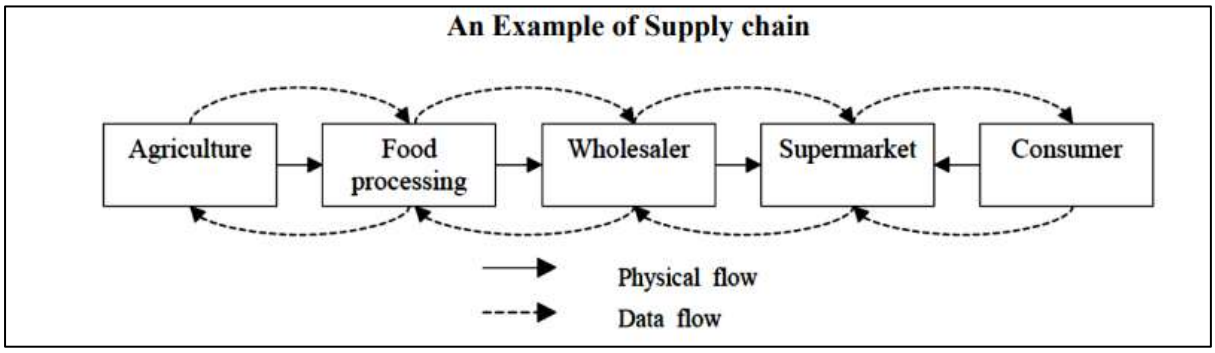


*Figure 3: An example of a Supply Chain. Source: Lumsden, 2010*

The data and physical flow are two significant streams shown in the diagram above. Every component of the supply chain that depends on transmitted data to increase efficiency will be impacted by e-commerce (Barenji, Wang, Li, and Guerra-Zubiaga 2019). Although most products require physical shipping, it is still possible to determine the logistical needs for e-commerce by looking at the e-commerce customers (Boysen, De Koster, and Weidinger, 2019). Demands for future reliance on seamless integration of these processes will rise from being an advantage over rivals to a requirement. While there are only virtual (abstract) ties between the nodes in external logistics (between chains of organisations), fixed installations or permanent information connections frequently create an interconnection between the recipient and the sender in internal logistics within a plant.

A supply chain has been acknowledged as a crucial strategy to boost an organisation's market share, which will raise shareholder value and help them become more internationally competitive. It benefits from various ideas established in many fields, including operations research, logistics, economics, system dynamics, marketing, information systems, and system dynamics. Several ideas and tactics are used when building and managing supply networks (Simchi-Levi and Kaminsky 1999). Given the growing significance of supply chain integration, the challenge for research is to concentrate greater emphasis on supply chain modelling (Tayur et al., 1999). The Council of Logistics Management published a revised definition of logistics in October 1998 in response to the growing divergence between SCM and logistics. The Council states that logistics management is a component of SCM in the updated definition (Lambert and Cooper, 2002). Ayers (2001) demonstrates how much money may be saved by logistical operations, and one possible action is to include logistics in the supply chain. The following definition is simple to understand logistics is the process of organising, implementing, and managing the movement, storage, and related information of goods, services, and related information from the beginning until the conclusion of consumption to satisfy the needs of customers (Jahre, Pazirandeh and Van Wassenhove, 2016; Couture, Alshubiri, 2017 Faber, Gu, and Liu 2018). The term logistics refers to the coordination of two or more tasks to efficiently organise, carry out, and manage the movement of goods from the origin to the site of consumption (Nam and Song, 2012; Jahre, Pazirandeh and Van Wassenhove, 2016; Amr, Ezzat and Kassem, 2016; Jafari, 2015). Information, transportation, inventory, warehousing, material handling, and packaging are all integrated into logistics (Božić, 2022). Depending on where it came from, logistics is frequently associated with operations related to distribution, such as supply and transit, Supply Chain Management, pipeline management, or physical product distribution (Harrison, Skipworth and van Hoek, 2019). Whatever the terminology, delivering the right things arrive at the proper time and location and in the condition that the

consumers' demand is the fundamental concept of logistics (Attwood, Peter, and Nigel Attwood, 1992).

### 2.2.2 7 Key Functions of logistics

Moving products throughout a company's supply chain is known as logistics (Waters, 2019). However, to enhance the productivity and reliability of the organisation's supply chain, several functions involved in this process must be appropriately managed (Tang and Veelenturf, 2019).

#### 2.2.2.1 Order Processing

A logistics company's primary responsibility is order processing (Facchini, Oleśków-Szłapka, Ranieri, and Urbinati, 2019). Order processing, which may fall under the purview of the commercial department of the logistics organisation, is the first step in the logistics process (Acero, Torralba, Pérez-Moya, and Pozo, 2019). Before processing the order within the organisation, the commercial department confirms that the payment and delivery terms have been met (Iliev, Kyurkchiev, and Markov, 2015).

#### 2.2.2.2 Materials Handling

This is the practice of material handling, which involves transferring products within a warehouse (Azizi, Yazdi, and Humairi, 2018). It involves handling the inventory in a way that enables the warehouse to fill orders promptly and accurately. Even though it seems like a typical task, it is essential and needs to be done frequently (Sarkis, Meade, and Talluri, 2017).



#### 2.2.2.3 Information

Logistics is essentially the movement of inventory along a supply chain based on information. Consequently, an information system is essential for providing clients with a higher level of service (Galkin, A., Dolia, C. and Davidich, N., 2017). Utilising IT solutions for logistics operations such as information identification, access, storage, analysis, retrieval, and decision support in assisting business organisations in becoming more competitive (Winkelhaus, S. and Grosse, E.H., 2020; Liu, Liang, Bao, Qin, and Lim, 2022)

#### 2.2.2.4 Warehousing

Storage of finished goods before delivery is referred to as warehousing, essential to a company's logistics operations (Marchuk, Harmash, and Ovdiienko, 2020). The appropriate warehousing selections impact the efficacy of a company's marketing (Nantee and Sureeyatanapas, 2021). Technology advancements have greatly enhanced warehousing (Buntak, Kovačić, and Mutavdžija, 2019). Older multi-storey automated warehouses with staff have been replaced with single-story automated warehouses (Srinivas and Marathe, 2021). Warehousing is a crucial logistics decision-making area (Gutelius and Theodore, 2019).

#### 2.2.2.5 Inventory Management

A logistics company's most crucial task is inventory management (Song, van Houtum, and Van Mieghem, 2020). Inventory management's main objective is to have sufficient stock to meet client demand while minimising carrying costs (Richards and Grinsted, 2020). Offering top-notch customer service while avoiding market share loss and the associated costs is a balancing act (Huang, Fang, and Lin, 2020).

#### 2.2.2.6 Transportation

Since transportation enables the movement of goods from the provider to the customer, it is the most significant and fundamental logistical function in supply chain management (Perego, Perotti, and Mangiaracina, 2011). Orders placed by customers are not considered to be fully paid for until the products are physically delivered to the customer's address (Humayun, M., Jhanjhi, N.Z., Hamid, B. and Ahmed, G., 2020) 60 to 70 per cent of logistical expenses go toward transportation, especially for products with low unit prices and broad consumer appeal. Items are physically moved using various transportation methods, including rail, truck, water, and air (Karrieva, Y., 2020). Businesses choose their modes of transportation based on the state's or region's transportation systems. The cost should always be considered when selecting a mode of transportation. However, the customer's need for the product may occasionally overcome the economic concern (Castaneda, Ghorbani, Ammouriova, Panadero, and Juan, 2022).

#### 2.2.2.7 Packaging

A crucial component of logistics management tasks is the packaging. Altering the physical flow of a product affects the logistics system's efficacy. It differs from package design, driven by marketing objectives (Escursell, Llorach-Massana, and Roncero, 2021). However, logistical packing is essential for item handling, breakage avoidance, and practical storage space

utilisation. Logistical packaging is highly impacted by load utilisation in terms of the cost of packing (Castaneda, Ghorbani, Ammouriova, Panadero, and Juan, 2022).

### 2.2.3 The Impact of Globalisation

Global communications became possible in the 1990s with the help of the Internet, an open-system computer network with significantly cheaper running costs. Cyberspace on the World Wide Web (WWW) has given businesses a chance to develop electronic commerce (e-commerce) with clients directly or with other business entities that may subsequently cooperate in the SCM (Bayles, 2001).

Globalisation has led to advancements in logistics science. The importance of SCM and the connections between sources, intermediaries, producers, purchasers, and end users have increased. The way that items are sold and transported has been entirely transformed by the internet and e-commerce (Kanagavalli and Azeez, 2019). Customers need customised products supplied quickly, conveniently, and with total order flexibility. Today's customers expect to be able to track their orders quickly from when they place them until they reach their doorstep, as well as to split their orders for various ship-to addresses, reroute parcels, and calculate delivery costs and time-in-transit (Ilchenko and Freiuk, 2020). Whether they are consumers or businesses, buyers claim they will not tolerate situations like partial shipments of items on a payment plan basis, bad product return policies, or surprise backorder performance due to the power transfer from the supplier to the buyer.

Notably, the Internet has significantly impacted how people interact with one another, study, and work, as well as go about daily activities like shopping. An online marketplace called electronic commerce (E-commerce) enables people to buy and sell goods. The OECD defined e-commerce as "an electronic transaction that involves the selling or purchase of goods or services" in 2001. Networks mediated by computers are utilised for inter-organisational commerce. E-commerce is the term for conducting business using electronic tools and technologies (Manzoor, 2010). Today, e-commerce is most frequently used for vendor and product information research. This is one of the significant contributing factors why some retailers only have a Web page on the Internet where they merely promote their goods. Other businesses, however, have more sophisticated online procurement systems that enable a buyer to electronically verify stock availability, negotiate a price, place an order, track the purchase status, generate an invoice, and collect payment. The ultimate method for e-commerce procurement is still in the works and will change over time. According to Ross (2003), e-Commerce significantly impacts the logistics function in most organisations, causing

the distance between suppliers, manufacturers, distributors, customers, and consumers to continue to decrease. Organisations are being forced by e-Commerce to re-evaluate their value propositions, market suppositions, and value delivery mechanisms.

The SCM concept has reached a new level thanks to Internet technologies. With e-Logistics technology, SCM has transformed from an internal cost and productivity optimisation technique into a potent strategic function that can design external, Internet-enabled collaborative channel alliances to create new customer value propositions (Ross, 2003). The natural fusion of supply chain and e-commerce, an e-supply chain, is the wave of change that will sweep away outdated paradigms and completely alter how businesses operate.

e-SCM is quickly turning into an integral part of the international logistics sector. It transcends the use of Internet technologies, or, as it is currently understood, the usage of Information that has been electronically processed to make supply planning and execution easier. As a result, businesses may better manage, plan, and carry out their supply chains effectively (Lim, 2002).

### 2.2.4 Electronic Logistics and Traditional Logistics

Businesses can deliver goods to clients at the precise location they require, at the appropriate time, and for a reasonable price using an efficient logistics management system (Lagorio, Zenezini, Mangano and Pinto, 2022). Arranging, carrying out, and managing the flow of raw resources and completed items from suppliers to customers is included in logistics management (Schönsleben, 2018). Due to globalisation, most large corporations are now required to cut back on their company expenses, and these corporations are working to find ways to do so without sacrificing efficiency (Tien, Anh, and Thuc, 2019). They began using new management techniques, including supply chain management and e-Logistics (Erceg and Damoska-Sekulowska, 2019). e-Logistics transforms the idea of simple logistics into e-logistics by bringing the logistics business into the current world via the internet (Miraz, Hassan, and Hasan, 2020). The most recent innovation in logistics, known as e-logistics, condenses the whole corporate world into a single virtual space (Qurtubi, Janari and Febrianti, 2021). By exchanging data, delivering information, and precise statistics with the supply chain clients, this revolutionary set of communication transforms the new logistics into a customer-oriented technology (Majzoub, Davidavičienė and Meidute-Kavaliauskiene, 2020). e-Logistics aids in managing the industry's newest supply chain difficulties. Multi-channel operations, cross-border tasks, warehouse planning and inventory, planning, estimating, and performance management, are the core elements of e-Logistics (Chen, Meng, and Choi, 2022).

Song and Hu (2014) examined the differences between traditional and electronic logistics and presented the results in Table 1.

*Table 1: Differences between Traditional and e-Logistics (Source: Wang et al., 2014)*

| | **Traditional Logistics** | **e-Logistics** |
|---|---|---|
| **Shipment** | Bulk | Parcel |
| **Customer** | Strategic | Unknown |
| **Customer service** | Reactive, Rigid | Responsive, Flexible |
| **Distribution model** | Supply-Driven push | Demand-Driven pull |
| **Inventory / Order flow** | Un-directional | Bi-directional |
| **Destinations** | Concentrated | Highly Dispersed |
| **Demand** | Stable consistent | Highly seasonal, fragmented |
| **Orders** | Predictable | Variable |

The distinctions between conventional logistics and e-Logistics that have been outlined highlight issues for businesses engaged in logistical operations if they wish to establish and retain market competitiveness (Moroz, Kreslin, and Jason, 2014). e-Logistics is described as the application of logistics principles using the Internet, and it refers to the essential procedures for transporting items that are sold online to their customers as in Figure 5:

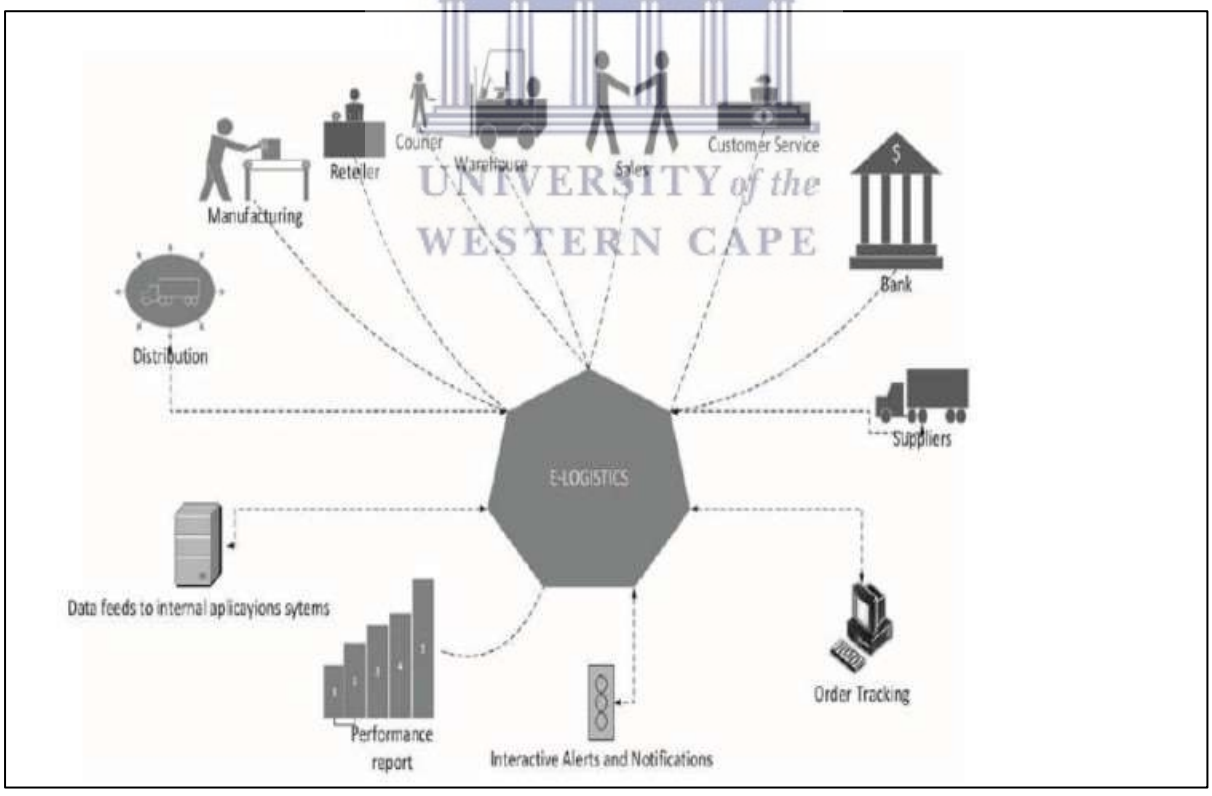


*Figure 4: e-Logistics. Source: Moroz et al. (2014)*

Groznik (2018) noted that the more complex aspects of electronic logistics are the broader subject of supply chain integration. e-Logistics eliminates intermediaries, for example, wholesalers or retailers and fosters new players with traditionally adaptive logistics operator supply chains to meet demand electronically. Qurtubi, Janari and Febrianti (2021) noted that electronic logistics uses internet technology to support material acquisition, warehousing, and transportation and to enable distribution through route optimisation through inventory tracking. They concluded that e-Logistics resulted from the introduction of e-commerce into logistics. e-Logistics can describe the three central internal processes: warehousing, shipping, and customer interaction, which are required to receive an order after clicking the buy button at the bottom. The latter process typically includes a call centre where customers can ask questions, place orders, check the status of their orders, and arrange for return shipments if necessary. In today's world, in many cases, different companies perform each of these individual functions and handling them efficiently and immediately requires a thorough understanding of each part of the process. In addition, it is much more complicated if the organisation wants to integrate it with their systems.

One of the most crucial industries is now logistics. Ways to improve material flow efficiency and reduce sales costs in various industries. On the other hand, the development of e-commerce aids in the growth of the logistics industry and logistics-related technologies (Yu et al., 2016). It has also influenced many studies related to electronic logistics (Bask et al., 2012, Masmoudi et al., 2014, Ramanathan et al., 2014). Some studies regard logistics performance as an essential component of e-commerce and last-mile delivery (Ignat and Chankov (2020), while others investigate the company's logistics function and its effect on e-commerce logistics performance (Jo et al., 2018).



### 2.2.5 The History of e-Logistics

The usage of e-business systems started in the early 1960s with systems like distributed resource planning, inventory management, and materials requirements planning (MRP), among others (Wang, Pettit, 2016). These systems, which were functionally based, continued to advance in the 1970s; they did so independently without interfacing with one another (Wang and Pettit, 2016). As shown in the following table, development has continued.

| Evolutionary Stages | 1960s | 1970s | 1980s | 1990s | 2000s | 2010+ |
|---|---|---|---|---|---|---|
| **Typical E-Logistics Systems** | Accounts receivable, inventory management and control | Transport planning application; MRPI | TMS, WMS, MRP II | ERP DSS CRM | ERP II, internet-based ELM or e-logistics network | Internet-based community systems, mobile apps |
| **Emergent IT Trends** | Stand-alone applications | Siloed functional applications | Applications portfolios | Integrated systems | Service-oriented architecture and web-based services | Multi-scale ecologies, cloud computing, Web 2.0, mobile and social media |
| **Integration Focus** | Functional | Functional | Functional | Internal end-to-end integration in a company | External integration, extended value chain | Multi-enterprise, collaborative value network |
| **Business Applications** | Transaction automation | Business function automation | Desktop and workgroup automation | Enterprise-wide automation | Industrial system automation | Cross-industry automation, loosely coupled flexible configuration |
| **Supporting Computer Technology** | Mainframe computers | Minicomputers | Personal computers and local area networks | Enterprise-wide computing | Internet and web platform | Internet and web, mobile platforms |

*Figure 5: Historical Development of e-Logistics Source: Wang and Pettit, 2016*

Globally, the rapid expansion of digital commerce illustrates the future of shopping and the new job opportunities that e-commerce creates (Kaple, 2022). e-Logistics firms have adapted and developed logistics (Miscevic, Tijan, Žgaljić, and Jardas, 2018). The logistics industry has adopted new techniques and technology to support the expansion of e-commerce (Erceg and Damoska-Sekulowska, 2019). e-Logistics oversees every logistical procedure related to e-commerce. As a result, it emphasises developing a successful business relationship between customers and e-commerce (Kanagavalli and Azeez, 2019). e-Logistics covers various responsibilities, including stock management, order dispatch, tracking and even after-sales support (Joy, 2021). The phrase e-logistics gave rise to three key ideas: e-procurement, mass customisation, and e-fulfilment.

- Using ICT to connect a company's procurement processes with its suppliers is known as e-procurement (Nani and Ali, 2020).
- E-fulfilment is a group of procedures guaranteeing an order is delivered while satisfying the customer's needs at the lowest cost possible (price, deadline, and quality).

- Mass customisation is the capacity to create a product with mass personalisation wide variety of goods from a small number of parts, combining the commercial advantages of customisation with the cost-savings of mass production.

### 2.2.6 Defining e-Logistics.

There is no solitary, accepted definition of "e-Logistics." To provide consumers with the most excellent logistical services, Gunasekaran, Ngai, and Cheng defined e-Logistics as the value chain of Third-Party Logistics (3PL) backed by the internet (Gunasekaran et al., 2007). Later, Idoughi, Kolski, and Seffah defined e-Logistics to integrate and automate logistics, providing actors with end-to-end supply chain management services (Idoughi et al., 2010). E-Logistics research is not commonly seen. As a result, to learn more about e-Logistics, more profound information on previous studies is sought.

Applying logistics principles electronically to online company operations is known as "e-Logistics" (Bayles, 2001). Since the potential effects of e-business on logistics and SCM are still not fully understood, a comprehensive definition of e-Logistics is challenging to conceptualise. e-Logistics might be defined as simply the procedures required to deliver the products sold online to clients (Auramo, 2001). According to Kim and Lee (2002), the definition of e-Logistics is the virtual economic activity and corporate architecture based on Internet technology. The e-Logistics framework augments traditional logistics and permits business interaction between the various information systems. e-Logistics, the procedures needed to deliver products purchased online to clients, are one of the most critical parts of e-commerce. (Auramo, Aminoff and Punakivi, 2002.)



e-Logistics provides clients complete data access and links directly to the business' transportation and warehouse management systems. e-Logistics enables rapid and easy access to information about all supply chain processes. There are several handling, control, and transparency options accessible. e-Logistics personnel may use the Warehouse to calculate freight charges, issue transport orders, manage detailed process sequences, identify suitable products or services for clients' logistics needs, and track clients' cargo in real-time. The business achieves maximum transparency by scanning barcodes consistently throughout the supply chain (Wölmert & Papies, 2016). Refer to Figure 4 for an overview of the evolution of logistics.

Highlighted below are a few key distinctions between electronic and conventional logistics.

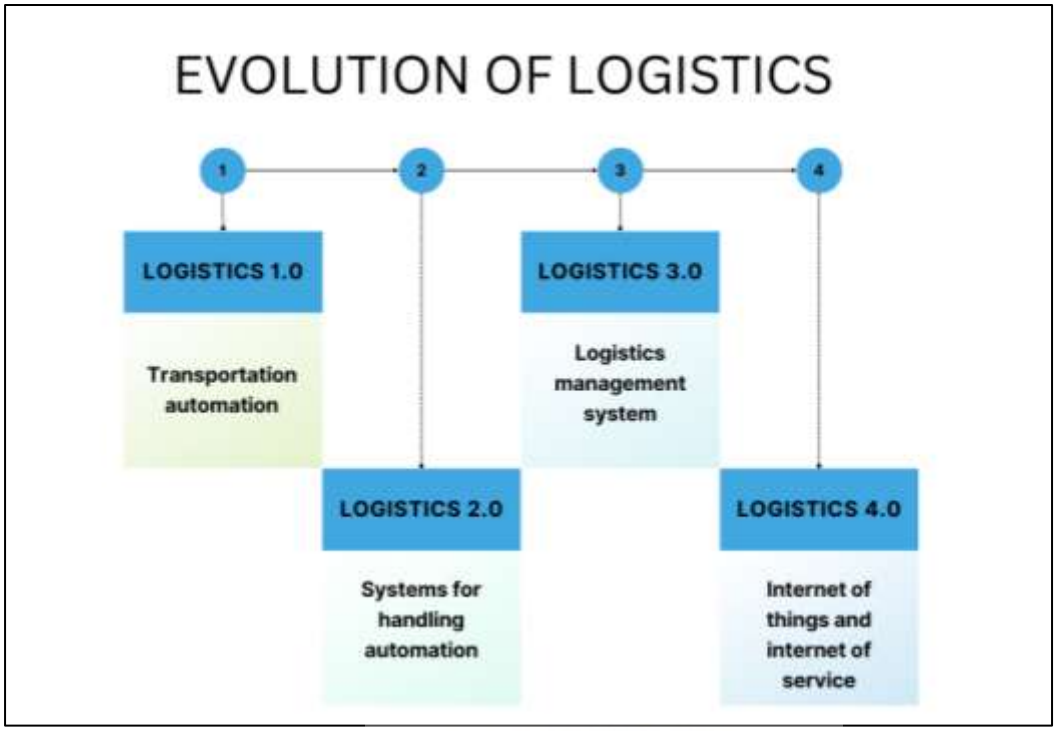


*Figure 6*: Evolution of Logistics (Source: Adapted from Galindo, 2016)

The theory of e-Logistics is covered in three studies. First, the study of the conceptual model by Gunasekaran, Ngai, and Cheng, which produced the model on logistics management in a 3PL setting, validated the usefulness of the model design (Gunasekaran et al., 2007). Based on a literature review and many scenarios, this study creates a conceptual framework for e-Logistics. This framework outlines the challenges a logistics company must overcome to provide integrated online.



The second research on the theory of e-Logistics is by Kadlubek (2013) discusses a few topics of e-logistical—supporting logistics operations using ICT systems, tools, and the Internet based on information technology solutions.

The third research on e-Logistics was also done by Skitsko (Skitsko, 2015). This study is based on e-Logistics and m-logistics, as m-logistics has not been the subject of any systematic research. This study aimed to learn about e-Logistics and m-logistics as elements of information economics. This study is built on earlier scientific, theoretical, applied, and professional studies and publications. As a result, m-logistics is defined as a subset of information logistics, and its role in information economics is discussed.

### 2.2.7 e-Logistics Process

When business transforms their logistical systems by electronic means for data storage, transferring, and data manipulation, it will prepare business with the flexibility to deliver customer-configured merchandise and value-added services quicker than rivalry and also allow the businesses to provide quality service (Viswanadham & Gaonkar, 2001).
E-logistics is a complex subject which includes manufacturing, logistics centres, resellers, carriers, and consumers, among which there is an electronic exchange of data through the internet to decrease data inaccuracies and improve decision-making (Islam & Zunder, 2013). E-logistics is responsible for exchanging data through the internet and enables joint management and monitoring between organisations (Leu, Huang & Lu, 2011).

According to Alper and Arslandere, 2017:5 the services in the e-logistics process include:

- Delivery of products
- Packing and the classification of goods
- Implementation of handling process
- Carrying out the entire loading process electronically by benefitting from automation software
- Preparing the route after planning the load,
- Tracking of transport using satellite and communication system
- Automatically unloading the cargo to the port and warehouse by applying a computerised integrated automation system
- Running of Web-based online electronic customs consultancy services,
- Provision of electronic insurance services,
- Transporting the load from the port or warehouse for the provision of on-site delivery; and, for that matter, setting the load up and delivering to the customer in working condition (Export Promotion Center: 2002 as cited in Alper & Arslandere, 2017).



The interaction and integration define the e-logistics concept in the interfaces between traditional logistics, Information and Communication Technology (ICT) and process management. To succeed, deep knowledge and competence within these areas are required. Studies conducted by (Kanagavalli and Azeez, 2019**;** Dumanska and Matviiets, 2021) present the process of being involved in e-logistics as follows:

#### 2.2.7.1 Method of Payment

Possibilities for paying at the time of purchase – At the time of delivery with e-payment. A system of payment verification is required before shipping for electronic payments.

#### 2.2.7.2 Check Product Availability

If feasible, notify the customer of availability before accepting the order. Inform the customer of the delay if the product is out of stock or will take some time to make.

#### 2.2.7.3 Arrange shipments.

Electronic delivery is prompt and efficient. Determine the optimal shipping method for the physical product's service level. It is the most prominent e-Logistics activity regarding labour, energy, and money.

#### 2.2.7.4 Insurance

Customers must have access to this option due to the possibility of product loss or damage during shipping.

#### 2.2.7.5 Replenishment

This phase is an overview. It should review every component of a location's physical inventory and place new orders as necessary: non-products include shipping materials, components for machines in use, and things needed for the shipping process. Products include objects on shelves or resources used to make products (scanners, totes, carts.)



#### 2.2.7.6 Contact with clients

The consumer must be as well-informed as feasible while dealing with an unseen procedure (back-door activities). The following are the most typical forms of communication: order confirmation, payment success, shipping confirmation, tracking details, and any issues encountered during the process.

#### 2.2.7.7 Returns

Reverse logistics refers to the flow of products from the customer back to the seller. Customers might return or exchange a purchase for the following reasons: Damaged, dysfunctional, unappealing, wrong product/type/colour.

### 2.2.8 The future of e-logistics

What will the state of the logistics industry be in five to 10 years? That is a matter of debate. This section examines some of the significant industrial upheavals in further detail. For quite some time, we have been progressing more and more toward so-called Logistics 4.0, a term taken from Industry 4.0 (Sinha, 2022). The digitisation of commercial and logistical processes and the interconnectivity of devices and enterprises are the main forces behind this new era in logistics (Rad, Oghazi, Palmié, Chirumalla, Pashkevich, Patel, and Sattari, 2022). Logistics 4.0 intends to improve productivity, stabilise global supply networks, and streamline processes. Identifying and eliminating supply chain risks immediately is critical (von Stietencron, Hribernik, Lepenioti, Bousdekis, Lewandowski, Apostolou, and Mentzas, 2022).

#### 2.2.9.1 Big Data

Logistics cannot function without data, which is becoming more and more critical as data volume increases (Aliahmadi, Nozari, and Ghahremani-Nahr, 2022). Thanks to continuously updated software and more intelligent hardware, a growing amount of data can be acquired and shared between systems (Lekić, Rogić, Boldizsár, Zöldy, and Török, 2021). Big data deployments and intelligent networking of market players are used to stabilise the complete supply chain, anticipate and minimise potential failures or delays, or build contingency plans so that the deadlines may still be reached (Jiang, Ma, Zhang, Wang, Cao, Li, and Tong, 2022).

#### 2.2.9.2 Robotics in Logistics

We coexist alongside robots in one of the most well-liked future scenarios. Even while the functionality of modern robots is quite distant from science fiction films, they can already carry out simple duties and help us in our professional lives (Chauhan, Brouwer, and Westra, 2022). Currently, robots are employed in commissioning, for instance, to lighten the labour of warehouse employees (Shamout, Ben-Abdallah, Alshurideh, Alzoubi, Kurdi, and Hamadneh, 2022). They are primarily utilised in consumer products warehousing and e-commerce (Chauhan, Brouwer, and Westra, 2022).

Robots move oversized shipments through the warehouses and gather the inventory for incoming orders (Gharaibeh, Eriksson, Lantz, Matarneh, and Elghaish, (2022). They do this by planning the quickest routes, efficiently preparing the shipments, and transporting the products to the handover location where the next robot assumes control (Stepper, 2021). Sensors prevent collisions between humans and robots (Ali and Phan, 2022). Such robots will be used in commissioning more and more in the upcoming years (Katoch, R., 2022). Demand will continue to increase due to the rapidly expanding e-commerce industry, as will the capabilities of digital assistants (Gibbons, 2022).

#### 2.2.9.3 Automation and artificial intelligence

Many contemporary logistics methods, including warehousing, supply - chain management, and return handling, already make use of automation and artificial intelligence-powered technology (AI) (Özdağoğlu and Bahar (2022). Using AI to plan and predict product routes and to determine the most effective means of transporting goods to new places makes it an invaluable tool in modern logistics (Gibbons, 2022). Artificial intelligence (AI)-enabled automation makes large-scale e-commerce companies unnecessary while allowing other businesses to handle their daily tasks (Lekić, Rogić, Boldizsár, Zöldy, and Török, 2021).

#### 2.2.9.4 The Internet of Things (IoT)

It is not a brand-new idea for logistics to use the "Internet of Things" The best examples of the Internet - of - things automation of logistics that depends on location data assist in tracking. Utilising historical data analysis, businesses can enhance their logistical processes (Aliahmadi, Nozari, and Ghahremani-Nahr, 2022; Tran-Dang, Krommenacker, Charpentier and Kim, 2022). Low-voltage networks, satellite trackers, and RFID tags are a few examples of technology used in logistics with the Internet of Things (Xie and Chen, 2022). Many online retailers now track their shipping containers in their warehouses and distribution centres with RFID tags. Goods during transportation are GPS-based devices (Aydınocak, 2022).

#### 2.2.9.5 Tracking and Analytics in real-time.

Managers and executives in the sector now have greater access to real-time information and monitoring than ever because of Radio frequency identification (RFID) and other cutting-edge technologies (Aslekar, 2022). Customers can be informed of the specific location of their merchandise and the anticipated delivery time (Chen, Chen, and Yang, 2022). They can recognise and foresee issues and resolve them faster (Sazu and Jahan, 2022). They can even identify hiccups in production or efficiency, which helps them build the ideal company from the bottom up (Alakaş and Eren, 2022).

#### 2.2.9.5 GPS Precision Enhancements

Supply chain companies no longer typically use computer-generated instructions (Richey, Roath, Adams, and Wieland, 2022). Almost anything can be done using a smartphone or a delivery van equipped with GPS (Gibbons, 2022). GPS devices' accuracy in logistics has significantly increased over time, benefiting drivers and streamlining supply chain operations (Katoch, 2022). Traffic data can be accessible in real-time, and this information can be utilised to track delivery vehicles (Stepper, 2022).

#### 2.2.9.6 Improved Shipment Traffic Monitoring (Barcodes)

Barcode technology businesses are concentrating on creating more user-friendly barcodes that can be swiftly integrated into printing and boost overall economic viability as the warehousing industry expands quickly (Gibbons, 2022). The system will solve the problem of barcodes that have been stolen or altered (Vasiliki and Apostolos, 2022). Technology is crucial to enhancing the dependability and security of product delivery (Raja and Venkatachalam, 2022). Although widely used, digital technologies may not be the only means of success (Chen and Cao, 2022). By proactively implementing them, businesses can increase productivity, order, transparency, staff, product safety, and overall success (Chan, Hogaboam, and Cao, 2022).

The skills and competencies required to manage e-logistics are discussed in the next section of the chapter.

### 2.3 Part 2: Skills and Competencies Required to Manage e-Logistics.

Part two of the literature review focuses on the skills required to manage e-logistics and will examine the technology-specific skills and how this translates to the different levels of work; then, make a clear distinction about competencies and why they are essential to be discussed when examining skills. "Skill" and "competency" frequently suggest they relate to the same thing. While skills and competencies are undoubtedly related, there are some significant distinctions. Skills are the unique learnt talents required to complete a task (Graesser, Sabatini, and Li, 2022). Contrarily, a person's competencies are knowledge and behaviours that enable them to succeed in a job (Srivastava, Ganguli, Suman Rajest, and Regin, 2022). Competence alignment is crucial to define a person's or group of people's position inside an organisation (Li, N., 2022). It is for this reason that competencies are evaluated in this study.



#### 2.3.1 The emphasis on e-Logistics Skills Requirements instead of digital logistics skills requirements.

e-Logistics, often known as electronic logistics, is the management and optimisation of various activities within the logistics sector using electronic systems and technologies (Matviiets and Dumanska, 2021). It includes using computer systems, digital communication networks, and electronic data interchange (EDI) to streamline logistics processes (Vasiliki and Apostolos, 2022). The main goal of e-logistics is to automate and enhance conventional logistics processes, including ordering the operation, managing inventory, scheduling, and tracking (Ruthramathi, Sivakumar, and Saranya, 2022).

On the other hand, the application of digital technology and data across the entire logistics ecosystem is referred to as "digital logistics," which is a more comprehensive notion (Ilin,

Maydanova, Dubgorn, and Esser, 2022). Restructuring and optimising the entire logistics value chain entails the integration of numerous digital tools and platforms, including cloud computing, big data analytics, the Internet of Things (IoT), artificially intelligent (AI), and blockchain (Ashima, Haleem, Bahl, Nandan, and Javaid, 2022). For all phases of the logistical procedure, spanning sourcing and procurement through storage, transport, and last-mile delivery, digital logistics intends to use these technologies to provide immediate visibility, connection, cooperation, and decision-making based on data (Vincze, Karovič and Kavalets, 2022)

### 2.3.2 Reasons Why e-Logistics Skills are Prioritised Over Digital Logistics Skills.

#### Technology Advancement

Comparatively speaking, e-logistics has existed longer than digital logistics (Lai, Feng, and Zhu, 2023). To automate and enhance logistical processes, many organisations are currently utilising electronic systems and technology (Kumar, Singh, Mishra, and Vlachos, 2023). Thus, to manage and optimise these current systems, there is a need for people with expertise specialised in e-logistics (Memon, Shah, and Warsi, 2023)

#### Expertise

E-logistics skills frequently concentrate on facets of logistical operations, like managing orders, control of inventory, and transport scheduling (Yavas and Ozkan-Ozen, 2020). Such skills are frequently more specialised and directly related to daily logistics operations (Semerádová and Weinlich, 2022). On the other hand, digital logistics covers a broader spectrum of technology and notions, including the Internet of Things, big data analytics, and cloud computing, which may call for a more excellent range of skills and a better comprehension of these technologies (Bawack, Wamba, Carillo, and Akter, 2022)

#### Industry standards

Regarding e-logistics skills, the logistics sector may have distinct demands and prerequisites (Alima Homed-Wilson, 2023). To satisfy their urgent requirements and address current issues in their operations, organisations in the field of logistics may provide preference to applicants with experience in e-logistics (Liu, Chen, Yang, Xiong and Chen, 2022). Although a young subject with enormous potential, digital logistics may still be developing as far as industry regulations and processes (Banyongpisut and Aunyawong, 2023).

It is crucial to remember that the growing significance of digital skills in the logistics sector should not be overshadowed by the focus on e-logistics skills (Bawack, Wamba, Carillo, and Akter, 2022). Organisations will increasingly look for people with broader digital capabilities to

promote innovation and optimise the logistics value chain as the digital revolution continues changing the logistics landscape (Semerádová and Weinlich, 2022). Consequently, in the expanding logistics job market, those who can blend e-logistics knowledge with a deeper awareness of digital technology would probably have an advantage (Winkelhaus and Grosse, 2020).

### 2.3.3 Skills Requirements to Manage e-Logistics.

Skills in supply chain management allude to skills needed for overseeing complex logistics activities and connections (Mangan and Christopher 2005; Murphy and Poist 2007). Research in supply chain management has presented an index of SCM skills, including SCM specialised skills, business organisation skills like advertising, department of finance and human capital management, and social skills like interpersonal skills (Murphy and Poist 1991, 2007). The "Industry 4.0" push for automation and digitalisation has prompted various colleges, businesses, and organisations, including the World Economic Forum (WEF), to make predictions regarding the future of the labour market. Predictions range from a 50 per cent drop in jobs to suggestions of a lot with many new jobs. Automation is anticipated to lower the overall workforce and the actual presence of humans on the shop floor and warehouses due to the apparent reduction of traditional tasks performed by human operators. Employees in logistics, particularly those in low-wage jobs, may experience anxiety due to this. To solve this issue, educational institutions, businesses, and policymakers are all working hard to re-skill and up-skill the workforce to avert job losses. Workers will therefore be able to learn new skills and competencies connected to digital technologies, which they can use in the changing labour market (Cimini, Boffelli, Lagorio, Kalchshmidt and Pinto, 2020).

The lack of skills in South Africa is commonly identified as one of the significant factors limiting the country's economic growth. One of the primary impediments to expanding corporate operations in South Africa, according to Grant Thornton's International Business Report (2012), is the absence of a competent workforce. Furthermore, according to the report, South African business owners have highlighted this barrier for the past five years as a significant constraint. 'South Africa's skills shortage, according to most economists, is a severe constraint on the country's long-term economic growth potential. Feasible economic prospects are limited because of a scarcity of necessary talents, such as managerial, professional, and technical abilities.

According to a 2010 global skills study by Harvey and Richey, supply chain managers need management and transformational abilities to succeed in a global market. Richey et al. (2006) suggest a high verbal IQ, strong achievement orientation and high adaptability as the core

SCM competencies for managers. Murphy and Poist (2011) developed a frequently used framework that distinguishes between business, logistics, and managerial (BLM) skill categories and includes many precise skills. Many companies worldwide find it increasingly difficult to recruit enough skilled labour. Especially concerning skills and competencies are critical to logistics and SCM (Cottrill & Rice, 2012).

When an experienced manager retires, the company looks for talent with a wider variety of skills than before. As technology becomes more critical in this field, applicants need more technical and analytical skills, even in the skilled job of working as a forklift driver. Similarly, businesses seek people with knowledge beyond traditional functional silos such as logistics, procurement, and manufacturing. In addition, as supply chain managers play an increasingly strategic role in the company, they need softer skills, including project management, leadership, communication, and relationship management (DHL Report 2020). As more logistics systems become semi- or fully automated, logistics operators must learn new skills and competencies to effectively "co-work" with their new software and hardware social robot companions. The essential competencies are technical knowledge of digital devices and systems and interpersonal and methodological skills to cope with the complex and integrated innovative logistics environment (Cimini, Lagorio, Romero, Cavalieri, Stahre, 2020).

The Business Logistics Management framework developed by Murphy and Poist (1991:2007) consists of the required skills for senior-level logistics professionals. The framework consists of 83 skills in total under three classifications. These are business skills or knowledge primarily associated with the business, such as operations finance, marketing and other knowledge that is not directly associated with the everyday running of the business. Areas such as public relations and organisational psychology are included, with 33 skills under this category. The second area classifies logistics skills or the knowledge of logistics functions as well as the academic knowledge of the aspects of the logistics functions; there are 18 skills under this category. Lastly, managerial, and personal skills are classified, which consist of management functions and skills such as negotiation and decision-making abilities and personal skills, which are distinctive qualities of managers such as personal integrity and the ability to motivate others.

According to Jim, Huang, Goh, and Hsieh (2013), these are the following skills that logistics professionals should possess: the application of IT, a global perspective, knowledge of international transport distribution, consumer-oriented perspectives, and financial analysis. There has been an increasing need to improve digital skills in the ICT industry for current and future professionals. Digital skills have become a requirement for all fragments of the population. The entire group of digital skills must expand beyond the minimum level to skills needed for every job. The digital skills framework developed by (Classen, 2017) consists of

sector user skills, which are those skills, which can be applied to numerous formal sectors, and the professionals in that sector need to possess those generic skills appropriate to that sector. These sector user skills can be diverse due to the extent of digitised work that uses the internet. The framework consists of ICT practitioner skills needed for technical specification, technology, servicing and maintenance and support of ICT systems. Classen thoughtfully chooses to use the term ICT practitioner instead of ICT professional for this total cluster as it is more suitable with most global approaches on the chosen terms. The skills in this cluster differ from sector user skills, as their action results in a programme, whereas user skills enable professionals to improve their daily job duties.

E-Leadership skills are strategic management skills linked to innovation management. This is the ability to leverage opportunities in the ICT space, particularly the internet, digital devices, and media, to enable better performance and discover new business methods, improving business efficiency using ICT.

### 2.3.4 Technological Skills for Managing e-Logistics

Digital technology is essential to the logistics sector's ability to lead the supply chain. As technology develops, employees must keep up with demand (Cimini, Boffelli, Lagorio, Kalchshmidt and Pinto, 2020).

#### 2.3.4.1 Emerging Information Technology Skills

The Internet, mobile technology, artificial intelligence, big data, robotics, nanotechnology, and other disruptive technological phenomena can significantly change organisations and societies (Brem & Voigt, 2009). The Internet has transformed the music, tourism, commerce and service sectors, and the role of digital technology is expanding across all economic sectors. New services have emerged, including e-tourism, e-health, e-marketing and digital learning. Artificial intelligence is transforming the industry, especially where close collaboration between humans and computers is required—significant data changes how information is organised, opened, selected, visualised, and used. Robotics has significantly changed, primarily in the automotive, aerospace, and medical industries (Martins and Rocha, 2016; Gonçalves, Rocha and Cota, 2016). Nanotechnology is transforming the data processing, energy, and health industries. These advanced technologies are considered catalysts of change and profoundly impact the economy by creating new businesses (Dedrick, Kraemer, & Seever, 2013; Porter & Heppelman, 2014; Mejia, Muñoz, & Rocha, 2014; Gonçalves).

#### 2.3.4.2 Cloud Technology Skills

Under the US National Institute of Standards and Technology, cloud computing is a model that provides access to ubiquitous networks on demand from a pool of shared configurable resources, including networks, servers, storage, software, and services. Little effort is made to manage or interact with service providers (Chard, Caton, Rana and Bubendorfer, 2016). This concept requires using platform-independent applications anywhere online without installing them on a PC or private organisation. Application providers design, store, maintain, update, backup, and scale to reduce costs through new business models (Osunmakinde & Ramharuk, 2014). Cloud services include, among other things, the concept of software as a service (SaaS), where you do not need to purchase software licenses, pay for the resources used and spend time. Cloud services also include infrastructure as a Service (IaaS), which provides technical infrastructure components such as storage, CPU, memory, and network, and Platform as a Service (PaaS), such as application infrastructure (Chard et al., 2016). The cloud computing concept provides flexibility and fast execution, allowing businesses to be more flexible and responsive to market changes. Resources can be expanded through the Internet. Cloud is an infrastructure that can improve the market and increase competitiveness.

#### 2.3.4.3 Big Data skills

Big data is a new phenomenon associated with increased data (McAfee & Brynjolfsson, 2012) due to the influence of the Internet, social media, and mobile technology. The potential benefit of this information has prompted the creation of new methods for processing and analysing large amounts of data, such as images, text, and speech. Technologies such as data analysis, selection, and security are essential for everyone in the organisation (Chen, Chiang, & Storey, 2012). With this technology, businesses can use data collection and interpretation to access information about their business and make strategic decisions. This includes decision analysis based on large volumes of data with the following characteristics: The amount of data for research. Different data provide information about the same task (Taylor, 2015): data, speed, reliability, and value. Big data will present the IT sector with several disruptive potentials for most software and hardware to store and manage massive volumes of data. The immediate potential is in increasing productivity and operational effectiveness. In the long run, new business models for pay-as-you-go services will emerge. The vertical industry segment stems from partnerships with customers and partners (Wang, Gunasekaran, Ngai, and Papadopoulos, 2016).

#### 2.3.4.4 Mobile Technology Skills

Mobile technology opens new business models, growth opportunities, and ways of working for businesses (Brynjolfsson & McAfee, 2014). The possibilities for using mobile devices are endless because they provide access to real-time information (Ben-Zeev et al., 2014; Bhalla & Bhalla, 2010) and download mobile applications quickly and inexpensively (Free et al.). Thanks to the steady decline in mobile phone prices (Ben-Zeev et al., 2014). Such technologies include laptops or notebooks, smartphones, and Global Positioning System (GPS) devices. Various organisations and the procurement, logistics, distribution, service, sales, and maintenance market can use mobile technology. The app store-based business model makes accessing personal information on mobile devices easy anytime, anywhere. Smartphone and tablet 3D displays will fuel the wide use of 3D products. Can computer system design do tasks that usually require human intelligence? This technology has many applications in the industry (Brynjolfsson & McAfee, 2014). Human data can be clearly defined, and computer formats can imitate it. Currently, AI is applied in various situations, such as writing speech and recognition devices, games for medical diagnostics and communication programs, software, security systems and robotics (Bostrum, 2014). The application of artificial intelligence is also applied to business intelligence processes through the processing of dynamically calculated metrics.

Modern robotics using artificial intelligence systems significantly improves productivity. For example, automating a car that allows one to drive alone can lead to fewer accidents: human error and loss of concentration. Robots access information faster and store large amounts of data. In medicine, since it can react without emotion, it can be used for precision surgery, and it is helpful in disease diagnosis as it can analyse a large amount of data in real-time.



#### 2.3.4.5 Robotics Skills

It automates the system and incorporates technology with compact, high-performance sensors. Next-generation robots work with humans and perform various tasks in unpredictable environments (Brynjolfsson & McAfee, 2016). Examples include drones, vacuum cleaners, and consumer goods such as toys and appliances. While robots are still limited to factory assembly lines and other control tasks, a new era of robotics is beginning, which means they can be used with GPS technology, such as smartphones, in other precision tasks (Brynjolfsson & McAfee, 2014).

### 2.3.3 Skills for Logistics Managers

The competence of logistics experts carefully studies the skills that are the competencies needed in the logistics and supply chain industry. The BLM stand for Business, Logistics and

Management skills (Derwik, Hellström and Karlsson, 2016). Logistics and supply chain management uses complex technologies in the following areas of the BLM or referred to the Business, Logistics and Management (P. R. Murphy & Jobs, 2012). The skills needed include general skills, functional skills, supply chain management qualifications and leadership, experience, and industry (Shou & Wang, 2017). These soft-side skills include emotional and social skills (Van Hoek, Chatham, & Wilding, 2002). This framework comprises thirty-three business skills, eighteen logistics skills, and thirty-two management skills. It has since become a spine model for the exploration of the abilities and capabilities of logistics experts.

To achieve supply chain integration in today's dynamic and unpredictable business environment, supply chain managers require an equal balance of "hard" (analytical and technological) and "soft" (human and behavioural) business-related abilities (Christopher, 2012; Cottrill, 2010; Sweeney, 2018). Complexity management, influencing skills, and team leadership are all essential parts of a supply chain manager's playbook since they are the "quarterbacks" in charge of delivering intra- and inter-organisational supply chain projects (Ellinger 2002). However, according to Fawcett (2010), most supply chain managers have strong analytical skills but lack the skills required for team building and change management.

### 2.3.4 Skills of the Logistics Workers

It is clear from the research that logistics managers need different skills to be effective. Researchers have demonstrated the importance of a wide range of skills in four groups: analysis, communication, and computer skills (DHL 2020). (Gibson, Gibson and Ruthner, 2013) with 83 points, classified as Business Skills, Logistics Skills and Management Skills by Murphy and Jobs in Thailand in 2012. In many other studies (Young 1998; Le May 1999), the skills required of logistics managers range from skills to organisational and interpersonal relationships.

With 33 companies, 18 logistics skills and 32 management skills developed by Murphy and Jobs (2021), the BLM system has become the basic model for checking logistics staff skills and competencies. In this study, leadership skills have proven to be considered an essential component of logistics managers, emphasising traditional leadership such as motivation, planning, and organising. Logistics skills are then critical, and business skills are second. These results affect practitioners, head-hunters, employers, and teachers. Since then, Murphy and Jobs have conducted other studies investigating the effects on the stomach. Results presented in a follow-up study by Murphy and Poist (2021) to compare the views of head-hunters and practitioners found that some differences between the two groups of respondents were related to logistics and management skills.

Faculty Respondents at Murphy and Jobs (2017) thought leadership was the most important, followed by logistics and business skills, and respondents confirmed the results in later studies (Murphy and Jobs 1998). Of the 83 skills presented, teachers identified the nine most crucial leadership skills for senior logistics managers in this study, which confirmed previous findings that logistics managers should have highly proficient leadership skills. Using the same BLM framework, Murphy and Jobs (2006) found that leadership is paramount for executives and starters, followed by logistics and business skills. Nevertheless, the two groups differ significantly in meaningful ways. The BLM framework has also been tested in an Asian context, supported by research by Razzaque and Sirat (2015). The study also scored high in business and government skills, showing that it may reflect the strong impact of municipal policy, legislation, and social issues in the various countries surveyed. While this study highlights changing the role of logistics managers, researchers like Razzaque and Sirat (2015) suggest a lack of emphasis on "the skills and properties that make good logistics professionals". Similarly, Gammelgaard and Larson (2019) added, "little has been written about these new logistics technologies and capabilities.

### 2.3.5 Competencies Required to Manage e-Logistics in The Supply Chain Management Sector

Competency can be defined as a job description or one's ability to perform a task effectively (Thai, 2011). Competencies are a mix of abilities, knowledge, and attitude. Essential knowledge, skills, talents, and other traits that enable workers to complete their digital media-related professional activities efficiently and with high productivity are embodied by digital competencies at work (Li, 2022). Digital competencies are a collection of fundamental skills, knowledge, and abilities that enable employees to perform and accomplish job duties in digital work settings (Oberländer and Bipp, 2022).



*Table 2 Definitions for competencies required in e-Logistics.*

| COMPETENCE | DEFINITION | SOURCE |
|---|---|---|
| Cognitive Competence/Conceptual Occupational | Cognitive competence is characterised as basic reasoning and innovative reasoning abilities which encourage powerful critical thinking, dynamic, and learning. | Daviesm, Fidler & Gorbis (2011); Ferrari et al. (2012); Griesel & Parker (2009); Sultana (2009); Winterton, Delamare-Le Deist & Stringfellow (2005) |
| Functional competence | These are essential abilities and conduct that are expected of an individual to do a task | (Winterton, DelamareLe Deist & Stringfellow, 2005; Sultana, 2009) |

| | | |
|---|---|---|
| | effectively: | |
| Social competence | Social competence is characterised as the capacity to deal with social connections adequately. As such, social capability alludes to coexisting great with others, having the option to shape and keep relationships, and reacting in versatile methods in group environments. | Mitrovic, Taylor, Sharif, Claassen & Wesso (2013); Daviesm, Fidler & Gorbis (2011) |
| Meta-competence. | Meta-competence incorporates unique psychological, basic and severe thoughts about character and actions. | Yorke & Knight 2004) (Ferrari, Punie, & Redecker 2012) Bogo et al., 2014 |
| Technical competence | Indicates expertise or subject matter utilised in the occupations of a particular industry | (Maneschijn, Botha & Van Biljon, 2013) |
| Ethical competence | Ethical competency is defined as managers' and professionals' sensitivity to moral challenges in their organisations, followed by moral judgment and acts. As a result, firms are in desperate need of ethically competent staff. Character strength, ethical awareness, honest judgment skills, and willingness to do good describe moral competence. | Pohling, R., Bzdok, D., Eigenstetter, M. et al,2016 (Ferrari, Punie, & Redecker (2012) (AlaMutka 2011) |
| **ICT COMPETENCIES** | | |
| ICT competence | Refers to having the option to utilise virtual ICT devices for | (Ferrari, 2012) |

| | | |
|---|---|---|
| | fundamental assignments and learning. | |
| Basic ICT Skills | Refers to having the option to utilise virtual ICT devices for fundamental activities and learning. | (López-Bassols, 2002) |
| Intermediate ICT skills | This category applies to using standard ICT techniques in non-ICT environments. | (López-Bassols, 2002) |
| Advanced ICT skills | All capabilities requiring digital ICT skills to coordinate, present, or exchange knowledge fall under this category of ICT skills. | (López-Bassols, 2002; Maneschijn, Botha & Van Biljon, 2013) |

### 2.3.6 Identifying Key Competencies required in e-Logistics.



Heyns and Luke (2016) argued that South African supply systems had difficulty correctly moving domestic and international freight. Their research suggests that whilst the sector needs technical (hard) skills, there is a more critical requirement for soft skills, which are undervalued mainly by students. The current curriculum focuses on hard skills, does not meet the industry's required skill sets, and provides evidence of gaps within the existing supply chain education programmes.

Employees are now needed to master a more excellent range of software packages and digital tools in addition to regularly used technologies such as document processing and email (Harteis and Goller, 2014; Brown and Souto-Otero, 2020).

The competencies of other front-line managers and workers are now receiving more attention than only those of the top management team. Bag, Wood, Xu, Dhamija and Kayikci, 2020 discovered that the ability to use big data analytics positively correlates with staff growth, which is then correlated with long-term Supply Chain performance. According to Saniuk, Caganova and Saniuk (2021), logisticians are in great demand in manufacturing companies adopting Industry 4.0. Essential managerial or industrial abilities were needed for their jobs. Technical expertise, the capacity to solve problems, the use of IT systems, the capacity for critical thought, the communication, and a commitment to lifelong learning are all prerequisites for supply chain employees.

Lifelong learning, social media service, the capacity to combine technology and management, teamwork skills, and an openness to change should all be considered critical competencies for managerial employees. Contrary to popular belief, management personnel should not assume the job of a technology expert but rather update their managerial skills to guide technological innovation. Research by Sanuik et al. (2021) shows that both administrative staff and industrial learning skills. Similarly, van Hoek et al. (2020) argued that university education and research methods should be modified to accommodate the crucial competency of lifelong learning.

Managers' emotional intelligence is another competence essential to supply chain management effectiveness in firms in the digital age. Keller, Ralstona and Lemay (2020) investigated 155 manager-level supervisors in the United States of America and discovered that supervisors with higher emotional intelligence could support their subordinates in managing their emotions and creating more supportive work environments, which increases employee retention and improves service outcomes for external customers in the SCM process. This viewpoint was backed up by van Hoek et al. (2020), who also made the case that Supply Chain managers' emotional intelligence should be emphasised in the post-COVID-19 era. Employee resilience can be strengthened, and they can receive support from emotionally intelligent management through challenging and uncertain times.

In certain research, the ability of top management team members to support SCM performance in the context of digitalisation was the main subject. For instance, Akhtar, Khan, Frynas, Tse, and Rao-Nicholson, 2018) identified tangible competencies of top management team members, such as education, experience, and analytical-based competencies, as critical determinants for developing relationship-based business networks, which should be essential for organisations to achieve sustainable performance. Additional research has revealed that top management support fosters green SCM performance by boosting teamwork and workplace culture (Muduli, Luthra, Mangla, Jabbour, Aich and De Guimarães, 2020) as well as enabling HRM to leverage big data analytics to strengthen their competitive advantages (Hamilton and Sodeman, 2019).

The structure of the South African labour force and the training of e-logistics is discussed in the next section of this chapter.

### 2.4 Part 3: The Structure of the South African Labour Force and Training of e-logistics

This section looks at the structure of the South African Labour force, focusing mainly on the logistics. The training in logistics skills is discussed, followed by the training in e-Logistics

skills. This section closes off by examining the literature to determine if there is a need for an e-logistics qualification.

### 2.4.1 The Structure of the South African Labour Force

The nation with the most significant rate of unemployment was South Africa. Group of Twenty (G20)'s 19 members as of October 2022, according to a publication by Statista's research division. That year, South Africa had an unemployment rate of 34.6 per cent, while Turkey had a rate of 10.8 per cent. The lowest unemployment rate, though, was in Japan, where it was only 2.6 per cent. Commencing with the 2022 first quarter39.8 million people in South Africa were working age, and the country's unemployment rate was 33.9% (Published by Statista Research Department, 2022).

According to StatsSA, 2022, the percentage of the working-age population employed or seeking work is the labour force participation rate. South Africa's labour force participation rate increased from 56.90 per cent in the first quarter of 2022 to 58.60 per cent in the second quarter. Between 2008 and 2022, the working population grew by an average of 1.76% per year. Population not in the workforce and those aged 15 to 65 not looking for work are considered out of the labour market or not economically active. Between the two quarters, the number of discouraged job seekers increased by 545 000 (16,4%). The population of individuals not in the workforce increased by 988 000; the number of persons who are not working due to factors other than discouragement increased by 443 000 (3,3%). In 2009, there were 13.9 million persons who were employed, which is an increase of about 1.1 million from 2001. Over the following several years, fewer individuals were employed, resulting in the recession. There were 2.1 million more people working than there were before. Between 2011 and 2016, slightly over 16 million. Despite a rise in employment from 2008 to 2016, there were more unemployed in 2016 than in 2008. This is because the growth in the labour force (on average, 1.76% annually) outpaced the employment growth (on average, 1.24% annually). Youth (15 to 34 years old) experience high rates of unemployment, which are rising as more young people join the labour force (StatsSA, 2022).

According to the South African economy's first quarter of 2017 statistics, there has been negative growth for two straight quarters. As a result, South Africa is formally experiencing a recession. The first quarter's -0.7% compared to the fourth quarter of 2016's -0.3 will likely cause the 1% growth rate projected for 2017 to be revised downward. At 27.7%, the unemployment rate is at its highest level in 13 years. Revenue Services in South Africa will struggle to accomplish their goals, resulting in job losses and fiscal failure on the part of the government. This has been a feature of the South African economy that has contributed to a

low employment rate. Due to the slow employment rate's inability to absorb new young workers, the unemployment rate is rising. The World Economic Forum's Global Competitiveness Report (2020) states that the quality of the secondary school systems in the area to address employment needs is ranked at 59 points (out of 100) and 42 points in advanced economies in emerging and developing economies (out of 100). Significant economies have experienced declining developments in recent graduates' skill sets, including how adequate they are years, with India, South Africa, Germany and the United States among them. Most workers in South Africa are unskilled, and the recent economic expansion has favoured skilled people, creating a mismatch between the supply and demand of labour (Schwab and Zahidi, 2020).

The education and skill levels of the South African labour force are lower than those of other productive nations. Nearly 50% of employed employees lack a high school diploma, 31% have completed their secondary education, and 20% have a tertiary degree. 59% of unemployed people have less than a matric certificate (excluding discouraged work seekers and not economically active), and 77% of people who are not working have educational levels below matriculation. The World Economic Forum's Global Competitiveness Report 2020 ranked South Africa 126th for the quality of its primary education system, 134th for higher education, and 138th for scientific and math education. One hundred thirty-eight nations received ratings.

#### 2.4.1.2 South Africa Labour Force and Logistics Industry



South Africa's workforce currently faces many challenges, and the two most pressings are the severe shortage of skilled workers in the country and the unstable labour market. (DHL Express South Africa 2020). Heimans (2012) recently studied the supply chain skills gap at the University of Johannesburg. They found that South Africa's supply chain gap increases and hinders logistics opportunities and the country's financial ability. According to the survey by McKinsey and Company (2016), about 65% of employers have difficulty filling low-level positions, and 66% of employers find it increasingly challenging to fill strategic places, which has increased by 3% since 2011. This is coupled with the logistics industry's lack of capacity, and various national strikes have boosted the sector's inability to provide efficient services and hindered the supply of goods (Heimans 2012).

Bridging the skills gap is an ongoing challenge in the logistics industry and other sectors of the economy (Heinmans 2012). As foreign direct investment increases and the demand for talent exceeds supply, the skills gap in South Africa continues to widen. One of the biggest challenges for all multinational corporations operating in South Africa is the lack of adequate education and the global standards that sometimes fail the education system. Heimans (2012)

purports that the lack of training means that further movement of the staff is urgent. He also asserted that logistics efficiency could positively or negatively impact a country's economic growth, so it is essential for companies in the logistics sector to work to close the technology gap in the industry.

Fleet Watch (2016) suggested that the logistics sector is not just trained but needs proper skills training combined with IT. On that note, the automotive industry struggles to find exceptionally competent machine operators and e-supply chains. South Africa's logistics sector supports the continent's second-largest economy (Gains Report 2020). It is a relatively complicated sector. Local and multinational companies use South Africa as their gateway. However, investment in infrastructure maintenance and developing sound Management Information Systems is lacking in the logistics sector.

Furthermore, the logistics challenges occur from neglected maintenance conditions and related ICT and management systems infrastructure. Gains Research Institute (2020) purports that relatively high-quality degradation and logistics costs are increasing. The other challenge is that many South African organisations currently lack digital skills. Effectively, this opens great opportunities for most companies to offshore and have expatriate labour from countries such as Zimbabwe, which has a high literacy level in accounting. ICT supply chain employees with digital competencies and more profound knowledge than our locals (McKinsey and company 2019). The goal is to maximise the efficiency of the internal logistics infrastructure system with sufficient capacity in most logistics companies to increase the value chain (Chandler 2012).



#### 2.4.1.3 Training of Logistics Skills

Since an increasing number of businesses are realising how crucial supply chain management is to their success, there is a greater than ever need for talent in the supply chain industry. It has not been enough to meet demand, even though more people gain degrees and certificates in supply chain management each year. Businesses worldwide may struggle to fulfil the demand for goods and services if this trend persists (DHL 2020). More generally, companies that attract the right skills have a positive employer brand. Leaders need to think about the environment in which they invite new employees. Mindfulness, flexibility, and purpose are three traits that employers must incorporate into their skills development strategy (Grant Thornton, 2019).

With more willingness to invest, the demand for technology is increasing globally. It is supported by COVID-19, which has exacerbated the digitalisation of many companies in digital technologies in ICT (McKinsey and Company 2020). Despite indications that the labour

economy may be cooling in developed countries such as North America and Europe, where employment growth is static, 46% of business leaders feel the impact of labour costs on development, with the most significant impact being Asia-sea quiet (Heller 2019). At the same time, 45% of managers expect employment to continue to grow over the next 24 months, 2020 and 2021, with enormous growth expected in the Association of Southeast Asian Nations (ASEAN), Latin America and Africa (Grant Thornton, 2020).

Considering the situation in the United States, where many educational institutions and industry associations provide refresher education and Training in supply chain management and logistics, the E-supply chain is very advanced (Grant Thornton 2019). However, companies struggle to fill high and low supply chain vacancies. At the same time, warehousing costs rise as businesses struggle to find skilled warehouse workers (DHL 2020).

In some developing countries, there are no universities, colleges, and other institutions that offer logistics and supply chain management courses. According to Stryker, Heidrick and Struggles (2020), the emerging market has avoided this problem by providing similar courses such as marketing, management, and IT. Still, fewer colleges are offering pure supply chain courses and degrees. Unlike other developing countries in Asia, many educational institutions in the Philippines offer courses, degrees, and certification programs in supply chain management. As a result, the Philippines has been able to "export" supply chain experts to other developing Asian countries such as Vietnam and Indonesia (Stryker 2020). ICT skills are missing among most business and private sector employees (Mckinsey and Company, 2020). The list of missing skills by the employees joining the logistics sector echoes the list of the required skills in ICT (Murphy 2017).



#### 2.4.1.4 The Training of e-Logistics Skills

With increased aims to make investments, the need for e-logistics skills is developing. However, as unemployment ranges hit historic lows, commercial enterprise leaders are worried about the value and availability of skilled workers. Apart from some trends, the labour market is cooling across developed economies with the North United States of America and Europe, where the employment boom is static. Forty-six per cent of enterprise leaders feel that the impact of labour costs on their growth in the Asia Pacific and Southern Europe is worrying. In the meantime, forty-five per cent of business leaders count on employment to expand during the following year, with ASEAN, Latin American and African nations waiting for significant full-size increases (Grant Thorton, 2019).

The United States has various higher education establishments and business associations that offer diploma guides and Training in logistics and supply chain management. Companies

have trouble filling senior-level supply chain control positions and lower-degree jobs. Researchers reveal that for each qualified supply chain manager, there are six vacant positions. The scarcity is also being felt in skilled labour. The lack of truck drivers in the United States of America is drastically driving up transportation fees and getting in the way of available capability. At the same time, warehouse prices are rising as businesses have difficulty locating qualified warehouse labour (Thai, 2020).

Not enough colleges, universities, and establishments in developing nations provide logistics and supply chain management courses. One emerging market that has avoided that trouble is the Philippines, according to Jeffrey Greg Stryker of the executive seek company Heidrick & Struggles. In contrast to other growing Asian international locations, many academic establishments within the Philippines provide publications, levels, and certification applications in delivery chain management. As a result, the Philippines has been able to "export" supply chain specialists to different growing Asian international locations, including Vietnam and Indonesia, in line with Stryker (DHL, 2020).

Associations control competencies and expert improvement, for example, (SAPICS) South African Production and Inventory Control Society (dos Santos, Brown and McHenry, 2019) and the Transport Sector Education Training Authority (TETA). While these associations add to human resources advancement, the limit is restricted. The Training and development that mainstream universities give are sufficient to prepare graduates for the world of work. The industry has reacted by working with private colleges to create rebuilt training and development training (Sector study: logistics -South Africa).



### 2.4.2 Is There a Need for a Qualification to Address the Skills Gap?

The South African labour force has three mismatches: demand, education, and qualification. Demand mismatch is how the economy is currently moving in terms of structure. For instance, the services sector's contribution to the GDP has grown over the past several years, creating jobs there. The same can be stated for the primary sector's downturn, particularly in mining and agriculture, which reduced employment in these industries. Although most of South Africa's workforce is unskilled, skilled labour is scarce due to the economy's structural change favouring high-skilled labour. This affects young people who enter the workforce and results in a concerning demand mismatch. An educational mismatch constitutes the second mismatch. Here, it is compared the kinds of skills the educational system produces and how workers' skills adapt to the educational requirements of jobs. Qualification mismatch is the third mismatch (Laubscher, 2018).

The employee's qualifications are compared to the prerequisites for successfully performing the job. Demand mismatch is the main obstacle to long-term job growth in South Africa. According to PWC's transport and logistics 2030 report, Logistics firms in developing nations like South Africa must invest significantly in their young labour force's training, development, and education (PWC, 2022). According to DHL, Higher Education Institutions are urged to design more specific e-Logistics courses to lighten the deficiency (DHL, 2020). The lack of skills is being looked at globally in almost every industry. The issue is intense in non-industrial nations, where organisations struggle to discover individuals with the correct blend of information on the nearby market and store network skills. In China, for instance, the Chinese Institute of Sciences delivered a report in 2007 saying that both local and overseas organisations were having trouble discovering senior e-Logistics managers and e-Logistics staff.

To cultivate e-Logistics skills, businesses that manage e-Logistics can establish formal teaching, training, and job coaching (Aguinis & Kraiger, 2009), as cited in (Goffnett, Williams, Gibson, and Garver, 2016). From a scholarly point of view, lecturers can be better educated regarding changing requests and work to help the supply chain industry needs by assisting with delivering graduates with fundamental e-Logistics competencies. The educational program should cover significant and essential competencies, especially those that are basic with low current capacities or accessibility in industry. These competencies can be presented through cases, lessons, tests, and company visits. Furthermore, lecturers can develop competencies by offering students team and individual work (Pyne, Dinwoodie, and Roe, 2007; Yi, 2012). This can be achieved through e-Logistics case competitions, case studies that include current industry projects, and professional development.



This can also be accomplished through supply chain simulations and logistics case competitions, student organisation activities involving real-world projects, and professional development events, for instance, business fairs, office visits, industry accreditations and community service. Lecturers could build up a service-learning project prospect with a non-profit business that needs students to use their essential skills to provide e-Logistics solutions to the companies (Goffnett et al., 2012; Yi, 2012) as cited in (Goffnett, Williams, Gibson, &Garver, 2016).

According to Wayne (2019), the training requirements to become a logistics manager vary by employer and industry in most European countries. However, ONet (2020) indicates that 74% of logistics managers have a bachelor's degree. The Council of Supply Chain Management Professionals (CSCMP) (Advanced Solutions International, 2023), a board in supply chain management, asserts that it has encouraged potential logistics and supply chain managers to

acquire the skills and knowledge they need to work through internships and work experience. He also encouraged likely managers to learn business skills and supply chain knowledge.

According to DHL (2020), in South Africa, a teaching assistant or bachelor's program in logistics, supply chain management, business administration, or related fields can prepare graduates for careers in logistics management. Students explore key concepts, strategies and processes in logistics, transportation and supply chain management and combine business planning with supply chain-centric courses (Murenga 2017). The logistics degree program studies include procurement, global logistics, logistics operations, warehousing and distribution, economics, accounting, and commercial law. For most Cape Town and Gauteng companies, DHL 2020 purports that a degree in South African logistics is still rare and not recognised by most companies. Most companies are taking accountants and ICT and business courses. The next generation must be attracted and trained, and workplaces must be modified to meet the demands of older workers. Therefore, logistics and transportation organisations must ensure that a solid commitment to tackling human resources issues comes directly from the top.

Frameworks on skills requirements for logistics professions are discussed in the next section.

### 2.5 Part 4: Frameworks on Skills Requirements for Logistics Professionals

Murphy and Poist (1991a, 1991b) established a framework for the logistics industry called the BLM model with 83 necessary abilities (33 business skills, 18 logistics skills, and 32 management skills). Additionally, they defined business acumen as the knowledge logisticians must possess concerning business, directly and indirectly. A logistician needs specific abilities to be educated or equipped in various logistics-related professions. To lead businesses to survive in the complicated business climate, managers must have the skills in planning, organisational, and personal qualities.

The BLM model has been used in numerous studies to address skill needs or logistics education (Razzaque and Sirat, 2001, Murphy and Poist, 2006, Murphy and Poist, 2007, Thai et al., 2011, Thai, 2012, Lin and Chang, 2018). This suggests that this model has become a fully evolved structure. The BLM model has been validated primarily in American contexts, despite being used frequently to test logisticians' required skills (Thai et al., 2012).

Murphy and Poist (2012) initially studied techniques essential in advanced logistics to manage logistics functions. Available in three technologies: Business skills, logistics skills, and management skills called BLM skeleton. The actions are divided into three groups. The traditional category belongs to the essential management functions such as planning,

organisation, oversight, and management; Unconventional types include time management and the ability to adapt to change. Personal skills represent leadership qualities such as confidence and personality. This model has been implemented in Singapore and Malaysia (Vinh et al., 2012), Australia (Thai et al., 2011), and Egypt (Elzarka & El-Nakib, 2014) Vinh et al. (2012). By applying the BLM framework, they could standardise the competencies or skills needed in the E-Supply chain logistics of many companies. The top five competencies that exist according to business-related competencies are:

- Transportation and Logistics,
- Supply Chain Management,
- Business Ethics,
- Business Strategy and risk management.
- Management

Murphy and Poist (2017) refreshed their exhaustible business-Logistics-Management (BLM) framework, made from over 80 skills. They analysed the overall significance of every skill of senior-level logistics professionals.

Thai (2012) interviewed senior logistics professionals in Australian companies utilising a reduced variant of the Business Logistics Management structure. They discovered individual respectability, critical thinking, connections, cost control, and preparation among the highest-level skills constructed on their significance now and in the coming years. The three skills grouped in the Business Logistics Framework were similarly significant.

There is a stream of research in the logistics literature dedicated to talent, mainly focusing on the value and recognition of skills. For example, the Council of Supply Chain Management Professionals published a thorough report 1999 called The Growth and Development of Logistics Staff. Which was mainly concerned with using auditing gap analysis to identify capability deficiencies and establish improvement plans (Goffnett, Williams, Gibson, & Garver, 2016).

Gibson and Cook (2015) gathered data from interviews and surveys of executives and mid-level managers from 40 of the top 100b Third-Party logistics (3PL) companies, revealing various skills required for entry-level management positions. Among them were problem-solving, oral communication, planning/organisation, learning capacity, decision-making, collaboration, relationship management, creative thinking, and written communication. This study was re-examined and revised (Cook, Gibson, and Williams, 2009). For SCM staff, the replicated research identified and highlighted the value of leadership characteristics and skills (Goffnett, Williams, Gibson, &Garver, 2016.). Ellinger and Ellinger (2014) compiled a list of

critical skills for supply chain managers based on four research, including problem-solving, communication, teamwork, global orientation, change management, and coaching.

Elzarca and El-Naqib (2014) compared the skills required at the undergraduate level. Logistics between the perspectives of researchers and practitioners based on the BLM model. According to their research, more students per client must be reorganised and practised regarding logistics technology. Service, warehousing, international logistics, return shipping, recycling, and scrap Disposal were using the BLM (Thai et al., 2011). Terms of business skills it was developed in strategic management, but it should be noted (Thai et al., 2011) and business rules (Thai et al., 2011). The management category was linked to critical thinking, leadership, analytical thinking, and emotional intelligence skills.

The researcher envisages that the BLM framework worked in Latin America in developing countries such as Singapore, which share some qualities with South Africa as an industrialised and emerging economy. The South African curriculum in the SETAs needs to implement this model in the SETA that deals with the skill competency following the BLM model, which can help improve the Supply Chain Management in South African logistic industries. The other criticism of the model is that it focuses mainly on soft skills and undermines the hard- skills in ICT, which are essential in the e-supply chain or e-Logistics management. The model underpins the conceptual skills needed for managers and middle managers, although it lacks hard-core IT skills. The BLM framework has served as a general tool for evaluating the skill and knowledge of logicians but has been primarily tested in the United States. It is also essential to consider factors affecting and changing the business environment, such as a greater focus on globalisation, outsourcing, technological advances, climate change, logistics knowledge, and risk management that may affect technology choices. EU environment, recent studies have shown that competency prioritises the level of competency in international business experience or related foreign languages (Scheraga & Semey, 2014). Except for a recent US study by Murphin (2016), logistics managers' interest in knowledge and skills has declined somewhat.



### 2.5.1 Conceptual Research Framework

Silverman (2000) states that the conceptual framework comprises concepts connected to already-in-use procedures, behaviours, functions, relationships, and objects. According to Miles and Huberman (1994), the conceptual framework is an illustrated or narrative form that

describes primary studies. After examining the literature, theories are conceptualised to address our research issues.

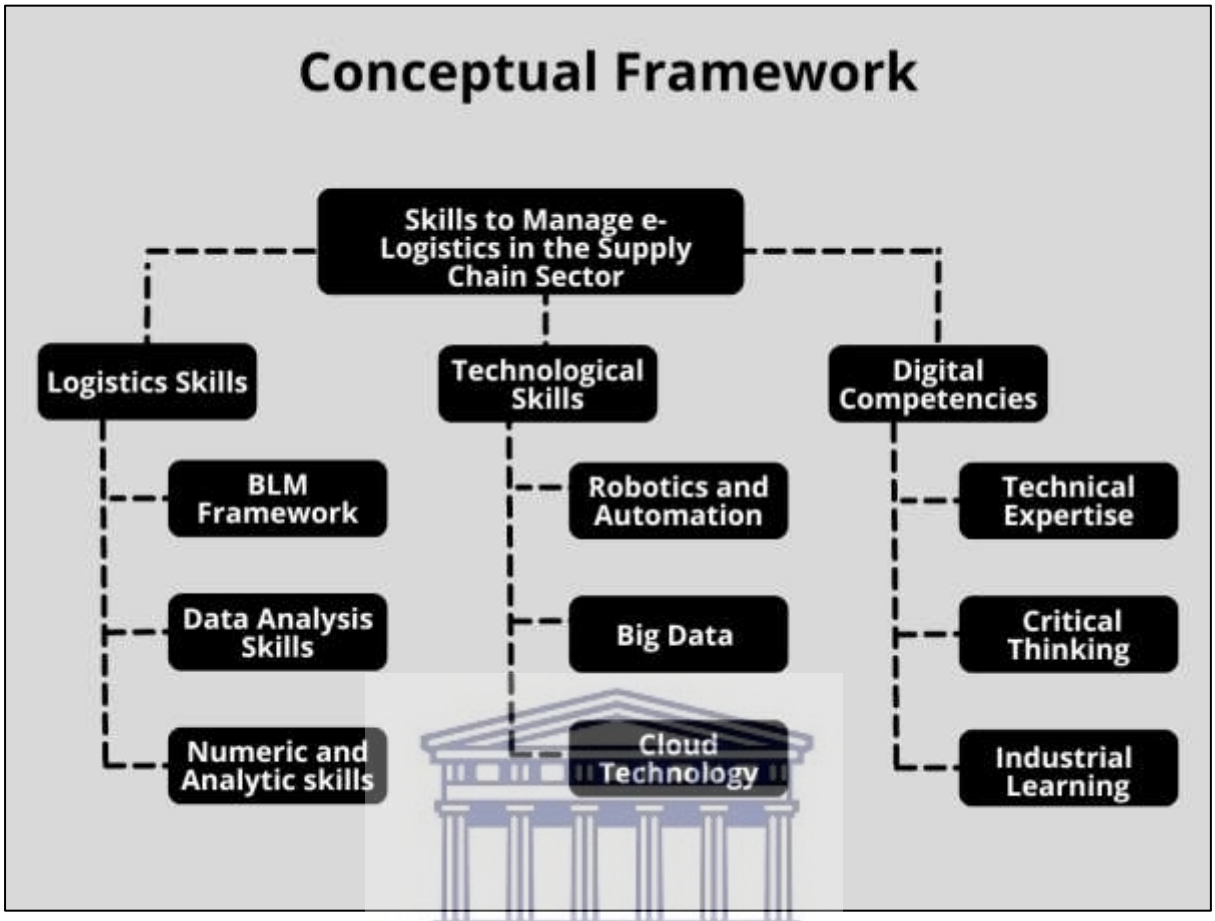


*Figure 7: Conceptual Framework. Source: (Researcher's construct from Literature Review)*



After conceptualising the research problem of the skills gap in the e-Logistics sector, the literature review findings and the theoretical frameworks outlined above, the researcher then designed a model to bridge a hole and add to a body of knowledge for future research.

**2.5.1.1 Rationale for developing a new conceptual framework for e-logistics skills requirements.**

Previous research conducted by Murphy and Poist (1991) and Thai (2012) has decided that an assortment of Supply Chain Management competencies is needed to perform supply chain capacities sufficiently. There is a not insignificant rundown of Supply Chain abilities in the writing, which incorporate logistics and supply chain, general administration, and data innovation (IT) - related abilities (Mangan and Christopher 2005; Murphy and Poist 1991). Scientists have little agreement regarding e-Logistics capabilities (Tatham et al., 2017). For example, a few scientists have arranged the skills into three zones (Murphy and Poist 1991), four (Rahman and Qing 2014), five (Sinha, Millhiser and He 2016) and six (Heyns and Luke

2012) zones. This way, the current writing on the production network abilities system is profoundly divided regarding characterising abilities structures, for instance, business logistics the board (BLM) by Murphy and Poist (1991), T-shaped skills gathering by Mangan and Christopher (2005) and Heyns and Luke's (2012) structure.

2016; Wu et al. 2013) have not given direction to rising scholastics and specialists regarding which system is more fitting for grouping e-Logistics abilities.

Consequently, the issue can be described as how studies distinguish numerous skills conceivably needed for successful SCM and depict various frameworks. In this manner, disarray among specialists also scholastics regarding which skills and skills classifications are most significant while deciding the abilities needed to manage e-Logistics in the supply chain sector.

#### 2.5.1.2 Design of the conceptual framework

It is essential to point out how this framework does not imply that a person must possess each of these skills at any time. Instead, this conceptual framework should serve as a starting point for the skills that an e-logistics professional can demonstrate and use as needed in specific work situations.

Although this framework combines the necessary core skills, it should be done in the finest way feasible, highlighting that it is impractical for any supply chain professional to expect all these abilities to be at the highest degree of competency at any given time.



Skills ought to be assessed on a range rather than in binary terms. As a result, it should be assessed how well (at what skill level) an e-logistics professional can perform a specific ability in each context rather than stating that they either do or do not possess a particular skill.

For these skills to be integrated into education and training starting at the postgraduate level, it is recommended that this framework be a guide for academics, curriculum developers, and industry. Professionals will be able to apply these skills in the workplace.

Table 3: Key Concepts used in the conceptual framework.

| **Key concepts used in the conceptual framework** | | |
|---|---|---|
| **Skills** | Skills are the unique learnt talents required to complete a task | (Graesser, Sabatini, and Li, 2022) |

| | | |
|---|---|---|
| **Logistics skills** | logistics abilities to gather data, identify supply chain optimisation opportunities and guarantee the accuracy of production processes. | (Murphy and Poist 2006) |
| **BLM Framework** | Business, Logistics, Management Framework Murphy and Poist (1991) gave 83 skills driven by business- and management-related abilities and 18 logistics skills. They claimed that the logistics abilities required for top managers are anticipated to empower managers to manage cross-functional operations, as logistics affect other areas. Thai (2012) reduced the number of abilities from 83 to 68 based on Murphy and Poist's (1991) list, but his findings supported those of the original study. Overall, it was found that senior-level managers must possess strong management abilities and have a solid foundation in logistical knowledge areas to work in the industry. | (Murphy and Poist, 1991; Thai, 2012) |
| **Digital competencies** | Digital competencies are a collection of fundamental skills, knowledge, and abilities that enable employees to perform and | (Oberländer and Bipp, 2022) |

| | | |
|---|---|---|
| | accomplish job duties in digital work settings. | |
| **Technological skills** | The capacity to work with and perform tasks utilising computer-based and other related technologies is referred to as having technical skills. They could be physical or digital tasks. | (Luke and Walters, 2023) |
| **Numeric and Analytic skills** | Problem-solving involves defining a problem, figuring out its root cause, locating, ranking, choosing potential solutions, and putting them into action. | (Kamalov, and Leung, 2022) |
| **Data Analysis** | Organisations employ analytical processes to evaluate and coordinate the supply chain and logistical functions to ensure their business's efficient and timely functioning. | (Hendriyati, Agustin, Rahardja, Ramadhan, 2022) |
| **Robotics** | Robotic process automation is used in supply chain management to automate low-value jobs, speed operations, and eliminate human error. Robotics enables supply chains to expand quickly and satisfy demand as it rises. | (Chauhan, Brouwer, and Westra, 2022) |
| **Automation** | Supply management automation uses contemporary technologies to automate formerly manual operations to | (Ashima, Haleem, Bahl, Nandan, and Javaid, 2023) |

| | | |
|---|---|---|
| | improve workflows and productivity. | |
| **Big Data** | Big data is defined as either impractical to analyse utilising conventional techniques because it is so huge, quick, or complex. | Verma, Lamsal, and Verma, 2022). |
| **Cloud Technology** | Through their internet-connected PCs, smartphones, tablets, and wearables, users of cloud computing technologies can access storage, files, applications, and servers. | (Alzakholi, Shukur, Zebari, Abas, and Sadeeq, 2020. ) |
| **Mobile Technology** | Utilising various technology, including mobile laptops and cell phones, to accomplish supply chain operations. | (Zhou and Wan, 2022.) |
| **Technical expertise** | Technical skills are the specialised knowledge and proficiency needed to carry out activities and use equipment and programmes in practical settings. | (Asif, McInnis, Dang, Ajzenberg, Wang, Mosa, Ko, Zevin, Mann, and Winthrop, 2022). |
| **Critical Thinking** | The capacity to understand how the business fits into the strategic mentality and critical thinking and how supply chain and procurement contribute to the direction and value proposition of the company to its consumers. | (Guerrero, Ali, and Attallah, 2022) |

## 2.6 Chapter Summary

In general, e-logistics expertise is essential for supply chain risk mitigation, cost optimisation of logistics management, and client retention enhancement. Businesses which engage in e-logistics talent development and utilisation get an advantage over their competitors by enhancing efficiency in operations, exceeding client expectations, and fostering company growth in the hurried logistics sector. This chapter discussed the origin of logistics, looking at the impact of the digital economy and the birth of e-logistics. Then it discussed the skills requirements for e-logistics. The South African labour force and the training in e-logistics were discussed. The chapter closed off by investigating literature frameworks related to logistics skills and examining the literature on the qualifications required; a conceptual framework was developed to discuss and interpret the empirical findings in Chapter 4. The next chapter presents the research methodology.

# CHAPTER 3: RESEARCH METHODOLOGY

## 3.1 Introduction

The previous chapter discussed the impact of e-Logistics on supply chain management and the skills required to manage e-Logistics. It then presented a conceptual framework that examined the skills requirements to manage e-Logistics. This chapter offers thorough reasoning and clarification of the research methodology process used. To align the selected design with the study's original purpose, it starts by restating the aims and objectives as well as the primary and sub-questions of the study. After that, a thorough discussion of the research philosophy, research approach, research design, study population, sampling strategy and sample size, data collection, the trustworthiness of data, data analysis, and ethical considerations are presented. The chapter closes off with a synopsis of what was discussed.

## 3.2 Aims and Objectives of the Study

The study had one aim, which was based on evidence of the skills gaps in e-Logistics that were described in the problem statement in Section 1.2**:**

- To determine the skills required by the e-Logistics industry.

The study focused on two main objectives: identifying and measuring the various initiatives and benchmarks related to e-skills and e-competencies.

- To develop a conceptual framework that can be used to assess the skills required by the supply chain sector to manage e-Logistics.
- To determine the qualification needed to effectively address the skills gap in managing e-Logistics.

## 3.3 Main Research Question and Sub-questions

The following question formed the basis for this research.

**What are the requirements to address the skills gap in managing e-Logistics in supply chain management?**

The following two sub-questions are included to support answering the primary research question.

1. What skills are required to manage e-Logistics in the supply chain management sector?
2. Is there a need for a qualification that will address the skills gap to manage e-Logistics effectively?

## 3.4 Research Philosophy

Guba & Lincoln (2004) assert that a paradigm is a mental model that shapes and impacts how researchers conduct research. Research philosophies or paradigms guide research approaches, research design, sample size, data collection instruments, and data analysis. The three facets of the research philosophy are as follows:

***Ontology***: Nature of reality, that is, what entities exist and how they are related and interact with one another (Babbie & Mouton, 2010)

***Epistemology***: People's ability to know reality or how they learn about the world (Guba & Lincoln, 2004)

***Methodology***: Conducting legitimate research investigation into reality and verifying the validity of knowledge obtained.

The following section will explain the four main paradigms that can be used in research: positivism, interpretivism, critical realism, and pragmatism. The area will also detail the research philosophy used in the current study and the justification for utilising the research philosophy.



### 3.4.1 Interpretivism Philosophy

Interpretivist approaches to the research aim to understand the world of human experiences, suggesting that reality is socially constructed (Morgan, 2007; Moller, 2011). According to Pham (2018), it is best to study social reality within its socio-historical context by balancing the subjective interpretations of its various participants. Interpretive researchers interpret social reality through a "sense-making" process rather than a hypothesis-testing procedure because they believe social reality is integrated within and hard to isolate from their social environments (Davies and Fisher, 2018). This contrasts with the positivist or functionalist paradigm, which holds that reality can be decomposed functionally and examined using objective methods such as standardised metrics and is primarily independent of context (Alharahsheh and Pius, 2020). In this research, the interpretive paradigm was used to guide

the study. To comprehend social phenomena, a phenomenologist argues that we must start by considering people's subjective interpretations and perceptions of the world (their life worlds) (Driscoll, 2011).

Interpretive research is an effort to make sense of social reality by using the varying perspectives of participants who have been embedded inside the setting in which the reality is situated (Creswell, Shope, Plano Clark and Green, 2006). As a result of their extensive contextualisation, these perceptions are inevitably less transferable to other situations (Toma, 2011). However, many positivist researchers view interpretive analysis as less rigorous because it is a sensitive understanding of the embedded researcher (Creswell and Miller, 2000). Since interpretive research is predicated on a different set of ontological and epistemological premises about social reality than positivist research, the positivist concepts of rigour, such as reliability, internal validity, and generalisability, do not apply similarly. (Creswell, and Poth, 2016; Lee and Hubona, 2009).

If two researchers independently evaluate the same phenomenon using the same body of evidence and come to the same conclusions, or if the same researcher observes the same or a similar phenomenon at different times and comes to the same conclusions, then the interpretive research is regarded as reliable or authentic (Tashakkori and Teddlie, 2008; Creswell, and Poth, 2016). This idea is comparable to the positivist concept of reliability, with the agreement between two independent researchers being comparable to the idea of inter-rater dependability and agreement between two records of the same phenomenon made by the same researcher (Morse, 2015; Schwandt, Lincoln, and Guba, 2007; Amankwaa, 2016). Interpretive researchers must give enough information about their phenomena of interest and the social environment in which it is entrenched to enable readers to independently authenticate their interpretive inferences to assure reliability (Whittemore, Chase, and Mandle, 2001; Venkatesh, Brown, and Bala, 2013).

If readers believe the inferences drawn by interpretive research can be credible (Stewart, Gapp and Harwood, 2017). Providing proof of the researcher's prolonged involvement in the field, demonstrating data triangulation across subjects or data collection methods, and upholding meticulous data management and analytical techniques that can enable an independent audit, including verbatim interview transcription, accurate contact and interview records, and detailed notes on theoretical and methodological choices. Can all increase the credibility of interpretive research (Patton, 1999; Thorne, Kirkham, and O'Flynn-Magee, 2004; Tashakkori and Teddlie, 2008)

Confirmability measures how easily other people can independently corroborate the results of the interpretative investigation, typically participants (Houghton, Casey, Shaw, and Murphy, 2013). This is comparable to how functionalist research views objectivity (Amankwaa, 2016). Confirmability is measured in terms of inter-subjectivity, or whether the study's participants concur with the researcher's deductions because interpretive research denies the idea of objective reality (Creswell and Miller, 2000). For instance, the results of a study can be considered confirmable if the participants largely concur with the conclusions that the researcher has reached about a specific occurrence based on an analysis of the study or report (Lee and Hubona, 2009; Creswell and Poth, 2016).

In interpretive research, transferability refers to how broadly the results can be applied to different contexts (Houghton, Casey, Shaw, and Murphy, 2013). The notion of external validity in functionalistic research is comparable to this one. For readers to independently determine whether or when and how much the results are transferrable to other contexts, the researcher must give readers thick descriptions of the research context (Venkatesh, Brown, and Bala, 2013; Amankwaa, 2016).

### 3.4.2 Positivism Philosophy

According to Maree (2016), empiricism is one of two types of foundationalist philosophy that holds that knowledge should be impartial and free from any prejudice resulting from the researcher's values and views. According to the ontology of positivism, there are verifiable truths; for instance, patient weight remains constant regardless of who measures it, and observation and measurement reveal that reality (Saunders et al., 2019). According to positivist epistemology, the world exists without the researcher (Bryman 2014). On a metaphysical level, they contend that only one external reality can be discovered by deductive reasoning, hypothesis, and experiment testing. For instance, if we are aware of an event, we can investigate its origins in the past. This naive realism suggests that what we observe precisely reflects the world.



### 3.4.3 Critical Realism Philosophy

The critical realism paradigm seeks to develop knowledge by recognising the role of personal information of social actors in each context or setting (Baskar, 2013). Bhasker (2013) further states that critical realists also take note of the independent structures that constrain and facilitate social actors to conduct research in the same contest. Furthermore, critical realism argues that the researcher's knowledge of the external world consists of subjective

interpretations because it is formed from the conceptual framework in which the researcher operates (Baskar, 1998).

### 3.4.4 Pragmatism Philosophy

A pragmatic research study concentrates on a single decision-maker in a real-world context. The first step in conducting practical research is to identify and consider an issue in its broadest sense. This leads to a research inquiry, which aims to get a deeper understanding of the problem and, ultimately, fix it. Finally, the findings frequently show policy recommendations, new environmental efforts, or social change (Maree, 2016).

Such deeper problems would only spark the interest of pragmatic research, which prioritises practical answers over philosophical debates. Mixed-methods approaches are frequently used in sensible studies. Any method that provides a meaningful approach to a given research subject, including qualitative and quantitative methodologies, could be used. This allows a researcher to create a holistic analysis considering many vital aspects. In order to better a situation, pragmatic studies are inductive, moving from a complex problem to a broad theory of knowledge (Creswell & Creswell, 2018).

Understanding human experience is the foundation of pragmatism. As a result, pragmatic studies frequently aim to comprehend the numerous aspects that influence people's actions in a specific circumstance (Maree, 2016). As a result, pragmatists admit that their investigation will not result in certainty because nothing in the world is undoubtedly in theory. Table 3.1 below shows the pragmatism paradigm's ontological, epistemological, and methodological perspectives.



## 3.5 Justification for Utilising the Interpretivism Research Paradigm

Based on a life-world ontology, interpretivism maintains that all observation is theory- and value-laden and that studying the social world cannot and should not be done in search of a dispassionate, objective reality (Goldkuhl, 2012; Ponelis, 2015). From an epistemological point of view, the interpretivism paradigm holds that human actors socially build our understanding of reality (Rashid, Rashid, Warraich, Sabir and Waseem, 2019). The interpretive research paradigm seeks an explanation inside the participant's frame of reference rather than the action's objective observer and is characterised by a need to comprehend the world from a subjective point of view (Wynn and Williams, 2012). The interpretive paradigm prioritises relevance over rigour on an axiological level (Perry, Riege and Brown, 1999). The evaluation standards used to compare research results produced by

the positivist and interpretative paradigms differ (Cepeda and Martin, 2005). The value of an interpretive study's findings is assessed by how well they fit and complement participants' perspectives, as opposed to the latter, which is valued according to how well results may be generalised to the public (Schwandt, Lincoln, and Guba, 2007). Qualitative research's reliability is determined by its dependability, credibility, confirmability, and transferability. The benefits of interpretive research are numerous and distinct (Baskarada, 2014). First, when quantitative information may be skewed, erroneous, or otherwise challenging to gather, Poth 2016ited for examining hidden causes behind intricate, interconnected, or diverse social processes, such as inter-firm ties or inter-office politics (Creswell and Poth, 2016). Second, they are frequently helpful in developing theories in fields with little to no or insufficient a priori theory (Davies and Fisher, 2018). Thirdly, they help research unusual, idiosyncratic, or context-specific phenomena or processes (Rashid, Rashid, Warraich, Sabir, and Waseem, 2019). Fourth, interpretive research can assist in generating intriguing and pertinent research questions and problems for further study (Wynn and Williams, 2012).

## 3.6 Research Approach

### 3.6.1 Qualitative Research Approach

Understanding the mechanisms and social and cultural factors that underpin different behavioural patterns is a goal of qualitative research. It primarily focuses on investigating the "why" issues that arise in research (Maree, 2016). Qualitative research often investigates individuals or systems by engaging with and watching participants in their natural surroundings, emphasising their meanings and interpretations (Maree, 2016).



Instead of focusing on the extent or breadth of the information the participants supplied, qualitative research emphasises the quality and depth of the data. Sale and Thielke (2018) define the term qualitative research as one that encompasses several research approaches that are, in some respect, different from one another. They mentioned that qualitative methods have two things in common: they focus on phenomena that occur in natural settings known as the real world. Secondly, they evolve by studying those phenomena in all their complexity.

### 3.6.2 Quantitative Research Approach

By analysing a representative sample of the population, quantitative research draws findings about the population that are statistically significant (Bloomfield and Fisher, 2019). The group being researched makes up the population. Any person who meets the criteria for the group

being studied must be included in the population, regardless of how large or small it may be (Gable, 1994). Due to resource shortages and ongoing population turnover, conducting a census that counts every population member is impractical (Chen and Hirschheim, 2004.). Instead, a representative population sample is selected (Choy, 2014). If the sample is appropriately chosen, it will be statistically identical to the population, allowing findings drawn from it to be extrapolated to the whole (Cavaye, 1996). There are typically two forms of quantitative research: experimental and descriptive (Kaplan and Duchon, 1988). By examining whether the researcher-controlled independent variable(s) impacts the dependent variable, experimental research evaluates the validity of a hypothesis, that is, the variable being measured for change (Venkatesh, Brown, and Bala, 2013; Queirós, Faria and Almeida, 2017). To establish causation within a credible confidence interval, surveys, correlation studies, and assessments of experimental results are frequently assessed (Creswell and Creswell, 2003).

### 3.6.3 Mixed Research Approach

Diverse research approaches are known to be both a method and a process involving gathering, analysing, and combining quantitative and qualitative data in a single study or longitudinal inquiry program (Creswell & Poth, 2018).

Mixed methods are used:

- To compare the results from quantitative and qualitative research.
- To use qualitative research to help explain quantitative results.
- To explore phenomena using qualitative research and then generalise findings to a large population using quantitative analysis.
- To augment an experiment with qualitative data.



When planning to use a mixed methods approach, four essential aspects influence the design of procedures. Those four aspects are timing, weighting, mixing, and theorising (Creswell & Poth, 2018). The researcher's main area of interest was the mixing process, which keeps qualitative and quantitative data distinct on one end of the continuum while somehow combining them between these extremes. They might be two databases kept separate but connected. Both quantitative and qualitative data were associated during the phases of research. The four factors mentioned above helped shape the procedures of a mixed methods study as they incorporate specific data collection, analysis, and interpretation procedures to help understand more procedures used.

### 3.6.4 Justification for Adopting a Qualitative Research Approach in this Study

Qualitative research is naturalistic. A qualitative lens is used to study real-world situations as they unfold naturally. The current study includes real-world problems on requirements to address the skills gap to effectively manage e-Logistics in supply chain management. It is emergent, whereby accepting the need to modify an inquiry as knowledge increases and circumstances change, avoiding rigid designs that prevent reacting to possibilities to pursue new lines of inquiry as they present themselves. A qualitative study is purposeful, whereby each case study base, for example, people, organisations, culture, and events, are selected because they are information-rich and illuminative (Creswell & Poth, 2018). In this regard, a purposive sample of 15 critical e-Logistics informants was selected from case organisations to give deep, rich, thick data on requirements to effectively address the skills gap in managing e-Logistics in supply chain management. Qualitative research offers practical manifestations of the phenomenon of interest, and sampling is aimed at insight into the phenomenon, one of the most potent research tools in not empirical generalisation derived from a sample and applied to a population. The researcher chose the qualitative approach because of the quest to understand the requirements to address the skills gap to manage e-Logistics in supply chain management effectively.

### 3.7 Interpretive Research Designs

#### 3.7.1 Case Study Research

Case research is an intensive longitudinal investigation of a phenomenon at one or more research to draw specific, contextualised inferences and comprehend the dynamic process behind an interest occurrence (Cousin, 2005). Case studies are a particular type of study since they can be utilised both interpretively to develop hypotheses and to test them (Walsham, 1995.). Both strategies are thoroughly covered in the chapter before on case research, including illustrative examples (Tsang, 2014). The case researcher does not actively participate in the social situation but observes it objectively (Themistocleous, Irani and Love, 2004).

#### 3.7.2 Action Research

Action research is a qualitative, positivist research approach that aims to test theories rather than develop new ones (Lau, 1997). This interactive design is based on the premise that the best way to understand complex social phenomena is to make modifications, interventions, or actions within them and then watch how those changes affect the phenomena of interest (Baskerville and Myers, 2004). In this approach, the researcher typically takes the form of a

consultant or organisational member who is integrated into a social context such as an organisation, takes action in response to a social issue, and then examines how that action affects the phenomenon while also learning about and developing insights into how the action and the phenomenon are related (Avison, Lau, Myers and Nielsen, 1999).

### 3.7.3 Ethnography Research

The ethnographic research approach, which has its roots in anthropology, strongly emphasises examining a phenomenon in the context of its culture (Brewer, 2000). The researcher must spend a significant amount of time, often eight months to 2 years, fully immersed in the social culture under study, engaging with, observing, and documenting daily life among the culture's social participants in their natural environment (Reeves, Kuper and Hodges, 2008). Participant observation is the primary method for gathering data, while sense-making is used to analyse the findings (Van Maanen, 2006). For readers to experience the same culture as the researcher, the researcher must also take in-depth field notes and describe her experience in vivid detail. In this approach, the researcher plays two roles: rely on her distinctive expertise and involvement to produce(Gusterson, H., 2008).

### 3.7.4 Phenomenology

The study of conscious experiences is emphasised in the research methodology of phenomenology as a means of comprehending the world we live in (Flood, 2010). It is founded on the concepts of German philosopher Edmund Husserl, who held that all knowledge comes from experience in the early 20th century (Connelly, 2010). In order to appreciate and describe social reality from the various subjective perspectives of the participants in it and comprehend the symbolic meanings and deep structure underlying these subjective experiences, the systematic reflection and analysis of phenomena connected to conscious experiences, such as human judgment, perceptions, and acts, is the focus of phenomenology (Caelli, 2001; Mapp, 2008; Converse, 2012).

## 3.8 Justification for Using Case Study Research *Design*

The case study approach is growing in popularity among academics due to its comparability to other methodologies and its trustworthiness Gustafsson, 2017.) Due to its value in evaluating "real world" instances, case studies have frequently been regarded as logistics and supply chain management (SCM) research (Ellram, 1996; Voss et al., 2002; Seuring, 2008). (McCutcheon and Meredith, 1993). Compared to other methodologies, case study research

in logistics and SCM has historically been less popular (see Dunn et al., 1994; Mentzer and Kahn, 1995; Näslund, 2002; Frankel et al., 2005; Sachan and Datta, 2005; Guinipero et al., 2008).

An updated study by Hilmole (2018) paints a different picture. The study's author examines 1,699 "supply chain" papers from 214 journals between 1995 and 2015 that mention the usage of case studies. Evidence suggests that since 2009, the number of published case studies has skyrocketed, mainly due to the economic crisis's shock waves pushing environmental concerns further up on legislatures' and businesses' priority lists.

Choosing whether to employ one case study or several case studies is one of the essential questions in case study analysis. How many cases are required to obtain the intended generalisability of results if a multiple-case design is chosen? Before collecting data, this question must be addressed as part of the research design Creswell (2014), Stake (1996,2006). Before continuing, it is important to dispel a common misunderstanding: that each case study is comparable to a single experiment observation. Instead, because each case study has a distinct setting that is a part of the experiment, each one is, on its own, a self-contained experiment Babbie & Mouton (2010; 2011).

Identifying single or numerous cases is challenge number two, which could be challenging. When a detailed analysis is sought, Creswell (2007) argues that the study of more than one example dilutes the fundamental analysis, and the more cases one individual investigates, the less depth is acquired. Because comprehensive and accurate descriptions were essential to this study, it was decided that multiple case studies would be adequate.



Qualitative research design varies on the method used to gather data—participant observations, in-depth interviews, and focus group discussions. The present investigation took a case study design because it allowed the researcher to explore requirements to effectively address the skills gap to manage e-Logistics in supply chain management. Using the case study helped the researcher ensure that issues were not explored through one lens but through various lenses, allowing for multiple facets of the research problem to be explored. The case study was based on the interpretivism research paradigm or philosophy (Stake & Kerr, 1995). The approach was the close collaboration between the researcher and the participants while enabling participants to tell their stories (Baxter & Jack, 2008). Through these stories, the participants could describe their views of reality, allowing the researcher to understand the participants' actions better. The researcher wanted to gain a richly detailed understanding of the requirements to effectively address the skills gap in managing e-Logistics in supply chain management. The researcher wanted to understand the requirements to address the skills gap to effectively manage e-Logistics in supply chain management,

interpreting critical informants drawn from e-Logistics vital informants. Hence 15 participants were selected from 15 Case organisations to participate in the current study.

### 3.9 Sampling Technique and Sample Size

Purposive sampling was adopted for selecting participants for this qualitative research study. Carter and Little (2017) posit that qualitative research samples purposively. It is often referred to as a selective or arbitrary sample. Its main goal is to focus on Interested in population features that will best enable the researcher to answer questions (Creswell & Poth, 2018).). The researcher engaged or selected e-Logistics experts from various organisations who happened to give information on the need for an e-Logistics qualification.

### 3.10 Data Collection Method

Interpretive research gathers data using various methods (Walsham, 2006); the most popular method is interviewing (face-to-face, telephone, or focus groups). Observation is a second tactic (De Leeuw, 2012). Direct observation, where the researcher is unbiased, both participant observations, where the researcher is an outsider to the event of interest (as in case research), and passive observation, where an engaged participant whose contributions or mere presence affects the phenomenon being studied, are two examples of observational techniques as in action research (Bourenkov, and Popov, 2006; Willson and Miller, 2014). A third method is documentation, in which outside and internal records, including letters, emails, financial statements, annual reports, newspaper articles, and websites, may be utilised to support other types of evidence or to shed light on an issue of interest (Bowen, 2009).



Data collection for this current study was done through in-depth interviews. Interviews constitute the gold standard for qualitative research (Oltman, 2016). An interview is a discussion with a goal. (Rubin & Rubin, 2011). The researcher conducted in-depth interviews with purposively selected participants. The purpose was to understand participants' perspectives of requirements to effectively address the skills gap in managing e-Logistics in supply chain management. In principle, an interview is a conversation in which two parties (interviewer and interviewee) discuss a topic of interest. Discussions have a cycle consisting of the following four sequential steps:

> ***Planning phase***: Formulating relevant questions, designing motivating questions, and establishing a communicative atmosphere.

***Doing phase***: Delivering the question, listening to the interviewee, observing the interviewee's non-verbal behaviour, evaluating the response, probing these, and recording the information.

***Analysis phase***: Transcribing the interview, making interview records, analysing one's interviewer's behaviour,

***Reflecting phase***: Identifying information gaps, preparing for the following interview,

Interview data may be collected telephonically, face-to-face, and through Zoom or MS Teams. In this study, the interviews were held on the MS Teams platform. The researcher used semi-structured interviews over the MS Teams online platform. Focus on predetermined questions, but the order can be modified based on the interviewer's perception of the most appropriate. Question-wording can be changed, explanations given, inappropriate questions for a particular interviewee can be omitted, or additional ones included. The researcher interviewed 12 e-Logistics experts.

## 3.11 Data Collection Instruments

The study used two data collection instruments. These were (1) the researcher as a critical instrument and (2) the interview schedule. The following sub-sections describe these two instruments in detail.

### 3.11.1 The Researcher as a Critical Instrument



In qualitative research, the researcher is the crucial instrument (Pezalla, Pettigrew & Miller-Day, 2015). To collect valuable data, the researcher had to spend considerable time preparing for data collection. The process involved extensive reading of research methods articles and books, for example, Carter & Little (2017) and Rubin (1995). The researcher learned that "qualitative interviewing is more than a set of skills; it is also a philosophy, an approach to learning" (Rubin & Rubin, 2011).

### 3.11.2 Interview Schedule

According to Van Teijlingen (2014), a qualitative research interview aims to cover both the factual and meaning levels, albeit it is typically more challenging to interview on a meaning level. Qualitative research interviews aim to describe the significance of essential topics in the subjects' universes. Understanding the meaning of what interviewees say is the primary goal of the interview proc (Fox, 2009). To guide the interview process, the researcher generated

an interview schedule after conducting a thorough literature search to identify gaps. The interview schedule consists of the key or guiding questions written down before the interview. It serves as a memory aid and helps to standardise questions across participants.

### 3.12 Data Collection Procedures

The interview approach was employed to gather qualitative data. This data collection method is a. technique that involves direct communication and interaction between the interviewer and the subject. The qualitative interviews were conducted on Microsoft Teams, explaining the participants' rights, such as voluntary participation, anonymity and confidentiality, and the right to withdraw from participation without any negative consequences. Permission to use a digital audio recorder was routinely sought from each participant. Audio recording helped the researcher to capture data that were later transcribed accurately. The data were collected in English. Hence there was no need for translation during the process of transcribing. The researcher remained neutral in all the questions and conducted secondary research to ensure a complete understanding of the topic. The researcher also requested assistance from multiple people to code and verify the data with more data sources, which gave the researcher confidence that the results were legitimate. Member checks were conducted to enhance the trustworthiness of the study.

### 3.13 Data Analysis



Qualitative data analysis refers to information that is not numerical, such as video, notes, and interview transcripts. Audio recordings, images, and text documents (Creswell & Poth, 2018). It can be divided into five categories: content analysis, narrative analysis, discourse analysis, framework analysis, and grounded theory. In the study, the researcher used the coding process in ATLAS.ti. To ensure credibility, the researcher was transparent in the coding process. ATLAS.ti is a qualitative examination of data. ATLAS.ti enables researchers to assign codes and labels to text, sounds, pictures, or video to search these codes for patterns and to construct classifications of codes that reflect stable models of the conceptual structure of the underlying data (Lewis, 2014). ATLAS.ti 22 was used in the current research. The analysis of the data process is detailed below:

#### 3.13.1 Data analysis process in ATLAS.ti

##### 3.13.1.1 Importing Transcribed Interviews

All the transcribed interviews were imported to ATLAS.ti to form the Primary Document. The Primary Document Manager program can store and analyse several documents temporarily stored in the Primary Document Manager. Furthermore, the Primary Document Manager allowed the researcher to create Primary Document families, which assisted in organising data for the current study.

#### 3.13.1.2 Open Coding

The second step was the generation of various categories using constant data comparison through open coding (Age, 2011). The available coding procedure saturated the research process since it involved comparing cases to cases and then comparing the emerging data to more cases throughout the data collection process (Heath and Cowley, 2004). The Code Manager is used in ATLAS.ti to execute this process. By using this function, data were clustered into related ideas called codes

#### 3.13.1.3 Core Categories and Selective Coding

Here multiple codes were amalgamated into families or themes in which further analysis was conducted. Continuing the above procedure of constant comparison, the researcher established core codes (innovation and creativity, digital skills) based on the information the research participants provided. It is the umbrella category for all other types (for example, skills and competencies). When the core code emerged, selective coding was conducted by the researcher (Heath and Cowley, 2004). Selective coding allowed the researcher in the current research to incoming data to the core codes more precisely than at the time the categories were initially created (Neegaard and Uhoi, 2007). Only those categories related to the codes were considered to generate improved categories through selective coding.

#### 3.13.1.4 Thematic Analysis

According to (Castleberry and Nolen, 2018), thematic analysis is a technique for studying qualitative data that comprises looking through a data set to find, examine, and document recurring themes. It is a technique for summarising data, but when choosing codes and creating themes, it also involves interpretation (Guest, MacQueen and Namey, 2011; Vaismoradi, Jones, Turunen, and Snelgrove, 2016). The versatility of thematic analysis, which may be utilised within a wide range of theoretical and epistemological frameworks and a method used for various study objectives, methodologies, and several respondents, is one of its distinctive characteristics (Braun and Clarke, 2019).

### 3.14 Trustworthiness of The Study

It is credible when results are supported by solid evidence, and a compelling case can be made using those results. Its equivalence in quantitative studies is validity and reliability. Shenton (2004) suggested four criteria to ensure a valid interpretation of data credible, dependable, confirmable, and transferable.

**Credibility:** Anney (2014) defines credibility as the degree of certainty that can be given that the research results are accurate. It determines whether the research findings are credible data derived from the participants' initial viewpoints. The researcher showed rigour in the inquiry by adopting one of the credibility strategies known as initial and focused coding in data analysis.

**Dependability:** The steadiness of results throughout time is called dependability (Shenton, 2004). In support of that, it involves participants evaluating the findings and the interpretations and recommendations of the study to ensure they are supported by the data received from the study participants. Dependability was established using the triangulation technique explained in the credibility above and conducting member checks.

**Confirmability:** Confirmability is the degree to which other researchers can confirm or corroborate the results of questions. Confirmability aims to demonstrate the data's integrity and the results' interpretations. The researcher's imagination is derived from data. In this study, the researcher used audit trails and reflexivity to confirm the study findings. An audit trail is known to be a technique that confirms the confirmability findings of the study to be helpful when writing up the results. The researcher detailed the procedure for gathering, analysing, and interpreting the data (Shenton, 2004). Reflexivity is practical in qualitative research. The researcher looked at the background and position at work to see how these would influence the research process by selecting the current topic, choosing the methodology, analysing the data, interpreting the results, and presenting the conclusions. The researcher kept and maintained a reflexive journal to reflect on what happened in the research process regarding the values and interests of the current study (Shenton, 2004).

**Transferability:** According to Creswell & Creswell (2018), transferability is the extent to which qualitative research findings may be used in different situations with different participants. It is generalisability's interpretative counterpart. The researcher facilitated transferability by purposeful sampling. This means that the researcher provided detailed descriptions of the enquiry, and participants were selected purposefully. It then facilitated the transferability of the questions. Purposive sampling helped the researcher focus on knowledgeable participants of the issues under investigation. These were the skills requirements for e-Logistics.

### 3.15 Ethical Considerations

Research ethics addresses the questions that are ethically relevant to the study. Issues caused by researchers' intervention can be expected to impact the people with or about whom they research. It concerns the steps taken to protect those who participate in the research if necessary (Flick 2011). Maree (2016) stated that "it is imperative to obtain clearance from ethics committee when human (or animals) subjects are involved in any kind of research of an empirical nature." The implication is that ethical clearance will have to be sought whenever researchers are developing questionnaires and interview schedules with a view to the implementation thereof.

The researcher received research permission from the Humanities and Social Sciences Research Ethics Committee of the University of the Western Cape see Appendix 1 for the sample. In addition, the ethical clearance proposal that UWC has administered highlighted that the research study would be kept on the university's premises for five years. All forms of ethical approval were disclosed to the participants, who were free to participate or withdraw from the study.

Informed consent and voluntary participation

Participants' permission was gained, and the researcher reassured them that whatever information elicited would remain confidential and no one would be informed of their names. The researcher obtained verbal informed consent before administering the questionnaire and conducting the in-depth interviews. In addition, the researcher ascertained that the volunteers were available and willing to participate in follow-up interviews later and assured the researcher that they were open (Maree, 2016).

Privacy, confidentiality, and anonymity

Flick (2011) mentioned that both the researcher and the participant must clearly understand the confidentiality of the results and findings of the study. All participants' information and responses shared during the study were kept private, and the results were provided anonymously to save the participants' identities. By university policy, all the recordings and audio recordings will be destroyed three years after the study has been completed.

Management of information

Information management can be defined as a controlled use of resources and information provided by participants anonymously and confidentially. The researcher assured that audio tapes, notes, and transcripts would be locked away and accessed only by the researcher. The

researcher will destroy all the recordings and transcripts on completion of the research to honour the promise to the participants that no one would be aware of their identity.

Protection from harm

The researcher ensured that participants were not exposed to undue physical or psychological harm (Pezalla et al., 2016). During the study, the researcher strived to be honest, respectful, and sympathetic towards all participants. If, by any chance, the participants required debriefing after an interview, the researcher was willing to provide it.

### 3.16 Chapter Summary

The chapter presented the research methods adopted in the study, described the study setting, the research approach adopted, and the other research components. It also showed the research design, sampling strategy, data collection and procedures, and ethical considerations. This chapter discusses research paradigms because "there is no foundation for following decisions concerning the approach, methods, literature, or research design without selecting an approach as the first step (Rehman and Alharthi, 2016). The topic of the research paradigm is founded on each paradigm's ontology, epistemology, methodology, and methodologies. The interpretive theoretical framework was used for this study because the research was conducted in a setting where participants build reality. Considering the technique is influenced by the paradigm choice, the interpretive research methodology selected for the study was qualitative research methods. The goal of qualitative research methodology is to analyse what those who participated expressed and clarify why they chose to say it said it. It deals with respondents' perceptions of a life event. The data collection method was to interview over an online platform. The same questions were asked of all the participants in the same manner. To understand, comprehend and clarify their behaviour. The next chapter presents an interpretation of the findings. Data were analysed using thematic analysis when analysing the qualitative data, which involved searching through a set of data to identify, explore, and record recurrent themes.

# CHAPTER 4 DATA ANALYSIS AND RESULTS

## 4.1 Introduction

This study's objective was to determine the skills required by the e-Logistics industry and to inform on the need for developing a qualification to effectively address the skills gaps to manage e-Logistics in the supply chain management sector. The case study research approach was used in the study, which was conducted in the interpretative paradigm. This study entailed researching the skills and qualifications needed to manage e-logistics in the supply chain management sector. This was done by interviewing e-logistics professionals in the supply chain management sector. To establish the necessity for an e-logistics qualification, this chapter aims to explore and uncover the e-logistics skills requirement. In order to determine the e-Logistics professionals' understanding of e-logistics skills, data from the professionals was gathered, analysed, and interpreted. In this manner, the chapter is structured as follows firstly, and the research approach is described in Section 4.2; then, the data collection process is presented in Section 4.3. The data analysis process follows this in Section 4.4, the data interpretation in Section 4.5, and the chapter is concluded with a summary in Section 4.6.

## 4.2 The Research Approach



The case study was the research methodology that was used in this study. The data was acquired following the set research questions and following permission from the ethical committee. The researcher selected and recruited qualified participants via the LinkedIn network, and after they accepted to participate in the study, she interviewed them. Through the interviews, she acquired data, which she then transcribed. The researcher used Atlas Ti to store and analyse the data. Atlas TI is a tool for qualitative data analysis using a computer program that assists users in analysing qualitative data for mixed-methods, qualitative, and quantitative studies. The rest of this chapter goes into more detail on all of this.

## 4.3 Data Gathering

The procedure the researcher used to collect data ethically is described in this section. Research paradigms and methodologies were reviewed in Chapter 3, along with a suitable strategy. The case study was the method of research chosen for this investigation. This

hypothesis fits under the paradigm of interpretive research. Interview questions are shown in the table below.

*Table 4: Interview Questions*

| Interview Questions |
|---|
| 1. What is your understanding of e-logistics? |
| 2. Do you think there is a misalignment between the skills that higher education institutions produce vs industry requirements? |
| 3. What do you think is required to close that gap? |
| 4. What can Higher Education Institutions do to produce e-logistics graduates with industry-required skills? |
| 5. How important is it to possess traditional logistics skills to manage e-logistics? |
| 6. How important is it to possess digital skills in e-logistics? |
| 7. What does a professional requirement to be successful in e-logistics? |
| 8. How meaningful experience vs qualifications in e-logistics? |
| 9. What are the top skills required to manage e-logistics? |
| 10. Is there a need for a qualification for e-logistics? |

### 4.3.1 Ethical Process Followed



Chapter 1 explained the study's ethical considerations. The University of the Western Cape's appropriate ethical committee permitted the study to be carried out. An electronic invitation was emailed to participants selected to participate in the study (refer to Appendix 3 for a sample). In section 4.3.3, participant selection is covered. The identified participants were allowed to accept or reject the request to participate and were assured that participation was optional. Twelve selected persons accepted the offer and participated in the investigation. The participants were required to sign a consent form before the interviews (See Appendix 2 for a sample of the consent form). The researcher made it clear at the beginning of the interview that participants could stop the interview and study at any time without any detrimental effects on them. Participants would maintain anonymity, and the business's name was not disclosed. To maintain the company's and participants' secrecy, any information could be used to identify.

### 4.3.2 Data Gathering Method

Open-ended, semi-structured (to allow for follow-up questions as needed), and individual interviews were the data collection technique employed in this study. By allowing the interviewee (also known as the participant) and the interviewer to converse with one another, the interviews were designed to gather valuable qualitative data. The conversation provided a chance for both parties to clear up any potential misunderstandings (if any) and provided an opportunity for any necessary follow-up questions. The interviews were performed individually and through the MS Teams online platform to gather comprehensive data based on the participants' lived experiences.

Rich data are a defining characteristic of qualitative inquiry and are usually viewed as essential to giving qualitative studies credibility and persuasive power. This is due to the perception that rich data imparts an intimate understanding of the relevant social condition or issue (Schultze and Avital, 2011). The participant and the researcher spoke verbally shortly after each interview to validate its content. The researcher then used the Atlas T.I. program to analyse the data to develop a theory. Theoretical saturation was attained from the data gathered and the text examined.

### 4.3.3 A Purposeful Sampling of Participants



The participants were purposefully chosen because they were specialists employed by e-logistics companies. Therefore, the participants had to fit the criteria of working in e-logistics or using the Internet to carry out logistics activities and be employed in the supply chain industry. The participants included workers with various job responsibilities and e-logistics experience (measured in years). The table below presents the participant profiles. The unique code allotted to them for this study is also shown in the table.

*Table 5: Demographic Profile of Participants. Source: (Research Data, 2022)*

| ***Participant*** | ***Age & Gender*** | ***Highest Qualification*** | ***Skills*** |
|---|---|---|---|
| ***Nandipha**** | 43 years-Female | B. Com Management<br>B. Com Computing (In progress) | 1) Supply Chain Management; (2) Logistics Management; (3) Logistics; (4) Microsoft Office; (5) Transportation; (6) Customer Service; (7) Management; (8) International Logistics; (9) Operations Management; (10) Negotiation; (11) Supply Chain; (12) Packaging; (13) Sustainable Development; (14) Shipping; (16) Freight Forwarding; (17) |

| | | | |
|---|---|---|---|
| | | | Customs; (18) Brokerage; (19) C++and (20) Python (Programming Language). |
| ***Sive**** | 36 years-Male | B. Com Informatics | (1) Information technology; (2) Supply Chain management |
| ***Thembi**** | 53 years-Male | PhD in Human Resources Management | (1) Human Resources; (2) Organisational development; (3) Talent acquisition; (4) SAP/3; and (4) Competency management. |
| ***Nomusa**** | 55 years-Female | MBA | (1) Supply chain; (2) Merchandising; (3) Strategic management; (4) Project planning; (5) Marketing strategy; and (6) Fast-Moving Consumer Goods (FMCG). |
| ***Manenji**** | 59 years-Male | MBA | (1) E-commerce, (2) Procurement, (3) Project management, (4) Business, (5) Process management, (5) demand forecasting, (6) Management, (6) Supply chain operations, (7) international trade, (8) digital strategy, (9) change management and (10) procurement strategy |
| ***Babalwa**** | 46 years-Male | Masters in marketing | (1) Customer service; (2) Accounts management; (3) Logistics; (4) Transportation; (5) Strategic planning; (6) International logistics; (8) Business strategy; and (9) Air freight. |
| ***Khethiwe**** | 32 years-Female | MBA Master in Entrepreneurship | (1) Entrepreneurship; (2) Management; (3) Strategic planning; (4) Marketing; (5) Business strategy; (6) Team leadership; and (7) Business Analysis. |
| ***Mafungwashe**** | 47 years-Male | PhD Electronic and Electronics Engineering PhD Computer Science | (1) IT; (2) Logistics management |
| ***Stacey-Lee**** | 33 years-Female | Bachelor's degree in | (1) Accounts management; (2) Logistics; (3) Transportation |

| | | | |
|---|---|---|---|
| | | management services | |
| ***Nico**** | 28 years-Male | Advanced Diploma in International Trade | 1) Supply Chain Management; (2) Logistics Management |
| ***Mncedisi**** | 41 years-Male | MBA | (1) Supply chain management; (2) Strategic management |
| ***Frank**** | 38 years-Male | Advanced Diploma in Sourcing and Supply Chain Management | (1) Operations Management; (2) Supply Chain Management; (3) Customer Service; (4) E-commerce; (5) Strategic Planning; (6) Supply Chain Optimisation; (7) SAP. |

### 4.3.4 Interview Process

Twenty people were chosen and invited to participate via email that contained information about the study's objectives and a request for consent to participate in the interview. Twelve candidates agreed to the request, whilst eight declined. Those that agreed to the request received an invitation to a follow-up confirmation meeting to confirm the interview date and time.

Before the interview began, the researcher reviewed the study's goals and the interview format. A consent form was provided to participants (Appendix 2). The information from the interview was documented using written notes. Each participant had an hour allotted for the meetings and interviews. After the interview, participants were given a chance to ask questions and the option to receive the research findings upon completion of the study.



## 4.4 Data Analysis Process

The researcher followed a thematic analysis for data analysis. Thematic or category analysis is one of the many strategies that may be applied to content analysis, commonly employed in qualitative research (Silver and Lewins, 2014). Pre-analysis, material exploration and handling of results, inference, and interpretation are the three stages of content analysis, as illustrated in the figure below (Soratto, Pires and Friese, 2020).

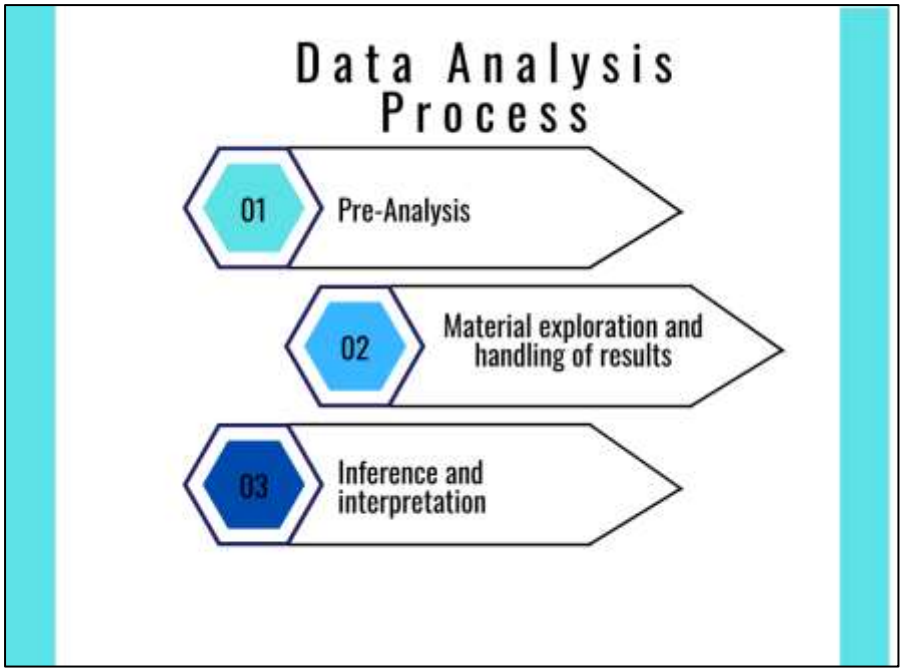


*Figure 8: Data Analysis Process*

### 4.4.1 Phase 1: Pre-Analysis

The process of data collection is explained in detail in Chapter 3. The first pre-analysis step requires the selection of materials to be examined to create hypotheses and objectives and construct indicators to substantiate the final interpretation. Chapter 3 explains the data collection procedure. It entails interview preparation. Purposive sampling of participants, conducting interviews and transcribing interviews and transcribing the interviews involved copying each participant's comments into a Word document. The raw data is shown in Table 5 below, illustrating a portion of Respondent 1 P1's data.

The snippets in Table 5.3 show that follow-up questions were raised when the interviewer felt the participant's response required further clarification. Respondent 1 answered a question if he/she thinks there is a *skills gap* in e-logistics, and the interviewer wanted to know more about what she/he meant about ground-level logistics by asking a follow-up question. *Initially, you mentioned that as much as e-logistics is essential, you must understand the ground level. So, when you say ground level, do you mean you must understand traditional logistics?*

*Table 6: Raw data as transcribed in the interview.*

| |
|---|
| Interviewer<br>Do you think there is a gap in e-logistics regarding the need for people skilled in e-logistics? |

Respondent 1

I think there is a need for more people who understand e-Logistics and ground operations because, at some point, a material thing will happen. Moreover, to combine those two, I think people struggle. For the firm I am currently at, we sell on Amazon, Walmart in the US, eBay, and a few other markets worldwide. So, most of the people that joined my team, I work in inventory management currently, and the majority have not worked in E-commerce before. Furthermore, my job is 100% remote, so that I can work for anyone from anywhere and with my teammates worldwide.

Furthermore, we learn as we go, which is trial and error. So, South Africa has many opportunities to grow in that sense. I think the E-commerce market is very limited in South Africa; there are a few significant players, and they are big guys, so it is hard for small guys to come up with markets that way. I think the United States and other countries are more geared up, and consumers have the knowledge and are familiar with buying, so I think the jobs that cater to logistics in South Africa are also small. For instance, I did apply to Takealot. I think it was for a few jobs.

Interviewer

Initially, you mentioned that as much as e-logistics is essential, you must understand the ground level. So, when you say ground level, do you mean you must understand traditional logistics?



Respondent 1

Correct 100%: You need customs clearance and a warehouse at some point. At some point, you need to deliver to the customer. However, at my previous job, I also worked in imports and exports and predominantly fresh fruit imports into SA. So, my role was managing the operations of the inputs. Moreover, I think a lot is happening, especially with international firms cutting down on manual work and being replaced by technology. So, I think there is a gap in that sense.

Moreover, I noticed in South Africa that consumers also want more information quicker and reliably, which empowers them to make better decisions. So, with inputs, we would have WhatsApp groups, and we would WhatsApp our customers. However, if you had a severe app that can track your good funding source to origin, that will empower the customer; knowledge is power, and then they beat their competition again. So, it is tricky, but it is growing. Moreover, I think the margins are tight for essential exports, especially with this

much competition. So, technology is replacing humans to be more accurate and add value. It is happening. It is a real thing, you know.

At this point, any empirical data, whether it be data that has been transcribed or data that is in the form of documents, images, audio, or video, must be thoroughly read (Soratto, Pires, and Friese, 2020). All empirical data files that the researcher deems pertinent to comprehending the phenomenon under study are included in the project. Based on the order in which the documents are uploaded to the project, a number is automatically assigned to each.

### 4.4.2 Phase 2 Material Exploration and Handling of Results

The goal of the second phase of material exploration, described as a lengthy and arduous phase consisting primarily of coding operations, breakdown, or numbering, is to get to the central point of understanding of the text (Smit, 2002). At this point, quotations are developed based on the theoretical framework and the study objectives, and each quotation is given a code (Soratto, Pires, and Friese, 2020).

The critical notion included in a group of related quotations is summarised by a word or phrase known as the code label (Hwang, 2007). The transformation of raw text data into a representation of the content or its expression through clipping, aggregation, and enumeration is referred to as the encoding process (Lewis, 2016). At this point, the ATLAS. ti Code Manager's visibility of code frequency, the simplicity of data retrieval for checking and validating code segments, and the code families to aid in creating the final coding structure are all helpful (Lu and Shulman, 2008).



### 4.4.3 Phase 3 Inference and Interpretation

The researcher can establish the outcomes of tables, diagrams, and figures once the raw data are processed to be relevant and valid in the third phase of interpretation (Silver and Lewins, 2014). In this stage, the theoretical framework and the research objectives are used to query the coded data (Lu and Shulman, 2008). The analysis tools mentioned above may be employed depending on the questions and the available data (Rambaree, 2014).

The code-occurrence matrix and the codes-documents matrix produce tables that quantify the results while providing access to the qualitative information hidden in the numbers (Lewis, 2004). Writing memos is crucial because writing is where the transition into sound output takes place (Konopásek, 2008). These memos and data segments that have been categorised and

the outcomes of searches can eventually be included in the study report (Soratto, Pires, and Friese, 2020). At this point, network views depict the conceptual connections that have emerged during the analysis process (Lu and Shulman, 2008). Data Interpretation and inference are discussed in more detail in section 4.5.

### 4.5 Data Interpretation

The researcher aimed to investigate several areas for exploration for the study, which is inclusive of the following:

1. *What skills are required to manage e-Logistics in the supply chain management?*
2. *Is there a need for a qualification that will address the skills gap to manage e-Logistics effectively?*

The exploratory nature of the aims of this study solicited the use of inductive analysis procedures, which according to Patton (1990), includes the determination of patterns, themes, and categories as they emerge from as opposed to being forced upon them prior to collecting and analysing data. This study's interview transcripts and field notes represented the primary data from which thematic analyses test the formulated propositions by examining, labelling, and organising evidence in themes (Yin, 2003).

#### 4.5.1 Themes



The key emerging trends were identified when all the data were analysed and compared, as depicted in Table 6. This process resulted in three main themes that were identified.

*Table 7: Identified Themes*

| Number | Identified themes |
|---|---|
| 1 | Skills gap |
| 2 | Skills |
| 3 | Need for a Qualification |

#### 4.5.2 Sub-themes

*Table 8: Themes and Sub-themes*

| Themes | 1. Skills Gap | 2. Skills | 3. Need for a Qualification |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **Sub-Themes** | 1.1 Trial and Error | 2.1 Logistics Skills | 3.1 Universities Partnering with Industry to formulate e-logistics Qualification |
| | 1.2 Limited E-Commerce Market | 2.2 Digital Skills | 3.2 Logistics qualification |
| | 1.3 Undergraduate-level modules that focus on traditional logistics education | 2.3 Digital skills plus logistics skills | 3.3 e-Logistics Certifications |
| | | 2.4 Transport Management Skills and Warehousing Skills | 3.1 Software Development Qualification |
| | | 2.5 Customs | |



**4.5.3 Skills and Competencies Required in e-Logistics.**

**4.5.3.1 Is there an e-Logistics skills gap in the industry.**

Cross-case analysis across codes indicates a skills gap exists regarding e-logistic skills in the industry. Three key elements emerged from the e-Logistics experts as the reasons why there was a skills gap concerning e-logistic skills that are (1) Trial and Error, (2) Limited e-commerce market, (3) Undergraduate level modules focusing on traditional logistics education.

**Trial and Error**: The interviewed participants acknowledged that there was a skills gap that existed in the logistics fraternity, as most people seem not to be understanding what e-Logistics was, its purpose, its benefits, and how it can be implemented to enhance both the logistics function and organisational success. This was evident in the following excerpts:

> *I think there is a need for more people who understand e- logistics and ground operations because, at some point, a material thing will happen, right? Moreover, to combine those two, I think people struggle. The firm I am currently at is that we sell on Amazon and Walmart in the US, on eBay, and in a few other markets worldwide. So, most people who joined my team currently work in inventory management, but most*

*have not worked in E-commerce before and rely on trial and error.* ***(Participant 1; Quote 2)***

*Nevertheless, there is a lot of trial and error; when it comes to e-Logistics, people get things out of the experience as they work their way out without prior training or learning what needs to be done.* ***(Participant 2; Quote 6)****.*

**Limited e-Commerce market**:

There is a need for a thriving e-commerce market for e-Logistics to be successfully implemented in the economy or market. The participants believed that, compared to the international market, there was limited e-commerce in the South African industry, which the organisations can use as a platform for e-Logistics. The following comment from Participant 1 supports this:

*I think the E-commerce market is very limited in SA; there are a few significant players, and they are big guys, so it is hard for small guys to come up with markets that way. I think the United States and other countries are more geared up, and consumers know and are familiar with buying.* ***(Participant 1; Quote 3).***

**Undergraduate level modules focusing on traditional logistics education*:*** The participants also believed there was an e-Logistics skills gap in the South African industry. Because undergraduate university modules were mainly focused on conventional logistics management and ignored the e-Logistics component that incorporates digital systems into the traditional logistics component, this was evidenced by the following excerpts:

*'Most of the undergraduate modules offered focus on traditional logistics, which does not incorporate the use of systems in managing logistics. On my Honours, the Supply Chain Management module I did, focused more on green logistics, Ethics in the Supply chain, and Humanitarian supply chain, and there was relatively nothing on e-Logistics.* ***(Participant 1; Quote 13)***

*Yeah, because universities do not prepare you to use these things when trying logistics or working in a digital environment in South Africa. Then the students do not know how to apply technology practically in logistics management.* ***(Participant 3; Quote 3****).*

The network, which shows the key themes that emerged concerning the e-Logistics skills gap, is shown in Figure 10 below:

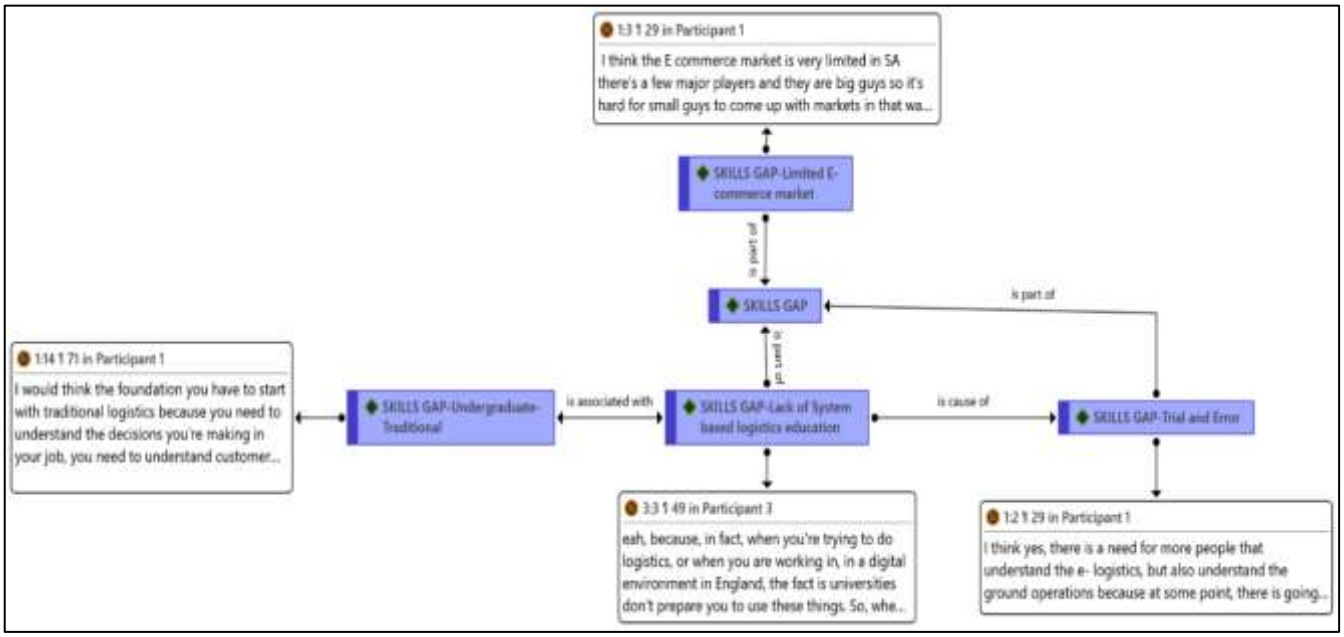


*Figure 9: e-Logistics Skills gap in the South African Market Source: (Research Data; 2022)*

#### 4.5.3.2 Skills and Competencies Required For e-Logistics.

The first investigative question evaluation of the current study's skills and competencies required for the successful implementation of e-Logistics in South Africa. This is against a background that the participants (based on responses presented in 4.4.4.1) acknowledged that there is an e-Logistics skills gap in South Africa. The skills and competencies required for e-Logistics, as put forward by the interviewed participants, include international business management, Digital skills, Transport management and warehousing skills and General management.

International Business Management: The participants interviewed highlighted the need for people to have international business management skills, including imports and export logistics management and payments, for e-Logistics to be successfully implemented in organisations. The following excerpts showed this:

> *Correct 100%: At some point, you need customs clearance; at some point, you need a warehouse. At some point, you need to deliver to the customer. However, I also worked at my previous job, working in imports and exports and predominantly imports of fresh fruit into SA. So, my role was to manage the operations of the inputs.* ***(Participant 1; Quote 35****);*

*And the shipping lines, we worked with words like Merce SC, MSC, CMA CGM, and I saw a more significant trend with the shipping lines and service providers of cutting down jobs, and it was going virtual* ***(Participant 10; Quote 15)*** *and.*

*Moreover, the import and export system we used a lot of the competition would also use. We were a forwarding agent, okay, that is sitting in the middle of your customer, and getting goods to market or to the import, export, the customs, clearing the transport, acting on behalf of our client to do the logistics. So, everyone in the industry uses one software code, Ship Shape* ***(Participant 12; Quote 22).***

Digital skills: Digital skills are critical to successfully implementing e-Logistics in organisations. The participants highlighted the need to incorporate digital skills in traditional logistics management. The following comments showed this:

*I think the industry is full of people that know traditional logistics. I think the industry needs people who know the tech and E-commerce sides and can advise them. I saw that in conventional firms, your teammates would even be threatened by it* ***(Participant 5; Quote 7).***

*If you are looking for a junior role recruiting for a junior, then you do not care much about the experience, but the systems are mainly a problem. So, if you have some knowledge of the system and you use it, and in general looking for a junior role, that will terrify them, because if not, I am looking for a junior person, but with two to three years of experience to fulfil the digital part of their role (****Participant 9; Quote 16****) and.*

*Yes, digital logistics or E Logistics is just streamlining many processes, currently in typical logistics, if I can use that jargon. (Participant 11; Quote 19)*

In addition, to the above general digital skills, Participants 1 and 7 stated that e-Logistics skills also require software development skills, as highlighted in the following comment:

*So, there was a small amount of SQL at my previous firm, but it was constrained to the IT team. If I wanted a report, I needed to ask it to pull information* ***(Participant 1; Quote 8)***

*Those product managers now need both technical knowledge as well as logistics knowledge because they take the requirements from customers, you know, a warehousing company or a retail company or logistics trucking company, and then they turn those requirements into business specifications that can be developed by the developers* ***(Participant 7; Quote 3).***

Contrary to Participants 1 and 7 on the need for software development skills, Participants 8 and 10 argued that people must have only e-Logistics data capturing and e-Logistics reporting skills using information technology rather than software development to implement e-Logistics successfully. The following comments evidenced this:

I do not necessarily think there is a need for one to develop apps, but I understand how to pull SQL reports. Yes, use SQL code, and ERP systems use SAP and NetSuite and maybe understand how to build those reports from there (Participant 8; Quote 22)

> *Suppose your marketing manager asked you much this product costs to deliver. In that case, you need to calculate how many units were shipped in that thing, and you know, you are sitting on a calculator, but if you can write a quick little simple extraction code and get it. However, the firm needs data warehouses* ***(Participant 10; Quote 14).***

Transport Management and Warehousing Skills: Participants 3 and 6 mention transport and warehousing skills as core skills and competencies needed to implement e-logistics successfully. Transport management and warehousing are essential functions in logistics management, which must be known by every logistics manager (Chen et al., 2012; Taylor, 2015). The following comments showed this.

> *So, work in land transportation in Overland. You can be, for example, a Dispatcher at flow operator, you can be administrative, you can be a warehouse or forklift, you have different positions, and they are other skills from one to forklift. (Participant 3; Quote 24)*

*For example, they do not need the same skills in warehousing, okay? Some of them are common. But some are. Because for example, if you are a forklift operator in warehousing, you can also provide other services to the warehouse for the climb. Nevertheless, if you are inland transportation, maybe not. (Participant 6; Quote 31*).

General Management: Chard et al. (2020) highlighted that besides digital skills, general management skills that include operations management, production management, decision-making, problem-solving, and communication skills are needed in the e-Logistics fraternity. In line with that, Participants 4, 6, and 9 highlighted the need for general management skills for e-Logistics to be successfully implemented in the industry. This was evidenced by the following excepts:

> *So, I do not think myself war; I would necessarily focus on logistics for the rest of my career. I want to hop into other things, but that is my opinion. Nevertheless, you might ask, okay, cool, how will you gain that industry when you hop into another sector?*

*However, in that case, I will be relying on wherever I am going in that institution to teach me everything I need to know that makes sense (**Participant 4; Quote 16**)*

*Another skill is that you must manage many different things simultaneously because you are not managing, for example, one sound going from that point to another function, maybe managing 100 trucks or going to different places, and there are loading and loading goods. (Participant 6; Quote 8)*

*So, regarding some of the critical skills for e-Logistics, one needs technical, business analysis or product analysis, and the third operational skills (Participant 9; Quote 16).*

In addition to the general management skills, Participant 3 highlighted problem-solving skills as a specific general management skill and competence needed in e-Logistics. This was shown in the following comment:

*The problem-solving skills are basic because, in logistics in e- logistics, things never work as you wish impossible (**Participant 3; Quote 7**).*

Participant 7 added that innovation and creativity core competencies are needed to implement e-Logistics successfully.

*There is an art and a science to innovation and creativity. So, people with that skill can find a solution quickly; the solution better understands client requirements in e-Logistics and how to use the available technology (**Participant 7; Quote 9.***

Due to technological changes in e-Logistics, participant 5 highlighted the need for change management skills for people to be well-versed in the e-Logistics changes that occur in the industry. Participant 1 highlighted several technological changes that e-Logistics people need to be conversant with that appeared recently in the e-Logistics arena, thus the need for change management skills:

*Alternatively, there is another one called QX, which is import-export orientated. And then often would build many in-house applications or APIs to try and match matches. Nevertheless, in my current firm, we use a lot of Google Sheets, which is all over the show. Furthermore, we use that as a database, which is, as you can think, just a mess; however, we have moved over to your ERP Net Suite. So, I know SAP in South Africa, and we are using Net Suite now **(Participant 1; Quote 10**).*

Network diagram on themes emerging on the skills and competencies that are required for e-Logistics are shown in Figure 10 below:

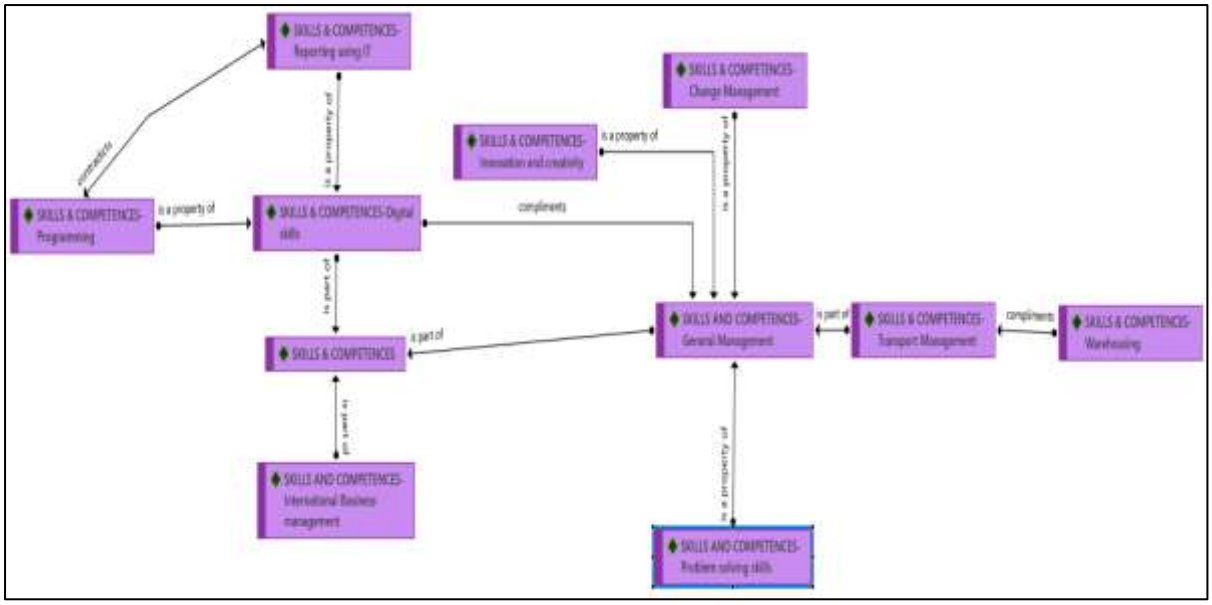


*Figure 10: Skills and competencies required for e-Logistics. Source: (Research data, 2022)*

### 4.6 Is There a Need for a Qualification That Will Address the Skills Gap to Manage e-Logistics Effectively?

The study's primary research question was, 'Is there a need for a qualification that will address the skills gap to manage e-Logistics effectively?' against the background of a skills gap in the e-Logistics fraternity in South Africa and the suggested e-Logistics skills and competencies put forward by participants in the last section. The participants were asked if there was a need for a qualification to address the skills gap in managing e-Logistics effectively. The study results that emerged were mixed.



1) Need for Qualification**:** On the extreme, Participant 4 highlighted that there was no need for qualification, as one can learn through industry experience and search on the internet on any pressing issues. The following excerpt shows this:

> *There is no need for qualifications. I mean, if you want to remember, technology constantly changes. Furthermore, we fought in a world. Fortunately, you can do a course; Google has them all free. So, you can do a course for a week, you know, education, as always, you cannot, yes, experience but and, you know, you are only going to get better if your knowledge comes from outsourcing, you know, outsourced areas, not just the environment you are working in.* ***(Participant 4; Quote 1)***

The rest of the participants believe there is a need for qualification. The following excerpts show this:

*I think the need for an e- logistics course on supply chains has changed over the years, especially regarding logistics. The focus needs to be purely on logistics,*

2) Digital plus Logistics Skills*:* The participants also highlighted the need for having both digital and e-Logistics skills qualifications to address the skills gap in managing e-Logistics effectively. Reflecting on contributions by participants, they believed that one has a pure Supply chain management degree and an Information Technology qualification or vice versa. The following excerpts showed this:

*I think the industry is full of people that know traditional logistics. I think the industry needs people who know the tech and E-commerce sides and can advise them.*

*So, I studied, become Management Science at Stellenbosch University as an undergraduate. Moreover, my majors were supplying chain, and my second major was marketing. Then I did my honours in the supply chain in logistics. And then, I did traditional imports and exports in South Africa. And then I have been doing my E-commerce job for over six months now.*

*Moreover, while doing my traditional job in South Africa, I felt a gap and the future was coming. Furthermore, I want to empower myself, so I started doing a part-time degree with UniSA and BSc in computing.* ***(Participant 1; Quote 36)***

*Okay, so my understanding of Logistics is moving goods, information, or services from point A to point B, and E would be the virtual side of that. So, a qualification incorporating traditional logistics into information technology is the way to go.* ***(Participant 5; Quote 16)***



*So, for example, if you are a dispatcher who must use an electronic method of dispatching trucks, you need more logistics experience. Digital, yes, then digital, but you now require a small quantity. I will give you a perfect example. I have hired people who come purely from logistics. We never use systems and things like that. Moreover, they did not do too well in our view.* ***Participant 7; Quote 4).***

*A supply chain management degree is ideal for solving the skills gap in e-Logistics, but there is a need for incorporation of general management modules in the degree like Business Environment, Communication skills, Strategic management, operations management, Project management, Research and Development, and IT modules like Information systems* ***(Participant 9; Quote 31)***

*A general logistics management degree that covers traditional and general management and general information technology courses can be done at B. Com*

*general level, and specialisation in e-Logistics pure can be done at the Master's level.* ***(Participant 12; Quote 22)***

3. Software Development certifications*:* Participant 7 suggested that there was also a need for software management certifications for one to upgrade himself to simple technological changes. This was highlighted in the following comment:

> *So obviously, for logistics to be, there must be people building the existing technology. Furthermore, those people do not necessarily need logistics experience from my learning. So, for example, in my company, I have multiple developers who have never done anything in logistics but are building things for logistics.* ***(Participant 7; Quote 2).***

> *I do necessarily think about developing apps, but I want to understand how to pull SQL reports. Yes, we use SQL code and also definitely ERP systems use SAP and NetSuite and also maybe understand how to build those reports from there* ***(Participant 11; Quote 13)***

4. e-Logistics certifications: Participant 5 believed there was a need for an e-logistics qualification encompassing both technological and logistics curricula. The following comments showed this:

> *Okay, so my understanding of Logistics is moving goods, information, or services from point A to point B, and E would be the virtual side of that. So, a qualification incorporating traditional logistics into information technology is the way to go.* ***(Participant 5; Quote 16)***



5. Universities partnering with industry to formulate e-Logistics programs: The participants recommended that the various universities in South Africa partner with the industry to develop e-Logistics programs to address the skills gap in managing e-Logistics (Martins and Rocha, 2020) effectively. This was shown in the following comments:

> *I think it should be a joint venture, and there is an opportunity for departments, if I am assuming, from an educational point of view. Moreover, if I look back at my supply chain degree, maybe more realistic explanations, and operations if you can work at a firm. That is where you learn because you can learn everything in theory. However, when you start the job, it is an entirely different story, where I think it is in that it is closer to, you know, what they studied, what happened? The supply chain has not* ***(Participant 1; Quote 16).***

*I think they need to partner with an international brand in that sphere. Because I would assume that to get that type of education, it would be best to have some history and research on what has been done and how it has been done. Conscious time sucks something, and although many things are becoming, many companies operate Similarly* ***(Participant 6; Quote 3).***

### 4.7 Reflections on Results

The results reflected that the qualifications needed to address the skills gap in South Africa must incorporate both traditional logistics and digital skills. Though the revised conceptual framework will be detailed in the discussion and conclusion section in the next chapter, the results' reflections showed the qualifications required to address the e-Logistics skills requirements.

### 4.8 Chapter Summary

The researcher described in this chapter how participants were questioned, and raw data was gathered. Open-ended questions created following Chapter 3 were utilised in the interviews. The interviews were online and one-on-one via Ms Teams; the researcher asked the respondents the same and follow-up questions when needed. The interview's objective was to grasp better the skills required to manage e-logistics and to inform on the need for an e-logistics qualification.

On a Word document, the transcripts of the interviews were written, then uploaded on Atlas ti for analysis and data interpretation. Three themes were unpacked based on the participants' inquiries and responses; the themes were explored. The data interpretation was presented following the identified themes. The research's conclusion is presented in the following chapter.

This chapter discovered and revealed the e-logistics skills required to determine the need for an e-logistics qualification. To determine the e-Logistics professionals' understanding of e-logistics skills, data from the professionals was gathered, analysed, and interpreted. The chapter described the research approach and then presented the data collection process. The data analysis process followed this in the data interpretation in Section 4.5, and the chapter is concluded with a summary.

# CHAPTER 5: SUMMARY OF FINDINGS, DISCUSSION, CONCLUSION AND RECOMMENDATION

## 5.1 Introduction

This study aimed to comprehend the skills required to manage e-logistics in the supply chain management sector. This chapter's objective is to give recommendations based on participant data. The research goals are reviewed to see if they were accomplished after being described in the various chapters. The specified parameters for case study research are used to gauge the research's rigour. The researcher also makes suggestions for additional research. The limits encountered and the assumptions considered throughout the investigation are explained.

This chapter is organised as follows: Section 5.2 reviews this study's research objectives to demonstrate how well they fit with those in Chapter 1. The research methodology is described in Section 5.3. Section 5.4 discusses the findings, which are then related to the research sub-questions in section 5.5. The revised conceptual framework is presented in section 5.6. Recommendations for future studies are discussed in Section 5.7. Areas for further research are presented in 5.8, followed by limitations of the study in section 5.9. The chapter closes off with the researcher's final reflection in 5.10.

## 5.2 Research Objectives Revisited

The study had one aim, which were based on evidence of the skills gaps in e-Logistics that were described in the problem statement in Section 1.2, to inform on the need for developing a qualification to effectively address the skills gaps to manage e-Logistics in the supply chain management sector. The themes were developed because of the data analysis in Chapter 4. Table 8 below depicts the alignment of primary research questions to the methods and research objectives. The study's accomplishment of the theoretical and empirical goals is then explored.

### 5.2.1 Theoretical Objectives

1. To develop a conceptual framework to assess the skills required by the supply chain sector to manage e-Logistics.

Part 2 of the literature review in Chapter 2 presented the skills required to manage e-logistics in the supply chain sector. It determined the technological skills for managing e-logistics, skills for logistics managers, skills for logistics and competencies required to manage e-logistics. Chapter 2 presented a literature review on e-logistics, skills gaps, and training on e-logistics.

The chapter closed off by presenting a conceptual framework to assess the skills required by the supply chain sector to manage e-logistics. Empirical research also addressed this objective, as discussed in 5.2.2 below.

2. To determine the need for a qualification to address the skills gap to manage e-logistics effectively

Part 3 of Chapter 2 presented literature on the South African labour force and the logistics industry. It discussed the training in e-logistics and whether or not a need for an e-logistics qualification was needed. Empirical research also addresses this objective, as discussed in section 5.2.2.

### 5.2.2 Empirical objectives

1. To determine the need for a qualification to effectively address the skills gap in managing e-Logistics.

The empirical objectives were achieved through data collection from online interviews. Data was analysed through thematic analysis using atlas ti software. Chapters 3 and 4 explained the interview questions and the method used to choose respondents.

## 5.3 Main Research Questions and Sub Questions

The research question for this study is:

**What are the requirements to address the skills gap in managing e-Logistics in supply chain management?**

The following two sub-questions directed the data gathering and analysis techniques:

1. What skills are required to manage e-Logistics in the supply chain management sector?
2. Is there a need for a qualification that will address the skills gap to effectively manage e-Logistics?

## 5.4 Discussion of Findings

The first component of the interviews used to collect data in the current study was to explore if there was an e-Logistics skills gap in the South African industry. The study's findings are discussed below.

### Finding One: Skills Gap

There is a talent shortage in the sector due to accelerated technological advancement. Both literature and empirical research confirm that traditional logistics expertise will not be adequate in the future due to the constant growth of technologies. Traditional knowledge and abilities will still be necessary since they are reliable; therefore, this is not to claim they will become outdated. However, managing the necessary process and technological advancements and

comprehending how new business strategies and technologies will impact how successful products and services are created and delivered will be crucial.

**Finding Two: A Need for an e-logistics qualification**

The study's results revealed undergraduate-level modules focused on traditional logistics education. The participants also believed there was an e-Logistics skills gap in the South African industry because university undergraduate modules mainly focused on traditional logistics management and ignored the e-Logistics component incorporating digital systems into the traditional logistics component. The same sentiments were also echoed in studies by (Gibson & Cook, 2015; Goffnett et al. 2016; Murphy and Poist, 2017).

**Finding three: e-Logistics skills**

The demand for specific skill sets is as high as for logistics specialists. Emerging, innovative technologies like blockchain and artificial intelligence are in high demand, but big data is a more prominent trend. There is a pressing demand for professionals who can process and analyse data using tools like Python, SQL, Tableau, and data science and use the results to guide tactical and strategic decisions.

**Finding Four: Reliance on Trial and Error**

Due to most people not understanding what e-Logistics is, its purpose, its benefits, and how it can be implemented to enhance both the logistics function and organisational success and rely on trial and error. The research results agree with Chard et al. (2016), who ascertained that most e-Logistics personnel in the USA e-Logistics market were unaware of how to utilise technological skills like Big Data and cloud computing in e-Logistics. In line with that, Rocha and Cota (2016) highlight that cloud services also include Infrastructure as a Service (IaaS), which provides technology infrastructure and Platform as a Service (PaaS), such as application infrastructure, which is very important in the e-Logistics sector.

**Finding 5: Misalignment between the supply and demand of e-logistics skills**

There is a gap between the supply and demand of e-logistics skills, and the supply chain sector will struggle to experience the growth and development they need in the current global climate. It is also clear that organisations must acknowledge the skills gaps in their businesses and remedy them with targeted interventions.

**Finding 6: Need for partnership between Higher education and industry.**

Conclusions on whether there was a need for a qualification to address the skills gap in managing e-Logistics were on two ends effectively. The opposite concluded that there was no need for qualification, as one can learn through industry experience and search the internet for pressing issues. The other end figured universities needed to partner with industry to formulate e-Logistics programs. Lastly, based on the findings, a conclusion can also be drawn that there was a need for an e-Logistics qualification with a blend of logistics and information technology skills.

**Finding 7: Skills gaps have an impact on competitiveness and the economy.**

Empirical and Literature conclude that the skills shortages in e-Logistics have a substantial impact on the competitiveness of the supply chain sector.

## 5.5 Relating the findings to the research sub-questions.

This study emphasised the skills requirements to manage e-logistics in the supply chain sector. The research questions therefore focussed on 1) determining the skills required to manage e-logistics and 2) determining the need for an e-logistics qualification. A pivotal point to determine if the study has met its goals and objectives, the findings mentioned above will be analysed considering the relevant literature and empirical data.

### 5.5.1. Sub-question 1: What skills are required to manage e-Logistics in the supply chain sector management?

To answer this question, the researcher examined the literature to explore which skills are required to manage e-logistics. This literature demand was tested with e-logistics through the interviews. Findings one, three, four, and seven answers this question and show the essential skills required to manage e-logistics in the supply chain sector.



In support of finding one, it was determined that South Africa has a high skills shortage, particularly in e-logistics. According to a 2020 global skills study by Couresa, supply chain managers need management and transformational abilities to succeed in a global market. Richey et al. (2006) suggest a high verbal IQ, strong achievement orientation and high adaptability as the core SCM competencies for managers. Murphy and Poist (2011) developed a frequently used framework that distinguishes between business, logistics, and managerial (BLM) skill categories and includes many precise skills. Many companies worldwide find it increasingly difficult to recruit enough skilled labour. Especially concerning skills and competencies are critical to logistics and SCM.

Maintaining a sufficient labour force of qualified logistics specialists who can maximise efficiency and address new issues has never been more crucial as supply chains have

become more international and complicated. Professionals in the logistics industry are in high demand, yet so are specific skill sets. Emerging, innovative technologies like blockchain and artificial intelligence are in high demand, but big data is a more prominent trend. There is a pressing demand for professionals who can process and analyse data using tools like Python, SQL, Tableau, and data science and use the results to guide strategic and tactical decisions.

The expense of logistics, issues with regulation and profitability in the public sector, skills gaps, and other difficulties faced by professionals in emerging economies are some of the significant problems that have been highlighted. The three most frequently discussed issues from a private sector standpoint were supply chain integration, outsourcing, and supply chain relationships. Risks in the supply chain, cost reduction, and the influence of big data were also emphasised. These concerns indicate that anomalies in public-sector procurement remain problematic, that the industry still struggles to find enough skilled workers, and that the private sector must keep looking for methods to improve supply-chain.

In support of finding seven, both empirical research and literature agree that the lack of skills in South Africa is commonly identified as one of the significant factors limiting the country's economic growth. One of the primary impediments to expanding corporate operations in South Africa, according to Grant Thornton's International Business Report (2022), is the absence of a competent workforce. Furthermore, according to the report, South African business owners have highlighted this barrier for the past five years as a significant constraint. 'South Africa's skills shortage, according to most economists, is a severe constraint on the country's long-term economic growth potential. Because of a scarcity of necessary talents, such as managerial, professional, and technical abilities, feasible economic prospects are limited skills gaps.



### 5.5.2 Sub-question 2: Is There a Need for a Qualification That Will Address the Skills Gap to Manage e-Logistics Effectively?

The study aimed to explore if there was a need for a qualification that would address the skills gap to manage e-Logistics effectively. The results revealed no need for qualification, as one can learn through industry experience and search on the internet for any pressing issues. The results were in line with Wayne (2019). He asserts that CSCMP, a supply chain management board, has encouraged potential logistics and supply chain managers to acquire the skills and knowledge they need to work through internships and work experience.

Conversely, the results showed that universities partner with industry to formulate e-Logistics programs. In line with that, Martins and Rocha (2020) recommended that various universities in South Africa partner with the industry when developing e-Logistics programs to effectively address the skills gap in managing e-Logistics (Martins Rocha, 2020). The results also revealed a need for an e-Logistics qualification with a blend of logistics and information technology skills. The results were in line with Grant (2020). He asserts that; besides logistics, logistics professionals require IT skills like big data analytics, statistics, simulation, optimisation, software development and e-Logistics certifications. The same sentiments were echoed by (Aguinis & Kraiger, 2009; Goffnet et al. 2016; Murenga; 2016). The educational program should cover significant and fundamental competencies, especially those that are basic with low current capacities or accessibility in industry. Pyne et al. (2012) also assert that e-Logistics qualifications need presentations through cases, lessons, tests, and company visits. Furthermore, lecturers can develop better competencies by presenting students with both team and individual work. This can be achieved through e-Logistics case competitions, case studies that include current industry projects, and professional development (Derwik et al., 2016)

The demand for the higher education sector to provide post-graduate logistics and supply chain management qualifications is increasing. A report by DHL (2017) stresses the talent shortage at the middle and senior levels that require people who can solve complex problems involving cost reduction and service enhancement in this complex industry. This points to too few graduates coming into the sector or higher education institutions (HEIs) not training in the industry's required skills (Joubert, U., Havenga, J., Simpson, Z., Kumar, D., Ittmann, H., Gertenbach, S. and Rossouw, 2014). This results in the need for a qualification to effectively address the skills gap to manage e-logistics in supply chain management.

South Africa’s supply chain industry’s future is not favourable due to the education system in South Africa and the need for work-integrated learning and skills transfer to the workplace. The skills shortage in South Africa has been recorded over the last few years, dating back to the 2006/7 scare skills list, where several skills required for the success of the supply chain were identified.

**5.6 Revised Conceptual Framework**

After evaluating the frameworks discussed in Chapter 2, section 2.5, the available skills frameworks are unsuitable for e-logistics skills requirements. From the discussion in Chapter 2, it is understood that there is a need for a skill that will address the e-logistics skills gap. The

researcher then developed a conceptual framework for the e-logistics skills requirement. However, the empirical results revealed new findings and complemented existing literature. The researcher deemed it necessary to update the conceptual framework. Additional aspects include the need for a partnership between the logistics industry and higher education institutions (HEI) to formulate an e-logistics skill set. The e-logistics qualification should blend the logistics and technological curriculum provided on a post-graduate level. The conceptual framework can be used by academia and industry.

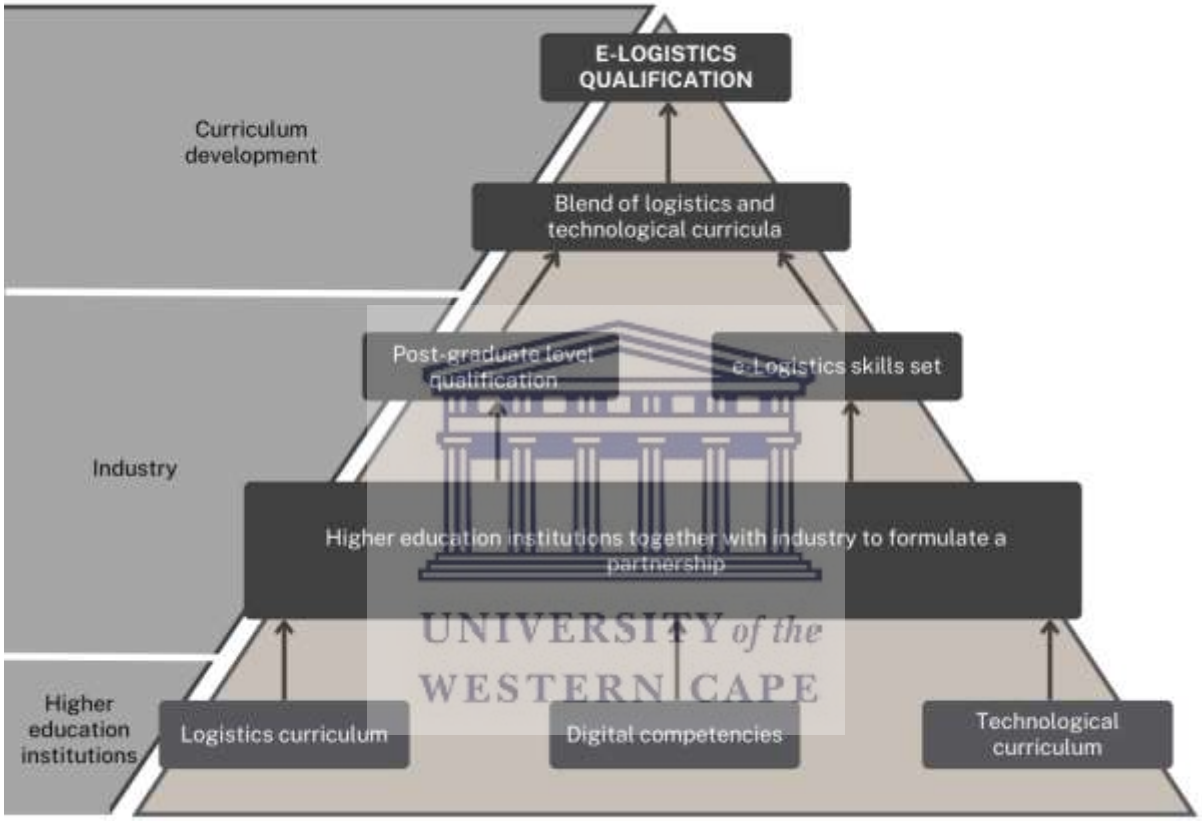


*Figure 11: Revised Conceptual framework: Requirements for an e-logistics qualification.*

### 5.7 Recommendations

To address the findings identified in Section 5.6, the following recommendations are made for Higher Education Institutions.

#### 5.7.1 For higher education institutions and curriculum developers

1. The industry must partner with universities and inform higher education institutions about

the e-Logistics skills expected. In this way, the industry captains in the e-Logistics field need to be incorporated in the drafting and formulating of the individual modules of the prospective-Logistics qualification.

2. The e-Logistics qualification that is proposed for the e-Logistics field needs to be a blend of both digital and logistics skills. There is a need for a degree that incorporates both IT and logistics modules. As for those people that have studied traditional logistics or information technology degree, there might be a need for Post Graduate Diploma in e-Logistics.

3. Based on the study conclusions, there is a need for e-Logistics personnel to upgrade themselves with e-Logistics certifications and information technology certifications for them to be able not to advance their skill set but be able to manage e-logistics. The qualification should be provided on a post-graduate level, catering to personnel in the supply chain sector and those interested in entering the sector, particularly those with undergraduate qualifications in ICT.

**5.7.2 For the supply chain sector.**

1. Partnerships for skills advancement of their employees
2. Confirm the current curriculum in terms of graduate attributes for e-logistics advancement comprehensive skill set
3. The industry should develop a comprehensive skill set in partnership with HEI institutions.
4. There are instances where one would have done a Supply Chain and Logistics Management skills, which equip less general Management skills. That personnel might need to enrol for Post Graduate Diploma in General Management or Master's in business administration to appraise themselves with general business management skills, problem-solving and critical thinking skills, financial management, and change management, among others.



**5.8 Areas for Further Research**

This research examined the skills requirements to effectively manage e-Logistics in supply chain management. These gaps in understanding serve as a springboard for examining the e-logistics skill needs and advancing the field's body of knowledge.

1. Specialised Skills Requirement for the Industry

Discover more about the e-logistics skills needed in many sectors, including electronic commerce, manufacturing, medical care, and retail. Examine the effects of industry-specific factors on the knowledge required for e-logistics. Organisations and professionals can be guided in adapting their development of skills efforts to meet the unique demands of various sectors by comprehending specific sector skill requirements.

2. The assessment of Education and Training Programmes for e-logistics.

The curriculum, instructional methods, and results of various training programmes may be evaluated as part of this research. This research can help design and refine efficient training initiatives suited to the needs of e-logistics skills by identifying the programmes' strengths and limitations.

3. The process of digitisation effect on Skill Needs

The impact of these changes on the need for particular skill sets, the introduction of new skill sets, and the shifting positions of logistical personnel can be investigated in this study.

4. Techniques for Developing Skills

This research may examine effective programmes, initiatives, or strategies initiated and placed in place to solve e-logistics skill gaps.

5. Prediction of skills in the future

In order to predict the competencies that will be essential in the upcoming years, this research may involve analysing trends, future technology, and industry advancements.



**5.9 Limitations**

For the researcher to measure the skills gap in the e-logistics industry, she would have to measure it by looking at the number of candidates needed, and the skill level required. She would then match that against the number of e-logistics professionals currently being trained and the graduates entering the industry. This data is unavailable; therefore, the researcher depended on the interviews she conducted.

**5.10 Final Reflection**

Overall, the most significant learning was skills gaps in e-logistics. Technology is racing, and business needs to adapt to remain competitive. This is important in terms of the skill set that their personnel have. There is a significant need to advance technological skills in the supply chain sector. To manage e-logistics, one needs a combination of logistics and technological skills, as e-logistics is driven by technology. Technological skills do not remove the need for a logistics understanding and background; one must possess knowledge in logistics as this is an industry with many components, and having just tech skills is not enough. There is a need

for an e-logistics qualification that will assist in closing the skills gap. However, this qualification will only be practical through a partnership between academia and industry to produce post-graduates who can add value to the supply chain sector.

This study contributes to the knowledge of Information Systems by adding contemporary literature on e-logistics skill sets for e-logistics professionals, which currently seems insufficient. This study will benefit senior-level managers in the Supply Chain Management Sector by enabling them to identify skills they can enhance. Higher Education Institutions can use the findings from the study to establish curricula that will facilitate the skills required for the e-logistics workforce.

The study achieved its aims and objectives, and through qualitative data, the findings determined from the qualitative feedback and discussions were triangulated and validated. In conclusion, the contribution this study has made to the existing body of knowledge is a requirement for the e-logistics qualification framework, which not only categorises the skills needed but also shows other building blocks required for the e-logistics qualification. This framework can be used by academia and the supply chain industry for e-logistics skills development.

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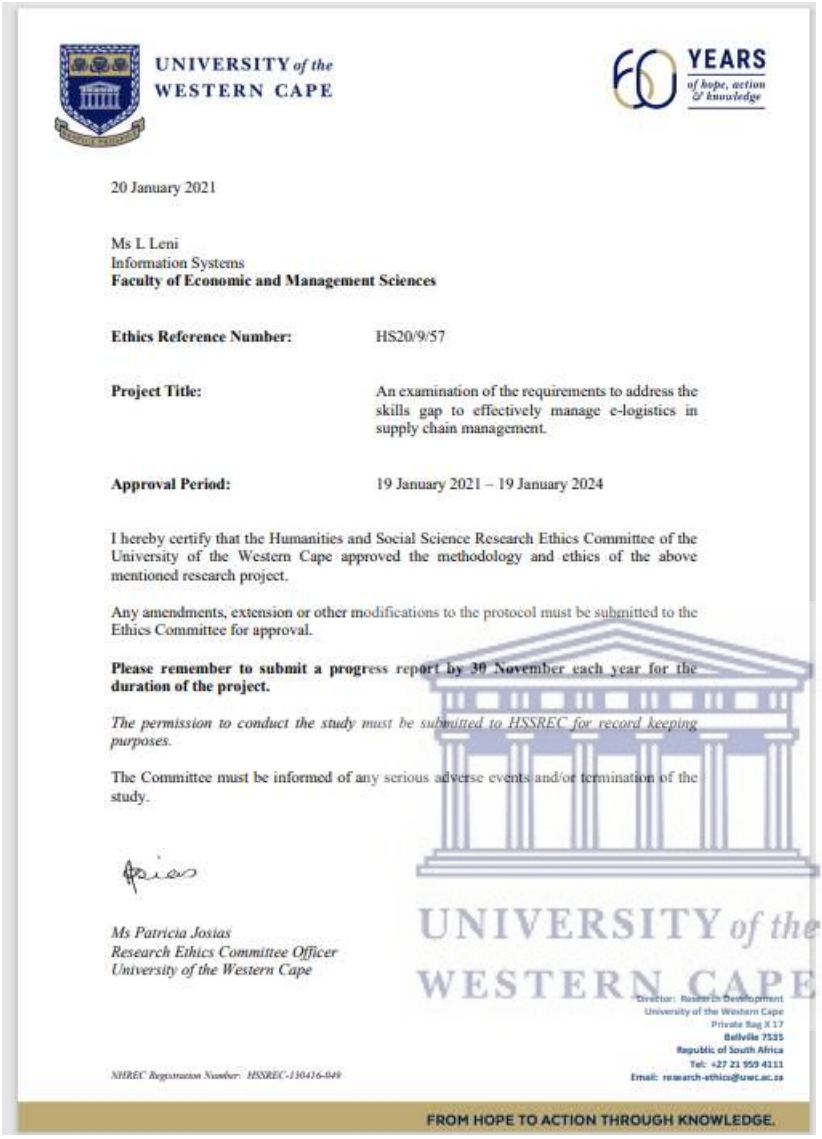
## APPENDICES

Appendix 1: Ethics Approval



UNIVERSITY of the WESTERN CAPE

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20 January 2021

Ms L Leni
Information Systems
**Faculty of Economic and Management Sciences**

**Ethics Reference Number:** HS20/9/57

**Project Title:** An examination of the requirements to address the skills gap to effectively manage e-logistics in supply chain management.

**Approval Period:** 19 January 2021 – 19 January 2024

I hereby certify that the Humanities and Social Science Research Ethics Committee of the University of the Western Cape approved the methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

**Please remember to submit a progress report by 30 November each year for the duration of the project.**

*The permission to conduct the study must be submitted to HSSREC for record keeping purposes.*

The Committee must be informed of any serious adverse events and/or termination of the study.

*Ms Patricia Josias*
*Research Ethics Committee Officer*
*University of the Western Cape*



Director: Research Development
University of the Western Cape
Private Bag X 17
Bellville 7535
Republic of South Africa
Tel: +27 21 959 4111
Email: research-ethics@uwc.ac.za

*NHREC Registration Number: HSSREC-130416-049*

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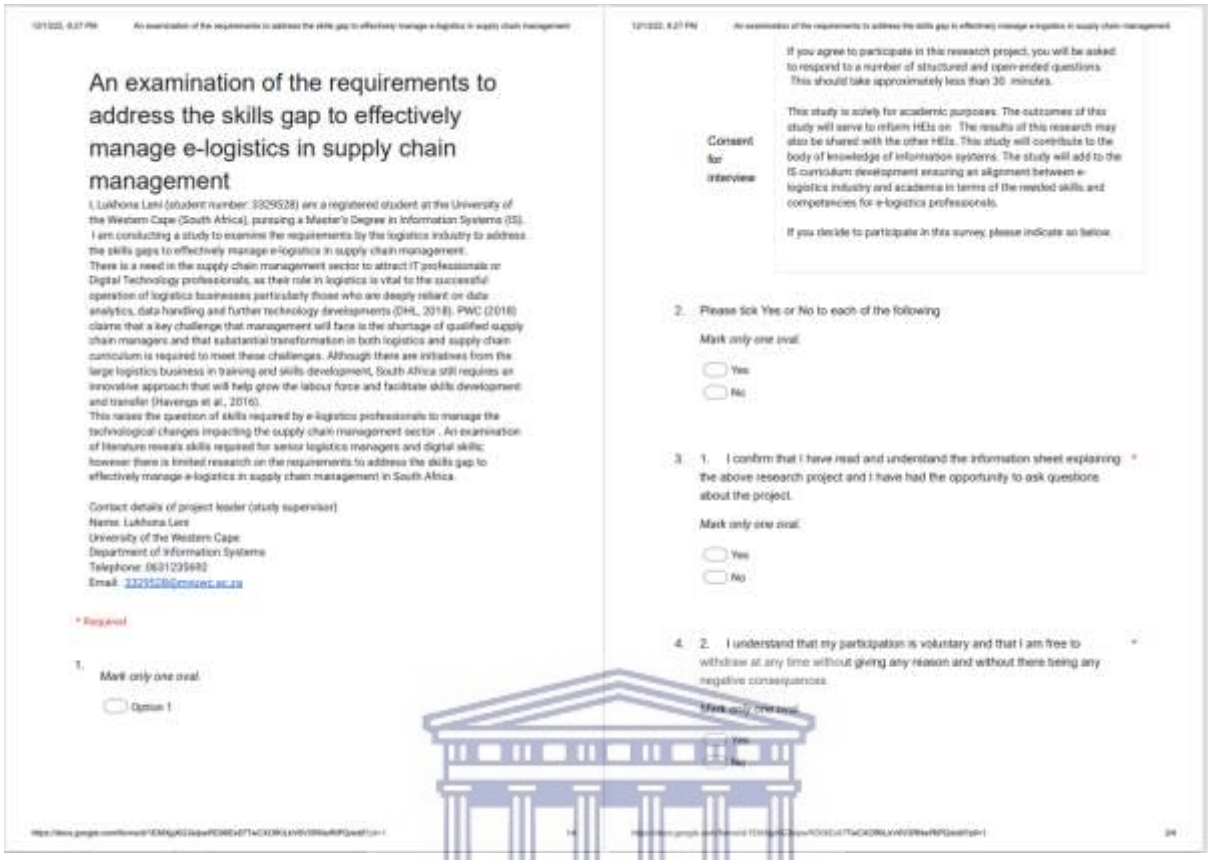
Appendix 2: Interview Consent Form



# An examination of the requirements to address the skills gap to effectively manage e-logistics in supply chain management

I, Lukhona Leni (student number: 3329528) am a registered student at the University of the Western Cape (South Africa), pursuing a Master's Degree in Information Systems (IS). I am conducting a study to examine the requirements by the logistics industry to address the skills gaps to effectively manage e-logistics in supply chain management.
There is a need in the supply chain management sector to attract IT professionals or Digital Technology professionals, as their role in logistics is vital to the successful operation of logistics businesses particularly those who are deeply reliant on data analytics, data handling and further technology developments (DHL, 2018). PWC (2018) claims that a key challenge that management will face is the shortage of qualified supply chain managers and that substantial transformation in both logistics and supply chain curriculum is required to meet these challenges. Although there are initiatives from the large logistics business in training and skills development, South Africa still requires an innovative approach that will help grow the labour force and facilitate skills development and transfer (Havenga et al., 2016).
This raises the question of skills required by e-logistics professionals to manage the technological changes impacting the supply chain management sector . An examination of literature reveals skills required for senior logistics managers and digital skills; however there is limited research on the requirements to address the skills gap to effectively manage e-logistics in supply chain management in South Africa.

Contact details of project leader (study supervisor)
Name: Lukhona Leni
University of the Western Cape
Department of Information Systems
Telephone: 0631235692
Email: 3329528@myuwc.ac.za

* Required

1. Mark only one oval.

Option 1

Consent for interview

If you agree to participate in this research project, you will be asked to respond to a number of structured and open-ended questions. This should take approximately less than 30 minutes.

This study is solely for academic purposes. The outcomes of this study will serve to inform HEIs on The results of this research may also be shared with the other HEIs. This study will contribute to the body of knowledge of information systems. The study will add to the IS curriculum development ensuring an alignment between e-logistics industry and academia in terms of the needed skills and competencies for e-logistics professionals.

If you decide to participate in this survey, please indicate so below.

2. Please tick Yes or No to each of the following

Mark only one oval.

Yes
No

3. 1. I confirm that I have read and understand the information sheet explaining the above research project and I have had the opportunity to ask questions about the project. *

Mark only one oval.

Yes
No

4. 2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. *

Mark only one oval.

Yes
No

5. 3. I understand that should I not wish to answer any particular question or questions, I am free to decline. *

Mark only one oval.

- Yes
- No

6. 4. I understand my responses and personal data will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the reports or publications that result for the research. *

Mark only one oval.

- Yes
- No

7. 5. I agree for the data collected from me to be used in future research. *

Mark only one oval.

- Yes
- NO

8. 6. I agree to take part in the above research project. *

Mark only one oval.

- Yes
- No

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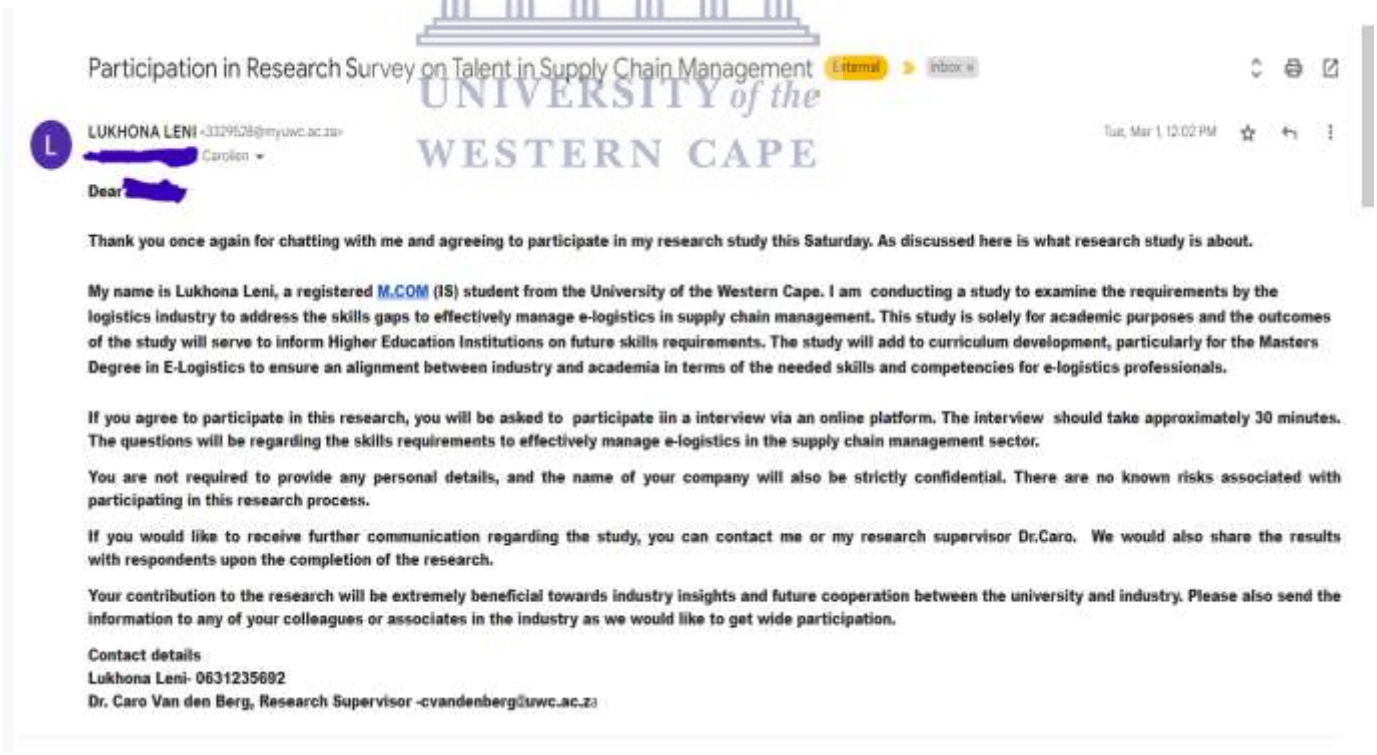
Google Forms



Appendix 3: Email invitation



Participation in Research Survey on Talent in Supply Chain Management External Inbox x

LUKHONA LENI <3329528@myuwc.ac.za>
[redacted] Carolien

Tue, Mar 1, 12:02 PM

Dear [redacted]

**Thank you once again for chatting with me and agreeing to participate in my research study this Saturday. As discussed here is what research study is about.**

**My name is Lukhona Leni, a registered M.COM (IS) student from the University of the Western Cape. I am conducting a study to examine the requirements by the logistics industry to address the skills gaps to effectively manage e-logistics in supply chain management. This study is solely for academic purposes and the outcomes of the study will serve to inform Higher Education Institutions on future skills requirements. The study will add to curriculum development, particularly for the Masters Degree in E-Logistics to ensure an alignment between industry and academia in terms of the needed skills and competencies for e-logistics professionals.**

**If you agree to participate in this research, you will be asked to participate iin a interview via an online platform. The interview should take approximately 30 minutes. The questions will be regarding the skills requirements to effectively manage e-logistics in the supply chain management sector.**

**You are not required to provide any personal details, and the name of your company will also be strictly confidential. There are no known risks associated with participating in this research process.**

**If you would like to receive further communication regarding the study, you can contact me or my research supervisor Dr.Caro. We would also share the results with respondents upon the completion of the research.**

**Your contribution to the research will be extremely beneficial towards industry insights and future cooperation between the university and industry. Please also send the information to any of your colleagues or associates in the industry as we would like to get wide participation.**

**Contact details**
**Lukhona Leni- 0631235692**
**Dr. Caro Van den Berg, Research Supervisor -cvandenberg@uwc.ac.za**