Organisational readiness for the adoption of smart delivery management systems for last mile delivery

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Plagiarism Declaration

Declaration

Hereby I, Janine Manuel Van Zyl declare that *Organisational readiness for the adoption of smart delivery management systems for last mile delivery* is my own original work and that all sources have been accurately reported and acknowledged, and that this document has not previously in its entirety or in part been submitted at any university in order to obtain an academic qualification.

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Signature

Approved by

Supervisor name

Professor Shaun Pather

…….

Abstract

Last mile delivery is one of the most expensive and challenging processes within the supply chain for organisations. The last mile delivery component of logistics has also become a very competitive space within the supply chain industry due to the significant rise in e-commerce adoption. Given the advancements in networking and digital solution development, many organisations now have, at their disposal various hardware and software options to improve business processes and associated supply chain efficiencies. However, there is a relatively low level of adoption of smart delivery management systems to date. This study aimed to understand what the readiness factors are that underpin the successful adoption and integration of such systems into the last mile delivery processes. The primary research question for this study is *"What are the key factors that contribute to the organisational readiness for adopting smart delivery management systems for last mile delivery processes within a logistics organisation?*". Qualitative data was collected by conducting semi-structured interviews with professionals using two case studies within the Western Cape. This qualitative method allowed for the gathering of experiential knowledge about the adoption of smart delivery management systems from industry professionals who provided first-hand experience of issues that were considered during the system planning and adoption phases. The data, which was collected via semi-structured interviews was synthesised during qualitative data analysis processes which led to findings in response to the primary research question. The findings are synthesised into an ICT readiness framework that may be applied by businesses in the logistics industry, in order to assess their readiness for the procurement and implementation of a smart delivery management system within the last mile delivery area. The application of this developed framework within the field, would help ensure that organisations reap a return from the ICT investment by ensuring that they are adequately prepared and ready to implement a smart delivery management system.

Keywords:

smart delivery management systems, last mile delivery, system procurement readiness, e-logistics, digital supply chain, technology adoption, organisational technology readiness

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List of Acronyms and Abbreviations

B2B	Business to Business
B2C	Business to Customer
BA	Business Analyst
DOI	Diffusion of Innovation
ICT	Information and Communication Technology
IOT	Internet of Things
IT	Information Technology
KPI	Key Performance Indicators
LMD	Last Mile Delivery
RBV	Resource Based View
ROI	Return on Investment
SC	Supply Chain
SCM	Supply Chain Management
SME	Small, Medium Enterprises
TAM	Technology Acceptance Model
TOE	Technology, Organisation, Environment
UTAUT	Unified Theory of Acceptance and Use
VRP	Vehicle Routing Problem

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Chapter 1: Introduction and background to the study

1.1 Introduction

This introductory chapter provides a background for this study and introduces and describes the research problem which was investigated. This chapter also presents a delineation of the study, describing what the scope of the study is. The significance of the study is also discussed, followed by a summary of the layout of the dissertation, briefly describing the chapters which follow.

1.2 Background to the Study

The Supply Chain (SC) industry has been gaining a vast amount of attention over the past years, as businesses are able to more easily meet the demands of their customers through coordinating production, shipping and the delivery of their products in a more efficient way (Aized & Srai, 2014). The World Economic Forum (2017) has mentioned that with the Fourth Industrial revolution, and the way in which organisations are now innovating their supply chain business models, there has also been a significant change in the way logistics services are delivered and produced today.

The coronavirus pandemic has had a clear impact on the supply chain across the world, and has increased the need for the implementation of technologies for visibility and improved efficiencies across the value chain (Sharma, Adhikary & Borah, 2020). With this, a trend that is transforming logistics is the rise in e-commerce platforms and retailers now need to evolve their distribution networks to now use omni-channel systems where customers can now purchase their goods, and receive their products through different channels suited to their needs especially within last mile delivery processes (Dekhne, Hastings, Murnane & Neuhaus, 2019).

Aized & Srai (2014), define last mile delivery, as the final step in the goods delivery process from a products initial transit point, to its drop off point within the delivery chain of a business. Another definition of last mile delivery is the quick movement of products from hubs to a final delivery destination which is said to usually be the residence of a customer (Weber, 2017). Various last mile delivery challenges identified within the literature are strict traffic regulations, high traffic congestion levels, inaccessibility within local roads in city areas as well as limited or inefficient parking and loading infrastructure (Aljohani & Thompson, 2020; Janjevic & Winkenbach, 2020).

The advancement of technology has transformed the way in which consumers are behaving, by expecting a shopping experience tailored to their needs, and the options of numerous different delivery channels (Weber & Badenhorst-Weiss, 2016; Pentz, du Preez & Swiegers, 2020). Also, with the rise of e-commerce and the increase in both Business to Business (B2B) and Business to Customer (B2C) logistics, there is a greater need for logistics providers to keep up with this increasing demand for transparency and flexibility from businesses and customers where they now demand better traceability, shorter lead times and the options to select flexible delivery locations (Allen et al, 2018).

Logistics providers are struggling to create efficiencies within the last mile delivery processes and these processes are found to be the most costly and polluting functions within the supply chain (Olsson, Hellström & Pålsson, 2019). Last mile logistics makes up approximately 28% of the total cost of delivery (Ranieri, Digiesi, Silvestri & Roccotelli, 2018), including costs relating to fuel prices, operational and route inefficiencies as well as failed delivery attempts to customers that are not home at time of delivery (Gevaers, Van de Voorde & Vanelslander, 2014). Products that require same day delivery such as perishables and pharmaceutical products, have an increase in the delivery cost and also requires complex route planning processes to be put in place (Hübner, Kuhn & Wollenburg, 2016).

The Vehicle Routing Problem (VRP) is a well-known research topic within the literature dealing with issues such as uncertainty on routes, being dynamic in terms of identifying time and distance factors, problems with linking inventory with scheduling, as well as integration and environmental issues (Caceres-Cruz, Arias, Guimarans, Riera & Juan, 2014). These routing problems puts further pressure on last mile deliveries and needs to be dealt with dynamically and in real time in order to create efficiencies within these last mile processes.

Weber & Badenhorst-Weiss (2018) found that the various last mile challenges that are experienced by grocery retailers, come from the inefficiencies of data management and information flow across their supply chains. Janjevic & Winkenbach (2020) state that in order to respond to challenges of last mile delivery, organisations need to implement distribution models that perform efficiently and are sustainable ensuring that it is cost effective and brings the expected customer satisfaction.

The development of e-commerce in South Africa is being held back due to businesses having insufficient knowledge about e-commerce, logistics and distribution processes (Cloete, Courtney & Fintz, 2002). Traditional delivery management systems are no longer capable of

achieving effective supply chain and logistics efficiencies (Wang, 2016). There is therefore an increasing need for e-logistics companies to become more efficient within their last mile delivery processes by up-scaling traditional delivery systems, and incorporating the latest smart delivery management systems in order to solve last mile delivery problems.

A smart delivery management system enables the integration of all supply chain operations and last mile delivery processes, by allowing for end to end visibility for customers, real-time tracking and control, optimizing of delivery routes, auto-scheduling and managing returns by applying smart technologies such as advanced GPS and machine learning algorithms (Keshavdas, 2020). Many logistics providers are however not responding to improve delivery methods using such intelligent systems (Wang, 2016), but there is however a need to do so in order to improve last mile inefficiencies and meet customer demands.

The table below provides an environmental scan of a few of the organisations within the e-commerce and logistics industry in South Africa. This table provides the specific delivery options and alternatives offered by each company, and identifies those who offers same day deliveries, returns, real time tracking, and updates after a product has been shipped to a customer. All of the below companies are delivering to customer specified addresses, and some provide the click and collect option. The majority however, are not currently providing their customers with real time tracking, or allowing a customer to update their delivery address or select an alternative, after an order has been shipped to a customer.

Table 1: Environmental Scan

Company	Delivery Options	Same Day Delivery	Return Option	Real Time Tracking	After ship update	Source
Takealot	Home Delivery or Pickup Point	No	Yes	No	No	https://www.takealot.com
Cotton On	Home Delivery or Click and Collect in store	No	Yes	No	No	https://cottonon.com/ZA
DHL	Home Delivery, Locker Delivery, Vacation Hold, Leave	Yes	Yes	Yes	Yes	https://delivery.dhl.com

Company	Delivery Options	Same Day Delivery	Return Option	Real Time Tracking	After ship update	Source
	with Neighbour, Alternate Address					
Mr Price	Home Delivery, Pargo Pickup, Store Pick up	No	Yes	No	No	https://www.mrp.com/en_za
Zando	Home Delivery	No	Yes	No	No	https://www.zando.co.za
Pick n Pay	Home Delivery, Click and Collect	Yes	Yes	Yes	No	https://www.pnp.co.za
Checkers	Home Delivery	Yes	No	Yes	No	https://www.checkers.co.za

Organisations looking to implement solutions and technologies to improve their business processes and efficiencies, need to be able to assess their business capabilities and readiness prior to this adoption in order to ease the implementation processes (Richey, Daugherty & Roath, 2007). The objective of a readiness assessment is to ensure improved system adoption, thereby supporting the e-commerce and logistics sector to better meet the evolving needs of their customers. A previous study by Molla & Licker (2005), has researched e-commerce adoption in developing countries through deploying a research-ready readiness assessment instrument within businesses within South Africa in order to understand the adoption decisions and manage the risks of the adoption. Aboelmaged (2014) has then also studied the adoption of e-maintenance systems within manufacturing firms using a technological, organisational and environmental (TOE) readiness assessment framework. These readiness assessment studies have proved useful for organisations to assess their readiness and ease their understanding of implementation of technologies.

1.3 Research Problem

The foregoing section confirms two salient aspects of the problem at hand. Firstly that there is a low level of adoption of smart delivery management systems used to improve last mile delivery processes within the supply chain industry, including those of e-commerce businesses. Secondly that that traditional delivery systems are no longer capable of creating logistics efficiencies to meet evolving customer expectations in an increasingly digitized era.

Following on this the lack of understanding readiness to onboard new systems is a problem that has been identified.

1.4 Primary Research Question

The research problem in Section 1.3 underpinned the design of the study. Following on the conceptualisation of the problem, in framing the research question and objectives, it was noted that are various reasons such as integration concerns, the size, available resources and capacity of an organisation or a lack of understanding of organisational readiness which impede the adoption of smart delivery systems. Further, it was noted that in order to remain competitive and create improved business efficiencies within the very complex last mile delivery process, organisations needs to be able to easily assess their business capability, readiness, and have access to the key factors that contribute to the ease of this adoption.

Given the latter, the primary research question for this study was:

"What are the key factors that contribute to the organisational readiness for adopting smart delivery management systems for last mile delivery processes within a logistics organisation?".

This primary research question is an "Exploratory Question" which as described by Mouton (2001), explores certain features, factors or groups of people as in the above research question. Exploration studies is a study where a researcher aims to understand situations better and satisfy their curiosities (Babbie & Mouton, 2001: 79).

1.5 Research Objectives

To answer the primary question, the following research objectives were derived:

- To identify best practises, frameworks and challenges for the adoption of smart delivery management systems within organisations.
- To determine which adoption dimensions affect the readiness for the implementation of smart delivery management systems for last mile delivery amongst the target population.
- To make recommendations and develop a model to assess the organisational readiness for the adoption of smart delivery management systems for last mile delivery.

1.6 Research sub-questions and alignment with objectives and methods

Table 2 provides the overarching framework of the study, showing how the main research question, the associated research sub-questions, methods and the objectives for this study relate with each other. For each research question, the methods used to achieve the research objective and answer the main research question and sub-questions are listed.

Table 2: Research sub-questions and alignment with objectives and methods

Research Question: What are the key factors that contribute to the readiness of adopting smart delivery management systems for last mile delivery processes within a logistics organisation?		
Research Sub-Questions	Actions Undertaken	Objective
Which models, frameworks and best practices have been used in previous studies to investigate the adoption of smart delivery management systems for last mile delivery efficiencies?	Analysis of Literature	To identify best practices, frameworks and challenges for the adoption of smart delivery management systems within organisations.
How can the Technological, Organisational and Environmental (TOE) framework be applied in order to provide a basis for this study and design the interview questionnaire instrument?	Analysis of Literature	To design an interview questionnaire instrument that will be used to investigate the key factors related to the adoption of smart delivery management systems for last mile delivery.
What are the TOE framework characteristics which affects the adoption of technology in the last mile delivery logistics context?	Questionnaire Design informed by theoretical model	To design an interview questionnaire instrument that will be used to investigate the key factors related to the adoption of smart delivery management systems for last mile delivery.
How are the TOE elements relevant to identify the dimensions of smart delivery management system adoption at a logistics organisation?	Collection of Qualitative Data (Interviews)	To determine which adoption dimensions affect the readiness for the implementation of smart delivery management systems for last mile delivery amongst the target population.
What are the main factors, gaps and challenges that were found to impact the adoption of smart delivery management systems for LMD?	Analysis of Qualitative Data	To determine which adoption dimensions affect the readiness for the implementation of smart delivery management systems for last mile delivery amongst the target population.
Based on the findings, what are the key recommendations to improve adoption readiness of smart delivery management systems for last mile delivery efficiencies?	Interpretation of findings	To make recommendations and develop a model to assess the organisational readiness for the adoption of smart delivery management systems for last mile delivery.

1.7 Delineation: The scope of the study

This case study was based at two large logistics organisations, referred to as Company X and Company Y. They are referred to Company X and Company Y based on the agreement that the company names are withheld in this study to uphold confidentiality. Company X, has a global presence within the logistics market, and the second case, Company Y, has a significant footprint within the South African retail market. This study was geographically confined to the logistics organisations head offices within the Western Cape. Due to the limited access to logistics organisations, only the two logistics organisations within the Western Cape were used for the case study which limits the generalisation of the findings. The study seeks to derive an ICT readiness model for the implementation of smart delivery systems. It did not seek to examine the implementation of the model in industry, which could be a focus of future research.

1.8 Significance of the study

The aim of this study was to provide a concise framework of factors that must be considered when organisations assess their readiness for the adoption of a smart delivery management system for their last mile delivery processes. This study applied the TOE framework which was further strengthened through the integration of the TAM model. The resultant additional constructs provided improved clarity and conciseness for the conceptual underpinning. The empirical investigation provided evidence which confirmed the combined framework. The findings demonstrate that all of the dimensions were relevant to the problem domain. The resultant model for understanding ICT organisational readiness applies for the particular industry sector that was under investigation. The outcomes of this research will serve organisations that are planning on embarking on their e-commerce journey, to be better prepared for this type of system adoption, by providing them with a readiness assessment framework. In answering the main research question for this study and determining the factors which should be considered prior to the procurement and adoption of a smart delivery management system, logistics organisations will be able to better assess their preparedness for this type of system adoption.

1.9 Layout of the dissertation

This dissertation comprises of five chapters in which **Chapter 1** covers an introduction to the study, providing a background setting the foundation for the study, thereafter the chapter describes the research problem, research questions and objectives and provides delineation and significance of the study. **Chapter 2** provides an exploration of the literature related to supply chain management, digital supply chains and last mile delivery overview, complexities and technologies. It then provides further findings from the literature related to technology adoption, and how organisations can improve their organisational readiness. The chapter finally provides frameworks taken from the literature which are known to be used for the adoption of technologies and describes how a specific framework applied within the context of this study.

Chapter 3 describes the research design and methodology used in this study. It describes the research design and provides the motivation for the selection of this research design. It then describes the unit of analysis for this study, how the research instrument was designed and how the interviews were conducted for this study. This chapter then describes data sources and sampling techniques, the population for this study and describes how the data analysis had taken place. Finally it provides details on how validity and reliability was ensured within the study processes, and how the ethical considerations were taken into account for this study.

Chapter 4 presents the findings for this study and provides a discussion on the analysis of the findings from the responses obtained in the interviews, and what was found within the literature review. It describes any patterns and correlations that emerged and describes a model which was developed in based on these findings and analysis. **Chapter 5** then concludes this study by reviewing the previous chapters discussing how the research objectives were achieved throughout the study and provides further academic recommendations for future studies, and the finally describes the limitations which were experienced within this study.

1.10 Chapter summary

This chapter provided a background to explain the rationale for this study and provided the main research question which this study aimed to answer. This chapter then described the research objectives, sub-questions and methods used in order to answer these research

questions. Finally the chapter describes the scope of the study, providing the significance of the research and describes what the various forthcoming chapters entails.

Chapter 2: Literature review

2.1 Introduction

This chapter presents an overview of the best practises, frameworks and challenges for the adoption of smart delivery management systems within organisations from the literature, in pursuance of the main research question: *"What are the key factors that contribute to the organisational readiness for adopting smart delivery management systems for last mile delivery processes within a logistics organisation?*". This chapter then also seeks to answer the research sub questions listed in table 2.

This chapter firstly provides an overview of supply chain management, and then describes digital supply chains and how the logistics area has evolved over time. The next section then provides an overview of last mile delivery, looking at factors that contribute to the complexity of last mile delivery, as well as describe various technologies used to manage some of these complex processes. This literature review then provides an overview of delivery management systems and how smart delivery management systems improve last mile delivery processes. Next a general overview of factors affecting technology adoption is described, as well as challenges experienced during technology adoption within organisation.

The literature review then provides a discussion on organisational technology readiness, and provides insights on various theoretical frameworks which studies technology adoption and technology readiness. Finally an overview of the adapted theoretical framework applied within the study is provided.

2.2 Supply Chain Management

Supply Chain Management (SCM) is described as the set of processes which covers the flow of raw materials and finances both upstream and downstream, and involves the integration of processes that delivers value to organisations moving products from the point of acquiring raw materials, converting these raw materials into products and then finally delivering products to the end consumer in order to meet the organisational goals (Aized & Srai, 2014; Mentzer, Stank & Esper, 2008). This section of the literature review provides an overview of supply chain management processes and describes how these processes are evolving to become more digitalized.

2.2.1 Supply Chain Processes

Supply chain processes involves various tasks such as product creation, sourcing and procurement, production, logistics, and the information systems required for the coordination of these activities (Prajogo & Sohal, 2013). Similarly Azaron, Brown, Tarim & Modarres (2008), further describes supply chain as a network of manufacturers, suppliers, distribution channels and warehouses that are organised in such a way to convert raw materials into finished goods and distribute these goods to final consumers.

Logistics and supply chain are often used interchangeably. However, the term logistics refers to the movement of products along the supply chain within a certain time period (Kirch, Poenicke & Richter, 2017). As such logistics comprises an important subset of the supply chain process. Logistics and transport of freight are both a strategic key within manufacturing processes as well as customer need satisfaction (Pronello, Camusso & Valentina, 2017). It is important to ensure that logistic processes are made efficient and cost effective in order to meet supply chain needs.

One of the key challenges in South Africa, in relation to supply chain processes, concerns the relatively high logistics costs which are much higher than the global average. A majority of these costs are said to attribute to road transport where the cost driver is fuel due to the volatile oil prices (Havenga, 2010: 460). The cost of last mile logistics also takes up a majority of supply chain costs at a total of 28% of the total delivery costs, and organisations are investing in efforts to optimize these processes (Deloitte, 2020). The cost of these processes could be driven down with the development and adoption of the latest and advanced supply chain and logistics technologies.

2.2.2 Digital Supply Chains (SC)

Prajogo & Sohal (2013), point out that Supply Chain Management is experiencing rapid changes that are being driven by globalisation, the business environment, technological advances in internet-based systems and the increased demand for the delivery of superior operational performance. Supply Chain Management has therefore been described as one of the areas in which the adoption of innovative and smart technologies has become highly beneficial, as the processes involved in this area has become very dynamic (ElMesmary & Said, 2019).

There are a variety of technologies that are dynamically changing processes along the value chain, as well as improving inefficiencies within the supply chain such as the internet of

things, social networks, drones and smart phone applications (Tiwapat, Pornsing & Jomthong, 2018). The implementation of advanced technologies could place organisations in a leading position within the industry. Organisations therefore need an effective supply chain strategy, in order to clearly to specify how the organisation aims to achieve competitive advantages through implementing technologies to improve supply chain activities and create cost efficiencies and flexibility (Ismail & Sharifi, 2006).

Lim, Jin & Srai (2018) also state that in order to remain competitive, organisations needs to ensure that they too meet the increasing demands set by consumers in this digital era by creating digital supply chains. The evolution and digitalization of supply chain processes, could allow for organisations to gain real time access to their customer needs, by efficiently tracking and sharing information within product and service deliveries (Sivula, Shamsuzzoha & Helo, 2018).

2.2.3 The Evolution of Logistics

Logistics is one of the main processes within supply chain management managing the flow of products and information in order to satisfy customer needs and meet customer demands (ElMesmary & Said, 2019). The internal integration within logistics refers to the means of unifying various logistics processes within the inventory management, purchasing, production and warehousing areas of the organisation (Soosay, Ferrer, Santa & Hyland, 2007). With this internal integration in place, it ensures that organisations are able to create better customer value through this internal integration. Further to this, the external integration of logistics processes refers to the unified control of processes across organisational and logistics trading partners (Soosay, Ferrer, Santa & Hyland, 2007).

There are various information technology systems which have supported the internal and external integration of many logistics processes such as, the internet of things, machine learning and artificial intelligence, vehicle routing software, automated picking systems, GPS and satellite navigation systems. Systems to track vehicles were first implemented in order to know where vehicles are at a given point at time within the shipping industry, but with the rate at which technology is growing, automated tracking systems are able to track exactly where vehicles are located within real time (Lee, Tewolde & Kwon, 2014). This allows for organisations to know exactly where drivers are at every exact point in time within their logistics processes.

With the rise of the fourth industrial revolution, logistics processes has evolved to also include technologies such as the internet of things and big data, significantly reducing the work that requires human intervention within the supply chain (Wang, 2016.). The Internet of Things allows for physical objects, information and data for processes to be shared and integrated across platforms, creating a smart system for SCM and logistics (Abdel-Basset, Manogaran & Mohamed, 2018). IoT and cloud-based solutions are therefore able to facilitate smart and connected supply chains, allowing for improved flexibility and efficiency within SC and logistics processes (ElMesmary & Said, 2019). The implementation of these technologies allows for the streamlining of processes and the creation of efficiencies within major trouble areas of the supply chain, one of prominent areas being last mile logistics.

2.3 Last Mile Delivery

The final leg of the logistics network related to delivery of goods from warehouses or hubs to the end consumer or recipient is described as the last mile delivery (Gevaers, Van de Voorde & Vanelslander, 2014). This section provides an overview of last mile delivery processes, its complexities, and the technologies applied within the last mile.

2.3.1 Last Mile Delivery Overview

There are various models making up the process of last mile logistics, with the most popular being Business-To-Business (B2B) and Business-to-Consumer (B2C) models (Cilliers & Bean, 2019). Gevaers, Van de Voorde & Vanelslander (2014: 399), define business-to-consumer (B2C) last mile logistics, as the final delivery process where a consignment is delivered to a customer, either at their home or at a collection point. Business-to-business (B2B) logistics models on the other hand refers to last mile processes which takes place between various organisations for example, a wholesaler and retailer (Cilliers & Bean, 2019). This study will focus on the B2C model as the technology being studied applies within this area of last mile logistics.

The consignments or deliveries within the B2C last mile delivery process, are packages that needs to be picked up and dropped off or delivered to various different locations within urban and rural areas (Bányai, 2018). These deliveries can include items such as mobile phones, medication, online shopping purchases such as electronics and clothing, as well as perishable goods such as groceries. Last mile delivery for the purpose of this research refers not only to

a physical delivery from business to consumers, but includes providing of alternative, on demand delivery options, real-time order tracking, and vehicle routing.

The increasing demand of customers who are now willing to pay extra fees for delivery of goods to take place instantly or on the same day, has increased the importance of designing and optimizing last mile delivery solutions implemented within the supply chain for these organisations offering these services (Bányai, Illés & Bányai, 2018). Meyer, Niemann, Mackenzie & Lombaard (2017) found that significant cost saving is possible with the creation of efficiencies within last mile logistics, thereby reducing transport costs. The delivery of goods is an operating cost, and saving money within these delivery processes, saves organisations a substantial amount of money in the overall supply chain operating cost (Herrel, 2014). This increases the importance of last mile delivery efficiencies, making sure that deliveries are done efficiently and with low uncertainties and risk.

2.3.2 Last Mile Delivery Complexities

The last mile delivery process in business-to-consumer home deliveries, have been fraught with many uncertainties due to changing customer demand, and organisations are unable to adequately order capture, tracing vehicle despatch, vehicle deliveries as well as vehicle returns (Herrel, 2014). Various authors state that logistics providers are struggling to implement last mile delivery efficiently, and they describe the process as very inefficient, expensive as well as the most polluting part of the supply chain (Olsson et al, 2019).

Last mile delivery processes is becoming very complex, due to the customer expectations which are increasing in terms of demanding shorter delivery lead times, the traceability and customizing of these lead times, as well as the ability to select different delivery locations due to failed delivery attempts (Allen et al, 2018). These failed delivery attempts requires carriers to attempt to delivery parcels again, impacting pre-planned schedules which could cost last mile delivery carriers time and money emphasizing the importance of vehicle scheduling to achieve efficiencies (Rincon-Garcia, Waterson & Cherret, 2018). Implementing intelligent technologies and systems to create efficiencies within last mile delivery processes are therefore becoming critical to the success of the supply chain within organisations.

2.3.3 Last Mile Delivery Technologies

Recent technological advances within last mile delivery processes are related to the massive amount of digital data, also known as Big Data (BD), as well as the use of the Internet of

Things (IoT) that allows organisations to use this data and sensor data to improve their processes and create better certainty (Speranza, 2018). The Vehicle Routing Problem (VRP) is a well-researched topic, related to a set of problems and constraints related to designing optimal routes for vehicle fleets in order to service customers (Baldacci, Mingozzi & Roberti, 2012). Various studies have investigated this problem relating to finding vehicle routes based on certain locations, delivery time windows and the demand of customers (Speranza, 2018). With the use of IoT technologies and BD, logistics companies now have the ability to view routes which vehicles are taking, see traffic data, and identify risks in real time, and use this information to better their routing and scheduling processes within the supply chain and last mile processes (Khairuddin, Akhir & Hasan, 2019; Speranza, 2018).

The implementation of smart intelligent technologies in order to solve last mile logistics problems is gaining huge importance within the SC and logistics industry as it provides adaptability, proactivity and flexibility (Wang, 2016). The utilization of new technologies is able to provide organisations with greater time efficiencies and cost savings (de Klerk & Kroon, 2005). As traditional delivery management systems are no longer capable of achieving effective supply chain and logistics efficiencies (Wang, 2016), there is an increasing need for e-logistics companies to become more efficient within their last mile delivery processes through the adoption of more advanced, smart delivery management systems.

2.4 Last Mile Delivery Management Systems

Last mile delivery management systems is one of the key dimensions of this study and the literature was explored in order to identify the various technologies and systems used to manage last mile delivery within organisations. This section provides an overview of delivery management systems and defines what smart delivery management systems are and how these systems can contribute to the efficiencies of last mile delivery.

2.4.1 Delivery Management System Overview

Last mile delivery movement and management is said to be very significant as it is the final leg of the logistics process, which reflects on the organisation and therefore they are trying to make it efficient as possible (Cilliers & Bean, 2019). The management of last mile delivery processes is said to be very challenging due to the trade-off between customer convenience and the efficiencies of routing within logistics (Punakivi, Yrjölä & Holmström, 2001). The

implementation of an effective delivery management system for last mile delivery processes is therefore critical to the success of correctly managing these processes efficiently.

A delivery management system is defined as a system which manages the transfer of products from a point of storage such as a warehouse or distribution center, for delivery to the end consumer (Onfleet, 2020). Customers now want to keep track of their orders in real time, forcing logistics organisations to make sure that their chosen technologies is able to integrate and create necessary delivery and distribution efficiencies (Kaplan, 2017). Logistics providers need to implement customer focused improvements within their last mile delivery strategy, and focus on adopting the advanced and smart delivery management technologies to become more competitive and improve their position within the market (Hesse & Rodrigue, 2004).

2.4.2 Smart Delivery Management Systems

Smart Delivery Management systems comprises of more advanced functionality as compared to traditional delivery management systems. These smart delivery management systems includes advanced features, such as route optimization, calculating the fastest and most efficient delivery routes in real-time using artificial intelligence and advanced geo-location technology; real time tracking of delivery vehicles allowing for the monitoring of driver behavior; as well as the real-time management of customer delivery delays, updates, changes and returns (Keshavdas, 2020). With the use of this advanced GPS functionality, smart delivery management systems allows for the tracking of delivery vehicles in real-time, creating visibility for customers to track exactly where their products are along the route, update or re-schedule their delivery as well as select alternative delivery options such as delivering to a specified collection point (Mavhungu, 2019). Offering customers this type of flexibility within delivery demand systems can create improved customer loyalty as well as reduce costs of failed delivery attempts within last mile processes.

These advanced, smart delivery management systems allows for the operations of last mile delivery to be monitored and tracked more efficiently, saving organisations costs and resources. It is critical for online e-commerce retailers and third party logistics companies to implement delivery systems that enables a faster and more efficient delivery service to customers and businesses (Ganapathi, 2015). The adoption of advanced technologies within last mile delivery processes however is said to be very low across companies due to low

overall technology adoption, IoT costs, budget constraints with unclear return on investments and the lack of successful implementations (Khairuddin, Akhir & Hasan, 2019).

In order to prepare for smart delivery management systems and IoT adoption, organisations needs to easily be able to assess whether they are prepared and have the capabilities to implement and use such smart systems to manage changes in demand and unseen situations during last mile delivery processes. Therefore their readiness or preparedness to adopt and integrate such systems becomes an important concern.

2.5 Technology Adoption at the Organisational Level

Technology adoption is a well-studied area in the literature. It refers to how an individual and/or an organisation voluntary decides to adoption and use a specific technology (Awa, Ojiabo & Emecheta, 2016). This section looks specifically at technology adoption at an organisational level and identifies specific organisational technology adoption challenges from the literature.

2.5.1 Technology Adoption Overview

Technology adoption is described as a sequence of processes which occurs prior to the acceptance of a new innovation or technology (Frambach & Schillewaert, 2002: 164). Innovation can be described as new to an adopting organisation, but it is not necessarily a new innovation in its own right (Wainwright & Waring, 2007). Kim (2015: 136) explains that the willingness of people to adopt to the changes, depends on their perceptions of it as well as the way in which the organisation manages the change. The development of an attitude that is favourable or unfavourable towards an innovation will precede the decision to adopt (Waarts, Van Everdingen, & Van Hillegersberg, 2002: 415).

Researchers have suggested that the preparation for a specific system or technology adoption, needs to include the considerations of how it aligns with the organisations Information Technology infrastructure, architecture as well as expertise available within the company (Willcocks, Lacity & Craig, 2015: 4). Organisations and departments could conduct workshops in order to evaluate the specific technology being adopted in order to identify what benefits and potential it has within the organisation (Asatiani & Penttinen, 2016), and how it is able to provide a competitive advantage and put the business in a leading position within their industry. Organisations that are early adopters of technologies however, are said to be at a higher risk as they will be adopting a technology that has not necessarily proven the

business value fully (Waarts et al, 2002). This could hinder the speed and rate at which organisations are willing to adopt the latest technologies within their industries.

2.5.2 Technology Adoption Challenges

If organisations have weak and inadequate information systems, it causes barriers when it comes to being able to collaborate with critical information required between partners within complex supply chain networks requiring the collection of large amounts of data (Abualrejal et al, 2017). Many logistic organisations are facing many problems when it comes to tracking and tracking of their products throughout logistics networks, leading to inadequate and poor quality last mile services (Khairuddin et al, 2019). This stresses the importance of technology adoption in order to improve these last mile delivery services and efficiencies. Even though organisations recognise the importance of adopting technologies for the improvement of processes, there are many difficulties that are being experienced by these adopters, especially within developing economies (Ejiaku, 2014).

Ejiaku (2014) found that there are several sources of these IT adoption challenges such as ineffective government policies and insufficient investment within IT; a lack of essential IT infrastructure, power supply, networks and expertise; as well as lack of skilled IT professionals to develop and adopt these technologies. The developing economy of South Africa therefore also experiences many of these challenges with IT adoption. Other significant challenges impacting the adoption of technology is the ability of the technology to integrate with the existing systems within the organisation, as well as redesigning of business processes and business strategy in order to create a strategic competitive advantages (Sabbaghi & Vaidyanathan, 2008). In order to adopt smart delivery management systems within the last mile delivery processes, organisations need to ensure that they analyze and take into account these challenges, and be able to make informed decisions on the organisational readiness to adopt this technology.

2.6 Organisational Readiness for Technology Adoption

An important factor which influences the adoption of a technology or system is the initial readiness of an organisation to execute the change (Holt & Vardaman, 2013). This section of the literature review provides an overview of technology adoption readiness within organisations as well as identifies various frameworks used to study the readiness of technology adoption from the literature.

2.6.1 Technology Adoption Readiness

The readiness for technology adoption identifies the degree to which organisations and individuals involved in the adoption are able to execute the specific adoption of a new technology or system (Holt & Vardaman, 2013). This assessment of readiness for technology adoption is described as an essential prerequisite for organisations in order to keep up with volatile market demands and manage resources efficiently (Aboelmaged, 2014). Organisations who assess their readiness prior to the adoption of new technologies are in a better position to experience a successful technology adoption. Therefore prior to any system implementation it is important to evaluate the state of readiness.

Parasuraman (2000) developed a technology readiness index (TRI) in order to measure the level of individual readiness with four dimensions namely optimism and innovativeness, described as drivers of technology readiness; and insecurity and discomfort, described as dimensions which inhibit the level of technology readiness. Organisations therefore needs to be able to assess whether not only the organisation as a whole, but also the individuals within the business, is ready to adopt the new technology, in order to ease the process and complete the implementation as effectively and efficiently as possible.

2.6.2 Frameworks for Technology Adoption

The literature is embodied with a variety of models and frameworks which investigates and studies this adoption of IT technologies in detail (Hameed, Counsell & Swift, 2012: 360). These frameworks assist organisations to understand their readiness and identify factors which influence the adoption of technologies. The Diffusion of Innovation (DOI) theory for example, is one of these frameworks which studies the rate at which innovation is adopted, by looking at how the relative advantage and compatibility of a system affects the adoption (Rogers, 2010).

The technology, organisation and environment (TOE) framework, provides a holistic organisational approach to guide the adoption of information systems using technological, organisational and environmental dimensions which could either inhibit or facilitate the adoption (Ramdani, Chevers & Williams, 2013). The Technology Acceptance Model (TAM) is used to explore the relationship between the technology acceptance and adoption by individuals, with their behavioural intention to use the technology (Gangwar et al, 2015a).

An extensive amount of literature applies these various frameworks to study the adoption of technology within organisations. Grandon & Pearson (2004) examined the adoption of

electronic commerce within small and medium enterprises using the Technology Acceptance Model (TAM). Mehrtens, Cragg & Mills (2001), investigates the adoption of the internet using the Resource-Based View (RBV) theoretical framework, Wainwright & Waring (2007), studies the adoption of information systems using the Diffusion of Innovation (DOI) framework and Ramdani et al, (2013), implements the Technology-Organisation-Environment (TOE) framework to study the adoption of enterprise systems in SMEs. All of these frameworks have been used extensively in existing literature, in order to study the adoption of technologies within different types of organisations. The integrated framework which was used to frame this study and design the research instrument is described in the following section.

2.7 Overview of Theoretical Framework

For the purpose of this study, the TOE theoretical framework was adopted, as this framework has been widely used for studies within an organisational context (Gangwar et al, 2015a). The TOE framework posits that the decision of an organisation to adopt an innovation or technology is based on three categories namely the technology, organisation and environment (Bernroider & Schmöllerl, 2013). This TOE framework developed by Tornatzky & Fleischer (1990), is relevant to this study of adoption as it examines three generic adoption factors for information system and IT products and services at an organisational level. The technological context of this framework refers to internal and external technologies that could improve organisational productivity (Hoti, 2015), which are either already in use, or available to be used by organisations (Baker, 2011).

Researchers then also included other technological factors influencing the adoption of innovations such as relative advantage, observability, complexity and compatibility of the technology (Gangwar et al, 2015b; Ramdani et al, 2013). The organisational context refers to resources and characteristics of the specific firms, identifying influences such as organisational resources for example, financial resources available, firm size and structures, top management support and ICT experiences (Baker, 2011; Ramdani et al, 2013). Finally the environmental context of the TOE framework, refers to external factors such as regulatory concerns, competitive pressures, market scope, the structure of industry and the availability of technology service providers (Baker, 2011; Ramdani et al, 2013). This framework is an organisation-level theory which explains these three elements related to technology adoption based on the context of an organisations adoption decisions and influences (Baker, 2011).

2.7.1 The combination of organisational and individual frameworks

Various authors such as Dedrick & West (2003) and Musawa & Wahab (2012), argue that the TOE framework is limited as it categorizes its constructs only within the three technology, organisational and environmental dimensions of the framework, and does not represent a very powerful integrated robust model to study the adoption of technology. This framework is also limited as it investigates dimensions only at the organisational level, and does not consider the role of individuals or end users within the organisation. There are also arguments that the individual is an integral part of the adoption of a system within an organisation, and that the user acceptance of information systems is important (Miltgen, Popovič & Oliveira, 2012). Ponce, Polasko & Molina (2016) similarly argues that end user perceptions plays a very significant role in the adoption of technologies within organisations.

One of the frameworks identified within the literature which studies the adoption of technologies at the individual level is the Technology Acceptance Model (TAM) Model. This TAM model was developed in order to determine the adoption of new information technologies by individuals (Venkatesh & Bala, 2008). This model is said to explore the relationships between technology acceptance and adoption based on the perceived ease of use, being the level which individuals expect the system to be easy to use, and perceived usefulness which determines whether individuals feel that using a specific technology will increase their job performance (Davis, 1989).

The Unified theory of acceptance and use (UTAUT) by Venkatesh, Morris, Davis & Davis (2003), is a model which similarly studies the adoption of technologies using the dimensions of performance expectancy, identifying how individuals believe technologies adopted achieves their goals within their job; effort expectancy, relating to the ease of use of this technology; social influence, looking at how leaders influence the use and facilitating conditions; which identifies how compatible the technology is perceived by individuals and within the organisation. With the TAM and UTAUT models we can see the significant theme of how end user and individual experience has an impact on the adoption of a technology or system. The usefulness and ease of use of a system or technology is said to be an important indicator, as when people believe using a system will improve productivity and business efficiency, will they more likely be willing to adopt this system (Gangwar et al, 2015a).

Given the foregoing thus study therefore will juxtapose theoretical approaches from both organisational and individual technology adoption perspectives. The integration of the TOE

framework with other frameworks or models would thus mitigate the documented limitations of the TOE framework. For example a study by Gangwar et al (2015a), integrated the TOE and TAM frameworks to include the perceived usefulness and ease of use constructs, in order mitigate TOE limitations, and better determine the factors which affects the adoption of cloud computing within organisations. In a different study, Awa, Ojiabo & Emecheta (2016) integrated the TAM, TOE and Theory of Planned Behaviour (TPB) frameworks, in order to expand on and include human and non-human constructs to conduct a deeper insight within their study of the adoption of e-commerce by small management enterprises (SMEs).

This study draws on the latter and integrates the TOE framework with an end user dimension in order to provide a more robust and extensive framework for richer insights into a smart delivery management system adoption readiness. In the context of this study, the end user dimension includes the perceived usefulness and ease of use for a smart delivery management system, as it was found to have an impact on the readiness for the adoption of this system at the organisational level.

2.7.2 Adapted TOE framework for Smart Delivery Management Systems

As previously mentioned, this study has applied a combined TOE framework, including an end user dimension with the perceived usefulness and perceived ease of use constructs, as seen in Figure 1 below. A study by Gangwar et al, (2015a) similarly developed an integrated TAM-TOE model in order to better understand the determinants and adoption factors related to the adoption of cloud computing services within organisations. The literature has found that the TOE framework has certain constructs which tends to be too generic (Riyadh, Akter & Islam, 2009), but suggests that it can be strengthened by integrating it with a model or additional constructs to give it more clarity as per the adapted TOE framework below.

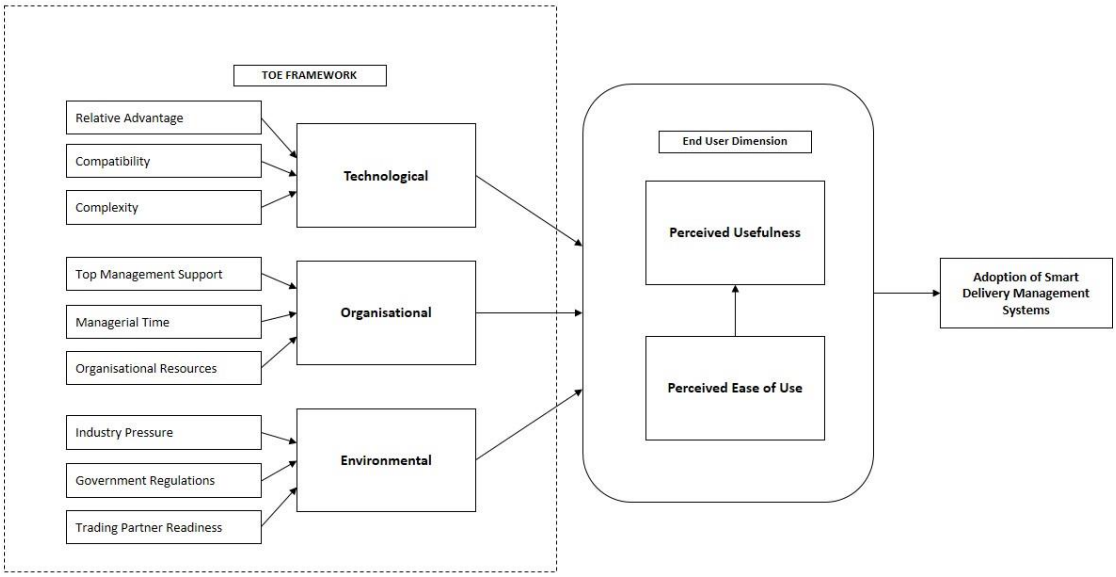

Figure 1: Combined TOE Framework adapted from Tornatzky & Fleischer (1990), Davis et al (1989) and Gangwar, Date & Ramaswamy (2015a)

Table 3 provides a description of the selected dimensions and constructs from the combined TOE framework, which was applied to this study in order to identify how they affect the organisational readiness for the adoption of smart delivery management systems. The below dimensions and constructs were used to design the questionnaire for the semi-structured interview schedule.

Table 3: Combined TOE Dimensions and Constructs

Dimensions and Constructs	Description	Source/s
Technological Dimension Constructs		
Relative advantage	The degree to which a smart delivery management system offers an organisation a competitive advantage within the logistics industry.	Rogers (2003); Ramdani et al (2013); Hwang, Huang & Wu (2016); Gangwar et al (2015a).
Compatibility	The degree to which the delivery management system is compatible with the existing needs, values and technological architecture within the organisation.	Gangwar et al (2015a); Hwang et al (2016); Ramdani et al (2013).
Complexity	The degree of complexity related to the system understanding, how	Rogers (2003); Ramdani et al (2013); Gangwar et al (2015a).

Dimensions and Constructs	Description	Source/s
	much time it takes to perform system tasks and integrate system results within the current working environment, as well as how efficient the data transfer and system functionality is.	
Organisational Dimension Constructs		
Top management support	The degree to which top management believes and supports that the organisation has the resources, commitment, and awareness to adopt the delivery management system.	Ramdani et al (2013); Gangwar et al (2015a), Hoti (2015).
Managerial Time	The degree to which the amount of managerial time required to plan and implement the new system impacts the system procurement decisions.	Hoti (2015).
Organisational Resources (Firm Size, Skills and Financial resources)	The degree to which organisational resources such as expertise, firm size and financial resources available affects the readiness of system adoption within an organisation.	Gangwar et al (2015a); Hwang et al (2016); Hoti (2015); Ramdani et al (2013).
Environmental Dimension Constructs		
Industry pressure	The degree to which industry competitive pressures has influenced the adoption of a new smart delivery management system within an organisation.	Ramdani et al (2013); Gangwar et al (2015a).
Government Regulations	The degree to which governmental pressures, sanctions, initiatives and support impacts the adoption of a smart delivery management system.	Hwang et al (2016); Ghobakhloo et al (2011); Hoti (2015).
Trading partner readiness	The extent to which partners have systems in place to support and integrate with the adopted smart delivery management system at the organisation.	Gangwar et al (2015b); Zhu, Dong, Xu & Kraemer (2006); Awa, Ojiabo & Emecheta (2016).
End User Dimension Constructs		
Perceived Usefulness	The degree to which individuals believe the system will enhance and improve job performance within an organisation.	Davis (1989); Gangwar et al (2015b).
Perceived Ease of Use	The extent to which individuals believed that the adopted smart delivery management system was free of effort and easy to use.	Davis (1989); Lai (2017); Gangwar et al (2015a).

As the objectives for this study were aimed at identifying organisational readiness factors for technology adoption within a single logistics organisation, the combined TOE framework has

been assessed and was found relevant to provide a deeper understanding of smart delivery management system adoption and organisational readiness for last mile delivery processes within organisations.

2.8 Chapter Summary

This chapter set out to address the research problem and answer the main research question and sub-questions as described within chapter 1. This chapter firstly provides an overview of the evolution of supply chain and last mile delivery processes, and describes how the industry is becoming more digital. Thereafter an overview of last mile delivery is provided. The literature review has shown that one of the key challenges in South Africa, in relation to supply chain processes, concerns the relatively high logistics costs which are much higher than the global average. This chapter then provided an overview of last mile delivery technologies and describes smart delivery management systems which are used to manage the last mile processes in the digital era.

Technology adoption readiness within organisations was then discussed in the chapter, providing detail about the various frameworks used to study the readiness of technology adoption. Based on this review, a combined TOE theoretical framework was adopted within this study, as this framework has been widely used for studies within an organisational context and included the end user dimension, in order to provide a more robust framework to investigate the adoption readiness of organisations for smart delivery management systems. The next chapter builds on this combined TOE framework, describing how this model was applied within this study.

Chapter 3: Research Design and Methodology

3.1 Introduction

This chapter presents the research design and methodology utilized within this study in order to answer the primary research question: *"What are the key factors that contribute to the organisational readiness for adopting smart delivery management systems for last mile delivery processes within a logistics organisation?*". This chapter firstly outlines the research design of this study, which describes how the research was conducted and thereafter provide the design choice and motivation for the selection of this design type. Thereafter this chapter describes and motivates the selection of the unit of analysis for this study, being two logistics organisations based within the Western Cape.

This chapter then describes the process for designing the research instrument which was deployed within the field for this study. Table 4 within section 3.4, provides a summary of how the research instrument was designed, including firstly a description of the dimensions and constructs derived from the combined TOE framework, then listing the questions drawn up for each construct in order to achieve the research objectives for this study and answer the main research question. The table then also lists the objectives for asking the specific interview question or questions. It also outlines the research methods for data collection techniques, data source selection and sampling, as well as pre-testing methods and the methods used for data analysis.

3.2 Research Design

A research design describes how research is conducted in order to answer research questions (Babbie & Mouton, 2001: 74). Further to this Creswell (2013), describes a research design as a systematic approach used to solve a research problem. The research design also provides guidance to a researcher about how to identify what data would be relevant to collect and how to go about analysing the results and findings (Yin, 2009).

The design choice for this study was a Case Study design type, which is qualitative in nature, linking to exploratory type research questions which is aimed at providing a detailed description of a small number of cases (Mouton, 2001). In this research this case study was aimed at identifying and describing the factors which could contribute to the readiness for adopting a smart delivery management system within two organisations.

This case study design was the preferred method of choice for this study due to the nature of the primary research question and as it allowed for the exploratory qualitative inquiry, allowing for appropriate professionals from the supply chain industry to be approached and interviewed. Babbie & Mouton (2001: 80) explain that this qualitative inquiry allows for the study to be flexible and adapted as required. This study used a general inductive qualitative approach, which is an approach whereby qualitative data is collected and analysed in order to develop a model or theory about the experiences and outcomes from the data (Thomas, 2006). This approach is aimed at presenting and describing the most important themes uncovered during the data analysis (Liu, 2016).

The use of a case study research design also allows researchers to have a degree of consensus and certainty instead of hypotheses (Yin, 2009). Therefore by selecting this inductive, qualitative approach and case study research design type, this study allowed for professionals

from two case studies to be interviewed, using a combined research instrument, developed for a deeper understanding about the adoption of smart delivery management system within the logistics organisation case studies. Based on the findings of the case studies, an organisational readiness model was developed.

3.3 Unit/s of analysis

The "Unit of Analysis" of the study identifies the actual "object, phenomenon, entity, process or event" that is being investigated (Babbie & Mouton, 2001: 84). The unit of analysis type for this study is "Organisations and Institutions" as this study was performed at two logistics organisations that has had experience in adopting a smart delivery management system for last mile deliveries.

The rationale for this study was to investigate factors influencing the adoption of a smart delivery management system within organisations that have already adopted this type of technology. The case study was based at two large logistics organisation within the Western Cape that has implemented a smart delivery management system within the last mile delivery area of their supply chain. These companies were ideal for this study, as both have a significant presence within the logistics industry, and their last mile delivery management system offers a wide range of advanced functionality which many major e-commerce retailers and logistics providers are not able to offer as yet. Research participants, that have been involved in the smart delivery management system adoption was identified and selected from within the organisations, and interviewed on the aspects relating to the adoption of this technology. This specific research population is further defined and described within section 3.8 below.

3.4 Design of the Research Instrument

The literature review chapter has described how this study will make use of an adapted TOE framework as seen in Figure 1, as a guide in order to measure the adoption of a smart delivery management system within the logistics organisations in the Western Cape. The TOE framework has been used to conduct research and analysis on innovation adoption within firms using three dimensions that influences the adoption and implementation processes for innovations being technology, organisation and environment dimensions (Gutierrez & Boukrami, 2015). The second dimension combined with the TOE framework was the end-user dimension derived from the UTAUT and TAM models, which explores the

adoption of technology from an individual experience investigating an end-user's perceived usefulness and perceived ease of use of a technology (Davis, 1989; Venkatesh et al, 2003). Based on the research design for this study, an interview schedule was designed and developed, guided by the combined TOE framework dimensions which are listed and defined in section 2.7, within table 3.

For the purpose of the instrument development for this study, these dimensions and constructs as defined in table 4 below, were selected in to explore the impact of these elements, and produce relevant questions applicable to the constructs on the adoption of a smart delivery management system. The dimension name and constructs within these dimensions that were investigated are listed, and a definition of the construct in the context of this study is then provided. The table then lists the interview questions which were deployed within the research instrument, and thereafter the objective for asking the specific question is described. This objective assisted in structuring the question/s per construct for the interview schedule as listed within this table. With a questionnaire that was developed in this way the researcher was able to then identify the factors and common themes relevant to the adoption of this system, and analyze the findings in order to develop conclusions and suggest an appropriate adoption readiness assessment model for organisations to use.

Table 4: Interview Schedule Development Framework

TOE Dimensions	Definition	Source/s	Interview Questions	Question Objective
Technology Dimension Constructs				
Relative advantage	The degree to which a smart delivery management system offers an organisation a competitive advantage within the logistics industry.	Rogers (2003); Ramdani et al (2013); Hwang et al (2016); Gangwar et al (2015a).	(Opening Question): What were the conditions and factors which influenced your organisation to procure this system? Did you have any thoughts that by procuring this system that it was going to place you as a company in a leading position?	To determine what type of advantages persuaded the organisation to procure the smart delivery management system.
Compatibility	The degree to which the delivery management system is compatible with the existing needs,	Gangwar et al (2015a); Hwang et al (2016); Ramdani et al (2013).	How did you determine the compatibility of the system with the existing technological architecture of your	To determine whether the level of system compatibility (of the anticipated system), was

TOE Dimensions	Definition	Source/s	Interview Questions	Question Objective
	values and technological architecture within the organisation.		organisation? Did you take any steps to evaluate whether this delivery system was compatible with the existing IT systems in your company? If so what were they? (OPTIONAL) Did your company have to make any changes to the existing IT infrastructure before implementation of the new system? If so what type of changes were made?	prominent in the process to procure the new system.
Complexity	The degree of complexity related to the system understanding, how much time it takes to perform system tasks and integrate system results within the current working environment, as well as how efficient the data transfer and system functionality is.	Rogers (2003); Ramdani et al (2013); Gangwar et al (2015a).	System complexity refers to how much time it takes to perform tasks on the system, how complex it was to integrate the system tasks within the current working environment and how efficient data transfer and system functionality is. Did any of these complexity items influence the decision to implement or procure the system? How?	To determine the way in which the organisation took the system complexity into account when deciding to procure the system.
Organisational Dimension Constructs				
Top management support	The degree to which top management believes and supports that the organisation has the resources, commitment, and awareness to adopt the delivery management system.	Ramdani et al (2013); Gangwar et al (2015a), Hoti (2015).	What were the necessary actions required to obtain top management support for this system procurement?	To identify the relevance / centrality of top management support for successful adoption /procurement of the system.
Managerial Time	The degree to which the amount of managerial time	Hoti (2015).	What do you think of the amount of effort and time that was required	To identify whether the complexity of managerial

TOE Dimensions	Definition	Source/s	Interview Questions	Question Objective
	required to plan and implement the new system impacts the system procurement decisions.		by managers during the planning phase? Was it over very complex and burdensome or not? How did that bear influence in making the final procurement decision?	involvement was a facilitating or prohibitive factor when procuring the delivery system.
Organisational Resources (Firm Size, Skills and Financial resources)	The degree to which organisational resources such as expertise, firm size and financial resources available affects the readiness of system adoption within an organisation.	Gangwar et al (2015a); Hwang et al (2016); Hoti (2015); Ramdani et al (2013).	How did organisational resources such as expertise, firm size and financial resources, influence the decision to procure this system? (OPTIONAL) Do you feel your firm size was beneficial and influenced the system implementation? What type of expertise were required for this type of implementation? (OPTIONAL) Would the cost of this type of procurement be small (<5m), medium (5-10m) or large (>10million)? What were the actions taken to acquire the technical and business expertise necessary for the procurement and implementation of this system?	To determine whether and if so, how the organisational resource availability of the firm was an influencing factor for the procurement of this system.
Environmental Dimension Constructs				
Industry	The degree to which industry competitive	Ramdani et al (2013); Gangwar et al	What type of competitive and industry pressures influenced the	To determine the type of industry pressures which has

TOE Dimensions	Definition	Source/s	Interview Questions	Question Objective
pressure	pressures has influenced the adoption of a new smart delivery management system within an organisation.	(2015a).	decision to procure this smart delivery management system? Would you recommend the implementation of this type of smart delivery management system to other logistics service providers? Please elaborate.	influenced the decision or need to adopt a smart delivery management system.
Government Regulations	The degree to which governmental pressures, sanctions, initiatives and support impacts the adoption of a smart delivery management system.	Hwang et al (2016); Ghobakhloo et al (2011); Hoti (2015).	Did any governmental regulations or initiatives influence the procurement of this system within your organisation?	To determine whether any government regulations, strategies or initiatives influenced the adoption of new delivery management systems.
Trading partner readiness	The extent to which partners have systems in place to support and integrate with the adopted smart delivery management system at the organisation.	Gangwar et al (2015b); Zhu et al (2006); Awa et al (2016).	What actions did you take in order to ensure trading or business partner readiness to support or integrate with this system prior to procurement?	To determine whether business partner readiness impacted the adoption of this system.
End User Dimension Constructs				
Perceived Usefulness	The degree to which individuals believe the system will enhance and improve job performance within an organisation.	Davis (1989); Gangwar et al (2015b).	What steps would have been taken to improve at the pre-implementation stage, the users' perceptions of the system's usefulness and ease of use? (OPTIONAL) Do you believe it is useful to involve the end users in the beginning stages of a system adoption? If so, please elaborate?	To determine how the perceived usefulness of the system was used to influence individuals for the procurement of the smart delivery management system within the organisation.
Perceived Ease of Use	The extent to which individuals believed that the adopted smart delivery management system was free of	Davis (1989); Lai (2017); Gangwar et al (2015a).		To determine what the perceived ease of use was of the smart delivery management system, prior to the adoption and

TOE Dimensions	Definition	Source/s	Interview Questions	Question Objective
	effort and easy to use.			implementation of the system.

3.5 Implementing the interviews

An interview schedule was designed and deployed within the case study organisations through conducting video call, semi-structured interviews to collect qualitative data. The method of semi-structured interviewing was selected, as it allowed for the researcher to explore the perceptions and opinions of the respondents on complex issues and allows for probing and clarification during the interview (Barriball & While, 1994). This semi-structured interview approach also allowed for participants to engage in a dialog with the researcher, creating flexibility in order to probe for participants for more information about important or interesting topics, as well as modify questions based on the responses of the participants.

This qualitative data was collected from a research population of thirteen professionals identified and provided by the organisations, taking up roles such as Business Analysts, IT, Operations and logistics, who have been involved in the adoption and implementation of a smart delivery management system. This qualitative method attempted to gather knowledge about the adoption of smart delivery management systems, allowing participants to provide their first-hand experience in the technology adoption during the interviews. A recording of the interviews were taped using functionality on the Zoom platform. These interviews were then transcribed verbatim and documented case by case. The transcripts were then subjected to a detailed review, firstly read by the researcher capturing and highlighting significant details themes from the transcripts, which were later used for the qualitative data analysis and findings for this study.

3.6 Data sources, Sampling Strategies and Techniques

A list of suitable business, IT and operational professionals that have been involved in the adoption and subsequent use of this system for last mile delivery processes, were interviewed to identify various factors affecting the readiness and adoption of a smart delivery management system within a logistics organisation. These professionals were selected for this study, as they would have had first-hand experience with this adoption and implementation

and they would be best able to provide context and challenges occurred during the technology adoption.

A purposive sampling strategy was used for this study as it is described as best applicable to studies where the researcher has selected a field of study to use, and participants for the study are selected for this purpose and from this field (Etikan, Musa & Alkassim, 2016). This purposive approach was applied within in this study in order to select two appropriate logistics organisations that have already adopted a smart delivery management system for last mile delivery processes. The case study selected were two large logistics organisations within the Western Cape. The participants that were interviewed were selected by the organisations, as they were best able to identify who would provide valuable insights towards this study. Therefore the research population for the purpose of this study included thirteen professionals within roles such as Business Analysts, operations managers, logistics managers and IT developers that have been involved in the adoption of this technology within the case study organisation.

3.7 Pre-testing

The interview schedule/questionnaire that was designed, was pre-tested by the means of "expert review", where an expert from the field of this study will be asked the questions informally, and given the opportunity to provide their opinion on the questions and whether they are problematic or not (Rothgeb, Willis & Forsyth, 2007). Three pre-testing participants within the supply chain field, were selected in order to test the questions drawn up within the interview schedule and identify which questions were suitable and which were not suitable or difficult to understand. Based on the pre-testing findings, any problematic questions were reframed and improved in order to better the questionnaire and ease the interview process prior to conducting the data collection within the case study organisation.

3.8 Research Population

The research population for this study were thirteen participants employed by the selected logistics organisations, who were involved in the procurement and implementation of a smart delivery management system within the business. These participants were selected by the organisation as valuable to provide sufficient insight and detail and being able to contribute to the study.

3.9 Data Analysis

Qualitative data was collected from the research participants for this study using semi-structured interviews. This interview qualitative data that was collected, was transcribed and read by the researcher in order to identify and note important points, themes and patterns related to the research question and objectives for this study. As seen in figure 2, a new project was created within the ATLAS.ti software in order to conduct the data analysis for this study. ATLAS.ti is an existing qualitative data analysis software and tool which allows for the analysis of documents with the use of codes in order to detect patterns.

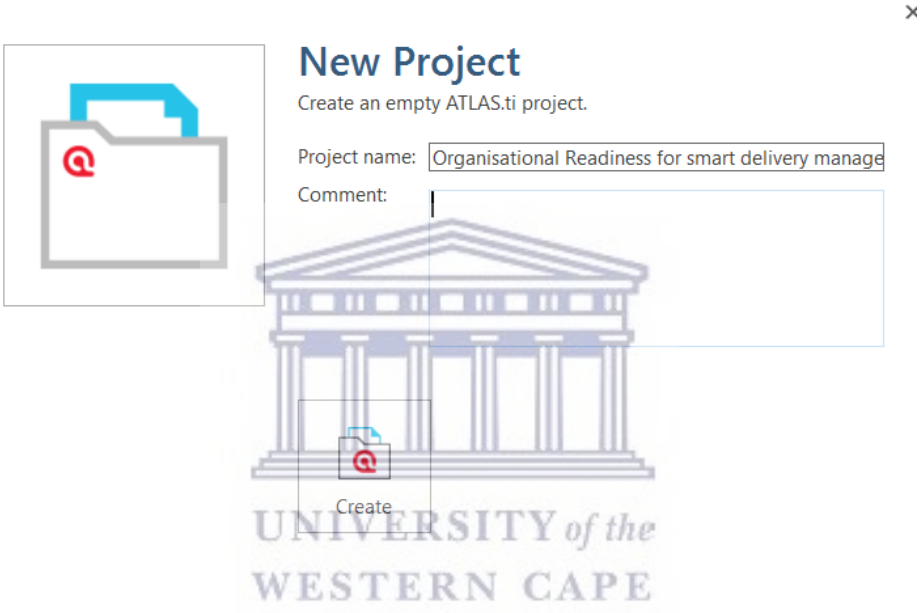

Figure 2: Creating a new project

Once the new project was created, the thirteen transcribed interview documents were added in order to begin the coding and analysis process as seen in figure 3 below.

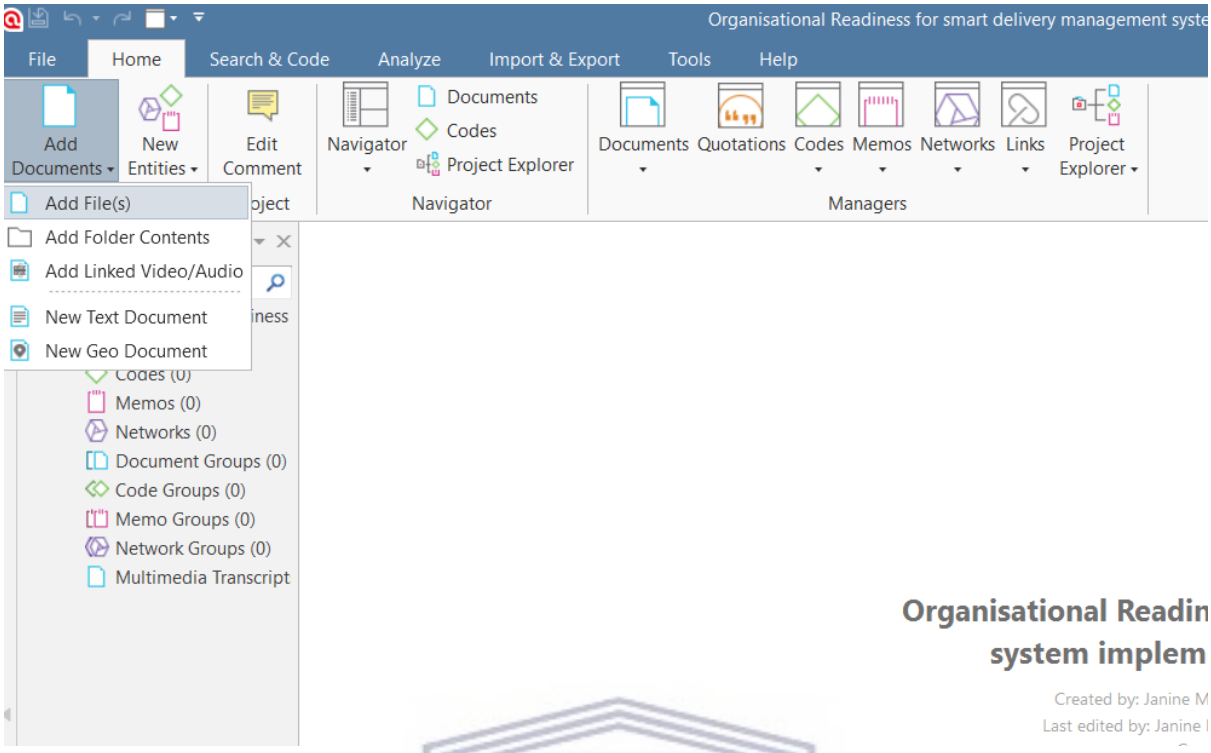

Figure 3: Adding interview transcript documents

The extraction of themes from the documented transcripts was then done through a process known as coding. The process of coding is described as a process where codes are defined as researcher generated constructs, which symbolizes interpreted meanings of data for pattern detection, categorization and analysis (Saldaña, 2013). Priori themes were used based on the combined TOE framework used to develop the research instrument as seen previously in table 4. Common themes were identified from the transcripts and from these themes a list of codes were developed. These codes are a general descriptive phrase related to the key points which underpin these codes. The codebook was then imported into Atlas.ti as per figure 4 in order to begin the data analysis.

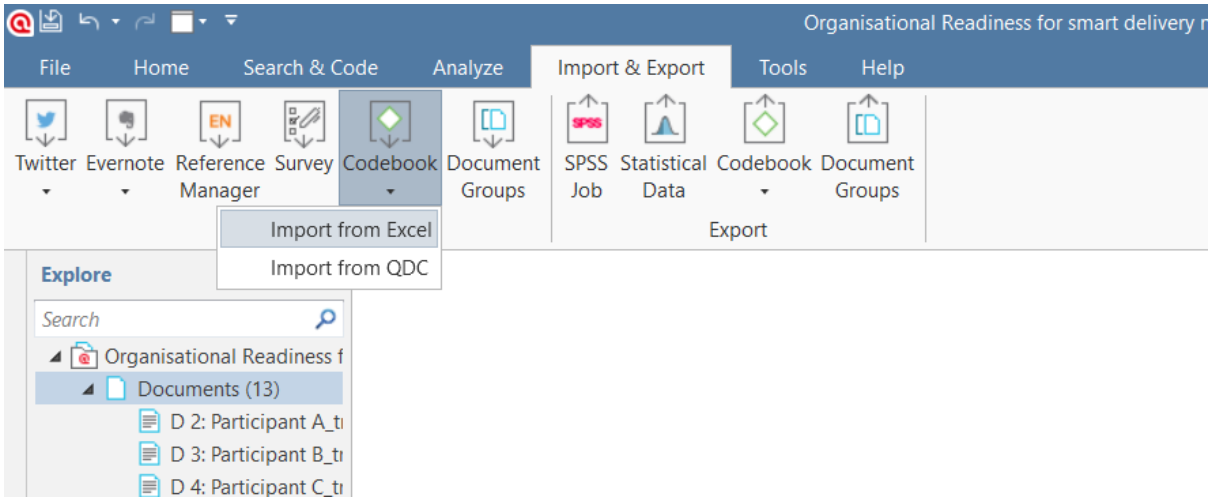

Figure 4: Importing code book

The codes were then applied to the interview transcript documents and analysis was done within the tool. Various relationships and patterns were detected amongst other codes and grouped into general categories and sub-categories by the researcher as seen in figure 5.

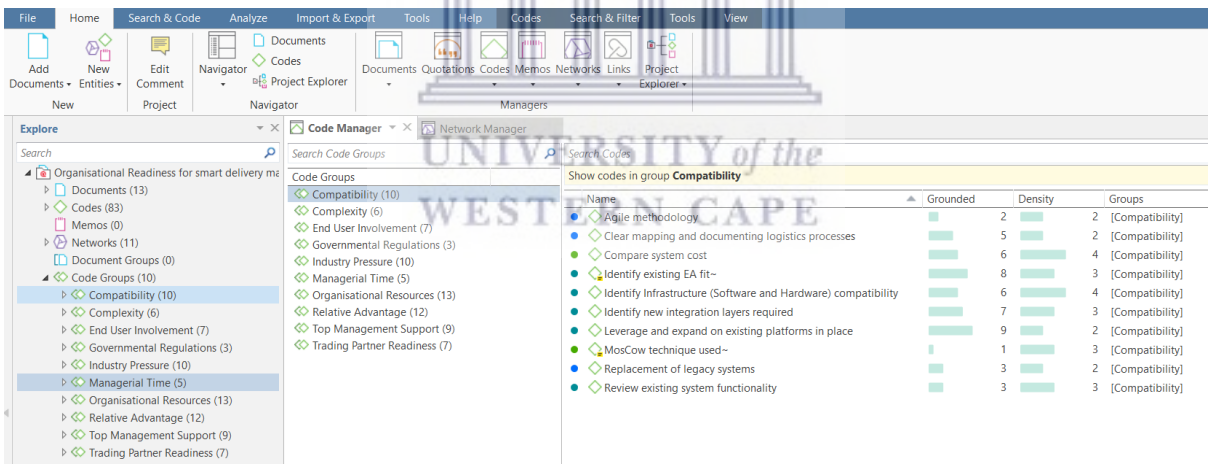

Figure 5: Code Manager

Finally network diagrams were generated within atlas.ti based on the various identified themes, categories and coding from the dataset, and the final findings and discussions were drawn from these diagrams. Together with the literature reviewed, these findings contributed to solve the primary research question and develop a readiness model, which can be implemented by organisations and used to assess their preparedness for the adoption of a smart delivery management systems within organisations.

3.10 Ethical considerations

This study has complied with all ethical issues and regulations as stipulated by the University of the Western Cape (UWC) code of conduct for research. The questionnaire for this study was designed in order to ensure that respondents are not exposed to personal, unpleasant and stressful questions. This study obtained the approval of the organisation before it was commenced, as well as approval from the individuals that will be interviewed. No minors or people with mental health issues was interviewed within this research study. Any further conditions from respondents relating to the research were identified, and noted within the ethical application forms for the university approval.

Detailed information sheets and consent forms as per Appendix A, were provided to all research participants in order for them to sign and thereby consent to providing certain confidential information and detail about their organisation. This information and data collected within this study was anonymous and will remain as such. All research material such as interview recordings and transcripts will be stored only within a secure location or drive, for a minimum period of 5 years. After this period has lapsed the research material will be removed from this location and permanently deleted.

3.11 Chapter summary

This chapter has presented the research design and methodology utilised within this study in order to answer the main research question. The chapter firstly outlined the research design for the study, describing how the research was conducted and reasons for the design choice. The chapter then described the unit of analysis and how the research instrument was designed and implemented, in order to meet the research objectives. Thereafter the data sources and sampling strategies were discussed, as well as the pre-testing processes used to test the research instrument for this study. Finally the research population was briefly described and thereafter a description of the data analysis process for this study was described.

Chapter 4: Research Findings and Discussion

4.1 Introduction

This chapter presents the research findings and discussions for the qualitative data analysis performed for this study. Firstly a case study overview is done, providing a brief description of the case organisations where the research instrument was deployed. Thereafter the demographics of the research participants are presented and described. Finally this chapter presents the research findings for this study, and provides a discussion around the significant themes and factors which were uncovered during the data analysis. The data is supported by code tables and network diagrams developed within Atlas.ti during the data analysis for the study.

4.2 Case Study Overview

The criteria used to select the case study organisations was to select a logistics organisation that has implemented a system in order to efficiently manage their last mile delivery processes successfully. The first case study organisation, referred to as Company X, is a large logistics organisation with a global presence that was selected. This organisation focuses on B2C and B2B logistics and last mile deliveries, and has become a global leader based on their innovative abilities and their competitive edge. Since 2017, this organisation has successfully rolled out their smart delivery management system within sixty nine countries including South Africa, with approximately twenty countries still in pilot stage.

This smart delivery management system has extensive capabilities, including a total of six delivery alternatives, which customers can select after their shipment has already been despatched. Many of the offered delivery alternatives are not offered by a majority of logistics providers within the South African industry. This organisation was therefore selected as suitable for this study, based on their world class delivery standards and success within the logistics industry. A total of nine participants were identified as suitable candidates for this research study and interviews were conducted with these participants.

The second case study organisation, referred to as Company Y within this study, was selected as they have recently embarked on the e-commerce journey within the South African market, and has also implemented a last mile delivery management system in order support their B2C deliveries. Company Y is a large retailer within the South African market founded in 1983, and has a national network of sixteen distribution centres managing their delivery to

customers. Company Y has launched their e-commerce platform in March 2021 and offers products within the entertainment, fashion, technology and home departments, housing over five hundred international and local brands. This organisation was selected in order to have an additional view of the experiences and factors organisations can consider when starting the e-commerce journey, as well as what they took into consideration when selecting and adopting a last mile, smart delivery management system within their organisation.

4.3 Demographics of Participants

For this study, a total of thirteen participants were interviewed from both case study organisations. Participant demographics such as age, highest level of education, current job title, and number of years within their current position can be seen in table 5 below. All participants within this study were over the age of 30 years old. Further to this, majority of the research participants' highest level of education was matric with four participants having a degree or higher qualification. Finally eleven participants were working for the organisation for a total of one year and more.

Table 5: Participant Demographics

Participant	Age	Company	Highest Level of Education	Current Job Title	Years in Position
Participant A	36	Company X	Matric	IT Support Specialist - Programme Delivery	1
Participant B	34	Company X	Certificate	Customer Manager	6
Participant C	36	Company X	MBA	Operations Programme Manager	3
Participant D	34	Company X	Matric	Ecommerce Manager	2 months
Participant E	45	Company X	Not provided	Operations Manager	5
Participant F	36	Company X	Degree	Customer Service Executive	10
Participant G	37	Company X	DIPLOMA NQF5	Field Sales Executive	1.5
Participant H	33	Company X	Matric	In-House Team Leader	4 months
Participant I	40	Company Y	Diploma	Information Analyst	3
Participant J	36	Company Y	BEng Honors Industrial Engineer	Business Process Architect	3
Participant K	40	Company Y	Degree	Project Manager/Business Analyst	4
Participant L	56	Company Y	Matric	SD Functional Consultant	1
Participant M	39	Company Y	Professional Qualification	CE Supply Chain	2

4.4 Findings and Discussion

The below section will present the research findings based on the data analysis performed within Atlas.ti and discuss what was discovered. The section presents the findings based on

the four priori dimensions from the combined TOE theoretical framework namely, **technology, organisational, environmental** and **end user involvement dimensions**, and presents the themes and sub-category findings based on these dimensions. This framework served as a tool in order to investigate the organisational readiness for the adoption of a smart delivery management system. The findings will present either code tables extracted from Atlas.ti, or network diagrams created within this software, and provides a discussion around what was found. The network diagrams shows all the codes linked to each sub-category and describes the relationships between each code. The **grounded value** for each code represents the number of times a code was applied within the interview transcripts analysed. The **density** of each code represents the number of codes that each code is linked to.

4.4.1 Relative Advantage Determination

The data indicates that respondents believe that the relative advantage of a system is an important factor which contributes to the organisational readiness for a smart delivery management system adoption. There are three sub-categories which emerged from the data as seen in Table 6 namely: *meeting and exceeding customer needs, creating a competitive edge* and *cost saving benefits*. From the data, these findings emerged as motivating factors in organisations for selecting a system in order to provide relative advantage.

Table 6: Relative Advantage Summary of Findings

Theme	Sub-theme	Code	Grounded	Density
Relative Advantage	Meeting and Exceeding Customer Needs	Improve customer experience and trust	9	5
		Customer expectation and control	12	6
		Customer Flexibility and Satisfaction	14	6
		Provide real-time delivery updates	9	6
	Creating a Competitive Edge	Reduction of manual intervention and processes	5	2
		e-commerce adoption preparedness	5	3
		Provide multiple re-scheduling options	12	6
		Improve Competitive Advantage and industry position	13	2
		Digital Innovation/Digitalization	11	6
	Cost Saving Benefits	Speed Up Delivery/ Delivery Process efficiency	7	2
		Reduce failed Deliveries	9	3
		Last mile cost savings	9	3

The network diagram in figure 6, displays how all codes are interlinked for each sub-theme and between each code for the theme relative advantage.

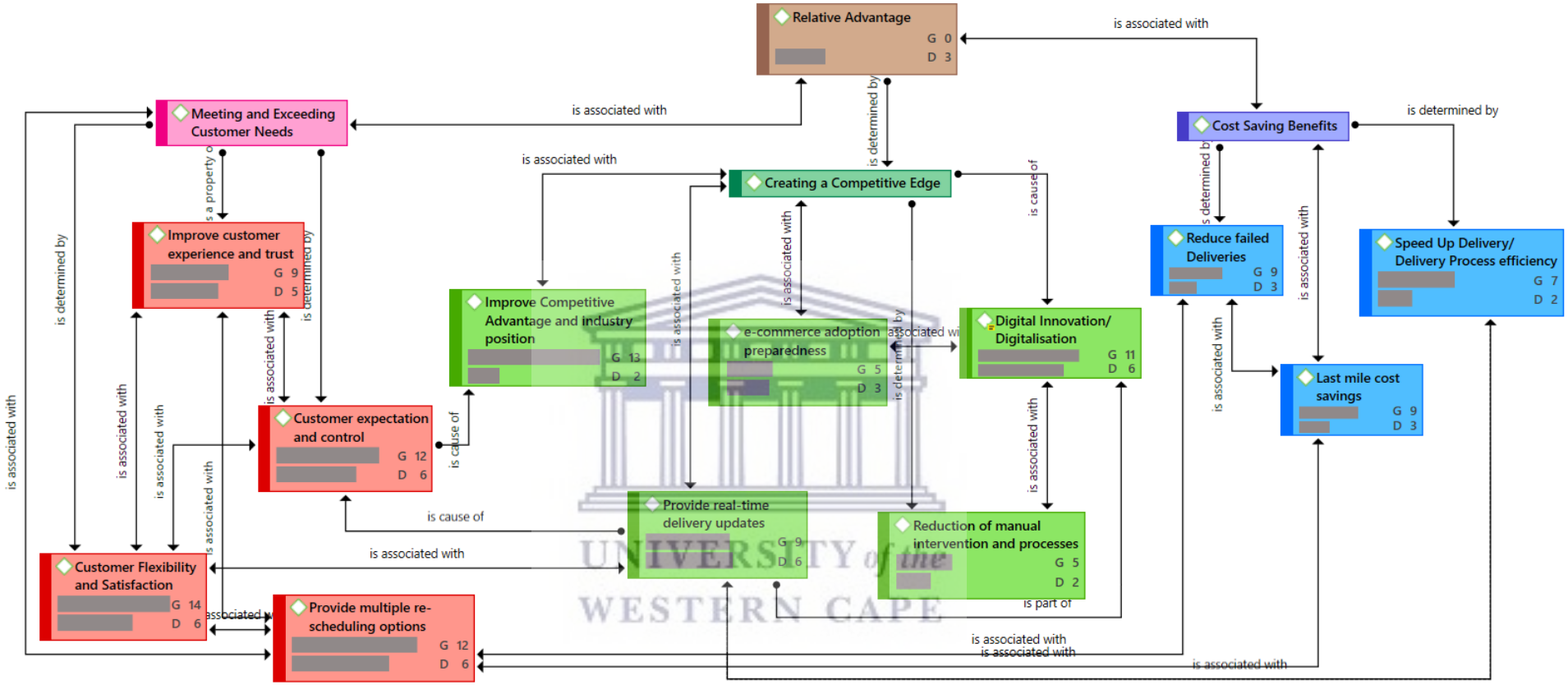

Figure 6: Relative Advantage Network Diagram

The findings and discussions for relative advantage is presented per sub-category in the following sections.

4.4.1.1 Meeting and exceeding Customer needs

The first two key issues in this category relates how the system procurement was aligned to providing c**ustomer flexibility and satisfaction** and also improving **customer experience and trust**. The data shows that adopting a delivery system which meets and exceeds customer needs, offers organisations significant relative advantage within the logistics industry. Respondents affirmed that in order to reap these advantages their organisations needed to consider ways in which their system will improve the customer experience as well as meet the evolving needs of customers through deploying an advanced delivery system with multiple re-scheduling options. Similarly Hesse & Rodrique (2004) are of the opinion that logistics providers need to provide customer focused improvements within their deliver management technologies. An example, in the following interview extract, Participant D describes what they offered their customers in order to place their organisation in a position to meet and exceed customer needs and provide their customers with control over their deliveries with their adopted last mile delivery system:

> *"Okay, so naturally giving the customer the options or the six options that we deem most necessary, which is rescheduling the delivery date, rescheduling the delivery address, delivering to a neighbour, release signature, hold for holiday and deliver to "Company X" service points has allowed customers to actually manage their delivery, delivery a bit more, which allows us to achieve a 95% success rates on first time deliveries, which actually reduces our costs" (Participant D; e-Commerce Manager).*

In addition **customer expectation and control** was found to be a significant requirement, as customers are demanding transparency and visibility of their shipments throughout the last mile processes and would like to have better control of when and where their parcels are delivered. The fourth finding in this category concerned the important of procuring a system that was able to provide **real-time delivery updates**. This means that customers want to have real time delivery updates of their deliveries, in order to keep track of where their shipments are at a point in time. Within the literature, Kaplan (2017), has also stated that customers would like to keep track of their deliveries in real time.

In summary there are two important issues promoting relative advantage. The first is to ensure that when procuring a delivery management system, organisations should review what type of benefits they wished to offer their customers, in order to better prepare for being aligned with meeting these needs. The second that customers are expecting flexibility and control over their shipments and are demanding real time delivery updates. Procuring a system able to provide this type of functionality will allow for organisations to create the beneficial relative advantage within the industry.

4.4.1.2 Creating a Competitive Edge

The second category identified within the data is that of creating a competitive edge. Two aspects that was found to be required was that organisations need to consider their **e-commerce adoption preparedness,** as well as the **reduction of manual intervention and processes** within their business. Also the respondents advised that their organisations needed to identify ways in which the adopted system will be able to **improve competitive advantage and obtaining a leading industry position**, through **digitalisation**. Similarly the literature has also found that logistics providers need to implement advanced technologies to improve their position within the market (Hesse & Rodrigue, 2014). Further to this the data shows that the smart delivery management system adopted at Company X, has ensured them to maintain a leading position within the logistics industry, and manage their last mile delivery processes better than their competitors, by **providing real time delivery updates**. One of the respondents describes these aspects in the below extract:

> *"there was no other there was no one else offering this service within the market and Company X is ahead of its game in terms of digitalisation. So, really, and truly when any tool is implemented or deployed, especially customer facing tools, the customers are into consideration, and we identify how do we simplify make the customer's life easier" (Participant A; IT support specialist).*

The type of competitive advantages experienced due to the implementation of a smart delivery management system within the studied organisations, played a major role in the decisions and reasons for selecting to procure this type of system within their last mile processes.

4.4.1.3 Cost Saving Benefits

The final category that was found to be a significant factor to consider when making the decision to procure and adopt a system for last mile delivery was *cost saving benefits*, which was found to be achievable with this type of system adoption. With this adoption the organisation managed to speed up **delivery processes, and creates delivery efficiencies** within the last mile. The smart delivery management system offered the studied logistics organisations **reduced failed delivery attempts** through providing customers with these options to change their delivery address after the delivery has been despatched from warehouses. Respondents also found that the system adoption introduced significant **last mile cost savings**, which is highly beneficial as the last mile is deemed the most expensive area within the supply chain. This therefore is a significant factor to take into account when implementing this type of system as reducing costs within this area allows for greater competitiveness within the industry.

4.4.2 Technological Compatibility Determination

In this study the compatibility of a technology is defined as the degree to which a technology is consistent with the organisational needs and existing values and past experiences. The data shows that all respondents in the study deemed an assessment of compatibility of the system to be important. In general companies undertook such an assessment prior to formal procurement. The prevailing rationale in the study population is that a system adoption of a selected technology that does not align with the needs and enterprise architecture of the organisation, will not be successful. There are 3 sub-categories that were developed during analysis namely, *technology prioritization management, determining organisational need and existing technological architecture fit.* Table 7 displays these sub-categories together with their underlying codes applied during the data analysis.

Table 7: Compatibility Summary of Findings

Theme	Sub-theme	Code	Grounded	Density
Compatibility	Determine organisational need	Clear mapping and documenting logistics processes	5	2
		Replacement of legacy systems	3	2
		Agile methodology	2	2
	Existing technological architecture fit	Identify existing EA fit	8	3
		Identify Infrastructure (Software and Hardware) compatibility	6	4
		Leverage and expand on existing platforms in place	9	2

Theme	Sub-theme	Code	Grounded	Density
		Identify new integration layers required	7	3
		Review existing system functionality	3	3
	Technology Prioritization Management	Compare system cost	6	4
		MosCow technique used	1	3

Figure 6 displays all the codes that emerged from the data, and which are associated with the compatibility category code group.

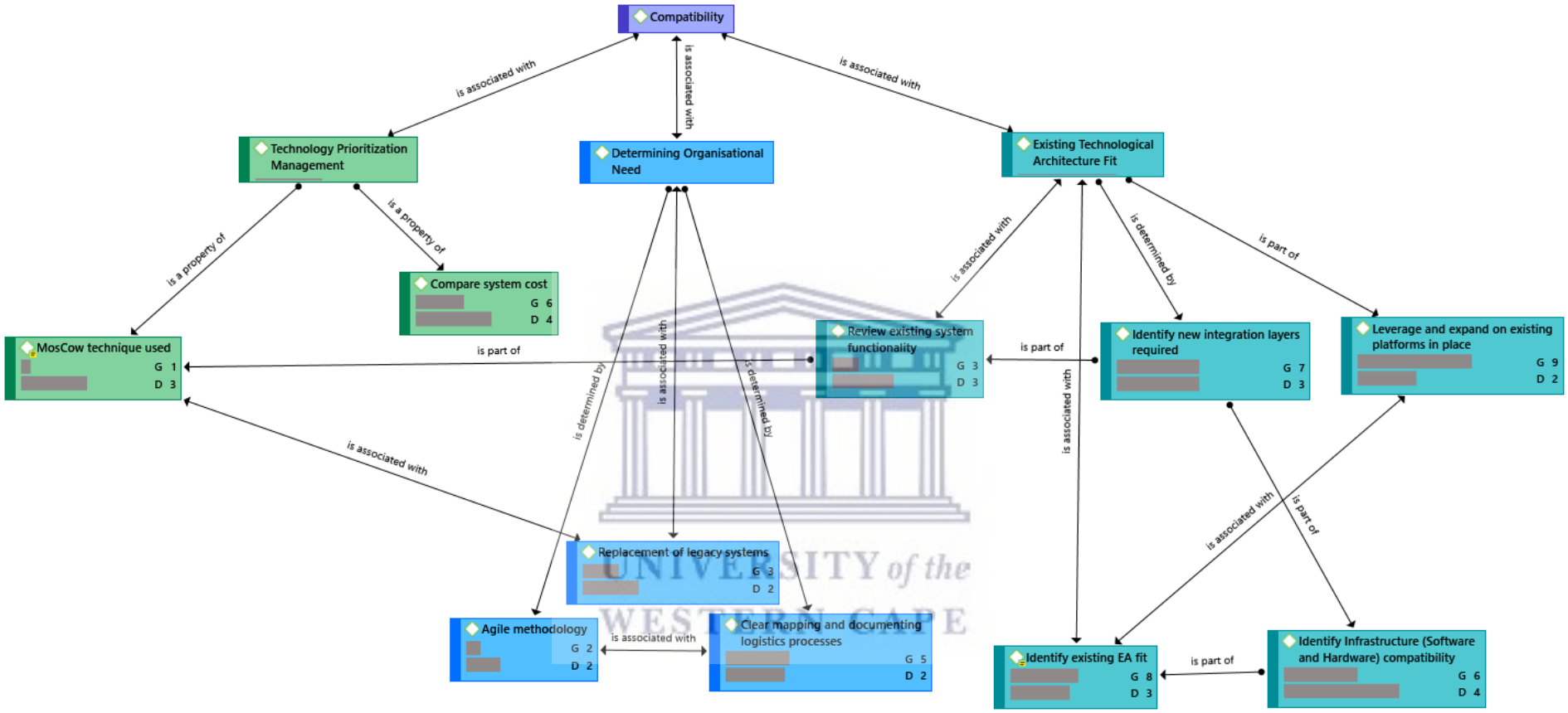

Figure 7: Compatibility Network Diagram

The findings and discussions for the compatibility code group will be presented within the further sub-sections based on each sub-category and the relevant codes.

4.4.2.1 Determine Organisational Need

All respondents engaged in some kind of assessment to determine organisational needs, and the data indicates that this was deemed to be an important factor for organisations to consider as a pre-procurement process to ensure the alignment with the enterprise architecture. The data then further shows that respondents also believe that organisations should determine whether there is possibly a need for the **replacement of outdated legacy systems** within organisations, in order to move into a more digitalized ways of working within the last mile delivery area. In terms of determining system compatibility, Participant C, the Operations Programme Manager at Company X stated that:

> *"we sit down and look at the application, what we need it to do and how we need to meet the customer's needs in an efficient way. And then we look at our current technology, if it can accommodate it, if it can't, sometimes we develop new systems and get new infrastructures to support this, as long as it's within a baseline and it's within budget" (Participant C; Operations Programme Manager).*

In addition the methodological approaches that are found to be important to ensure an appropriate organisational needs assessment included the deployment of **agile methodologies**, which involved completing a project by having several phases of planning, executing and evaluating the system. Ismail & Sharifi (2006), have supported this view in finding that agile methodologies enhance competitiveness within the supply chain industry. Further to this, the data shows that better determine this organisational system need, the business needs to have a **clear mapping and documenting of logistics processes**. In summary, this is an important part of organisational readiness in order to ensure, organisations are better equipped to determine the organisational need for the system.

4.4.2.2 Existing Technological Architecture Fit

The data has shown that the determination of the *existing technological fit* of a new system, is another factor contributing towards the organisational readiness for a system adoption. Determining the existing technological architecture fit was find to include **reviewing existing system functionality** within the organisation, and together with determining the need for the

system, specifically identifying how the proposed system options fits and is compatible with the current technological architecture already in place at the organisation. Thong (1999) however had a contracting view, as he had found that the adoption of ICT is not dependable on the existing technological infrastructures within organisation.

The findings for this study however, is that **identifying existing enterprise architecture (EA)** fit of the technology, is extremely important to assess organisational readiness for the adoption. What also emerged from the data was that organisation needed to **identify infrastructure compatibility**, and **new integration layers required** in order to cater for this type of delivery system procurement. Company Y went the route of **leveraging and expanding on their existing platforms in place,** to ensure better compatibility and limit the complexity of the adoption. Participant I, an Information Analyst at Company X, describes how they went about reviewing their organisational infrastructure compatibility below:

> *"We needed to map out all the processes and determine the technical ability of all hardware, we then needed to look at the type of integration that would be required and decide if the system is suitable or not based or not based on this" (Participant I – Information Analyst).*

Determining system infrastructure and integration compatibility within the current EA and technological architecture, were clearly significant factors to consider prior to a system procurement within the case study organisations.

4.4.2.3 Technology Prioritization Management

The final sub-category which emerged from the data was that of technology prioritization management. The data indicates that the organisations that were studied undertook specific management processes to enable them to produce a prioritization of technological needs and aspirations. The reason for undertaking prioritization management was to determine the need for, and importance of a adopting a new system, by comparing available systems from various vendors and considering factors such as system functionality, integration and return on investment. The following excerpt from the interviews states how Company Y used the priority methodology known as the **MosCow technique** to determine system compatibility at their organisation:

> *"Well, we did some analysis, we drew up some requirements, and we obviously used what we call the Moscow technique to try and see what was*

priority and we used that to assess responses from our potential vendors" (Participant K; Project Manager).

The MosCow methodology is used by organisations to understand and analyse what importance is placed on each system requirement. This technique identifies what organisations "*Must have*" in place in order for their business to keep running, what type of systems an organisation "*Should have*", which are considered important initiatives that are not vital but is able to add significant value to the organisation. Also what an organisation "*Could have*", identifying initiatives that has very little impact, and finally what an organisation "*Will not have*", identifying initiatives that are not a priority for the organisation. The evidence indicates that this is a useful way to do prioritisation management. Ramayasa & Candrawibawa (2021) supports this view by stating that this technique allows for the determination of priority needs in a fast and accurate way, and enables the listing of requirements based on a priority level. The other rational for technology prioritisation management was of a financial nature, to **compare system costs**. The comparisons of costs from various technology providers, will enable organisations to better determine what cost is associated with the various system functionalities which they are currently looking to implement.

In summary the data shows that determining the system compatibility, is a very prominent factor in the process to assess the readiness to procure and adopt a new delivery management system within an organisation.

4.4.3 Technology Complexity Determination

The complexity dimension aimed at understanding the way in which the organisations took the level of complexity in to account and which factors were considered, when deciding to procure the smart delivery management system. Table 8 presents the summary of findings as well as the groundedness and density for each code within the dataset.

Table 8: Complexity Summary of Findings

Theme	Code	Grounded	Density
Complexity	Significant impact on procurement	2	2
	Complex customer requirements determination	5	2
	High level of complexity	7	2
	Low level of complexity	8	2
	Determining integration and validation requirements	9	2

The network diagram in figure 8, shows the codes which has emerged from the data around system complexity, and its association with system complexity.

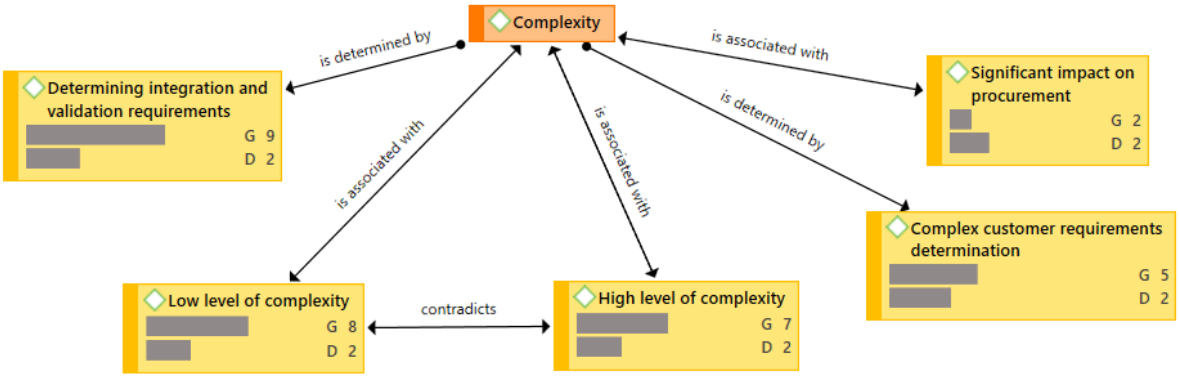

Figure 8: Complexity Network Diagram

The data shows that there were contradicting views on the level of system complexity from the interview respondents. There was a divide in those that viewed the system as having a **high level of complexity** and a **low level of complexity**. Awa et al (2016) found that organisations that have found ways to efficiently exploit the complexities of technologies, show improved technology readiness for creating value with the system adoption. The extract from Participant D below provides their view on how the level of complexity influenced their organisations decision to procure their smart delivery management system:

> *"..it was a simple decision, if you want to stick ahead of the times and give customers the functionality that they need. As we know, we're living in a more on demand world, and customers demand their request to be managed a lot quicker" (Participant D; e-commerce manager).*

Further to this, the data shows that the level of system complexity had a **significant impact on the procurement** of the system, part of which was to **determine complex customer requirements**. The extract below provides a view from one of the respondents:

> *"...these factors had a big influence on the decision to adapt this new delivery system, as we needed to ensure that the system was advanced enough to cater for last mile delivery services, which we wished to provide. But also, we needed the system to be easy enough to implement in terms of the technical requirements" (Participant I"- Information Analyst).*

Finally this study then further identified that in order to prepare for this type of system adoption, organisations need to **determine integration and validation requirements** for the system being procured. In summary, the system complexity was a factor which was considered prior to the system procurement by the organisations studied, if the complex system requirements were not clearly defined and met, it would be detrimental to the system adoption success.

4.4.4 Obtaining Top Management Support

This study then investigated the relevance and centrality of top management support for a successful adoption of a smart delivery management system. Table 9 displays the findings for the top management support category. This theme was broken down into two sub-categories namely: *obtaining top management support*, and *top management involvement requirements*.

Table 9: Top Management Support Summary of findings

Theme	Sub-theme	Code	Grounded	Density
Top Management Support	Obtaining management support	Conduct Workshops	1	4
		Proof of concept	2	3
		Project governance framework in place	2	2
		High Level requirements determination	3	3
		Prove return on investment and meeting of KPIs	4	4
		Develop detailed business case	6	7
	Top Management involvement requirements	Highly involved in procurement	4	3
		Top Management Driven	6	2
		System Cost benefit analysis	7	4

The network diagram in figure 9 displays all these codes embedded within each sub-category, as well as how each codes interlinks with other codes within the network.

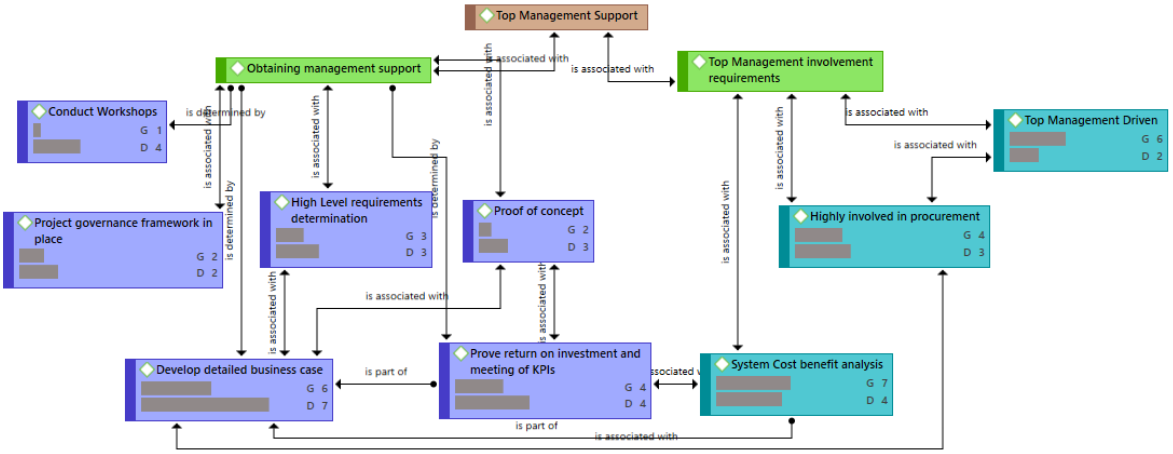

Figure 9: Top Management Support Network Diagram

The first sub-category which emerged from the data was to obtain top management support in order to ensure readiness for the system adoption within the organisation. The data here shows that respondents took the steps of **conducting workshops** in order to **develop detailed business cases** with **high level requirements** with top management for the specific system being procured. The respondents found that a system **proof of concept** encouraged further top management support. Hwang, Huang & Wu (2016) stresses the importance of having support from their internal management teams and stakeholders, in order to get the system procurement aligned with the business growth objectives. Further to this the data shows that in order to obtain the support of management, the **return on investment and logistics KPI achievements** needed to be evident. As per the extract below, it has also been found that the use of **project governance, a management framework** which governs organisational capital investments and within which project decisions are made, contributed towards a more successful system implementation.

> *"Top management gave us the direction, and when we went to implement the system, we obviously had our project governance in place where we would have our STEERCOs and our updates and our project plans" (Participant J; Business Process Architect).*

The second and final sub-category within this code group was to determine the top management requirements. The data has shown that the system procurement was mainly **driven by top management**, and that they were **highly involved during the procurement** process. It is evident that a **cost benefit analysis** of the system implementation needs to be

performed, in order to determine the return on investment of the system being procured. Therefore, in order to ensure readiness for this type of system procurement and adoption, organisations need to ensure that they have their support from top management, by involving them in the process.

4.4.5 Assessment of Required Managerial Time

The investigation of managerial time involved identifying whether the required level of managerial time was a facilitating or prohibitive factor when procuring the delivery system within the case study organisations. Table 10 presents the findings for this theme.

Table 10: Managerial Time Summary of Findings

Theme	Code	Grounded	Density
Managerial Time	Low level of impact on system procurement	2	1
	Not burdensome	2	2
	Significant amount of management time	3	3
	Critical to decision making	4	4
	Strategic alignment	4	4

The evidence presented has shown that there was a **significant amount of managerial time** required for the procurement of a new delivery management system, however this time from management was **critical to the decision making process** therefore it did not negatively impact the system procurement.

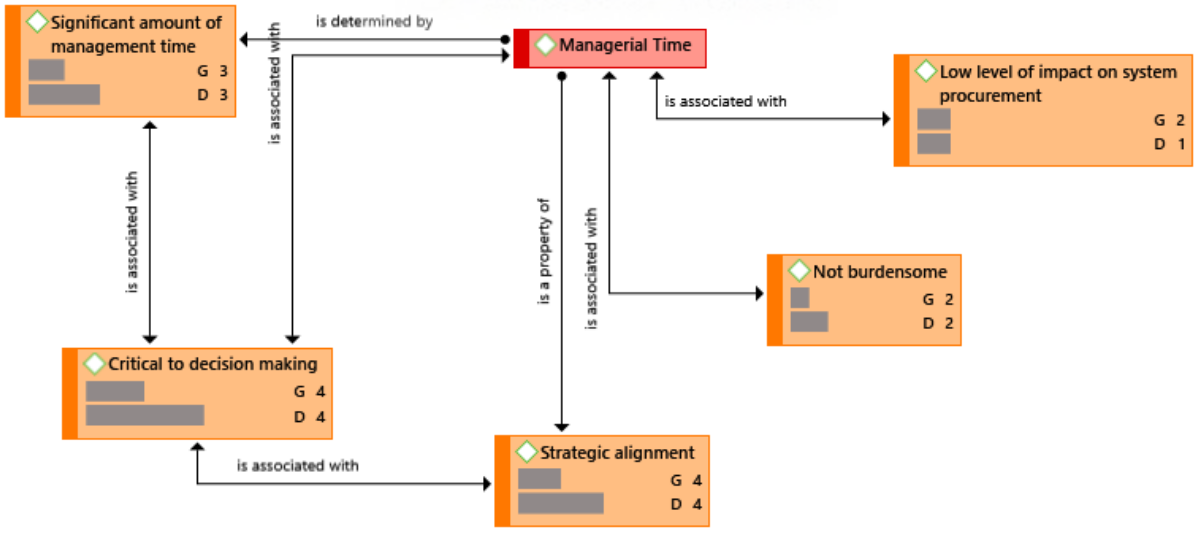

Figure 10: Managerial Time Code Group Network Diagram

The data has also shown that the required managerial time had a **low level of impact on the system procurement** decision, and that the time was **not burdensome** on management

within the organisation. The literature has also found that this time required from management is a critical factor contributing to a successful system adoption, as the initiatives needs to be encouraged by management (Hwang et al, 2016). In summary the managerial time was a significant factor to consider when assessing the organisations readiness for adopting this smart delivery management system, as it ensured **strategic alignment** within the business.

4.4.6 Determination of Organisational Resource Sufficiency

This study then aimed to investigate what type of organisational resources were required in order to be better prepared for the adoption of a smart delivery management system within an organisation. This category had an extensive list of codes and factors identified by respondents as being necessary in order to have the required organisational readiness for the system adoption. There were three sub-categories seen in table 11, developed from the data which were identified as factors to be considered namely, *influence of firm size*, *required expertise* and *resource requirements*.

Table 11: Organisational Resources Summary of Findings

Theme	Sub-theme	Code	Grounded	Density
Organisational Resources	Influence of Firm Size	Easily adopted by Larger firms	3	2
		Leverage existing skills	10	3
	Required Expertise	e-commerce expertise	1	2
		Experts in Supply Chain	2	1
		Financial Skills	2	2
		Data analytics skills	4	2
		Logistics expertise	5	1
		Operational Skills	5	1
		IT expertise	8	1
	Resource Requirements	Medium Implementation Cost (5-10m)	2	1
		Pre-identification of necessary expertise	2	2
		Significant capital flow availability	3	3
		Highly experienced software partner	4	1
		Clearly defined business processes	6	2

Figure 11 displays how the embedded codes for these categories are associated and displays their groundedness and density as analysed within the data. This study will discuss the findings for each sub-category in the following sections.

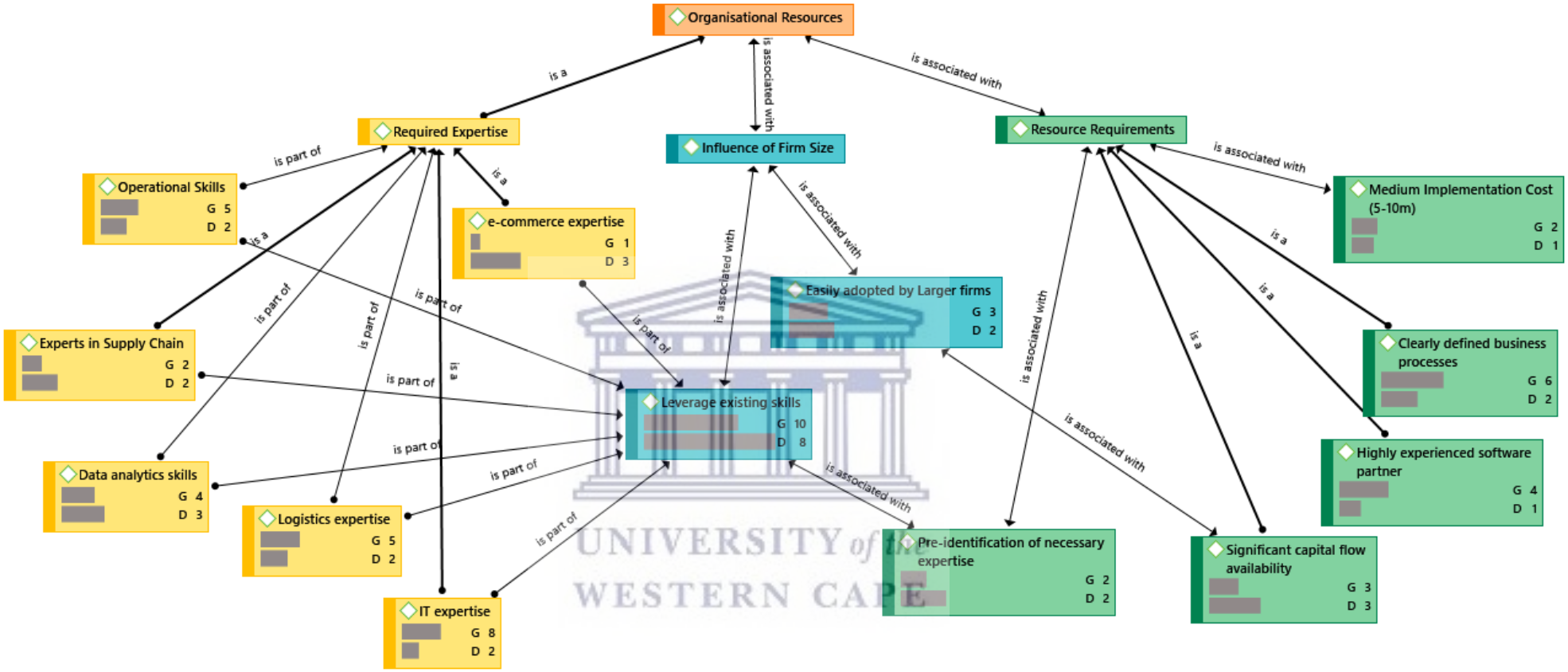

Figure 11: Organisational Resources Code Group Network Diagram

4.4.6.1 Required Expertise

The reason for investigating the required expertise for the system adoption is that it has a significant influence on the success of this implementation. Respondents felt that they needed to have knowledge of **experts within the supply chain** industry and also have access to expertise on areas such as **data analytics, financial skills, logistics expertise, operational skills** and **IT expertise**. Organisations are also required to have **expertise on e-commerce** processes, as this is the area in which a last mile delivery management system will prove highly beneficial. In order to ensure organisational readiness for the adoption of this type of system, the data found that identifying the required expertise prior to the system procurement and adoption is critical in order to ensure a smooth and successful implementation.

4.4.6.2 Influence of Firm Size

This study then further found that the size of the firm showed to have a beneficial impact on the ease and readiness for the system adoption. The extract below further clarifies this:

> *"definitely the impact of the size of our organisation assisted with them wanting to enable this function. And also, it made for an easier implementation" (Participant B; Customer Manager).*

The data has shown that this type of system was **easily adopted by larger firms**, and that the firm itself was able to **leverage off the existing expertise** and other organisational resources such as available budget, which were all readily available at larger organisations. There is however a gap in determining whether this type of system adoption would be as easily adopted within smaller sized organisations.

4.4.6.3 Resource Requirements

The final sub-category was to determine the required resources that contributes to a successful last mile delivery management system within the organisations. The data shows that this type of system adoption requires **significant capital flow to be available** at the organisation in order to be prepared for the procurement. The system cost was found to be of a **medium implementation cost,** ranging from between five and ten million rand. Participant D describes their process in the extract below:

> *"We determined what the cost elements of the system were, versus the return on investment if we should implement a system online. The return on*

investment far outweighed the cost elements" (Participant D; E-commerce manager).

To successfully adopt this type of system, respondents found that they needed to ensure that they had a **highly experienced software partner**, who was able to **provide clearly defined business processes,** and **pre-identify the necessary expertise** that needed to be in place for a successful system procurement. They were also able to better identify and communicate the necessary organisational and technical requirements, and guide the organisation with this system implementation. To support the resource requirements findings, authors Gangwar, Date & Ramaswamy (2015b), also argues that organisations that have effective infrastructure, sufficient financial resources and expertise have a higher success rate of system adoption. This has been found to be the factors needed to be considered with regards to resource requirements, which would determine whether an organisation was ready for the system procurement or not.

4.4.7 Minimization of Industry Pressure

In this study the industry pressure of adopting a smart delivery management system is defined as the degree to which competitive industry pressures has influenced the adoption of a new smart delivery management system within an organisation. The data shows that the industry pressure was a significant factor contributing to the readiness to procure this system, and organisations need determine ways of minimizing these pressures. In general, industry pressures are forcing logistics companies to implement advanced delivery capabilities in order to ensure they remain competitive within the market. Table 12 displays all codes which emerged from the data, and the sub-categories which were developed during the analysis namely, *increased industry digitalisation and competition*, and *evolving customer needs*.

Table 12: Industry Pressure Summary of Findings

Theme	Sub-theme	Code	Grounded	Density
Industry Pressure	Increased industry digitalization and competition	New industry entry competitors	2	2
		COVID-19 pressures	2	2
		Rise in e-commerce	4	2
		World class service and standards	8	3
		Staying competitive	10	3
		Digital Innovation/Digitalization	11	6

Theme	Sub-theme	Code	Grounded	Density
	Evolving customer needs	Free value added service for customers	4	2
		Innovation and Advanced delivery capabilities	6	3
		Customer Service	10	4
		Provide real-time delivery updates	9	6

Network diagram in figure 12 below represents a visual view of this code group, displaying all codes embedded within each sub-category, with a view of how each code is associated to the category and to one another.

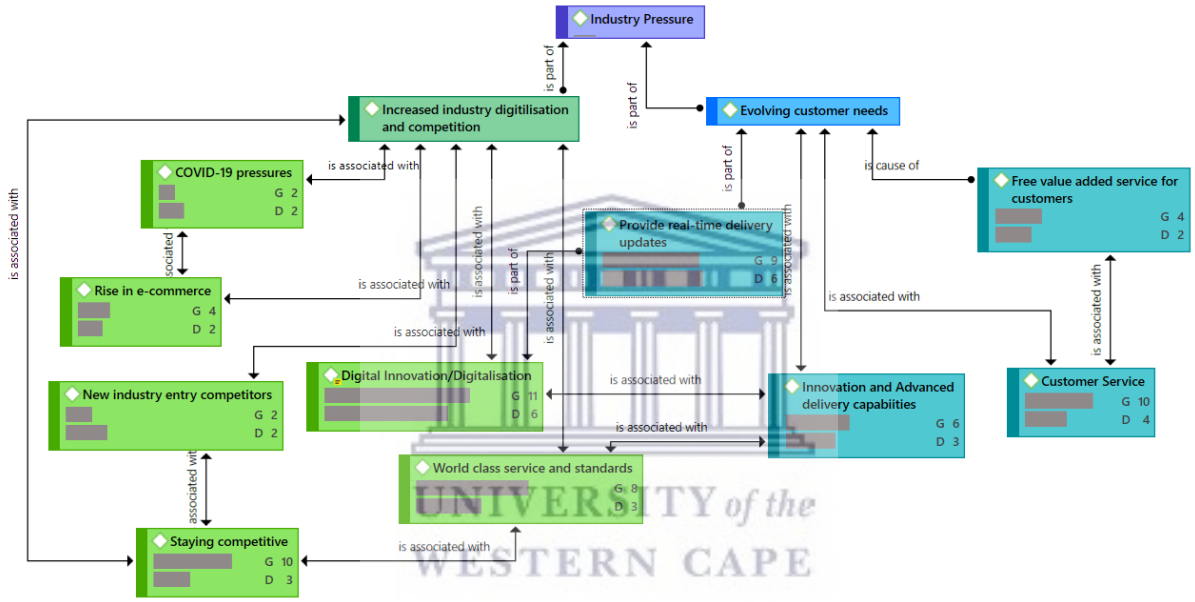

Figure 12: Industry Pressure Code Group Network Diagram

The outbreak of **COVID-19** has brought about a **rise in e-commerce** and with this, **new industry entry competitors**. The data shows that **staying competitive** within the industry was critical and that organisations should invest in providing **world class service and standards** to their customers through **digitalisation**. Participant G from Company X describes in the below extract, how their system adoption has allowed them to keep up with the industry pressures:

> *"So it's definitely given us a very large competitive edge because it is the only service available within our industry"(Participant G; Field sales executive).*

The second sub-category deemed relevant to industry pressure was the *evolving customer needs within the industry*. Respondents found that their customers are expecting **real time delivery updates**, and **advanced delivery capabilities** within the last mile space. In providing these type of functionalities the organisation was able to provide superior **customer service**. Company X went further and provided this service as a **free value added service to their customers**, increasing their customer satisfaction. In the extract below one of the respondents describe what pressures further influenced this system adoption:

> *"Other logistics firms started offering their customers, the ability to amend their delivery dates, after a delivery had has already been scheduled. This saved cost of failed delivery attempts and also increase their customer satisfaction" (Participant I; Information analyst).*

From the literature, competitive and industry pressures has been found to positively influence the adoption of IT, and studies have found that it is strategically necessary to adopt new technologies in order to compete within the market (Ramdani, Kawalek & Lorenzo, 2009). In summary the data shows that with implementing a smart delivery management system, organisations needed to consider factors such as providing a world class service to their customers, and achieve ways of to stay ahead of their competition thus reducing pressure from within the logistics industry.

4.4.8 Government Regulation Influences on Technology Procurement

This study then investigated whether any government regulations, strategies or initiatives had any influence on the adoption of this smart delivery management system within the organisations. Table 13 provides a summary of codes applied within the data set for this theme.

Table 13: Government Regulations Summary of findings

Theme	Code	Grounded	Density
Government Regulations	POPIA Compliance	3	1
	Low degree of government influence	7	1
	Customs Regulations	1	1

As seen in figure 13, there were only three factors identified by respondents, as influential to this system procurement and adoption.

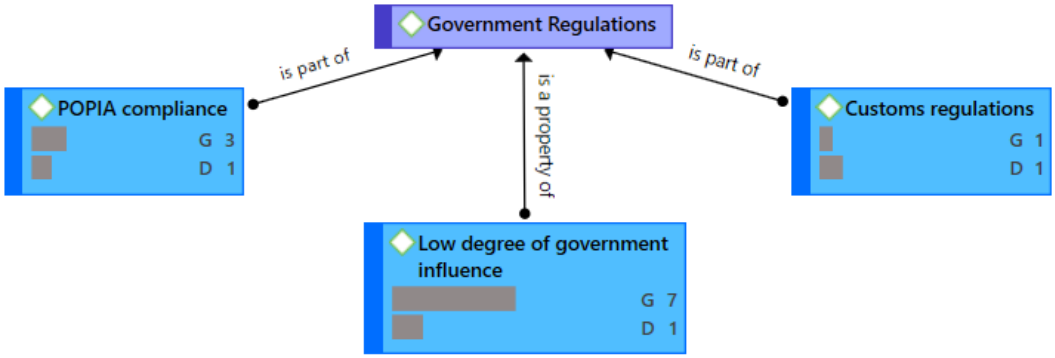

Figure 13: Government Regulations Code Group Network Diagram

The data shows that the only factors which could be of influence on the system procurement was **Protection of Personal Information Act (POPIA) compliance**, and complying with logistics **customs regulations**. In general within South Africa, all businesses need to adhere to both customs and the POPI Act, and therefore when implementing a new smart delivery management system, organisation needs to take these policies into account. Based on the data, it was found that government regulations had a relatively **lower degree of influence,** on the decision for the adoption of a smart delivery management system within an organisation.

4.4.9 Determining and Creating Trading Partner Readiness

Trading partner readiness was studied in order to determine whether business partners and third parties readiness had an impact on the organisational readiness for the procurement of the smart delivery management system. The data has verified that trading partner readiness is indeed a key factor contributing to organisational readiness for this system procurement. Table 14 presents a summary of findings for the trading partner readiness theme, which has been divided into two sub-categories namely, *communication and openness with partners*, and *partner technological readiness and compatibility review.*

Table 14: Trading Partner Readiness Summary of Findings

Theme	Sub-theme	Code	Grounded	Density
Trading Partner Readiness	Communication and openness with partners	Internal communication and change management	10	4
		Central and online training	7	2
		Transparency with partners	3	2
	Partner technological	Phased roll out approach	4	1

Theme	Sub-theme	Code	Grounded	Density
	readiness and compatibility review	Hardware functionality review	1	3
		Review 3rd party system compatibility/support	11	4

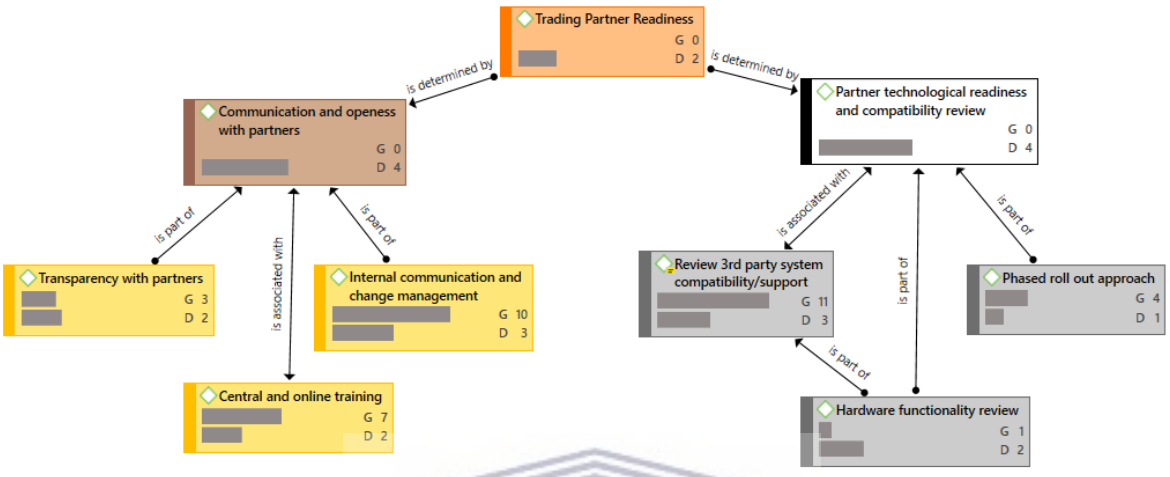

Figure 14: Trading Partner Readiness Code Group Network Diagram

The data shows that in order to ensure trading partner readiness, respondents said that they needed to provide **transparency with partners**, and effectively communicate system requirements with their partners, as well as providing them with **central or online training** and **change management** to be better equipped for the system adoption.

The second sub-category was to determine partner technological readiness, by identifying **third party system and infrastructure compatibility and support** for the new system being adopted. Further to this, the case study organisations were found to have had a more successful system adoption, with a **phased roll out approach** to their partners. The data also shows that in order to ensure a successful system adoption, organisations should conduct **a hardware functionality review**, in order to assess how compatible the system will be with their existing hardware. The extract below provides how Company Y went about reviewing partners with whom they were strategically looking to work with:

> *"..we made it mandatory that if partners wanted to get business from us, they would have to have the ability to integrate to this application." (Participant K; Project Manager).*

Here we can see that it is an important factor to consider and ensure trading partner readiness prior to the procurement of a new system, in order to achieve a successful implementation. The literature has also supported these views where Gangwar, Date and Ramaswamy (2015b), states that the architecture of systems, requires tighter integration with trading partners, and this influences the adoption as partners needs to ensure readiness in order to ensure an effective implementation and maximisation of the technology.

4.4.10 Assessing Required Levels of End User Involvement

The final category investigated for factors to consider when assess organisational readiness for the adoption of a smart delivery management system was the end user involvement factor. The data indicates that the organisation considered various factors and processes in order to improve the acceptance of the system by system users as well as customers. Three sub-categories were developed for the end user involvement category namely, *customer inclusion, end user involvement considerations* and *end user change management*. Table 15 presents the findings for this theme.

Table 15: End User Involvement Summary of Findings

Theme	Sub-theme	Code	Grounded	Density
End User Involvement	Efficient End User Change Management	Create end user awareness	7	4
		Internal communication and change management	10	4
	End User Involvement considerations	No initial involvement - created confusion	2	2
		Initial involvement not recommended	3	2
		End user involvement importance	10	6
	Customer Inclusion	Improve customers system acceptance	14	3
		Trial and improve on customer feedback	6	4

The breakdown of these sub-categories can be seen in figure 15, and the findings will be discussed per sub-section below.

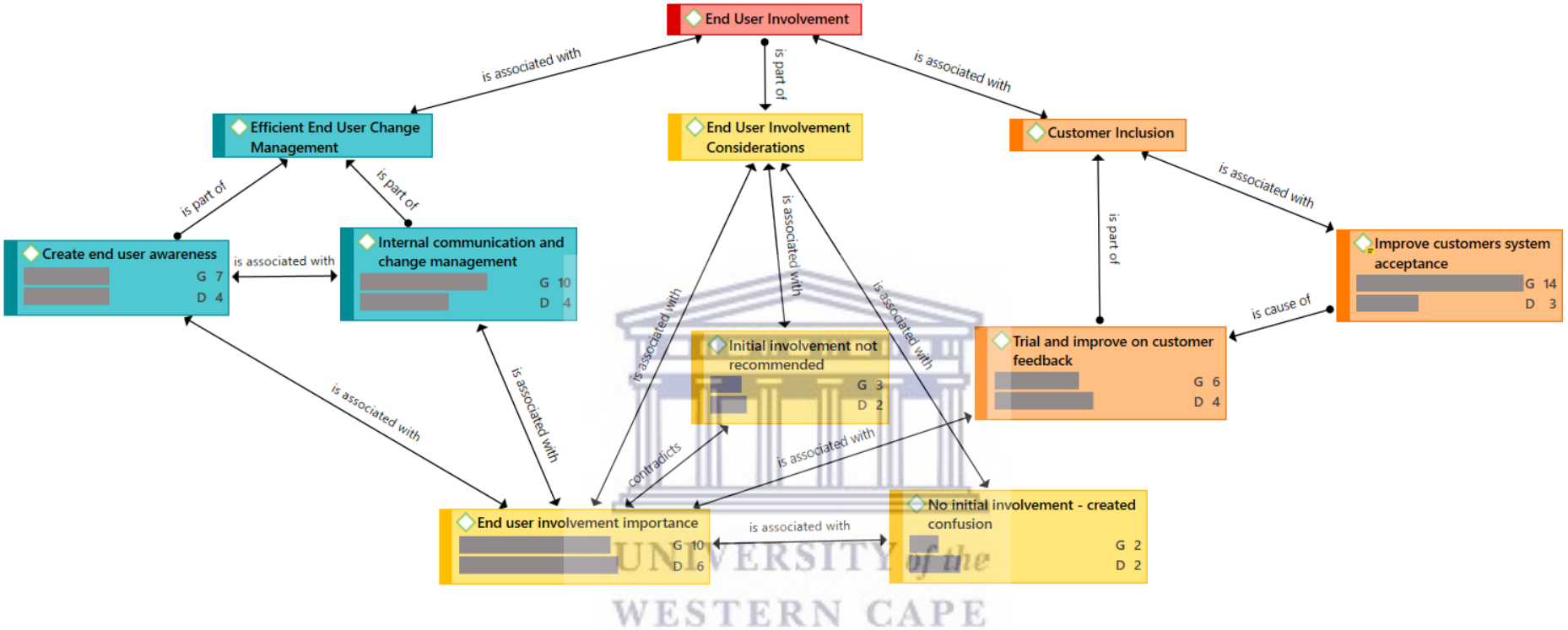

Figure 15**: End User Involvement Code Group Network **Diagram

4.4.10.1 Customer Inclusion

The data shows that respondents felt that including customers in the system procurement decisions had added significant value to the systems effectiveness. The first area of consideration was to **trial and improve based on customer feedback**. The studied organisations took customer concerns into consideration, and made system enhancements and improvements based on their feedback. The extract below describes how Company X went about including their customers:

> *"Employees actually went through to our customers to tell them our plans in terms of deploying a new tool or system, and asked how it would benefit them. Sometimes putting yourself in the customers' shoes is important. It's all about the customer end of the day" (Participant A; IT support specialist).*

In allowing customers to be included in this process, it was found that it **improved customers' system acceptance,** and thereby contributing towards a successful system adoption.

4.4.10.2 End User Involvement Considerations

From the data, there were some contradicting views from the respondents, on their opinions with involving end users in the procurement process. Certain respondents believed that when it came to end users, the **initial involvement was not recommended**, their motivation for this was that there would be too many people making decisions. On the other hand, other respondents believed that there had been **end user involvement importance** in the procurement decision processes, as they felt it created better system acceptance. Respondents found that **no initial involvement created confusion** with the system users. Venkatesh & Bala (2008) supports this view, as they have found that the involvement of users within IT adoption, leads to greater system acceptance and utilisation. The extract below provides the opinion on this from one of the study respondents:

> *"Users are able to provide the most value when it comes to procuring a system as they can best provide a breakdown of ways in which they perform their daily task" (Participant I; Information Analyst).*

In summary with having end users involved in the procurement process it was found that they will best be able to provide insights as to whether a specific system will fit its purpose or not, thus creating better readiness for the system adoption.

4.4.10.3 Efficient End User Change Management

The data shows that in order to improve system acceptance, the organisation needed to make sure that they had efficient change management processes in place. Respondents advised that they had to ensure that they **created end user awareness** about the system procurement. The way in which this was done to **implement internal communication and change management** processes to ensure business readiness. This internal awareness was created by communicating the decisions being made by the procurement team within the business, and where possible, including end users in the decision making processes by asking for their opinions and inputs about the system. This ensured for a more successful system adoption as end users felt comfortable to accept a system catered to their needs.

4.5 Evaluation of the qualitative research

The validity and reliability of a study identifies the degree to which the research makes sense and provides the readers with transparency and solid reasoning and evidence, ensuring the trustworthiness of the study (Suter, 2012). The evidence provided within qualitative studies, needs to be credible and valid in order to better support the research and to prove that valid findings were provided in the attempt the answer the research questions. Lincoln & Guba (1985) suggest that there are four criteria which can ensure the trustworthiness of the findings of a study namely:

- Confirmability
- Dependability
- Credibility
- Transferability

Confirmability refers to the degree in which the findings focuses on the qualitative inquiry and no bias from the researcher through the provision of an audit trail of the data used within the study (Babbie & Mouton, 2001:278). In order to ensure confirmability, this the researcher needs to be able to demonstrate that the data collected represents the respondents' views and not the biases of the researcher (Cope, 2014). The **dependability** of the study refers to the

extent to which sufficient evidence provided within the study was repeated in a similar context that the findings would be similar (Babbie & Mouton, 2001: 278).

In order to ensure confirmability and dependability, this study provided details with regards to the processes followed to conduct the research and provided a detailed description of the research instrument development and the process followed to conduct the interviews. The development of the research instrument was described and this instrument was then also pre-tested by conducting interviews with persons within similar fields of work, and amending the instrument questionnaire based on the coherent of the interview and any vague and ambiguous areas were improved on. A copy of the documented transcribed interview data and tape recordings of the interviews are provided as supporting evidence towards this study. By following these processes the researcher ensured that there was a high level of transparency and minimal researcher bias in order to better the confirmability and dependability of this study.

The **credibility** of the study refers to how truthful the data from the respondents is, and how the views of the respondents is interpreted and this credibility is improved by verifying the research findings with respondents (Cope, 2014). Triangulation is a method which creates this credibility and validity through having used different sources and methods in order to check data integrity, also having referential adequacy is also said enhance the credibility of research in which the researcher is able to prove that the evidence has been collected (Babbie & Mouton, 2001: 277). In order to create this credibility within this study, a recording of the data collection was done and will be kept for a given period of time. The data was also collected from various respondents In order to show the compatibility of their realities and thereby implementing triangulation.

Transferability refers to the extent that the findings of a study is able to be applied within other studies, contexts or conducted with other study participants (Babbie & Mouton, 2001: 277). This study enabled the transferability by using purposive sampling when selecting participants, as opposed to a random sampling strategy in order to make sure that relevant information can be collected from a specific organisation about the specific system being researched.

4.6 Chapter summary

This chapter has presented the findings for this study, on the factors contributing to the organisational readiness for the adoption of a smart delivery management system within an

organisation. Discussions on the findings were also presented, based on the dimensions used from the combined TOE theoretical framework. The data has shown that factors relative advantage, compatibility, top management support, system complexity and industry pressures all have a significant impact on the organisational readiness for the adoption of a smart delivery management system for last mile delivery. Finally, the evaluation of the research was described, outlining the validity and reliability criteria, ensuring that the data and findings presented were trustworthy.

Chapter 5: Conclusions and Recommendations

5.1 Introduction

This chapter concludes the reporting of the research study by providing a summary of how the research objectives were achieved to answer the main research question *"What are the key factors that contribute to the organisational readiness for adopting smart delivery management systems for last mile delivery processes within a logistics organisation?*". This chapter describes how the research objectives were achieved for this study, by conducting the literature review, deploying the research instrument, as we as analysing and interpreting the data to recommend an ICT readiness model developed based on the study findings. To conclude, this chapter presents the contribution of the research, the study limitations and finally provides recommendations for future research.

5.2 The attainment of the research objectives and summary of research findings

The main objectives for this research study were as follows:

- To identify best practises, frameworks and challenges for the adoption of smart delivery management systems within organisations.
- To design an interview questionnaire instrument which will be used to investigate the key factors related to the adoption of smart delivery management systems for last mile delivery.
- To determine which adoption dimensions affect the readiness for the implementation of smart delivery management systems for last mile delivery amongst the target population.
- To make recommendations and develop a model to assess the organisational readiness for the adoption of smart delivery management systems for last mile delivery.

The sub-sections below describes how each of these objectives were met within this study, and provides a summary of the research findings which were presented in chapter 4.

5.2.1 To identify best practises, frameworks and challenges for the adoption of smart delivery management systems within organisations.

This objective has been met by examining the literature in order to identify what best practises, frameworks and challenges are experienced when adopting smart delivery management systems for last mile deliveries within organisations. Literature states that the supply chain industry is experiencing immense changes due to digitalisation, technology

advancement and the increase in demand from clients for superior operational performance. Organisations needs to implement best practises and adopt innovative smart solutions which are able to dynamically change processes and improve inefficiencies within the supply chain. It was found that the implementation of various advanced technologies such as machine learning, the internet of thing and artificial intelligence could provide logistics organisations with improved operational benefits.

The literature then also identified various frameworks which is applied within research in order to study the adoption of technologies within organisations. Frameworks such as the Diffusion of innovation (DOI), investigates the rate of information system adoption. The TAM model is a framework used to explore the relationship between individuals and their technology acceptance and use, and the TOE framework is also used to study the adoption of information systems within the organisational context, and this was found to be appropriate for application within this specific study. An overview of these frameworks were drawn from the literature and presented in section 2.7.

There were also various challenges which were identified from the literature within chapter 2 such as, the fact that last mile delivery processes have become very complex due to a significant increase in customer expectations for shorter delivery lead times, real time traceability and on demand updates of delivery locations. The last mile area has become the most expensive part of the supply chain with many of these costs coming from failed delivery attempts. These findings have motivated the need for a smart delivery management system to be adopted within organisations in order to create operational efficiencies, reduce costs and improve competitive advantages.

5.2.2 To design an interview questionnaire instrument which will be used to investigate the key factors related to the adoption of smart delivery management systems for last mile delivery.

This objective was met for this study by designing the interview questionnaire research instrument, using a combination of the TOE and TAM models were used. From the TOE framework the dimensions, *relative advantage, compatibility, complexity, top management support, managerial time, organisational resources, industry pressure, government regulations* and *trading partner readiness* were examined.

From the TAM framework, an *end user involvement* dimension was included as part of the theoretical framework for the instrument development taking into account the *perceived ease*

of use and *perceived usefulness* of the system from an end user perspective. Chapter 3, section 3.4 further described how this combined framework was used to design the research instrument which was deployed within the two case study organisations, meeting this specific objective. From the interview transcripts, each of these dimension were analysed and presented within the findings in chapter 4 of this study.

5.2.3 To determine which adoption dimensions affect the readiness for the implementation of smart delivery management systems for last mile delivery amongst the target population.

In order to meet this objective, the designed research instrument was deployed within the field in order to gather the dimensions affecting the readiness for the procurement and adoption, of a smart delivery management system from the research respondents. This study achieved this objective by determining these factors from the data collected, based on the priori themes namely, *relative advantage, compatibility, complexity, top management support, managerial time, organisational resources, industry pressure, government regulations, trading partner readiness and end user involvement.*

The respondents were asked to provide the factors related to **relative advantage,** which persuaded the organisation to procure this smart delivery management systems and the main areas which they have identified were, to **create a competitive edge**, to **meet and exceed customer needs** and to provide their organisation with **cost saving benefits**. The study then investigated how **compatibility** of the system affected procurement and the study found that respondents needed to firstly **determine the organisational need** for the system, investigate the existing **technological architecture fit**, and perform **technology prioritization management** in order to compare systems and select the best fit for their enterprise architecture.

The main findings on the complexity theme for this study was that there were contradicting views of the level of complexity for the system adoption where half of the respondents found it to have a **high level of complexity**, and the other half a **low level of complexity**. The outcome however was that majority of the respondents found that **determining integration and validation requirements** for the system was quite complex, and that this had a **significant impact on the system procurement**. This higher the complexity, the more difficulty and trouble the organisation will have with the procurement. It is therefore critical to determine the factor of complexity in order to ensure business readiness.

The next factor that was investigated was to determine whether top management support was relevant for a successful system adoption. The data found that top management was **highly involved in the system procurement** and it was mainly **top management driven**. This study then found that **obtaining top management** support also had an impact on the system procurement, and that the organisations studied had to **prove return on investment and how KPIs will be met** in order to have better support from their management teams. The study then investigated the factor of **managerial time** required for the system adoption and whether it was burdensome or not. The data has shown that the time was **not burdensome**, but it was **critical to decision making** and **strategic alignment** of management within the organisation.

The theme of **organisational resources** then found that the **influence of firm size** had a significant impact on the system procurement, where the data shows that larger sized organisations had most of the **required expertise to leverage from, significant capital flow**, and the **technological architecture** already in place and readily available. Factors which were discovered as significant for the **industry pressure** theme, was the **increase of industry digitalisation and competition**, and the **evolving needs of customers**. This study found that **government regulations** did **not have a significant impact** on the adoption of the smart delivery management systems, with only **POPIA** and **customs requirements** being identified as pre-procurement factors, which needed to be considered within the case study organisations.

The final factors investigated within this study, were **trading partner readiness** and **end user involvement**. The study findings show that in order to ensure trading partner readiness, the organisation needed to ensure **communication and openness with partners** and determine the **technological readiness of partners**, by reviewing their current system integration and new system compatibility readiness, prior to the system procurement. Finally, the **end user involvement** factors were that it was important to **involve end users** in the procurement process, in order to **eliminate user confusion** and **manage the change** efficiently. Respondents also felt that **customer inclusion** was also a factor to consider during their system adoption, this caused for a successful system adoption as they **trialled and improve** the system based on their customers feedback.

5.2.4 To make recommendations and develop a model to assess the organisational readiness for the adoption of smart delivery management systems for last mile delivery.

In this study, the factors which contribute to organisational readiness for the adoption of a smart delivery management system for last mile delivery processes were investigated and identified. As per the discussion in section 5.2.3, the factors which had a significant impact on organisational readiness were found to be the themes embedded within the combined theoretical framework namely, *relative advantage, compatibility, complexity, top management support, managerial time, organisational resources, industry pressure, government regulations, trading partner readiness* and *end user involvement.* The following sub-section deals with the model and recommendations in more detail

5.3 Organisational ICT Readiness Assessment Model

The research objectives described in 5.2.4 was met by developing a model which organisations can use in order to assess their readiness to adopt a smart delivery management system to support last mile delivery. The model is derived from the factors inherent in the main findings which were found to influence organisational readiness.

Based on the theoretical framework applied within this study, there are **technological, organisational**, **environmental,** and **end use involvement** factors for consideration which influences organisational readiness for the adoption of a smart delivery management system within last mile delivery. Figure 16 provides an overview of the main management actions which are required to ensure organisational readiness for each framework dimension based on the combined TOE framework applied within this study.

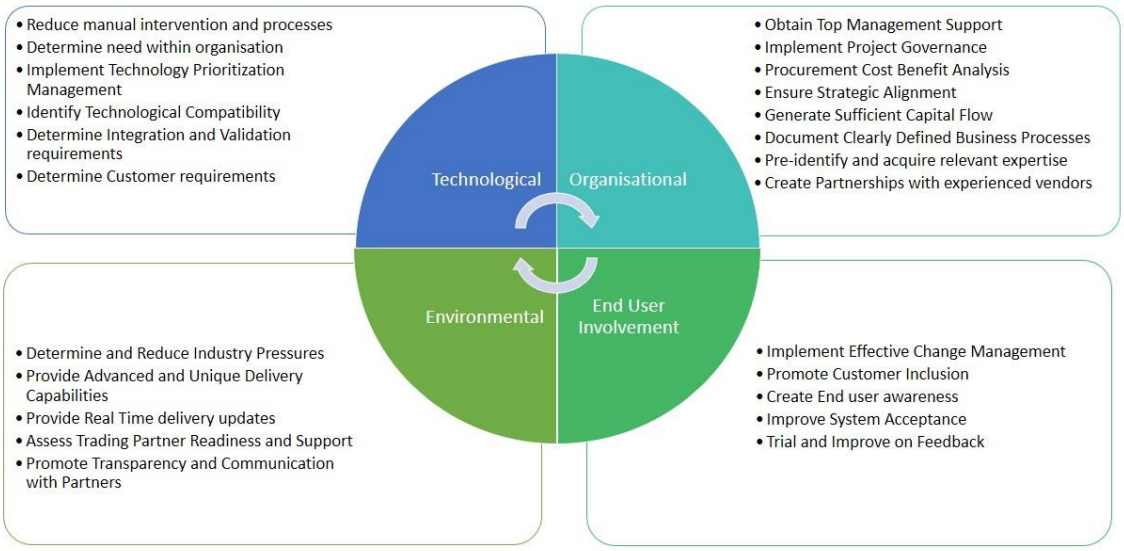

Figure 16: Management Actions towards Organisational Readiness

While Figure 16 presents the findings according to the adapted TOE framework, it is also important for the findings to be organised as a set of key actions, in a more practical perspective for practical implementation. Figure 17 therefore displays the organisational ICT readiness model developed for this study. This model provides the key actions organisations are required to use when assessing their readiness to implement a smart delivery management system. This model describes the main factors which were found to be both critical and non-negotiable, in order to ensure the preparedness of an organisations for a smart delivery management system within the logistics industry.

Figure 17: Organisational ICT Readiness Model

Based on this ICT readiness model, it is recommended that organisations should consider taking the following steps in order to assess their readiness for the ICT adoption:

Step 1: Assess the system's relative advantage so as to ensure that the selected system is aligned with the anticipated benefits and competitive advantages for the business.

Step 2: Determine the compatibility and complexity of the system in order to ensure a successful and smooth integration with existing technological architectures.

Step 3: Determine the necessary required expertise for the system, and ensure that the business is equipped with these skills in order to successfully implement it.

Step 4: Obtain the support from top management support for the system procurement.

Step 5: Establish sufficient managerial time in order to ensure strategic alignment of the system with the organisational strategy.

Step 6: Ensure that the system selected is able to alleviate the industry pressure and provide organisations with advanced and innovate functionalities.

Step 7: Determine the readiness of trading partners' external to their business, ensuring integration compatibility and support.

Step 8: Promote end user involvement by ensuring system acceptance internally within the business.

As a final point, it must be noted that Figure 17 presents the core actions. The findings do however identify other actions that do contribute to organisational readiness, but which could be deemed as optional, and should to be considered according to individualistic circumstances. Table 16 lists these items which were deemed as a *low to medium priority* when determining the organisational readiness for the adoption of a smart delivery management system based on the research findings.

Table 16: Optional Organisational Actions

Dimension	Low to Medium Priority Organisational Actions
Technological	Improve customer experience and trust
	Determine e-commerce adoption preparedness
	Provide multiple re-scheduling options
	Digitalize business processes
	Create a clear mapping of logistics processes to determine need
	Implement technology prioritization management
	Replace existing legacy systems
Organisational	Develop a proof of concept
	Determine the impact of organisational size on procurement
	Attempt to leverage off existing skills
Governmental	Determine governmental influences on the procurement
Environmental	Partner with highly experienced software partners
	Implement a phased roll out approach
	Identify the extent of new industry competitors
End User Involvement	Inclusion of customers in the system procurement phase

5.4 Contribution of research

This study contributes to the body by having identified factors which to assess organisational readiness specifically aligned to the adoption smart delivery management systems for last mile delivery. It is posited that organisations would be better equipped for this type of system procurement by using the ICT readiness assessment model to assess their organisational readiness. This study makes a contribution at two levels. First and foremost, it does add to the body of academic knowledge in respect of ICT adoption and ICT organisational readiness.

The starting point for this research was drawing on the extent literature, in which I had drawn on the TOE and TAM frameworks, and presented a derived combined framework for the investigation. The investigation actually upheld my combined framework and demonstrates that all of the dimensions were relevant, with some tweaking which has now been presented in the in the section above. So my derived model presented in figure 17, does contribute to the body of knowledge, because it presents an adapted model for understanding ICT organisational readiness albeit in the context of this research for the particular industry sector. Whether this is applicable in other sectors, is a matter of investigation and recommendation for future research, refer to section 5.6.

At a practical level, the findings presented in figure 16 and 17, are going to be meaningful to an organisation that is considering the adoption. In closing of this study, when these findings were presented with industry stakeholders, I had verification of the usefulness of this to help and support in the making of sound IT investment decisions. As indicated in the literature and as it is well known within industry circles itself, IT investment has always been a problem in terms of getting return from value, and I believe them that the application of this framework to assess readiness, would help ensure that organisations reap a return from the investment by ensuring that they are adequately readied for a system.

5.5 Limitations of the study

As this was a mini thesis (contributing 30 credits to the degree), the scope of the research was limited to only two case study organisations, and was geographically confined to organisations based in the Western Cape. This study was also limited to investigate the readiness for the adoption of a smart delivery management system specific to last mile delivery within the logistics industry. A limited number of 13 participants were interviewed

and therefore the data collected only represent their views and opinions. Two logistics organisational case study restricts the ability to generalise findings on other populations. Another limitation within this study, was that the results reflects only the perceptions of individuals interviewed, and not actual conditions and data experienced and related to the actual adoption of the software within the organisation.

5.6 Recommendation for future research

The scope of this study was a mini-thesis, investigated at two case study organisations within the Western Cape with 13 interview respondents, this limits the amount of knowledge and experiences obtained in order to answer the main research question. Further studies could look at involving more participants and expanding the research to study and compare insights from multiple logistics providers across South Africa or globally. This study also focused on larger sized organisations, it is recommended that this type of organisational readiness could also be studied within Small Management Enterprises (SMEs) n order to determine the factors affecting their organisational readiness for this type of smart delivery management system.

Further studies within the last mile logistics field, could also then focus on the comparison of various technologies available within the supply chain market, and provide functionality comparisons. With customers being one of the main focus points in the area of last mile deliveries, the investigation of the success of the smart delivery management systems based on customers' opinions could also be done. Finally, this study investigated and developed an ICT readiness framework specific to the logistics industry within the last mile delivery management area. Future studies could investigate the relevance of this ICT readiness model within other industries.

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Appendix A: Research Information Sheet and Consent Form

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Faculty of Economic and Management Sciences
Department of Information Systems
Research Project Information Sheet: Interviews

Project Title:	Organisational readiness for the adoption of smart delivery management systems for last mile delivery

What is this study about?
My name is Janine Manuel Van Zyl, a student at the University of the Western Cape (South Africa) pursuing a Masters' Degree in Information Management. I am conducting a study to investigate the key factors that contribute to the readiness for the adoption of a smart delivery management system for last mile delivery processes. This study is solely for academic purposes.

What will I be asked to do if I agree to participate?
If you agree to participate in this research project, you will be asked to respond to a number of structured questions. This should take approximately 45 minutes. If you do not want to answer any question, you do not have to.

Would my participation in this study be kept confidential?
You are not required to provide any personal details, such as your name, address or identity number. All other details such as your age, education, employment status etc is therefore anonymous.

What are the risks of this research?
There are no foreseeable risks associated with your participation in this study.

What are the benefits of this research?
The outcomes of this study will serve to inform organisations on how they can better prepare for the adoption of smart delivery management systems for last mile delivery processes.

Do I have to be in this research and may I stop participating at any time?
Your participation in this survey is completely and entirely voluntary. You may choose not to take part at all. If you decide to participate in this survey, you may stop participating at any time.

What if I have questions?
If you have any questions feel free to contact the study leader:

Contact details of project leader (study supervisor)
Name: Shaun Pather
University of the Western Cape, Department of Information Systems
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NOTE: *This research project has received ethical approval from the Humanities & Social Sciences Research Ethics Committee of the University of the Western Cape, Tel. 021 959 2988, email: research-ethics@uwc.ac.za*

University of the Western Cape

Faculty of Economic and Management Sciences
Department of Information Systems

Research Participant Consent Form: Interviews

Project Title:	Organisational readiness for the adoption of smart delivery management systems for last mile delivery

Please tick Yes or No to each of the following

		Yes	No
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.		
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.		
3.	I understand that should I not wish to answer any particular question or questions, I am free to decline.		
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.		
5.	I agree that the interview may be recorded.		
6.	I agree for the data collected from me to be used in future research.		
7.	I agree to take part in the above research project.		

Name of Participant (*or legal representative*) Date Signature

Name of person taking consent Date Signature

Contact details of study supervisor:
Name: Shaun Pather
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Department of Information Systems
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Appendix B: Interview Schedule

TOE Dimensions	Definition	Interview Questions	Question Objective
Relative advantage	The degree to which a smart delivery management system offers an organisation a competitive advantage within the logistics industry.	(Opening Question): What were the conditions and factors which influenced your organisation to procure this system? Did you have any thoughts that by procuring this system that it was going to place you as a company in a leading position?	To determine what type of advantages persuaded the organisation to procure the smart delivery management system.
Compatibility	The degree to which the delivery management system is compatible with the existing needs, values and technological architecture within the organisation.	How did you determine the compatibility of the system with the existing technological architecture of your organisation? Did you take any steps to evaluate whether this delivery system was compatible with the existing IT systems in your company? If so what were they? (OPTIONAL) Did your company have to make any changes to the existing IT infrastructure before implementation of the new system? If so what type of changes were made?	To determine whether the level of system compatibility (of the anticipated system), was prominent in the process to procure the new system.
Complexity	The degree of complexity related to the system understanding, how much time it takes to perform system tasks and integrate system results within the current working environment, as well as how efficient the data transfer and system functionality is.	System complexity refers to how much time it takes to perform tasks on the system, how complex it was to integrate the system tasks within the current working environment and how efficient data transfer and system functionality is. Did any of these complexity items influence the decision to implement or procure the system? How?	To determine the way in which the organisation took the system complexity into account when deciding to procure the system.
Top management support	The degree to which top management believes and supports that the organisation has the resources, commitment, and	What were the necessary actions required to obtain top management support for this system procurement?	To identify the relevance / centrality of top management support for successful adoption /procurement of the system.

TOE Dimensions	Definition	Interview Questions	Question Objective
	awareness to adopt the delivery management system.		
Managerial Time	The degree to which the amount of managerial time required to plan and implement the new system impacts the system procurement decisions.	What do you think of the amount of effort and time that was required by managers during the planning phase? Was it over very complex and burdensome or not? How did that bear influence in making the final procurement decision?	To identify whether the complexity of managerial involvement was a facilitating or prohibitive factor when procuring the delivery system.
Organisational Resources (Firm Size, Skills and Financial resources)	The degree to which organisational resources such as expertise, firm size and financial resources available affects the readiness of system adoption within an organisation.	How did organisational resources such as expertise, firm size and financial resources, influence the decision to procure this system? (OPTIONAL) Do you feel your firm size was beneficial and influenced the system implementation? What type of expertise were required for this type of implementation? (OPTIONAL) Would the cost of this type of procurement be small (<5m), medium (5-10m) or large (>10million)? What were the actions taken to acquire the technical and business expertise necessary for the procurement and implementation of this system?	To determine whether and if so, how the organisational resource availability of the firm was an influencing factor for the procurement of this system.
Industry pressure	The degree to which industry competitive pressures has influenced the adoption of a new smart delivery management system within an organisation.	What type of competitive and industry pressures influenced the decision to procure this smart delivery management system? Would you recommend the implementation of this type of smart delivery management system to other logistics service	To determine the type of industry pressures which has influenced the decision or need to adopt a smart delivery management system.

TOE Dimensions	Definition	Interview Questions	Question Objective
		providers? Please elaborate.	
Government Regulations	The degree to which governmental pressures, sanctions, initiatives and support impacts the adoption of a smart delivery management system.	Did any governmental regulations or initiatives influence the procurement of this system within your organisation?	To determine whether any government regulations, strategies or initiatives influenced the adoption of new delivery management systems.
Trading partner readiness	The extent to which partners have systems in place to support and integrate with the adopted smart delivery management system at the organisation.	What actions did you take in order to ensure trading or business partner readiness to support or integrate with this system prior to procurement?	To determine whether business partner readiness impacted the adoption of this system.
Perceived Usefulness	The degree to which individuals believe the system will enhance and improve job performance within an organisation.	What steps would have been taken to improve at the pre-implementation stage, the users' perceptions of the system's usefulness and ease of use?	To determine how the perceived usefulness of the system was used to influence individuals for the procurement of the smart delivery management system within the organisation.
Perceived Ease of Use	The extent to which individuals believed that the adopted smart delivery management system was free of effort and easy to use.	(OPTIONAL) Do you believe it is useful to involve the end users in the beginning stages of a system adoption? If so, please elaborate?	To determine what the perceived ease of use was of the smart delivery management system, prior to the adoption and implementation of the system.

Appendix C: Ethical Clearance

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22 June 2021

Mrs J Manuel-Van Zyl
Information Systems
Faculty of Economic and Management Science

HSSREC Reference Number: HS21/4/10

Project Title: Organisational readiness for the adoption of smart delivery management systems for last mile delivery.

Approval Period: 15 June 2021 – 15 June 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

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