UNIVERSITY OF KWAZULU-NATAL

Innovation in the Finished Vehicle Logistics Industry in South Africa

By

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Abstract

It is generally believed that the Finished Vehicle Logistics (finished vehicle logistics) industry is in desperate need of innovation, not only in South Africa, but worldwide. The level of innovation within the finished vehicle logistics industry is slow, and almost non-existent. Technologies that have been around in other logistics industries are only now garnering a foothold in the finished vehicle logistics industry. Supply chains need to constantly innovate to ensure that costs are kept to a minimum, and that they remain relevant. Industry leaders consider the lack of collaboration to be the major inhibitors of innovation in the industry, yet, it is believed that collaboration is where innovation can be found. This research identifies the external and internal barriers to innovation that are relevant to the finished vehicle logistics industry of South Africa. The challenges facing the industry are ready to drive innovation by stake-holders to develop innovative operational solutions to overcome these challenges. A mono-method qualitative research methodology was followed, with a questionnaire circulated to role-players are the single source of data collection. A purposive sampling technique was used to identify respondents from 3 sub-sections of the South African finished vehicle logistics industry, that being the vehicle manufacturers, logistics service providers and car carrying equipment manufacturers. The resultant sample of 121 potential respondents included management representatives from planning, operational and executive levels from the 3 sub-sections of the industry. A lack of willingness from the vehicle manufacturers to participate significantly reduced the number of potential respondents down to 25. Descriptive statistics were used to analyse the responses received to a questionnaire designed to form an understanding on the barriers to innovation in the finished vehicle logistics industry in South Africa. It was found that most of the general internal and external barriers to innovation are relevant in the finished vehicle logistics industry, with the exclusions of inappropriate infrastructure and a lack of innovative competencies. The failure of vehicle manufacturers to participate in this study not only creates the opportunity for future research to include a more heterogeneous sample, but also highlights the need for a formal platform to discuss and provide further insight in to the barriers to innovation plaguing all role-players within the finished vehicle logistics industry.

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1 CHAPTER ONE

Introduction

1.1. Introduction

Globally, innovation in the finished vehicle logistics industry has been very slow, or almost non-existent (Hogg, 2015). The role-players that are involved in this industry are the vehicle manufacturers who supply the finished product, the logistics service providers who move the product from one point to another and the suppliers of car carrying equipment. Vehicle manufacturers are at the forefront of innovation as they employ innovative technologies in the production processes of their continuously changing and evolving products. The same is true for the suppliers of car carrying equipment who use innovative technologies and processes to manufacture expensive and technologically advanced car carriers. However, the finished vehicle logistics industry has not been innovating at the same pace as the manufacturers of vehicles and car carrying equipment. There have been incremental operational innovations in response to changing customer demands, but no radical innovations to respond to the challenges facing the industry.

1.2. The Finished Vehicle Logistics Industry in South Africa

The finished vehicle logistics industry in South Africa comprised of 37 vehicle manufacturers, of which a total of 7 have manufacturing facilities in South Africa, and the balance of the vehicle manufacturers import completely built up units through the car terminals of Durban, East London and Port Elizabeth (NAAMSA, 2018). Finished vehicle logistics services by road is contractually provided to these vehicle manufacturers by a total of 5 logistics service providers, all 5 being South African owned and managed. Over and above the distribution of new vehicles, there is also a far smaller market for the transportation of used and private vehicles, including the transportation of “grey imports through South Africa to our neighbouring states. It is important to note that there are smaller logistics service providers that specialise in the transportation of used vehicles imported from Asia, to the rest of Africa. These logistics service providers have been specifically excluded from this research as they do not provide delivery services of new vehicles to dealerships in South Africa. The transportation of new vehicles by train is limited to a rail service between Durban and Gauteng, and between Port Elizabeth and Gauteng. Rail transportation is mostly used for the transfer of stock between the ports of entry to stock holding facilities inland, or the transportation of vehicles destined for export from inland manufacturing facilities to the port of Durban. Whether rail transportation is used to transport new vehicles across long distances, there is still a requirement for specialised road transport between rail sidings, stock yards and dealerships.

In 2017, the South African market for new vehicles consisted of 557,131 new vehicle sales, of which a total of 151,971 vehicles were locally produced and 405,160 were imported in to South Africa for domestic sales. Add to these numbers a total of 326,280 locally built vehicles exported to the rest of the world. That is a total of 883,411 new vehicles moved in South Africa during 2017 by logistics service providers on either specialised rail or specialised road transport (NAAMSA, 2018). It is estimated that the revenue generated by the 5 road transport logistics service providers was approximately R 100 million in 2017.

The equipment used by the logistics service providers are specialised equipment for the transportation of vehicles and is not suited for the transportation of shipping containers, or any other goods. There are currently two South African based and owned car carrier manufacturers, as well as one French and one Italian car carrier manufacturer represented in South Africa. Currently, all 5 logistics service providers have car carriers from all 4 car carrier manufacturers operating in their fleets, with one service provider also operating car carriers sourced from a manufacturer in Austria.

As a result of the limited applications, up to 42% of kilometres travelled by logistics service providers are empty kilometres (Automotive Logistics, 2014). Another challenge in the finished vehicle logistics industry is when rival logistics service providers, travel similar routes for rival vehicle manufacturers, and deliver part loads to separate dealerships in the same geographical area, and then continue to the same destination with the balance of their loads. Although logistics service providers do not always absorb the additional cost associated with these inefficiencies, the cost is ultimately passed on to the final customer who purchased the new vehicle.

These are some of the few challenges facing the finished vehicle logistics industry in South Africa. Although there have been incremental operational innovations in response to changes in the marketplace, there has not been any radical innovations to address the challenges that face the industry.

1.3. Motivation for the Study

Significant amounts of research have been done on the barriers to innovation, but none specifically tailored to the finished vehicle logistics industry, and even less so in a South African context. A literature review showed that since 2014, only 43 studies were done on the finished vehicle logistics industry worldwide, of which none were focussed on South Africa, and only 16 on innovations in finished vehicle logistics.

Unfortunately the costs associated with inefficiencies in the South African finished vehicle logistics industry has not been quantified, but it is estimated that the global finished vehicle logistics industry wastes approximately USD 50 billion per annum globally on empty kilometres (Automotive Logistics, 2014). The need for research to determine what the relevant barriers are preventing the finished vehicle logistics industry from responding to this challenge with innovative solutions is overdue.

A study of the barriers to innovation in the South African finished vehicle logistics industry would highlight both the internal and external barriers to innovation that are relevant to the finished vehicle logistics industry. The understanding of these barriers can be used by the finished vehicle logistics service providers, as well as the vehicle manufacturers to develop collaborative relationships to overcome the existing barriers in an attempt to respond to the challenges that all stake-holders are faced with in the industry. Furthermore, the knowledge of the barriers to innovation can be used by the suppliers of car carrying equipment to forge collaborative relationships with logistics service providers, as well as vehicle manufacturers, to design car carrying equipment that would respond to the utilisation and productivity challenges. An understanding as to what the barriers to innovation are, will allow leaders in logistics service providers to develop strategies to bridge the barriers of innovation and develop radical innovations to answer the many challenges in the industry.

Furthermore, an understanding of the challenges alluded to, should be the driving force of innovations and a link between these challenges and identified barriers would aid decision makers and stake-holders to develop strategies enabling innovative solutions to respond to these challenges. Finally, this study can aid scholars to further future research in not only innovation but also other studies in the finished vehicle logistics industry in South Africa.

1.4. Focus of the study

This study focusses on the area of innovation within the finished vehicle logistics industry of South Africa. Using the generic framework of barriers to innovation developed by Sandberg and Aarikka-Stenroos (2014) as the foundation for this research, this research will attempt to identify the barriers to innovation relevant to the South African finished vehicle logistics industry.

There are several challenges that currently plague the finished vehicle logistics industry. This study focus' on the operational challenges that affect the industry in term of agility, velocity, utilisation and productivity of equipment. Administrative and back office challenges are specifically excluded. Understanding the way in which these barriers relate to the challenges currently faced by logistics service providers will also be considered in terms of relevance.

1.5. Problem Statement

The barriers to innovation are known as extensive research has been done on the barriers to innovation (Sandberg and Aarikka-Stenroos, 2014), but what these barriers are in the finished vehicle logistics industry is unknown, and in particular in a South African setting. There are several challenges facing logistics service providers in the finished vehicle logistics industry, and none so important as the effect that empty kilometres has on profitability. It is estimated that empty kilometres waste approximately USD 50 billion per annum in the global finished vehicle logistics industry, and the South African figure has not been quantified (Automotive Logistics, 2014). The slow pace of innovation is not helping in reducing this figure either.

Another challenge faced by logistics service providers is underutilisation of car-carrying equipment in terms of load size. This challenge is brought about by several reasons, which include government legislations and regulations prohibiting loads exceeding a certain length and height, as well as changes in the demand for larger vehicles which usually reduces the number of vehicles that can be carried on a car carrier (payload) by 1 vehicle as it simply cannot fit in the permissible dimensions of the load. The removal of 1 vehicle from a 6 car carrier, or a 9 car carrier can reduce the revenue generated per load between 11% (1/9) to 15% (1/6).

Innovations are desperately needed to overcome these challenges, but it seems as if there is something holding back innovations in finished vehicle logistics in South Africa. To assist the industry in overcoming these challenges, the barriers to innovation, relevant to the South African finished vehicle logistics industry must be identified.

1.6. Objectives

The main objective of this study is to determine what the barriers to innovation are relevant to the finished vehicle logistic industry in South Africa. An existing framework of barriers to innovation was used to test the relevance of this framework in the finished vehicle logistics industry of South Africa.

The secondary objective of this study is to determine what the drivers of innovations are in the finished vehicle logistics industry of South Africa, based on the challenges faced by the industry. Challenges were linked to identified barriers to determine the importance of overcoming those challenges through innovation.

1.7. Research questions

- What are the barriers to innovation in the finished vehicle logistics industry in South Africa?
- What are the driving forces of innovation in the finished vehicle logistics industry in South Africa?

1.8. Significance of the Study

The findings of this study will contribute to the benefit of society considering that extra heavy trucks cause considerable amount of congestion and damage to the road infrastructure in South Africa. The inefficiencies in finished vehicle logistics contribute to the amount of extra heavy trucks on South African roads and adds additional cost to the purchase price of new vehicles. By highlighting and identifying the barriers to innovation in the finished vehicles logistics industry, the vehicle manufacturers and logistics service providers can develop strategies to overcome inefficiencies such as empty miles, and the underutilisation of car carrying equipment through innovation.

1.9. Delimitation of the study

The current study excluded the role-players involved in the transportation of second-hand or private vehicles, abnormal sized vehicles and motorcycles and vehicles that are not self-propelled. These are niche markets within the finished vehicle logistics industry and do not have the same role-players as the population comprising the transportation of new vehicles. Also excluded from this study are the service providers that transport finished vehicles by rail or sea. Rail transportation is mostly used for stock transfers from ports of entry to stock yards, or from manufacturing facilities to ports of exit. Sea transportation is specifically excluded as there is very limited use of short sea shipments from one port in South Africa to another port in South Africa.

1.10. Methodology

This research study followed a mono-method quantitative methodology, rooted in a positivist approach which is synonymous with a quantitative statistical data analysis. Questionnaires were circulated to the members involved in the commercial, general management and outbound logistics functions in their respective organisations with the aim of understanding what they believe the barriers to innovation are in the finished vehicle logistics industry. Responses received from these role-players were then analysed using descriptive statistical techniques, including frequencies and where relevant correlations drawn between variables.

1.11. Chapter Outline

The document structure used to effectively communicate the research carried out and resulting findings is:

- Chapter Two – provides a review of previous academic literature and a theoretical context for this research.
- Chapter Three – outlines the proposed methodology for investigating the research objectives.
- Chapter Four – conducts a statistical analysis of responses received from respondents.
- Chapter Five – discusses the findings by relating them back to the industry background and literature review.
- Chapter Six – provides conclusions to the research by outlining answers to the questions posed in the research objectives.

1.12. Summary

The finished vehicle logistics industry in South Africa is plagued by challenges and barriers to innovations preventing industry role players from responding to these challenges. The need for a research project is highlighted by the waste created by the underutilisation of car carrying equipment, including unproductive kilometres travelled. Identifying the relevant barriers to innovation will aid not only aid decision making to respond to the challenges, but also aid in the creation of strategies to overcome these barriers. The foundation of the research project in an existing framework of general barriers to innovation, and this research attempted to identify which barriers are relevant to the finished vehicle logistics industry. A review of existing literature highlighted the important aspects of each barrier, and these were linked to the findings from a quantitative research questionnaire.

2 CHAPTER TWO

Literature Review

2.1. Introduction

Globally, finished vehicle logistics industry leaders believe there is not enough innovation in finished vehicle logistics, and has been the topic of discussion at numerous automotive conferences across North America, Europe and Asia (Ludwig, 2012a). Innovation in this industry is not only related to IT, equipment and collaboration, but also initiatives between suppliers and competitors (Ludwig, 2012b). Since 2014, there has only been 43 studies done on finished vehicle logistics globally, of which 16 made reference to innovation. Incidentally, there were no research studies done on the finished vehicle logistics industry in South Africa. The international studies were tailored to actual innovations such as radio frequency identification, KPI management, and multi-modal solutions. None of these studies focussed on the actual barriers to innovation in the finished vehicle logistics industry. As a result, a framework developed by Sandberg and Aarikka-Stenroos (2014), based on the categorisation of innovation barriers gleaned from 103 studies, was used as the foundation to determine what the barriers to innovation in the finished vehicle logistics industry in South Africa could be.

2.2. Innovation

Innovation has an impact on the economic well-being of organisations and results in operational efficiencies, increased customer satisfaction, a reduction in costs, improved profitability, sustainability, flexibility and opens the door for the development of new strategies (Dibrov, 2015) (Stundza, 2009). Mandal and Korasiga (2015), goes on to say that innovation in supply chain is not considered valuable, unless it is seen to add value to customers, and is essential for ensuring effective service delivery. For logistics service providers to remain competitive, they have to continuously innovate their value proposition (Borgström and Gammelgaard, 2017). In context, this is also true for finished vehicle logistics service providers who seek opportunities to innovate their value proposition to vehicle manufacturers through efforts to increase carrier velocity not only in yard, but also on route to reduce the dwell time of finished vehicles in storage compounds.

As a concept, innovation is doing something new, technological innovations, or improving existing processes by doing something different, business process innovation (Garcia and Calantone, 2002, Madrid-Guijarro et al., 2009). Technological innovations refer to the discovery, incubation and commercialisation of new products or services, which would result in a competitive advantage for an organisation. Technological innovation also refers to the development of, or investment in new capital equipment to improve existing products or services or extend the existing product of service offering. Business process innovations, are innovations introduced to the organisation and can be structural changes that affect management and administrative processes, or changes that affect the efficiency of existing processes or procedures.

Logistics service providers are under increasing pressure to develop innovative solutions, and customised service offerings, to counteract the effects of sustaining efficient service levels at marginalised costs (Marchet et al., 2017). European studies have shown that inefficiencies are found internally within logistics service providers, and can be improved upon within the structures of the organisation (Lim and Jones, 2017). These studies also ring true in the South African finished vehicle logistics industry where inefficiencies such as empty kilometres, uneconomical loads, loading and trip velocities, not only add additional cost, but also provide a smaller base for cost recovery (Gligor et al., 2015). It should also be mentioned that these factors are not always within the control of logistics service providers, as service level requirements are often seen as dictatorial and not collaborative.

The negative effects of transportation on the environment has increasingly become more important for logistics service providers to develop innovative solutions to minimise the impact on CO2 emissions. (Rogerson, 2017). Manufacturing organisations have started to include the measurement and management of CO2 emissions from their logistics service providers in an attempt to minimise the overall carbon footprint of their products. Logistics service providers can reduce the environmental impact of their operations through the purchasing of more resource efficient equipment and improved operational efficiencies to reduce empty kilometres.

2.3. Barriers to Innovation

Research conducted by Sandberg and Aarikka-Stenroos (2014), found that the most common method of categorising the barriers to innovation is based on the division of internal and external barriers developed by Piatier (1984). This characterisation of barriers creates the distinction between those barriers that an organisation can directly influence, internal barriers, and barriers that organisations have limited control over, external barriers. The distinction between internal and external barriers highlights whether the organisation can manage the development of innovations internally and diffuse the innovations externally.

2.3.1. External Barriers

The environment in which a logistics service provider operates, can impact on the ability of that organisation to innovate (Grawe, 2009). In the model developed by Grawe (2009) a positive relationship between logistics innovation and external barriers exists. Evidence suggest that internal barriers assist in understanding how organisations innovate, whilst external barriers affect the potential of organisations to innovate (Hölzl and Janger, 2014). This argument suggests that the resistance or lack of support from external stakeholders of a logistics service provider would influence the type and timing of innovations by logistics service providers. These external stakeholders include the customers of the innovating the organisation, the policies of government that encourage innovations, the availability of external funding to finance innovation, as well as the rivalry between organisations.

2.3.1.1. Resistance or Lack of Support from Stakeholders

Customer Resistance

The process of adopting innovative new products or services often ends before it begins as customers reject innovations, disregarding the potential of the innovation (Talke and Heidenreich, 2014). It is critical for organisations to understand whether customers will adopt an innovative product or service offering, and the reasons why they would adopt such innovations (Claudy et al., 2015). Customers will be more willing to adopt innovation if the innovation provides either a relative advantage, or provides superior performance over the available alternatives (Talke and Heidenreich, 2014). Dodgson (2014) expands the concept of innovation to include collaboration between partners and describes collaboration as a prerequisite for innovation through a shared commitment towards a common goal.

Industry leaders in finished vehicle logistics are of the opinion that innovation is difficult when vehicle manufacturers constantly demand lower tariffs, and when finished vehicle logistics is seen as a means to an end (Hogg, 2015). The lack of collaboration between logistics service providers and vehicle manufacturers make service providers very reluctant to invest in expensive equipment, especially when they are only guaranteed to be contracted for a period of three years (Hogg, 2015). Collaboration is proving difficult to implement but it still has the potential to offer vastly improved performance (Ireland and Bruce, 2000). Many of the problems relating to collaboration are due to a lack of understanding of what collaboration actually implies, for example, collaborative planning, forecasting and replenishment initiatives suffer from a lack of initial agreements as to specifically what organisations were going to collaborate over (Barratt and Oliveira, 2001).

Unsupportive Government

The importance of logistics networks in emerging economies such a South Africa cannot be underestimated. Studies have shown that governments in emerging economies maintain control of logistics networks to leverage future economic growth (Hirschinger et al., 2015). The role of government is to encourage innovation through the creation of policies that are market-oriented, as the market dictates the pace of innovation (Hasnan et al., 2014). Poor policies and institutional frameworks lower the pace of innovation, and require sustained long-term investments to encourage innovation capabilities (Zanello et al., 2016). Jay (2014), in a study conducted in German construction enterprises found that the complex relationships between governments, national bodies and organisations often impede innovative organisations. However, governments that are actively involved in innovation have a positive impact on the performance of innovation (Jiuchang and Yang, 2015).

Regulatory frameworks, such as the National Road Traffic Act no 93 of 1996 and the Road Transport Management System, intend to enhance the safety of all road users, as well as preserve the national infrastructure, but at the same time may limit the innovation capabilities of logistics service providers.

Paucity of External Finance

Finance is considered an essential part of the innovation process (O'Sullivan, 2004) as organisations may require significant amounts of financial resources to finance innovations, and will not necessarily have the required equity available in internal reserves to finance product or service innovations. As an alternative to financing innovations through available internal reserves, is raising external finance through either equity or debt options (Makoni, 2014). To raise the required capital through equity financing, organisations may seek investment from an investor by selling off an ownership interest in the existing business. The alternative to equity finance is to finance the innovation through debt, the borrowing of funds from either a financial institution, or an individual who may already be a shareholder in the existing business.

However, the availability of external finance is dependent on the financial climate in the market place as this affects the willingness of lenders to loan funds, and also affects the willingness of borrowers to borrow funds (Jones-Evans, 2015). According to Lee et al. (2015), there are three main reasons why organisations may struggle to gain access to external financial resources. Firstly, the return on investment of an innovation may be uncertain, which in turn would increase the risk involved in making the investment (Mazzucato, 2013). The inherent risk of investing in innovations, is that not many innovations are successfully brought to market, or even fail to gain acceptance. Large organisations have the capability to commercialise many diverse innovations, even if the majority of these innovations fail in the marketplace, it is very likely that one innovation will prove to be very profitable (Lee et al., 2015).

Secondly, it is understood that the uncertainty of the return on investment that an innovation may create, makes it difficult for financial institutions to attribute a value to the innovation, and may require the skills of a venture capitalist (Lee et al., 2015). Financial institutions are more concerned about the ability of an organisation to generate sufficient income to repay not only the finances loaned, but also the associated interest (Mina et al., 2013). Conversely, venture capitalists and other investors are more concerned about the value of the business, and add significant value to the business through their network of contacts and mentorship (Macht and

Weatherston, 2014). The lack of information regarding the potential success of an innovation, coupled with the risk of profile not only increases the cost of finance, but also the paucity of finance. Innovative organisations would rather choose sources of finance that have a lower servicing cost, and requires them to give up less control of their business (Bruton et al., 2015)

Lastly, external financiers may find it difficult to invest in an innovation that may be useless outside of the organisation, and cannot be used as collateral (Jones-Evans, 2015, Mina et al., 2013). As a result, this constraint may increase financing cost as well as gaining access to funds to finance innovations. However, it must be considered that the size of the organisation, its ownership structure, as well as its life-cycle position does have an impact on the willingness of external financier to invest in new innovations that will guarantee growth (Fraser et al., 2015). The size of an organisation, and its track record in commercialising innovations are becoming increasingly more important criteria for the external financiers (Cowling et al., 2012).

Rivalry

According to Michael Porter, rivalry occurs between organisations when their products or services are considered substitutes for each other. Rivalry increases when one organisation takes strategic action to improve or protect its current market position, as these actions affects all their competitors (Porter, 2008). Strategically it is essential for organisations to distinguish themselves from their competitors, by creating a competitive advantage, which would allow them to take defensive action and develop both long term and short term strategies (Altuntaş et al., 2013). Rivalry has the ability to either intensify innovation, as rivals jockey for position, or abate innovation as rivalry devalues the value of innovation (Qian and Wang, 2017).

Porter (2008) further expanded on rivalry by stating that profitability decreases as rivalry intensifies, especially in industries that require intensive investment efforts in not only working capital, but also fixed assets. Finished vehicle logistics is a niche market, with a relatively small customer base, serviced by a limited number of service providers. The assets used to transport the product are designed specifically to fit the purpose and is not suited to transport any other product. Assets, in the form of car carrying equipment and storage space, are of strategic importance to finished vehicle logistics service providers, and requires service providers to maintain focus on their service offering to remain competitive (Du and Monge, 2009).

It is against this backdrop of fierce rivalry and narrow profit margins that actions by one logistics service provider will have a direct impact on its rivals. Logistics service providers may invest in innovative new service offerings, or innovative new assets that promise improved utilisation and reduced operating costs. Either way, investments in either type of innovation is not protected from replication or improvement by rivals within the industry. Rivals have three options to respond to an innovation, and that is replicate or imitate, reposition its market offerings, or exit the market (Argyres et al., 2015). Innovative organisations have learnt that they may not capitalise on the full economic benefits of their innovation, and either invest less than what is required which results in a longer development phase, or rush an innovative product or service to market without proper research and development (Kamien and Schwartz, 1972). Rivals can also not stand back and wait for another organisation to take the lead on investments in innovations. Organisations that innovate are the better performers, as the majority of innovations that are commercialised are eventually adopted, or improved by rivals (Lawless and Anderson, 1996). In a niche market, organisations that do not innovate, and do not adopt innovations, compete on pricing using older technology and processes.

DeBresson and Amesse (1991) stated that organisations that pool together their knowledge and resources, could encourage innovation, provided that the relationships between all parties is mutually beneficial. Collaboration is thus the realisation of both individual and mutual goals through the building of close relationships with rivals. Organisations need to collaborate their knowledge and resources to not only understand the current needs of customers, but also their future need (Grawe, 2009). The benefits to innovation through collaboration between rivals are numerous, from the sharing of complementary competencies, to the sharing of risk (Müller et al., 2017). Rivals that collaborate their efforts and resources towards innovation result in not only more effective innovation, but continuous innovation (De Faria et al., 2010). Research shows that there is a positive relationship between the collaboration of rivals and innovation.

2.3.1.2.Restrictive Macro Environment

Where the resistance or lack of support from stakeholders is attributable to the behaviour of specific actors, such as customers, rivals and financial institutions, there are barriers to innovation that emanate from the macro environment as well. In their research Sandberg and Aarikka-Stenroos (2014) categorised technological turbulence and an inappropriate infrastructure as two of the uncontrollable barriers to innovation.

Technological Turbulence

Turbulent environments create an environment of uncertainty, which in turn not only requires organisations to respond to this uncertainty, but also provides a platform for organisations to innovate (Preißner et al., 2017). Preißner et al. (2017) goes on to say that as a result of expert knowledge, the producers of technologies are in a better position to understand the changes brought about by new technologies, and are thus positioned to not only drive innovation, but also profit therefrom. Innovation relies on the advancement in technologies, which in turn results in the need for the producers of the technology to share knowledge with, and provide assistance to the users of the new technology (Tsai and Hung, 2016). To moderate the effect of technological turbulence, the relationship between supply chain partners is critical for technological innovations to perform better (Tsai and Hung, 2016). It is thus advantageous for supply chain partners to collaborate in the sharing of risk, knowledge and cost during times of technological turbulence, or uncertainty (Ralston, 2014).

The confusion brought about through continuously changing technologies makes it difficult for organisations to not only commit to a particular technology, but also successfully commercialise their own innovations (Sandberg and Aarikka-Stenroos, 2014) (Chiesa and Frattini, 2011). Developments in autonomous driving technologies and the implementation of new technologies are considered to be the biggest challenges facing the finished vehicle logistics industry (Tredway, 2017). This is particularly true when the changing technology is directly related to the equipment used to generate revenue, as is the case in finished vehicle logistics. Finished vehicle logistics service providers have the choice to invest in new car carrying equipment that employs the most current and up to date technologies, or they can attempt to replicate these technologies in existing equipment, ignore the technological advancements of the new equipment, or wait for a newer generation of car carrying equipment.

To mitigate the risk of technological turbulence, organisations are implored to integrate with partners that can cope with technological turbulence, reduce risk and sustain a competitive advantage (Trkman and McCormack, 2009).

This pace of change has encouraged organisations to adapt and innovate their internal processes to accommodate new technologies in not only their organisation, but the industry that they form part of (Grawe, 2009). Improvements in internal processes are not always visible to the business community, but manifest in visible changes elsewhere in the business. An example of innovations in internal processes would be the use of hand-held electronic devises to record the quality inspection of vehicles as they move through quality gates, which would assist in speeding up claims processes. Collected data could also be used to improve the quality of service delivered to vehicle manufacturers and dealerships alike.

Inappropriate Infrastructure

The lack of facilities and services can be considered a barrier to innovation. Unlike engineering, where innovation manifests itself in the commercialisation of a new product, for logistics service providers, innovation manifests itself in the investment of new capital equipment and technological advancements in infrastructure (Wagner, 2008). However, the infrastructure that finished vehicle logistics service providers are reliant on are not within the control of the logistics service providers. Finished vehicle logistics service providers are reliant on the loading and offloading facilities provided at manufacturing facilities, ports of entrance or exit, rail sidings, dealerships or stock yards. Logistics service providers thus do not have much control over the development or implementation of technological advancements in infrastructure, but only on the capital equipment that use these facilities.

2.3.2. Internal Barriers

Apathy and structured routines within organisations are considered some of the largest internal obstacles facing innovation within established organisations

(Sandberg and Aarikka-Stenroos, 2014). Furthermore, in their efforts to innovate, the biggest concerns for organisations with limited financial resources, are the risks associated with the high cost of projects and their commercial failure (Sandberg and Aarikka-Stenroos, 2014). These internal barriers, which are within the control of the organisation, are thus closely related to the management of an organisation, its available financial resources, as well as the mentality and proficiencies of its human capital.

2.3.2.1.Restrictive Mind-set

Organisations are faced with many barriers to innovation, that stem from within the organisation. These barriers are rooted in the lack of knowledge regarding the inputs and outputs required for the innovation (Wolfe et al., 2006). The lack of knowledge brings along uncertainty regarding job security, as well as an underestimation of the skills required. However, this lack of knowledge and uncertainty can be managed within the organisation. Through adequate training and existent experience and relationships, human capital resources can be managed to discover and exploit value adding innovations (Bello et al., 2016).

Employees may resist change as a result of their fear of change. According to Kurt Lewin, in his 3-stage organisational change model, the performance of a group will return back to its original level of performance if no effort is made to address the sources that resist change (Lewin, 1947). The sources that resist change on an individual level can be classified as either perceptive, emotional or behavioural (Lines et al., 2015). The perceptive dimension is the thought process of the employee, and what they think of the change and their proficiencies in delivering a new innovative service or performing an innovative new process as part of their daily routine. Ovidiu Nicolescu characterised some of these cognitive sources of resistance as convenience, habits, incompetence, loss of power, loss of confidence and the fear of the unknown (Ceptureanu, 2015).

Change also affects employees emotionally, and this is the second dimension of the resistance to change. Finally, the behavioural dimension is the exhibition of actions by an employee as a result of either the perceptive or emotional dimensions. The behaviour of employees can be observed as they will exhibit resistive behaviour, such as delaying implementation, openly criticising the innovation or spread negative opinions about the innovation (Lines et al., 2015).

Motivational research has shown that the fear of failure is a major contributor to human behaviour and success (Conroy and Elliot, 2004, Christian, 2017). This fear of failure is manifest in the uncertainty of the future and the fear of embarrassment (Christian, 2017). Despite the negative connotations associated with failure, research has shown that failure not only influences ones view on failure, but also has the capacity to add additional skills or qualities (Simpson and Maltese, 2017). Employees within an organisation that show a fear of failure may exhibit actions that avoid failure, they are motivated but have no ambition for success and will find many ways of shielding themselves from appearing incompetent (Geller, 2015). Innovative organisations need to create an environment for employees to freely innovate without the fear of failure, and this is achieved through the relationship between managers and employees, and in particular through positive support and encouragement (Riihiaho, 2016).

Innovation brings a certain element of risk to the market, which in turn result in a level of uncertainty. Organisational attitudes that are risk-averse, may exhibit conservative decision making practices (Li et al., 2014). This leads one to make the inference that innovative organisations do not exhibit practices of conservative decision making. However, it must be noted that the governance of an organisation plays a role in the cultivation of conservative decision making (Kiparsky et al., 2016). In large organisations, the appointed board of directors are answerable to the shareholders on decisions made on investments in innovation. As such, the approval of innovations may not pass the discovery phase if the project does not satisfy the internal financial controls. Such organisations often sacrifice innovation for efficiency.

It is widely documented that coercive organisational bureaucracy is a barrier to innovation (Hartmann and Hartmann, 2017, Kaufmann-Buhler, 2016). Bureaucratic organisations are characterised by formalised routines, specialised division of labour, efficiency and process orientation, central policy implementation, with no levels of autonomy or initiative (Karo and Kattel, 2015). Innovative organisations are more fluid, decentralised, has a variety of skills, and an openness to learning through experimentation (Karo and Kattel, 2015). The trade-offs between a bureaucratic and an innovative organisation, are efficiency and an obsession with control for effectiveness, flexibility and innovativeness. Restrictive organisational cultures of hierarchical bureaucracy do not innovate at the same pace as organisations with a culture of collaboration and trust, that employ agile management techniques (Stephen, 2015).

2.3.2.2.Lack of Competencies

Innovations succeed or fail for a myriad number of reasons, and success often relies on a strong a supportive management structure, as well as a highly motivated team. According to the DNA innovation model developed by (O'Connor, 2008), there are three core competencies required for innovation ability: discovery, incubation and acceleration (O'Connor and DeMartino, 2006). The ability to discover, incubate and accelerate innovation, are capabilities that allow managers to adapt to changes in the environment through the allocation of resources and skills, whilst creating a sustainable competitive advantage (Slater et al., 2014). However, the ability to successfully bring innovations to market, does not solely rely on the three core competencies, but also the culture of the organisation, strategy and relationships with business partners.

Discovery

The discovery capability includes activities that generates, identifies, explains, and communicates innovation opportunities (O'Connor and DeMartino, 2006). In their research, O'Connor and DeMartino (2006) also found that organisations may not have the required skills to develop innovations internally, and resort to "open-innovation" through collaboration and cooperation with business partners to search for innovation opportunities externally. This research is supported by an analysis done on existing literature by Nicholas et al. (2015) who found that the four main sources of discovery are through existing customers, collaboration, employees and market knowledge.

Continuous innovation is an organisations' value adding response to adapting to the changing needs of customers, the first source of innovation discovery (Nicholas et al., 2015). Secondly, open-innovation allows organisations to collaborate their resources in not only co-developing new technologies, products and services, but also reducing risk and the costs associated with research and development (Heidemann and Timenes, 2017). Collaboration also allows organisations to allocate research and development resources more effectively (Nicholas, 2014). The third source of discovery, employees, is reliant on an organisational culture that support employees to not only develop innovative ideas, but also provides them with a platform to communicate their ideas (Nicholas, 2014, Martini et al., 2017). Lastly, in order to discover innovations that would add value to the market, an organisation not only needs to be aware of opportunities in the market, but also needs to have a structure in place to source ideas from the market (Nicholas et al., 2015).

Incubation

The incubation of an innovation is the evolution of an innovation into a viable business proposition for the organisation. The objective of incubating innovations are to nurture a portfolio of opportunities that have uncertain outcomes, yet possess immense possibility for the market (O'Connor, 2008). Thus, the incubation capability is crucial at the early stages of an innovation when an organisation need to experiment with various business concepts and models before a breakthrough is made in to the marketplace (O'Connor, 2008, Isabelle and Westerlund, 2016). The success of incubation relies on the organisational network for support, the sharing of existing resources and financing, to successfully transform an opportunity to a successful innovation (Zhou et al., 2017). The capability to incubate an innovation may add value to the discovery capability, as the organisation may through its incubation process uncover opportunities in the marketplace that its existing business model is unable to commercialise (Markovitch et al., 2017).

Acceleration and Commercialisation

Following on from the nurturing and incubation phase, an innovation that has shown potential to be commercialised (Slater et al., 2014), is refined and grown to the point that it becomes part of the fabric of the organisation and is completely self-supporting (O'Connor, 2008). The capability of acceleration, allows an organisation to exploit and commercialise an innovation (Chiu et al., 2011), and is reliant on the skill of exploitation (Slater et al., 2014). Acceleration and commercialisation requires a culture of urgency that is responsive to market inquiries, and a leadership network that is powerful enough to enable autonomous decision making (O'Connor, 2008).

2.3.2.3.Insufficient Resources

The greatest concern for an organisation is whether they have sufficient resources for innovation, such as internal finances, abilities, knowledge, information and tools (Sandberg and Aarikka-Stenroos, 2014). However, the perceived lack of internal resources should not be seen as a barrier to innovation, but can be considered the driving force behind innovation (Story et al., 2014). In cases where an organisation does not have sufficient internal financial resources to finance innovation, attempts can be made to source external financing for innovation. To mitigate the risk of insufficient financial resources, organisations develop controls and procedures such as minimum Returns on Investment, and Internal Rate of Return for all new projects (Jackson and Richter, 2017). Many organisations have realised that they cannot rely on internal resources alone to innovate (Monczka et al., 2015). Through collaboration, organisations can pool together their limited resources to overcome this barrier to innovation.

2.3.2.4.Unsupportive Organisational Structures

In their research, Sandberg and Aarikka-Stenroos (2014) found that an unsupportive organisational structure in one of the main internal barriers in large organisations. This barrier is brought on by the coordination and communication conflicts between research and development teams, and the rest of the organisation. An unsupportive organisational structure can lead to weaknesses in the innovation capability of an organisation, which in turn would negatively affect the performance of innovation (Slater et al., 2014). An unsupportive structure, coupled with restrictive mind-set, has a negative impact on the exploitation of innovations (Kiparsky et al., 2016) (Das et al., 2018).

2.4. Summary

Finished vehicle logistics experts agree that there is not enough innovation within the finished vehicle logistics industry. Innovation may unlock operational efficiencies, reduce cost and improve profitability, yet it seems like innovations are not discovered or commercialised to harness these benefits. Logistics service providers in South Africa are facing numerous barriers to innovation that can be found both internal and external of the organisation. External barriers fall outside of the control of the organisation and reside in the resistance or lack of support from external stakeholders, as well as other barriers found in the macro environment. Innovating organisations not only face resistance or a lack of support from their own customers, but also the providers of financial support, government policies and frameworks, and the actions taken by rivals. The pace of changes in technologies, create sufficient turbulence to discourage organisations to commit to a particular technology, especially if these technological advancements are directly related to the capital equipment used to generate revenue. Finished vehicle logistics service providers also do not have sufficient control over the infrastructure used at the loading and offloading facilities, or even the roads in-between, to exercise sufficient influence over innovations to improve the infrastructure. Internal barriers to innovation fall within the control of an organisation, yet apathy, a restrictive mindset, and structured routines, an unsupportive organisation structure, are considered some of the largest obstacles within established organisations. Furthermore, some organisations do not possess sufficient competencies to discover, incubate or commercialise innovations, and in some cases have insufficient resources to drive innovation.

3 CHAPTER THREE

Research Methodology

3.1. Introduction

The literature review introduced the theoretical research context of both external and internal barriers to innovation. The industry background has also contextualised the research setting in terms of the South African finished vehicle logistics industry. Based on the background provided, this chapter outlines the proposed methodology for investigating the research objectives.

3.2. Research Design and Methods

There are three research approaches available to a researcher which will guide him/her through the process of designing the research, these approaches being quantitative, qualitative and a mixed method approach (Saunders et al., 2016, Bryman, 2015, Bryman and Bell, 2015).

The quantitative approach quantifies the gathering and analysis of data, whereby certain theories are tested by analysing the relationship between theory and research (Bryman and Bell, 2015). Research done in the fields of logistics and supply chain predominantly follow a quantitative approach where researchers seek correlations between variables, and the relationships between cause and effect (Amit and Subhash, 2005, John et al., 2004, Brandenburg et al., 2014).

In contrast to a quantitative approach to research where a researcher utilises a scientific model to collect and analyse data, a qualitative approach is more concerned with the context of the data, rather than a relationship between variables (Bryman and Bell, 2015, Saunders et al., 2016). Whereas quantitative research follows a deductive approach to test theories, qualitative research follows an inductive approach to build on existing theories, or create theories through observations and research (Fawcett et al., 2014, Saunders et al., 2016).

Finally, mixed method approach is a blend of quantitative and qualitative data collection techniques and analytical procedures. Creswell et al. (2003) point out that the advantages of a mixed method approach is that it strengthens a study by working around the limitations of either a pure quantitative or pure qualitative study. Thus, a mixed method approach is a single study, that involves either the concurrent or sequential collection of data, where the data is assimilated at one or more points in the research (Creswell et al., 2003).

Research has shown that one approach is not better than another when conducting research in the field of logistics, supply chain or transportation, but that the most popular approach to research is a quantitative approach (John et al., 2004). However, it is suggested that researchers should follow a mixed method approach to logistics related research to provide better insights in to management problems (John et al., 2004, Creswell et al., 2003). Bryman (2015) argues that the research questions serve as a guide to the research method that should be employed to answer the research questions satisfactorily.

The research approached used to carry out the research of this dissertation will be quantitative as it will use descriptive statistics to determine which barriers to innovation, as identified by Sandberg and Aarikka-Stenroos (2014), is relevant to the finished vehicle logistics industry in South Africa. These barriers will be linked to the challenges driving the need for innovation in the south African finished vehicle logistics industry. Based on the data collection, and the measure of statistical analysis used, it is expected that this research will arrive at the desired conclusions to answer the research questions.

Literature suggests that the method of research can be categorised further in to a mono, mixed or multi method, dependent on the integration between the collection and analysis of quantitative or qualitative data (Saunders et al., 2016).

As the name suggests, a mono method choice of research consists of a single technique for data collection and a corresponding procedure for analysis (Saunders et al., 2016). Thus, a qualitative method of collecting data will result in the researcher using qualitative techniques to analyse the data, and the same is true for a quantitative method of collecting data will see a researcher employ quantitative data analysis techniques.

When a researcher utilises both quantitative and qualitative data collections and analysis techniques in the same study, it is considered a mixed method research approach. The combination of various types of data collection methods should complement each other for the purpose creating a better understanding and validation (Montabon et al., 2018, Saunders et al., 2016).

Not to be confused with a mixed method approach, a multi method approach is when data is collected by means of more than one method, aligned with their appropriate analysis techniques, yet the research is still aligned with either a quantitative or qualitative approach (Saunders et al., 2016). Thus, a multi method approach can be either a multi method quantitative or a multi method qualitative research approach.

The approach used to carry out this research in to the barriers to, and sources of innovation in the finished vehicle logistics industry in South Africa will be a quantitative approached, using a mono method data collection and analysis technique.

3.3. Research paradigm

When undertaking research in business, there are a number of fundamentals that should be included when discussing research design and methods (Saunders et al., 2016). The “Research Onion” depicts “the issues underlying the choice of data collection techniques and analysis procedures” (page 122). Before any data is collected, examined and conclusions produced, the researcher must comprehend how the research objectives and researcher’s background relate to each layer of the research onion. Furthermore, the nature of the industry, and the literature review also governs what the research approach should be.

The outer layer of the “research onion” is the research philosophy. Research philosophy is the development of knowledge in a particular field, and forms the foundation of the approach the researcher will take in developing his theory, the method of data collection, as well as the strategy in collecting such data (Saunders et al., 2016). The choice between Positivism, Critical Realism, Interpretivism, Postmodernism and Pragmatism depends on the objectives of the research and not a commitment to a particular philosophy.

The Positivism philosophy values neutrality and the proving of theory and provides law-like generalisations (Ryan, 2018, Saunders et al., 2016). Existing theory is used to develop hypotheses which are either established or contested, leading to the development of new theory or further research (Eriksson and Kovalainen, 2015, Saunders et al., 2016). Positivism is generally associated with research that are quantitative in nature. Critical Realism explains that there is an observable external reality, but that this external reality cannot be objectively measured, and that the researcher is essentially biased (Sekaran and Bougie, 2016). Interpretivism is concerned with "how people interpret and understand social events and settings" (Eriksson and Kovalainen, 2015), for example their interpretation of text, phenomena and symbols. Interpretivism is closely related to research that is quantitative in nature. Postmodernism questions the accepted ways of thinking, based on the "role of language and power relations", and rejects any authority on knowledge (Saunders et al., 2016, Eriksson and Kovalainen, 2015). Pragmatism, depending on the research questions, balance both the objective, observable occurrences, and subjective meanings, to provide value adding knowledge.

It is suggested that ontology, epistemology, axiology and methodology should be evaluated alongside one another in order to determine which one of the philosophies should be used in management research (Aldawod and Day, 2017, Saunders et al., 2016). These parameters describe the perceptions, beliefs, assumptions and the knowledge of what is reality, and what influence they have on the research.

Ontology is the study of existence, or reality and deals with the question concerning what entities exist or can said to exist. Ontology thus describes our view on the nature of reality, and specifically, is this an objective reality that really exists, or only a subjective reality, created in our minds (Saunders et al., 2016). The failure to understand ones entrenched ontological assumptions may lead a researcher to draw certain conclusions, if his/her assumptions are not brought in to question or in fact incorrect. How ontology relates to the four research philosophies is described below (Saunders et al., 2016):

- Positivism – external, universal, granular, ordered, objective and independent of social actors

- Critical Realism – stratified, reality is external and independent, objective structure, causal mechanisms
- Interpretivism – socially constructed, subjective, may change, multiple meanings and interpretations
- Postmodernism – nominal, socially constructed, some interpretations are dominated by others
- Pragmatism – external, practical consequences of ideas, view chosen to best enable answering of research question

Epistemology is the theory or science of the grounds of knowledge, or what researchers consider as acceptable knowledge (Saunders et al., 2016). Epistemology relates to the five research philosophies as follows:

- Positivism – only observable experiences can provide facts. Focus on causality and law like generalisations, reducing experiences to simplest elements
- Critical Realism – knowledge is historical, facts are social constructions, causality cannot be reduced to statistical correlations
- Interpretivism – biased meanings and social experiences, focus on narratives, opinions and understandings
- Postmodernism – knowledge is decided by overriding beliefs, exposes power relations and challenge dominant views
- Pragmatism – either or both apparent occurrences and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, investigating different perspectives to help interpret the data.

Axiology is described as the researcher's view of the role of ethics and values in research which lends credibility to the process (Saunders et al., 2016). Axiology relates to the five research philosophies as follows:

- Positivism – research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance
- Realism – research is value laden, the researcher is biased by world views, cultural experiences and upbringing

- Interpretivism – research is value bound, the researcher is part of what is being researched, cannot be separated and so will be subjective
- Postmodernism – research is value-constituted, researcher radically reflective of own thinking, entrenched in power relations
- Pragmatism – value plays significant role in result interpretation; the views of the researcher is both objective and subjective

Considering the ontological, epistemological and axiological assumption of the five research philosophies, the research philosophy adopted in this research project follows a positivist approach. This research will examine facts as opposed to perceptions of, or interpretations of knowledge. A positivist approach lends itself to a quantitative statistical data analysis

3.4. Study setting

Industry leaders worldwide all agree that innovation in finished vehicle logistics has been very slow, and almost non-existent. This phenomenon does not exclude the finished vehicle logistics industry in South Africa, which is relatively small in comparison to its counterparts in North America, Australia, and across Europe and Asia. The South African setting is characterised by 5 finished vehicle logistics service providers, who transport new vehicles by road for the 37 global vehicle manufacturers whom have a presence in South Africa, albeit a very small footprint in comparison to other worldwide markets. In contrast to the global marketplace, Southern Africa is heavily reliant on road transport, with only the Durban to Gauteng, and Port Elizabeth to Gauteng routes serviced by rail, and even less short sea shipments along the coastal ports between Maputo and Walvis Bay.

Due to the small size of the industry, a decision was made to not limit the study to one service provider, or one vehicle manufacturer, but to invite all 37 vehicle manufacturers, 3 of the 5 logistics service providers, as well 2 car carrier manufacturers. The purpose was to provide a holistic view on innovation within the finished vehicle logistics industry in South Africa from vehicle manufacturers, logistics service providers, and car carrier manufacturers. It should be noted that the only logistics service providers that were approached to participate in the research, were the organisations that transport new vehicles on contractual basis for the vehicle manufacturers, and specifically excluded those organisations that sub-contracted their services on an ad-hoc basis or specialise in the transportation of used vehicles.

The operational inefficiencies in the finished vehicle logistics industry can be attributed to the 42% of all kilometres travelled being empty kilometres (Automotive Logistics, 2014). The industry is in desperate need for innovative and disruptive technologies to become more efficient and contribute to the sustainability of the environment.

3.5. Population and sample of the study

According to Saunders et al. (2016), a population is defined as "a full set of cases or elements from which a sample is taken". Sekaran and Bougie (2016) define a population as "all the things of interest" a researcher wants to study. For the sake of manageability, a researcher may consider redefining the population to a population size that is more manageable (Saunders et al., 2016)

The population of this research is all planning, operational and executive managers in the finished vehicle logistics industry, which includes the transportation of new vehicles from storage facilities to dealers, inter-dealer transportation, used and private vehicle transportation, as well as the transportation of vehicles in bond from a port of entry to another country. This research has narrowed the population to a target population with a specific focus on the transportation of new vehicles from storage facilities or ports of entry to dealers. During the course of 2017, 5 finished vehicle logistics service providers delivered a total of 557,131 new vehicles to motor dealerships in South Africa on behalf of 37 vehicle manufacturers (NAAMSA, 2018). Used vehicle distribution constitute a very small percentage of vehicles transported in South Africa as used vehicles are generally driven on their own wheels to its next destination, whereas new vehicles are transported to preserve mileage. The importation of "grey imports" does not add any value to the South African automotive industry as these vehicles are prohibited for sale in South Africa and is as such excluded from target population. Furthermore, the importers, manufacturers and logistics service providers of trucks, busses and chassis cabs are also excluded from this research as they are driven and delivered on their own wheels. The target population will include planning, operational and executive managers, from 27 vehicle manufacturers / importers, 5 logistics service providers and 4 South African represented suppliers of car carrying equipment. The target market would then consist of 81 potential respondents from the vehicle manufacturers, 35 potential respondents from the logistics service providers, and a further 4 respondents from the car carrier manufacturers.

In many research projects, the target population may still be too large, making the research not only impractical but also time consuming and expensive (Saunders et al., 2016). It is for these reasons that researchers may need to resort to selecting a sample from the target population. A sample can thus be described as a smaller subsection of a target population (Hair, 2015).

Within the organisations identified in the target population there are many people that fulfil their role within their respective organisations, ranging from planning, operations, back office support and management. Careful consideration on the strategic importance of innovation to an organisation, a decision was made to sample from the target population only respondents on management levels within the planning, operational and executive levels at each of the role players, which represent the culture and support structures within their respective organisations, resulting in a population size of 120 respondents.

3.6. Sampling method

The process of sampling starts off with a decision between single stage, where the researcher has access to all the elements within the target population, or multistage sampling, where the researcher identifies clusters from the target population, and then gains access to sample the elements within the cluster (Bryman and Bell, 2015, Creswell et al., 2003). According to Saunders et al. (2016) there are various sampling techniques available to a researcher and these are categorised in two groups, probability or non-probability sampling.

Probability sampling, also known as representative sampling according to Saunders et al. (2016), is most generally coupled with survey research strategies where interpretations from the sample are used to answer the research questions, and is typically applied in quantitative research (Hair, 2015). Representative samples follow strict procedures in defining the target population, selecting the sample frame, choosing the sampling method, determining the ideal sample size, and finally implementing the sampling plan (Hair, 2015). There are four sampling techniques for probability sampling, which include simple random, systematic random, stratified random and cluster. Random sampling is the random selection of respondents from the sample frame. Systematic random sampling is the systematic selection of respondents from a sample frame, based on calculated sampling fraction applied to a numbered target population. Stratified random sampling is a variation on the random sampling technique whereby the target population is further classified in to homogenous groups, from which an equal number of respondents are randomly selected from each group. Cluster sampling, which according to Saunders et al. (2016) is less representative of the population that a stratified random sampling technique, involves the clustering of the population in to homogenous clusters, and then randomly selecting whole clusters.

Based on an element of subjectivity, the elements in the target population cannot be generalised, and thus non-probability sampling provides alternative techniques to selecting a sample (Sekaran and Bougie, 2016, Saunders et al., 2016). According to Saunders et al. (2016), there are no guidelines as to the selection and size of the sample, and the size of the sample is dependent on the research question and objectives. There are also four sampling techniques for non-probability sampling, which include quota, volunteer, haphazard and purposive. Quota sampling, which is very similar to stratified sampling, is generally applied when conducting structured interviews in a survey strategy. Snowball sampling and self-selection sampling are forms of volunteer sampling, where respondents are referred by other respondents in the former technique, and where respondents respond to a call for participation in the latter technique. Haphazard, or convenience sampling is the selection of respondents based on their ease of availability.

Purposive sampling involves the judgement of a researcher to select respondents who will best answer the research questions and are not considered statistically representative of the target population. There are several purposive sampling techniques available to a researcher, being extreme case, heterogeneous, homogeneous, critical case, typical case and theoretical. This research has employed a homogeneous non-probability sampling technique whereby all members of the sample interact with one another on an operational or management level. From within the vehicle manufacturers the sample includes 3 respondents that interact with their logistics service providers on either a planning, operational or management structure. Within the car carrying equipment manufacturers only the senior management that engage with finished vehicle logistics service providers are included in the study, which is 1 respondent from each organisation. Finally, from logistics service providers all planning, operational and executive management structures were included in the study, which is a sample of 7 respondents from each organisation. The purpose of selecting this sample is to determine the feedback on the same barriers to innovation from three different angles.

3.7. Construction of the Instrument

A survey instrument, also more commonly referred to as a questionnaire, is used to collect the data from respondents. In this research project an instrument was specifically constructed for this research, based on the findings of a systematic review done by Sandberg and Aarikka-Stenroos (2014) on the barriers to radical innovation. The framework developed by Sandberg and Aarikka-Stenroos (2014) provides many proposals for further research and has been used as the framework to determine what the barriers are to innovation in the finished vehicle logistics industry in South Africa. The categories of barriers to innovation guided the questions in the instrument and provided the framework to determine whether these categories are relevant in the finished vehicle logistics industry in South Africa. Building on the framework on the barriers to innovation, the research instrument includes a section to ascertain the drivers of innovation, as well as what innovations are needed within the South African finished vehicle logistics industry. Three questionnaires have been constructed, with questions addressing the same issues, specifically tailored for either respondents from vehicle manufacturers, logistics service providers, or car carrying equipment manufacturers.

3.8. Data collection

In this study, the number of participants were influenced by the willingness of their organisations to participate in the research study. Of the 27 vehicle manufacturers that formed part of the sample, only 3 organisations were willing to participate in the research. This dramatically reduced the number of possible participants from 81 respondents to 9 respondents. Most of the motor manufacturers refused instantaneously, and others only after exhaustive consultations declined further participation. Only 2 of the 4 equipment manufacturers were willing to participate, and only 3 of the 5 logistics service providers. The un-willingness of potential participants significantly reduced the possible number of respondents from 121 down to 26.

A questionnaire was constructed based on the frame work developed by Sandberg and Aarikka-Stenroos (2014). This questionnaire was distributed by email to 26 possible respondents that fit the selected sample. Potential respondents were assured of confidentiality and anonymity and that their responses would note by unethically disseminated or sent to other respondents.

3.9. Data analysis

Descriptive statistics were used to analyse the collected data using tools such as Microsoft Excel and IBM SPSS Statistics. Where possible, correlations were drawn between variables, but most of the analysis relied on frequencies, means and standard deviations.

3.10. Reliability and validity of study

To accomplish validity in this study, the questions were structured in such manner that they covered the findings from a review in literature, as well as prior discussions with industry experts and learnings from watching numerous recorded finished vehicle logistics conferences.
Reliability, or the internal consistency of the questionnaire was tested by calculating the Cronbach's alpha. A Cronbach's alpha of 0.93137394 was calculated on the data collated, which indicate that the questions are indeed measuring the same thing.

3.11. Ethical considerations

Research objectivity was maintained throughout the study, and no data collected was misrepresented in any way or form to achieve a subjective outcome.

Respondents from rival organisations were assured of the confidentiality and anonymity of their responses, and no vehicle manufacturer, logistics service provider or trailer manufacturer was named in either the questionnaire, or in the research report. The data collected cannot reveal the identity or association of any respondent.

3.12. Summary

This research in to the barriers to innovation in the finished vehicle logistics industry of South Africa has followed a mono-method quantitative methodology, rooted in its positivist approach which is synonymous with a quantitative statistical data analysis. Questionnaires were circulated to the members involved in the commercial, general management and outbound logistics functions in their respective organisations with the aim of understanding what they believe the barriers to innovation are in the finished vehicle logistics industry. Responses received from these role-players were the analysed using descriptive statistical techniques and will be presented in the following chapters.

4 CHAPTER FOUR

Presentation of Results

4.1. Introduction

This chapter outlines the analysis of the descriptive statistics drawn from the responses of the respondents in terms of biographical information, external barriers, internal barriers and innovation in finished vehicle logistics.

4.2. Biographical Information

There was a total of 13 respondents from three logistics service providers within the finished vehicle logistics industry of South Africa. Unfortunately, neither of the 2 equipment manufacturers responded to the survey and only 1 of the 3 vehicle manufacturers that agreed to participate responded. The responses from the 1 vehicle manufacturer was thus excluded as it would not provide any value in contributing to a wholistic view on the barriers to innovation. The biographical data collected ranged from hierarchical information, including the core function that the respondents perform in their organisations, highest qualification achieved by respondents and the number of year experience within finished vehicle logistics.

The hierarchical position of a respondent within an organisation relates to the level of strategic involvement within the organisation, for example development of strategy or the execution thereof. As discussed in the literature review, the leadership qualities in the structure of an organisation plays a significant role on the internal barriers to innovation. Most of the respondents were employed in Senior Management positions in their respective organisations, followed by Middle Management and Lower Management. One respondent indicated “Other” and noted a position of “Business Unit Manager”, which could be considered a “Lower Management” position.

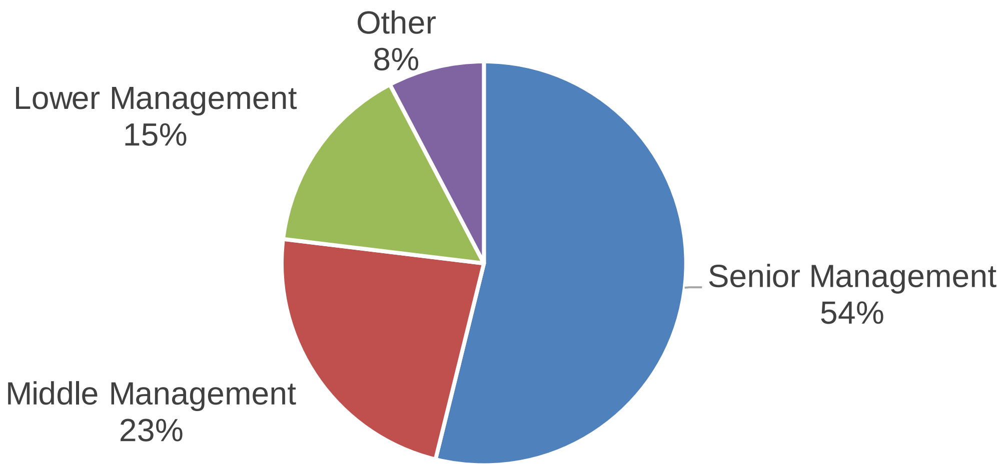

Figure 4.1 Hierarchical Position of Respondent in Organisation

The core function of a respondent within an organisation, would determine the opinion of that respondent on certain barriers to innovation, as well as what innovations are needed in the industry. Most of the respondents were directly involved in operations, followed by general management, and one respondent mostly involved in the commercial aspect of the business.

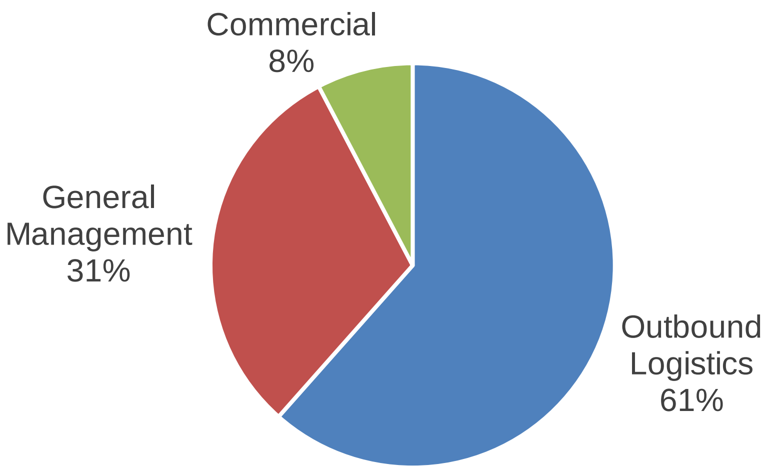

Figure 4.2 Functional Area of Respondent in Organisation

Respondents were asked to identify their highest level of qualification, but no distinct relationship was found between qualification and the feedback received on any of the variables. The qualification of respondents ranged from Grade 10, Grade 12, Graduate, and post-graduate qualifications.

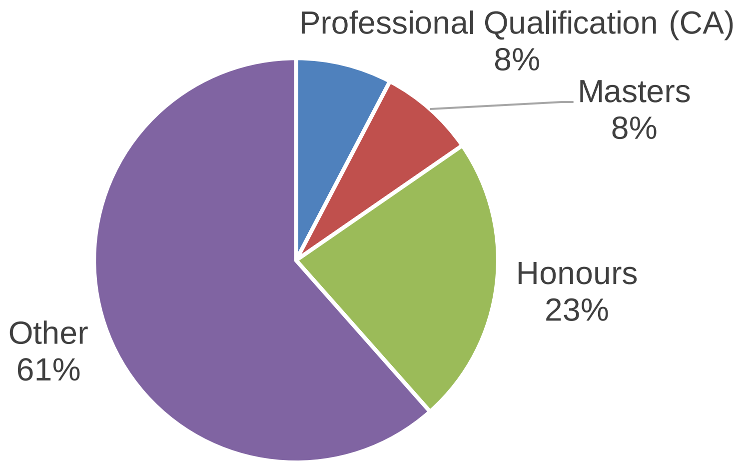

Figure 4.3 Highest Qualification of Respondent

An interesting statistic was the almost equal number of respondents from each category of years of experience within Finished Vehicle Logistics. It is anticipated that the number of years' experience will influence the opinion of respondents to certain variables. There were three respondents from each category, apart from four respondents whom have sixteen years or more experience within the industry.

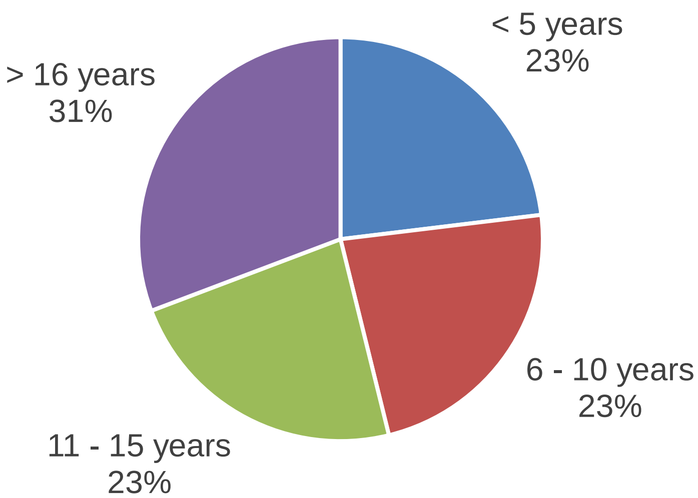

Figure 4.4 Years' Experience of Respondents in Finished Vehicle Logistics

The final bit of biographical data collect was regarding the age of respondents, and once again an almost equal number of respondents from each age category responded to the questionnaire.

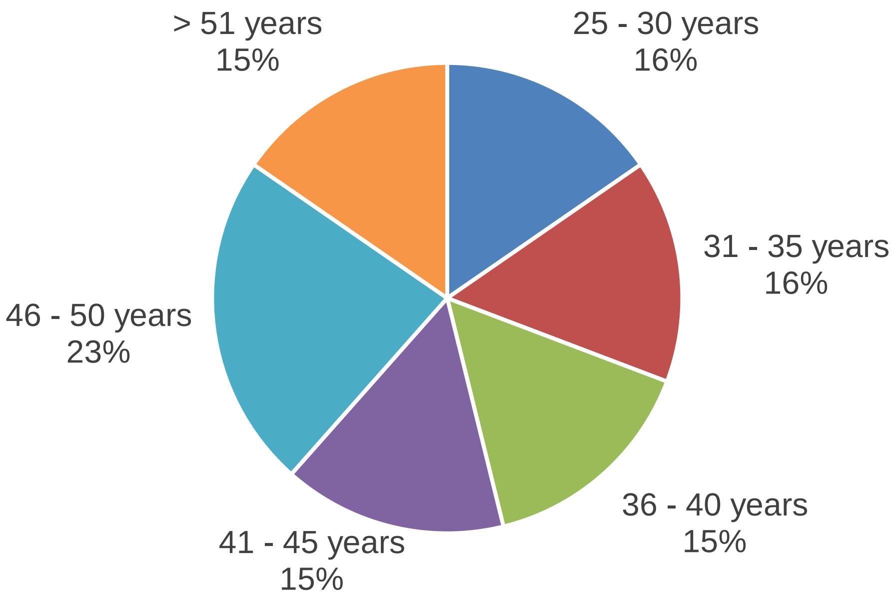

Figure 4.5 Age Distribution of Respondents

Based on the biographical data collected it can be ascertained that a homogenous group is represented. An equal representation of respondents from each age, and experience category, all working in the same industry, directly involved in either the daily running of their organisations, or the operations within their organisations.

4.3. External Barriers

4.3.1. Resistance or Lack of Support from Stakeholders

Customer Resistance

There were four questions related to the category of resistance to innovation where customers are considered the barrier to innovation. The first question asked respondents to rank what they think their customers consider important when choosing a logistics service provider. The choices were “Competitive Pricing”, “Innovative Solutions”, “Lowest Price”, “Quality of Service”, “Reliability” and “Service Offering”.

Table 4.1 Classification of Customer Needs

		Ranking (1 = Highest, 6 = Lowest)					
		1	2	3	4	5	6
Category	Competitive Pricing	5	4	1		1	1
	Innovative Solutions					3	8
	Lowest Price	7	1	1		1	1
	Quality of Service	1	2	5	4		
	Reliability		4	1	2	4	
	Service Offering	1		3	4	2	1

The same results were tabulated for respondents within Senior Management positions, to determine if the opinion of respondents in strategic positions are consistent with the sample. The highest and lowest ranked category is consistent between both sets of data.

Table 4.2 Classification of Customer Needs by Senior Management

		Ranking (1 = Highest, 6 = Lowest)					
		1	2	3	4	5	6
Category	Competitive Pricing	2	4	1			
	Innovative Solutions					1	5
	Lowest Price	5				1	
	Quality of Service		1	3	2		
	Reliability		1	1	2	2	
	Service Offering			1	2	2	1

The second question asked respondents to rate whether their customers, the vehicle manufacturers, collaborate with them, the logistics service providers to encourage innovation in finished vehicle logistics. Most of the respondents tended to agree with this statement, but a large proportion disagreed.

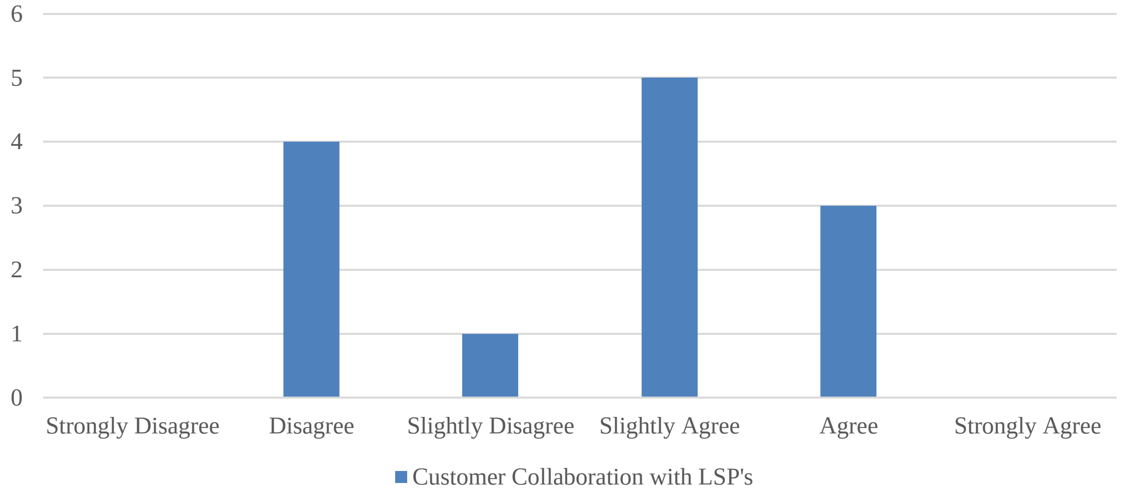

Figure 4.6 Collaboration Between Vehicle Manufacturers and LSP's

The third question measured the opinion on collaborations between vehicle manufacturers, from a logistics service provider point of view. Most of the respondents disagreed with this statement, thus vehicle manufacturers do not collaborate with each other to find innovative solutions to challenges faced within the finished vehicle logistics industry.

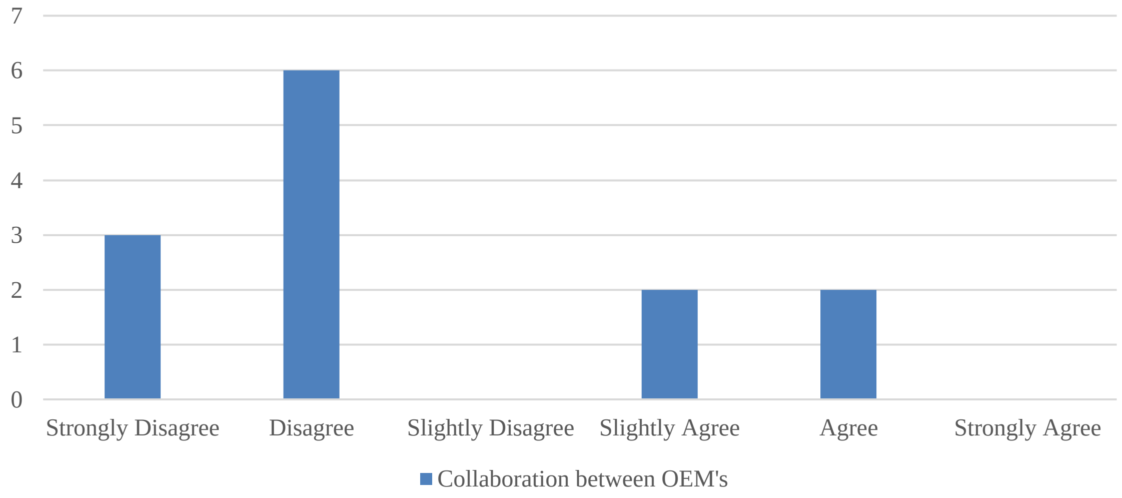

Figure 4.7 Collaboration between Vehicle Manufacturers

The fourth question was related to whether vehicle manufacturers provide sufficient visibility within their supply chain to encourage innovations by their logistics service providers. Once again, there is no clear agreement or disagreement with the statement, but respondent tended to agree that vehicle manufacturers provide sufficient visibility in their supply chains to encourage innovative decision making by logistics service providers.

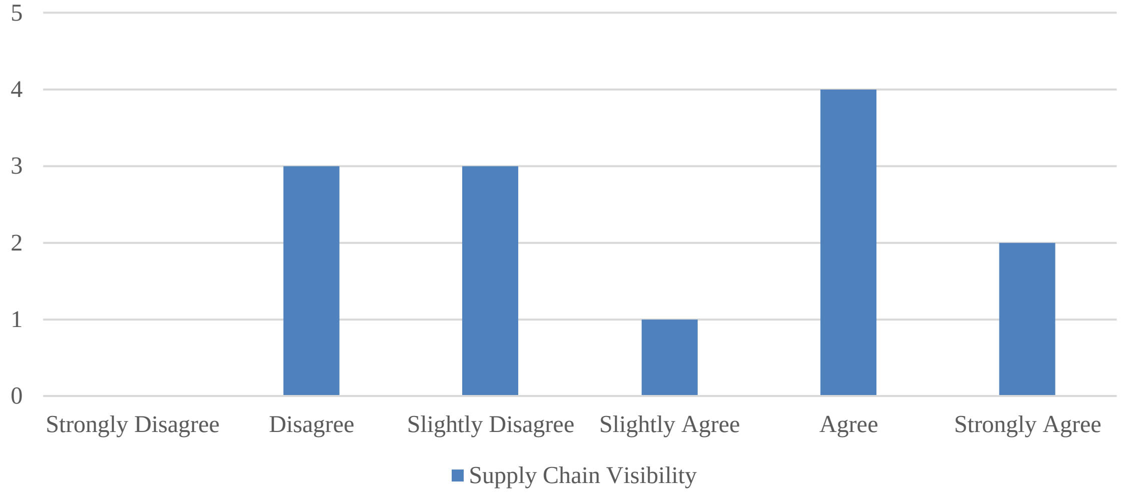

Figure 4.8 Supply Chain Visibility

Unsupportive Government

There was a total of two questions related to an unsupportive Government being considered a barrier to innovation. The first question asked respondents to rank in order of importance, where 1 is the most important and 3 the least important, where current Government legislation inhibits innovation.

Table 4.3 Legislative Barriers to Innovation in Finished Vehicle Logistics

		Ranking (1 = Highest, 3 = Lowest)		
		1	2	3
Category	Load Size	10	1	1
	Operating Hours	1	1	11
	Load Configurations	3	9	

The results from this ranking was conclusive enough not to warrant a further breakdown by management or functional level within the organisation.

The second question asked respondents to agree with the statement that Government actions hinder innovations, and manifest in new regulations or legislation. Most of the respondents agreed that government actions fail to support innovations.

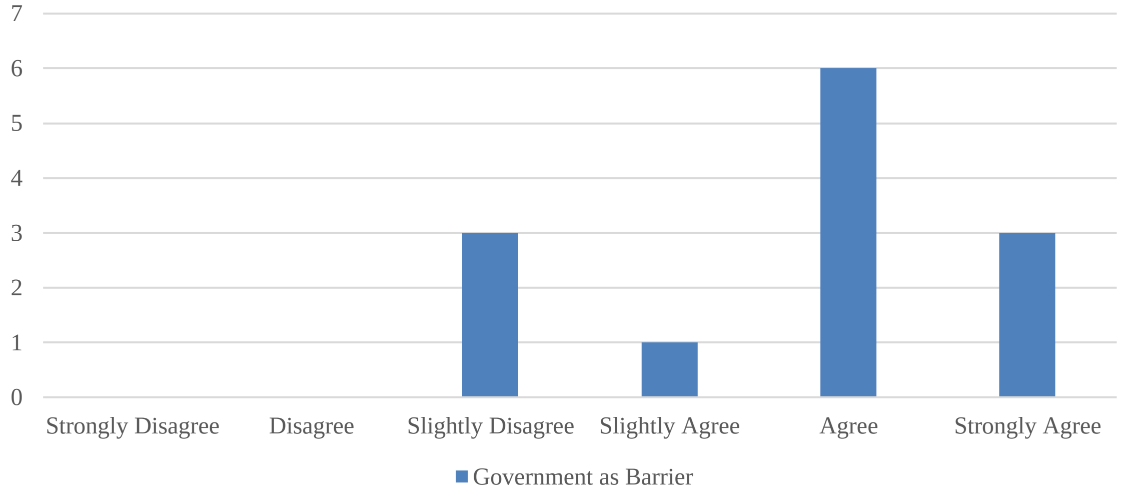

Figure 4.9 Government Actions Inhibit Innovation

Paucity of External Finance

There was only one question relating to the access to external finance as a barrier to innovation. Respondents were asked whether obtaining finance from banking institutions and / or investors is challenging. Most of the respondents agreed that obtaining external finance can be challenging.

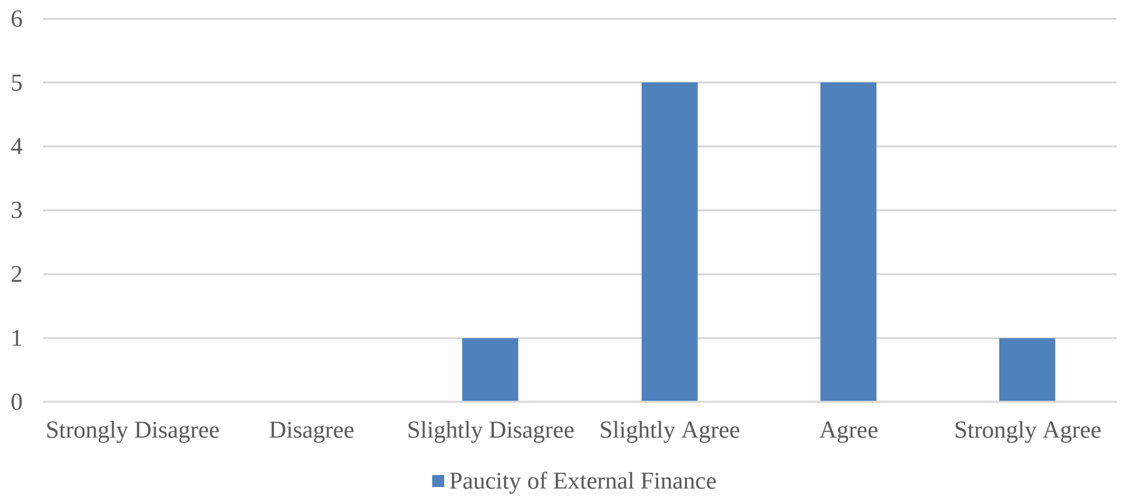

Figure 4.10 Obtaining External Finance is Challenging

The decision to source external finance is usually a function of Senior Management, the feedback regarding the Paucity of External Finance was then split up according to the various Levels in the organisation, with similar results as before.

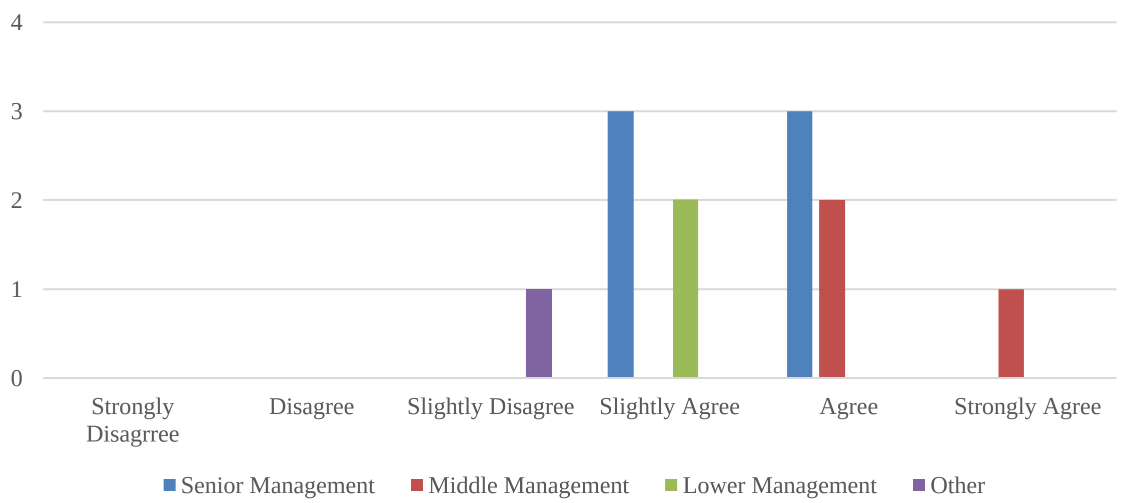

Figure 4.11 Obtaining Finance is Challenging - by Management Levels

Rivalry

There are two aspects to rivalry as a barrier to innovation that this research set out to measure. The first is collaboration between logistics service providers, and the second is a formalised platform to discuss innovations and challenges.

Firstly, respondents were asked whether logistics service providers collaborate on finding innovative solutions to challenges in the finished vehicle logistics industry. Most of the respondent disagreed with this statement, thus agreeing that logistics service providers do not collaborate.

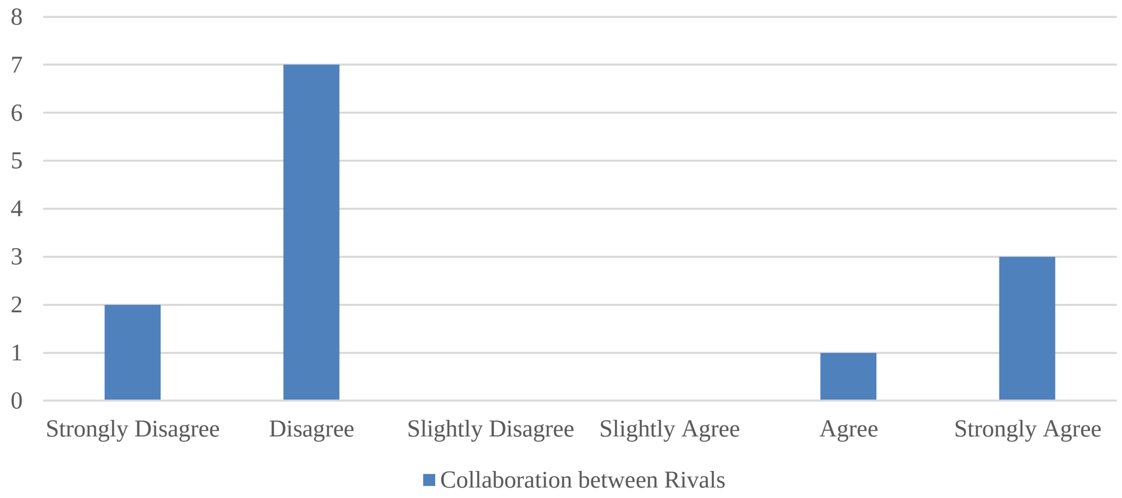

Figure 4.12 Collaboration Between Rival Logistics Service Providers

On the existence of a formal platform to discuss both innovations and challenges within the finished vehicle logistics industry of South Africa, respondents overwhelmingly agreed that the platform to discuss innovations in non-existent, and the platform to discuss challenges needs attention.

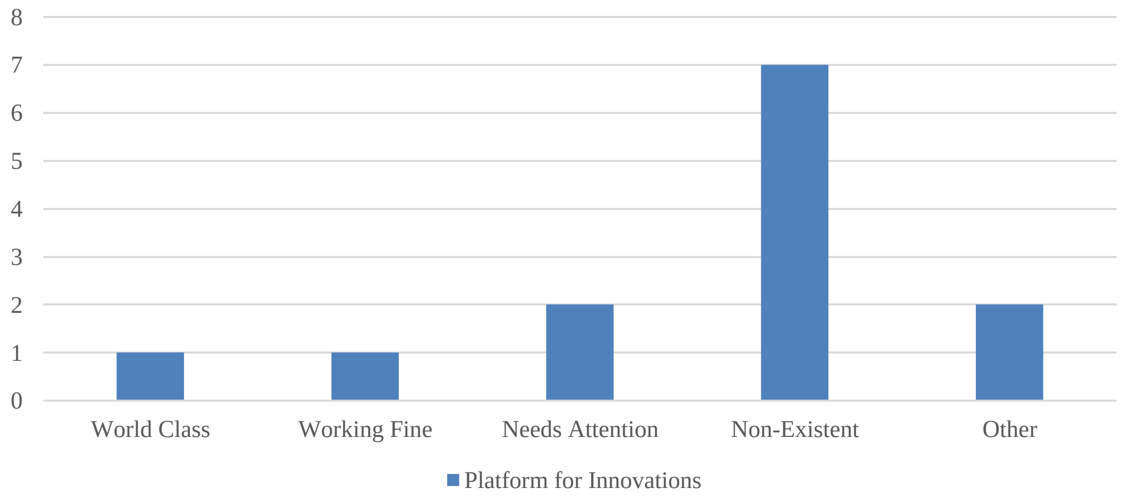

Figure 4.13 Existence of Platform to Discuss Innovation in FVL

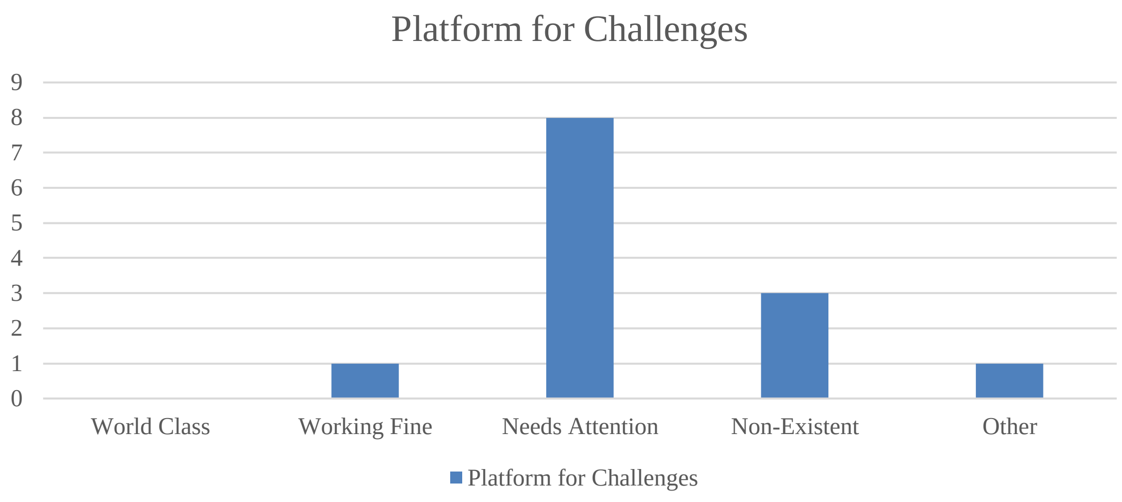

Figure 4.14 Existence of Platform to Discuss Challenges in FVL

4.3.2. Restrictive Macro Environment

Technological Turbulence

There are two sources of technological turbulence for logistics service providers, and that is the changing technologies in car carrying equipment and continuously change in vehicle design and technologies. The first question relates to the changes in technologies and how this makes it difficult for logistics service providers to commit to a particular technology. Most of the respondents agreed that it is difficult to commit to a particular technology in the face of changing technologies.

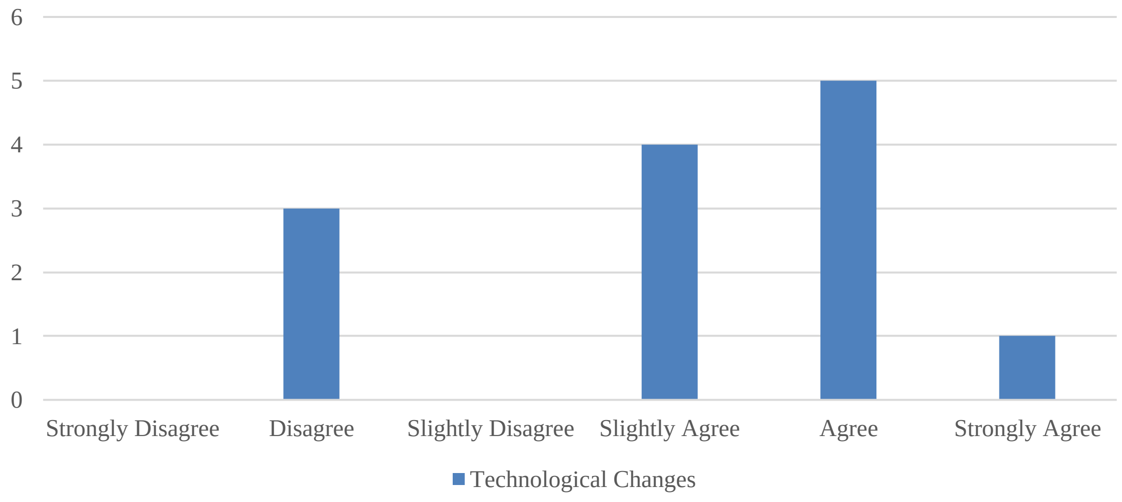

Figure 4.15 Continuously Changing Technologies Affects Decision-making

Secondly, the continuous changes in new vehicle design and technologies, may make it more difficult for logistics service providers to invest in and commit to expensive new and innovative car carrying equipment. Most of the respondents agreed that the purchase of new car carrying equipment is made more difficult by changes in vehicle design and technology.

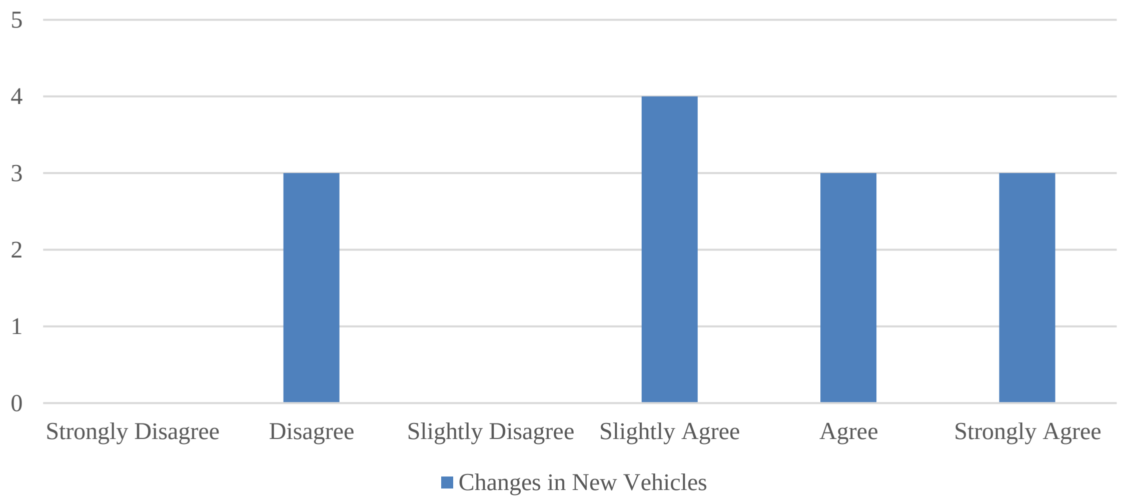

Figure 4.16 Changing Vehicle Technologies and Design as Barrier to Innovation

Inappropriate Infrastructure

There are a total five questions relating to infrastructure as a barrier to innovation in finished vehicle logistics. These questions relate to the location and design of loading and offloading facilities, the road network in-between, as well as the availability of alternatives to road transportation.

The location of loading facilities has an impact on the agility of logistics service providers to respond to sudden changes in demand, as well as the trip velocity of car carrying equipment. Respondents were asked whether the location of loading facilities encourage operational innovations. Most of the respondents slightly agreed with this statement.

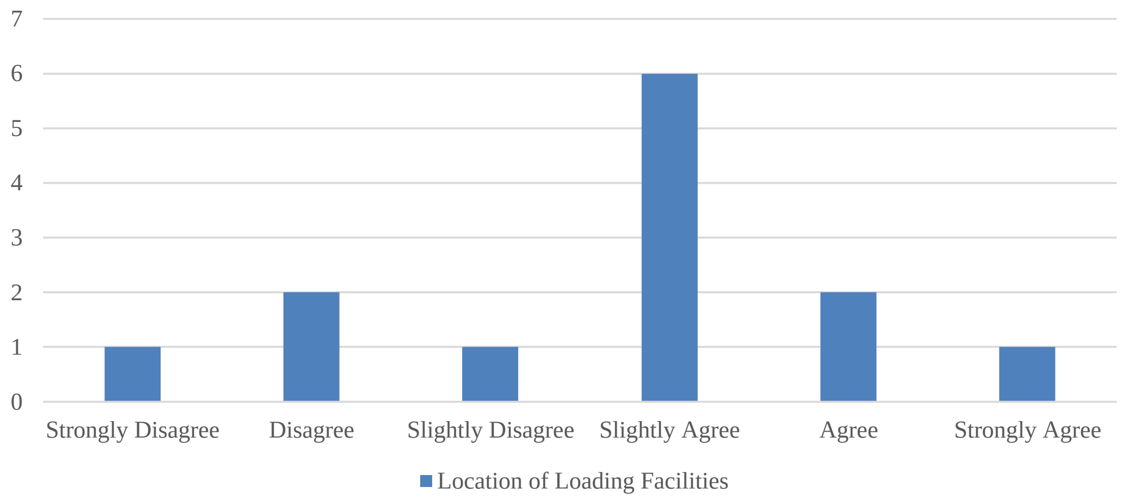

Figure 4.17 Location of Loading Facilities Facilitate Operational Innovations

The design and layout of loading facilities has an impact on the loading velocity of car carrying equipment and productivity of human resources. Respondents were asked whether the design and layout of loading facilities encourage operational innovations. Descriptive statistics does not show a clear pattern from respondents on whether the design and layout of loading facilities facilitate operational innovations. Proportionally, there are more respondents that agreed than disagreed with this statement.

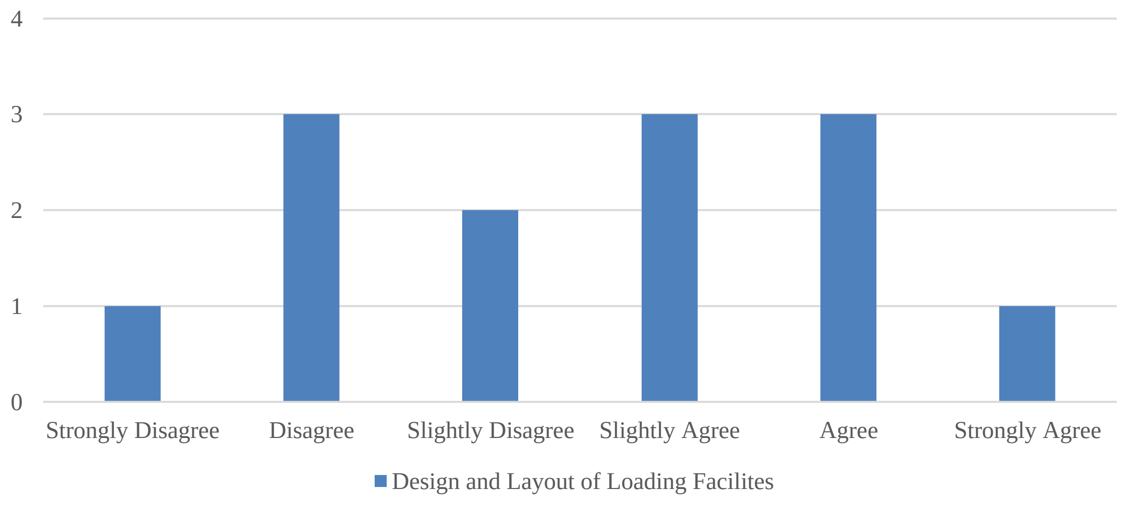

Figure 4.18 Layout of Loading Facilities Facilitate Operational Innovations

Road infrastructure is the back bone of the logistics industry in South Africa, as it facilitates the movement of goods from one point to another. The existing infrastructure, such as road conditions, bridges and road design also influence how logistics service providers can reduce cost and improve trip velocity. Respondents were asked whether the existing road infrastructure encourages operational innovations to improve velocity and reduce cost. Once again, there is no clear pattern in the data collated.

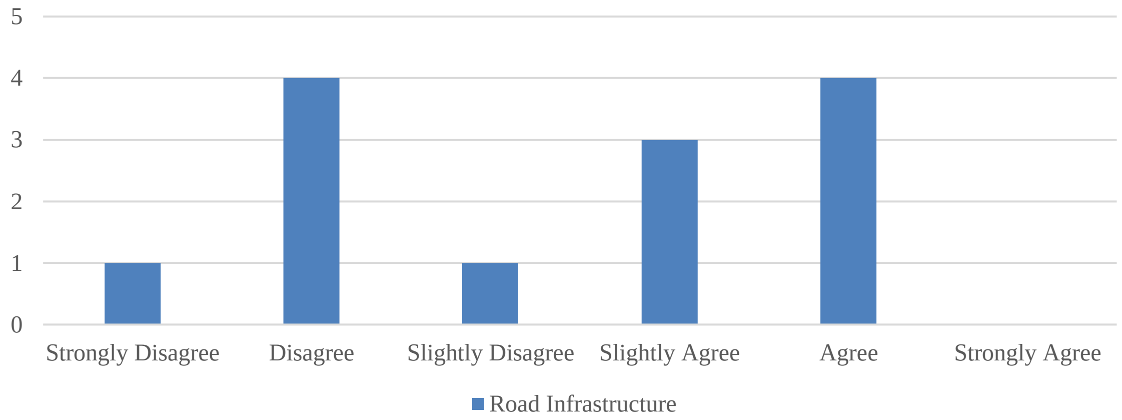

Figure 4.19 Road Infrastructure Facilitates Operational Innovation

Due to the inconclusive result on whether the current road infrastructure encourages innovative operations, a distinction was made between respondents in General Management and Outbound Logistics. Respondents that are more involved in operations tended to disagree more with this statement than respondents from General Management.

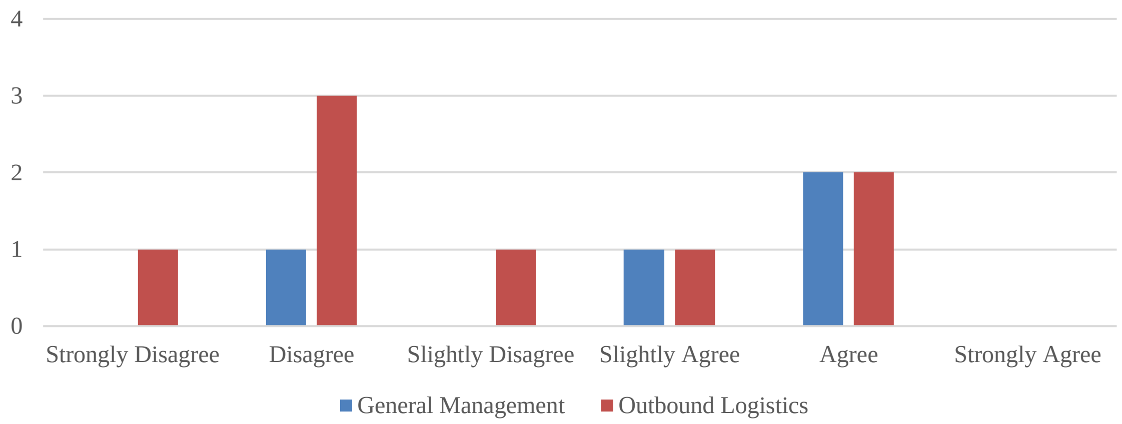

Figure 4.20 Road Infrastructure Facilitates Operational Innovation - by Function

In finished vehicle logistics, off-loading sites can either be another storage yard, when vehicles are re-positioned to another facility, or it can be a direct delivery to a motor dealership. The location of these off-loading sites has a direct impact on the trip velocity, economical load factors and the productivity of car carrying equipment in terms of empty kilometres. Respondents were asked to rate whether the location of off-loading facilities encourage operational innovations in velocity, productivity and economical loads. Descriptive statistics showed that feedback from respondents were opposites to each other.

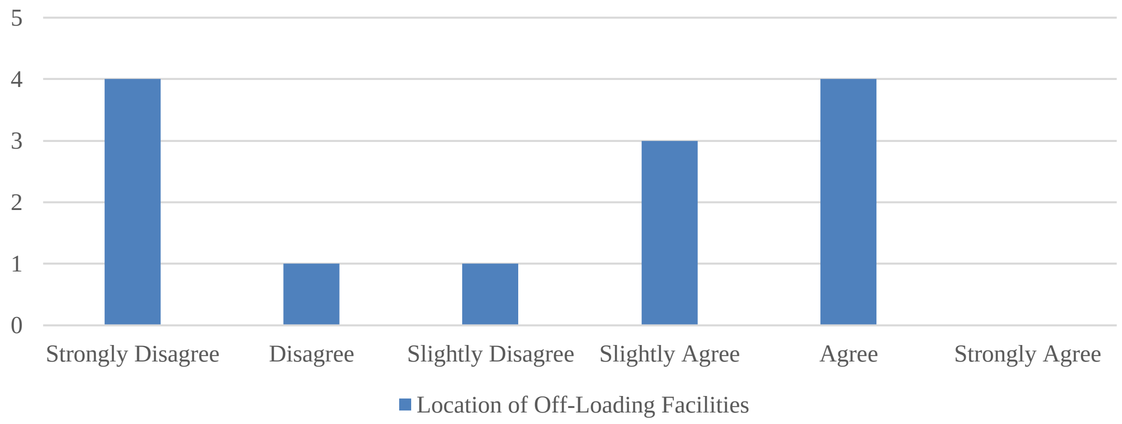

Figure 4.21 Off-Loading Facilities Facilitate Operational Innovations

Once again, a distinction was made between the data collected from respondents in General Management and Outbound Logistics, which yielded similar results.

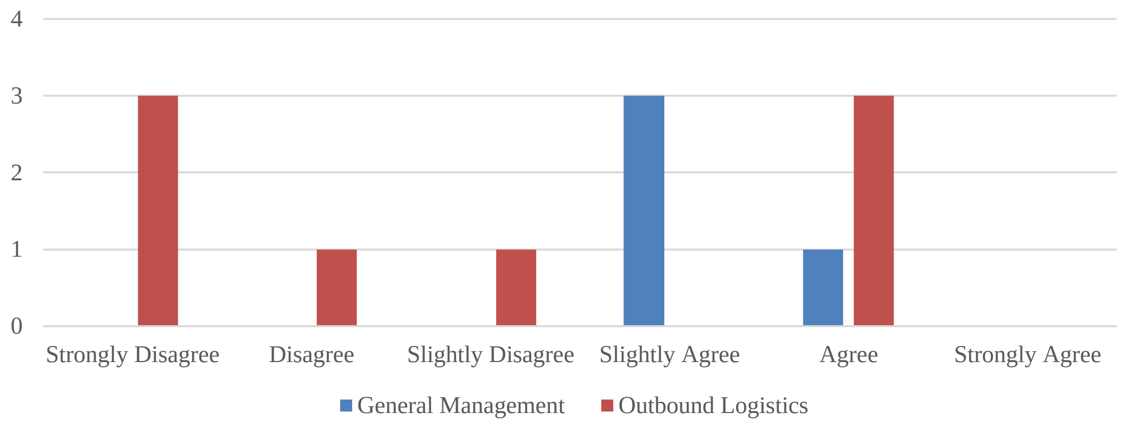

Figure 4.22 Off-Loading Facilities Facilitate Innovation - by Function

Finally, respondents were asked whether a reliable and cost-effective alternative to long-haul road transportation exists between major centres. Most of the respondents agreed that there is no cost-effective and reliable alternative to the transportation of new vehicles by road in South Africa.

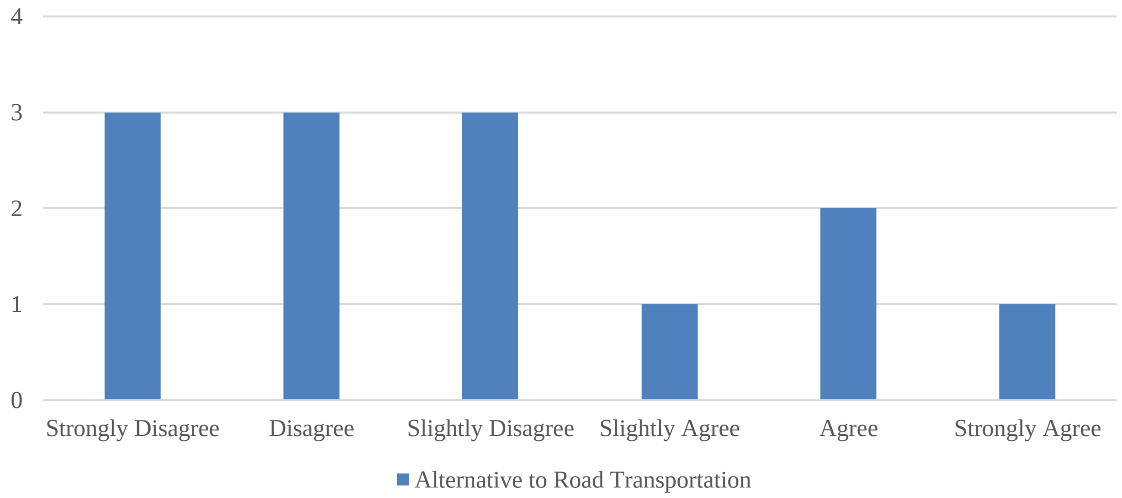

Figure 4.23 Reliable and Cost-Effective Alternatives to Road Transportation

4.4. Internal Barriers

4.4.1. Restrictive Mind-set

The first question relating to the internal barrier to innovation asked respondents to rank what they perceive to be the reasons for the slow pace of innovation in the finished vehicle logistics industry in South Africa. Conservative decision making was ranked as the highest internal barrier to innovation, followed by a restrictive organisational culture.

One respondent failed to complete all the categories, and only listed one additional category under “Other”, and that being a “lack of awareness of innovations”. This additional category will be discussed in the next section.

Table 4.4 Internal Barriers to Innovation

		Ranking (1 = Highest, 5 = Lowest)				
		1	2	3	4	5
Category	A Fear of Change	1	2	4	5	
	Fear of Failure	1	1	5	5	
	Conservative Decision Making	7	4	1		
	Restrictive Organisational Culture	4	4	2	2	
	Other	1				

4.4.2. Lack of Competencies

Discovery

The discovery competency relates to the ability of an organisation to create, recognise, develop and articulate innovation opportunities. Respondents were asked whether they had the ability to create innovation opportunities for their both their current and future customers. Most of the respondents agreed that they were able to create innovation opportunities for current and future customers.

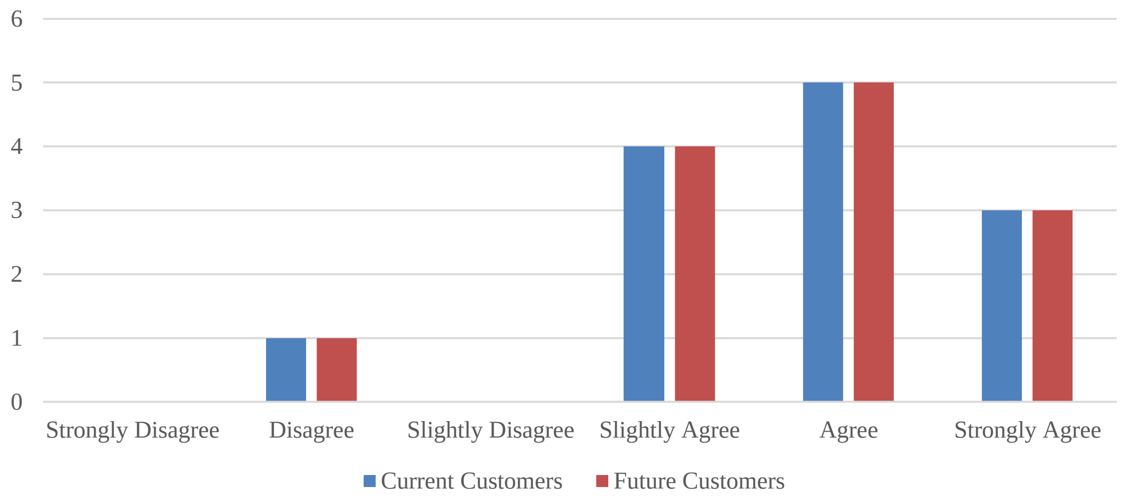

Figure 4.24 Creation of Innovation Opportunities

Further to the ability to create innovation opportunities, respondents were also asked if they had the ability to recognise innovation opportunities to meet the needs of both existing and future customers. Once again, respondents agreed that they had the ability to recognise innovation opportunities to satisfy the needs of customers.

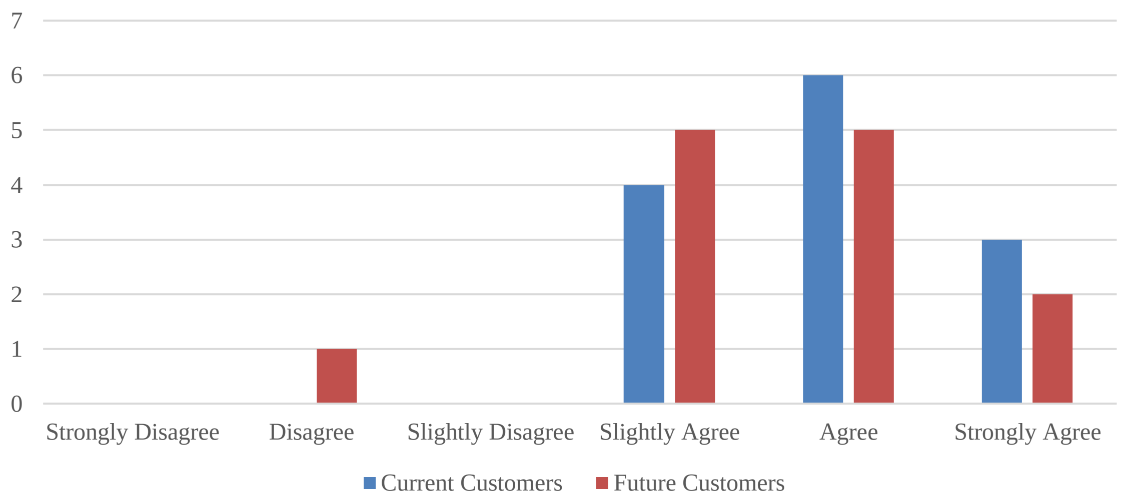

Figure 4.25 Recognition of Innovation Opportunities

The third aspect of the discovery competency is the ability to develop innovation opportunities to satisfy the needs of existing and future customers. Once again, respondents were in agreement that they had the ability to develop innovation opportunities to meet the need of their customers.

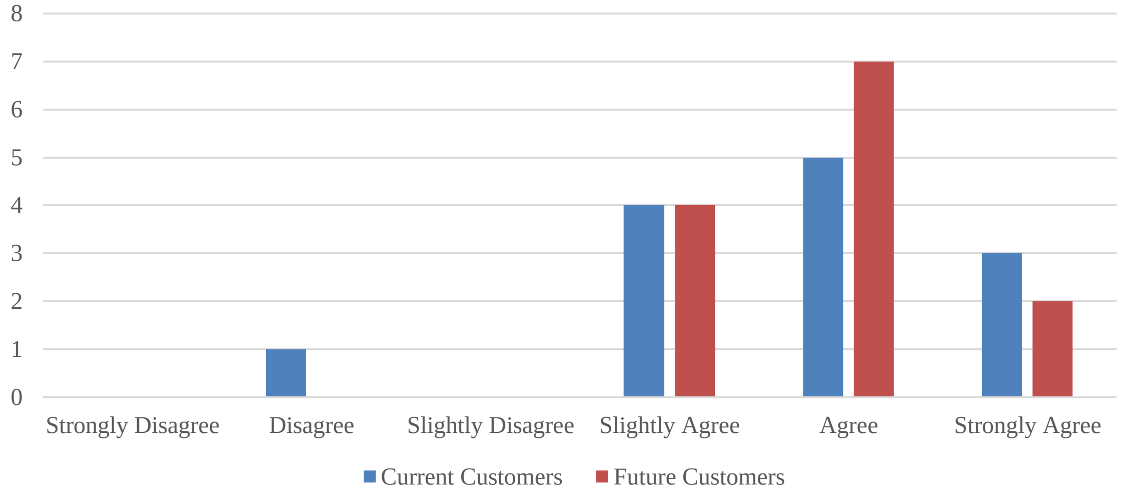

Figure 4.26 Development of Innovation Opportunities

Lastly, the ability to articulate innovation opportunities to meet the needs of both existing and future customers was the final question related to the discovery competency. The results from the respondents were consistent with the data collected from the other three questions related to the discovery competency, where respondents agreed that they had the ability to articulate innovation opportunities for their customers.

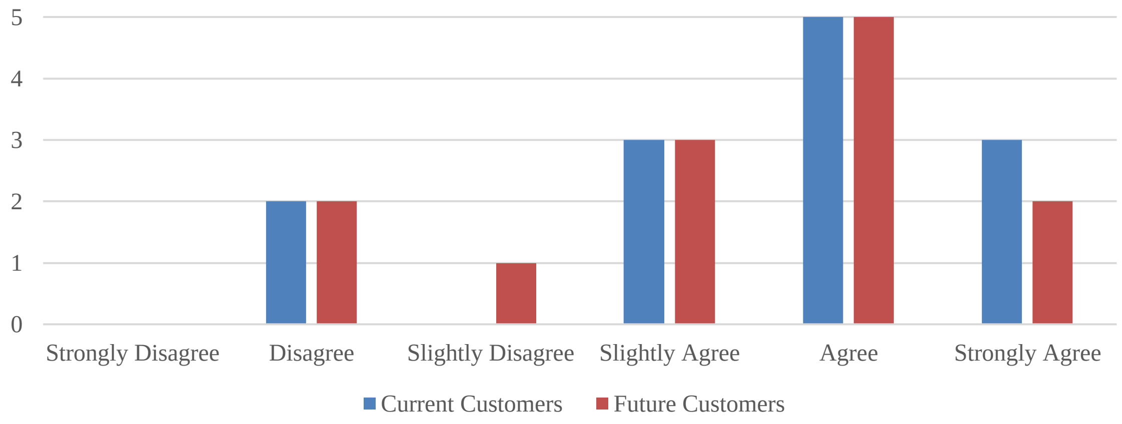

Figure 4.27 Articulation of Innovation Opportunities

Incubation

The incubation capability refers to the ability of an organisations to grow an innovation opportunity into a business proposal that take full advantage of the potential of the innovation. Most of the respondents agreed that their organisations can pursue activities that successfully convert innovation opportunities.

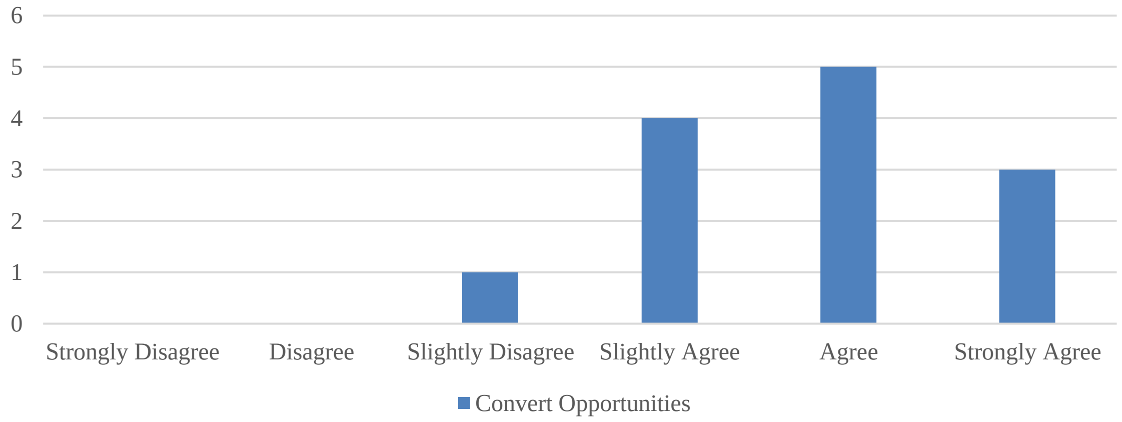

Figure 4.28 Ability to Convert Opportunities

Acceleration and Commercialisation

From the data collected, respondents agree that they can identify and work with both existing and new partners to bring innovations to the market.

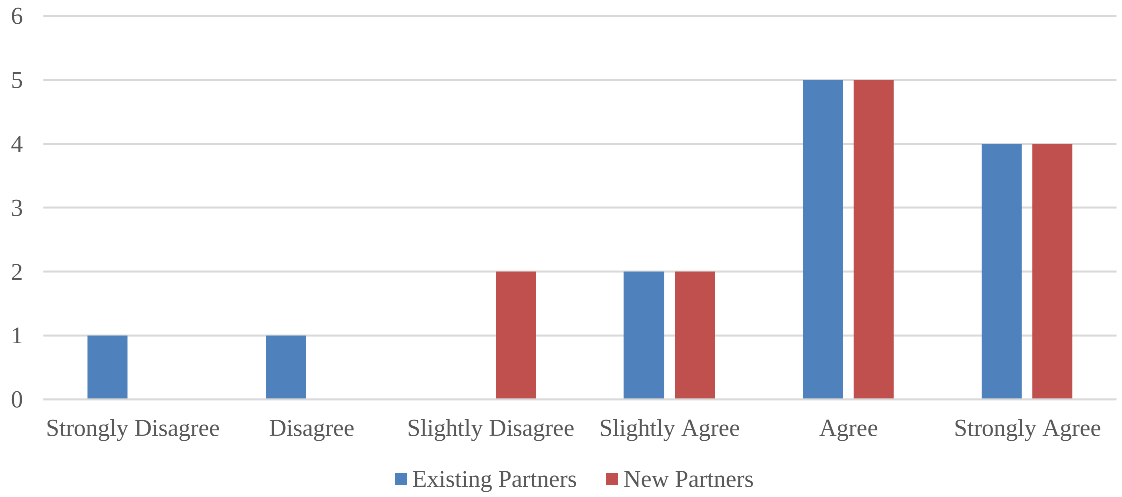

Figure 4.29 Ability to Bring Innovations to Market

4.4.3. Insufficient Resources

Data collected from respondents show that they agree that access to internal finance encourages the finding of innovative solutions to challenges in the finished vehicle logistics industry of South Africa.

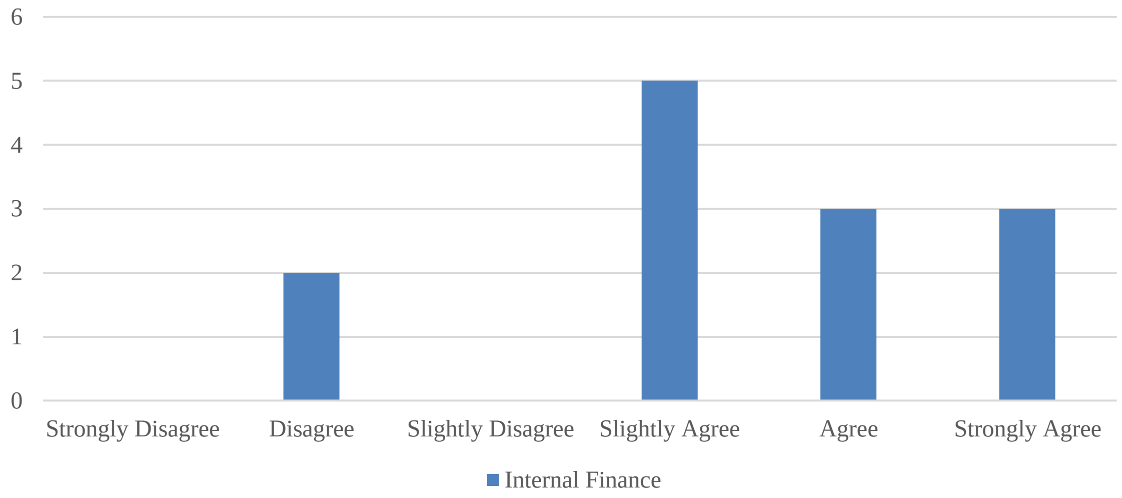

Figure 4.30 Access to Internal Financial Resources

Respondents also mostly agreed that the access to internal skills encourage the finding of innovative solutions to challenges within the finished vehicle logistics industry.

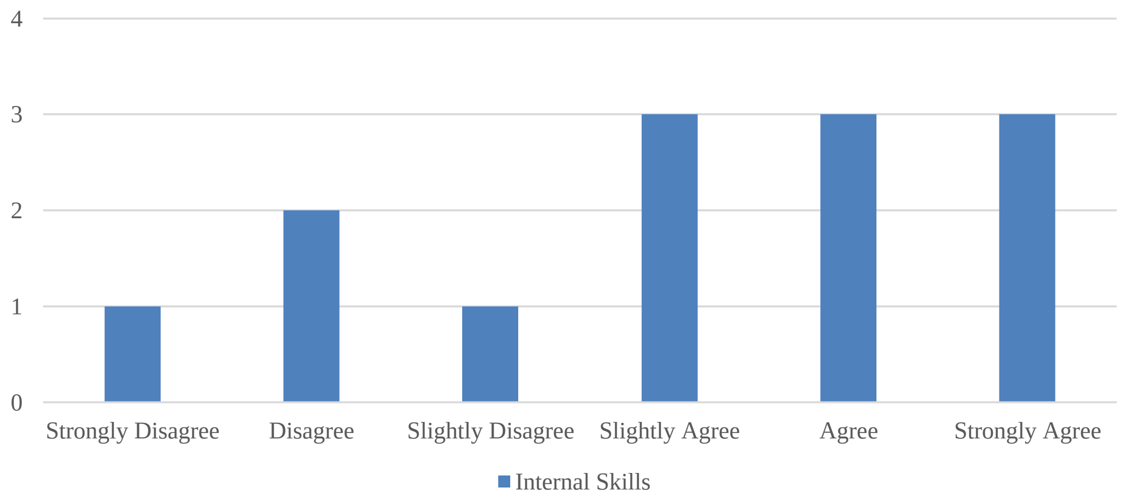

Figure 4.31 Access to Internal Skills

A further distinction in the data set was made to separate respondents by their function within their organisations, and respondents on General Management level only slightly agreed with this statement, whereas respondents from Outbound Logistics agreed more with the statement.

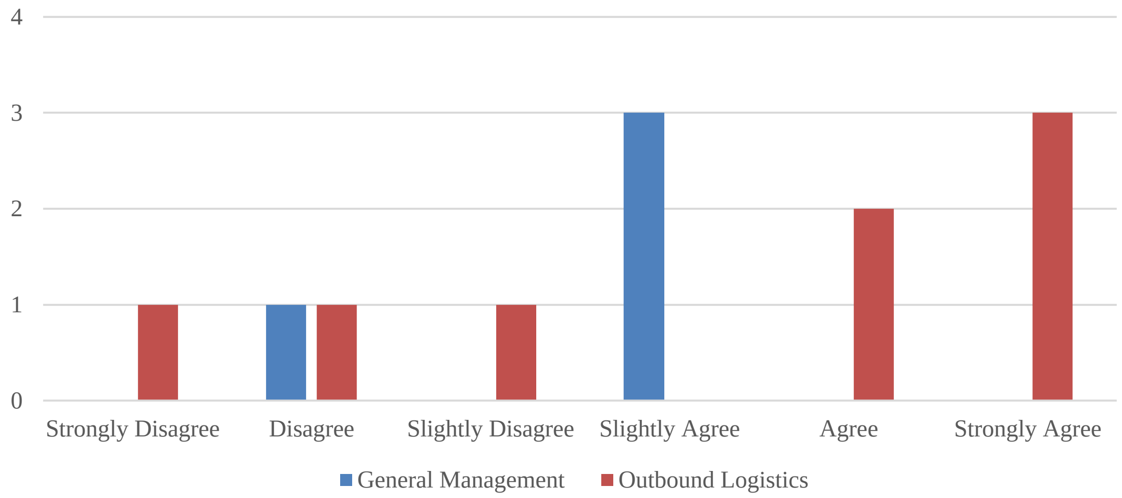

Figure 4.32 Access to Internal Skills - by Function

Access to internal experience encourages the finding of innovative solutions to challenges in the finished vehicle logistics industry is a statement that most respondents agreed with, with most respondent slightly agreeing with this statement.

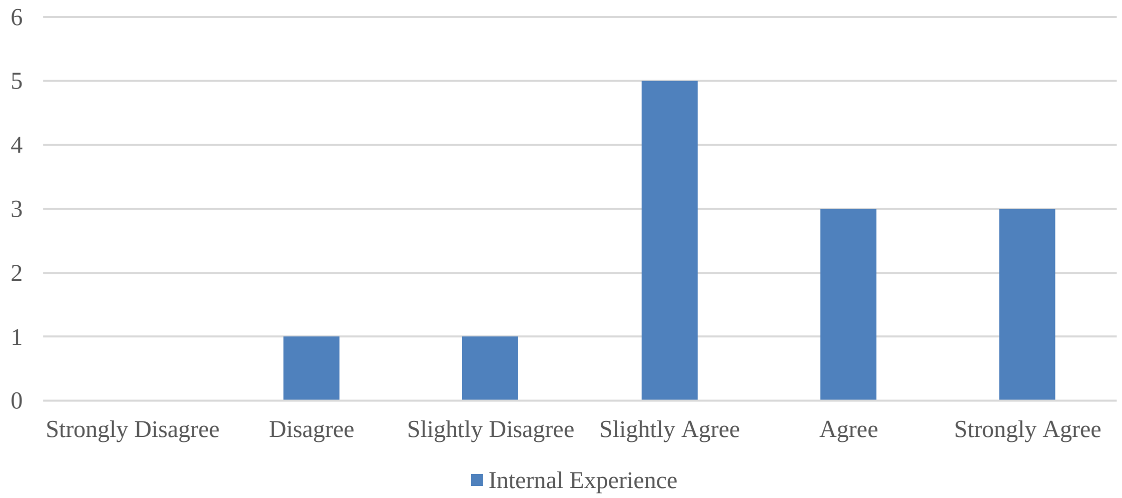

Figure 4.33 Access to Internal Experience

A further distinction on the data in relation to the years of experience of respondents in the industry, show that the respondents with sixteen years or more experience slightly agree that the access to internal experience is valuable in finding innovative solutions.

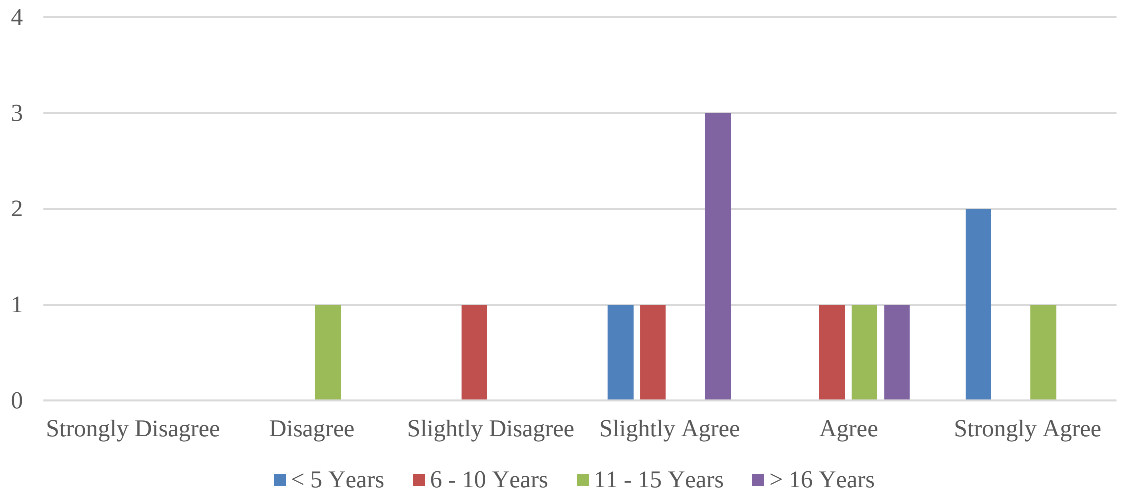

Figure 4.34 Access to Internal Experience - by Experience

Respondents tended to agree more with the statement that the access to information enables the finding of innovative solutions to challenges in finished vehicle logistics.

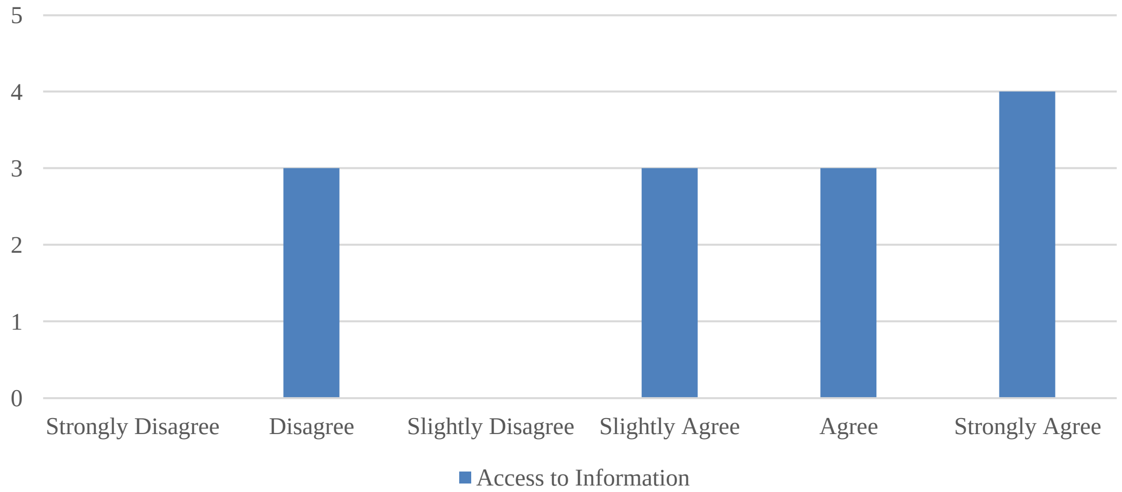

Figure 4.35 Access to Information

Respondents agreed that the access to internal capital resources enables the finding of innovative solutions to challenges.

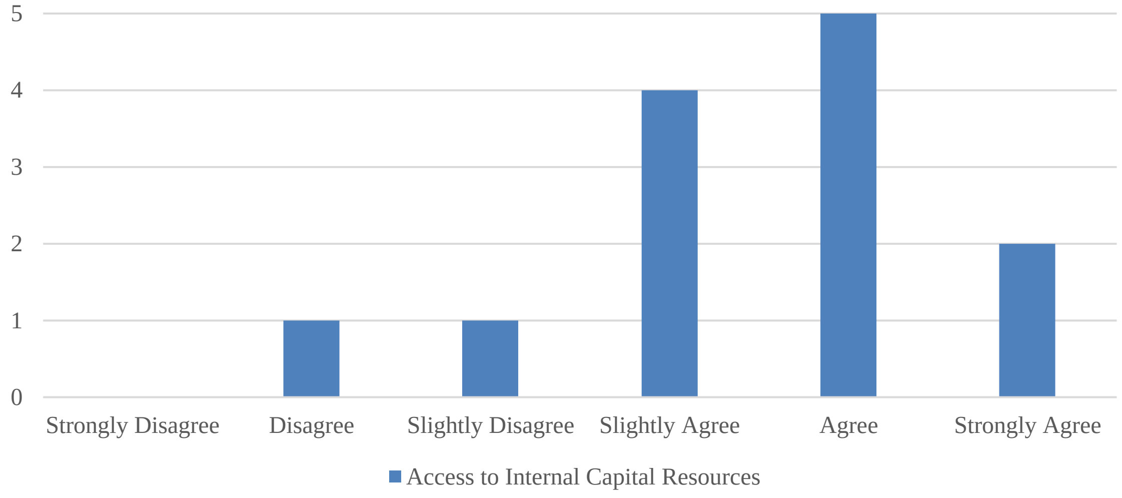

Figure 4.36 Access to Capital Resources

Most of the respondents disagreed that the Key Performance Indicators set in place by vehicle manufacturers provide their logistics service providers with sufficient resources create and bring to market innovative solutions to existing and future challenges.

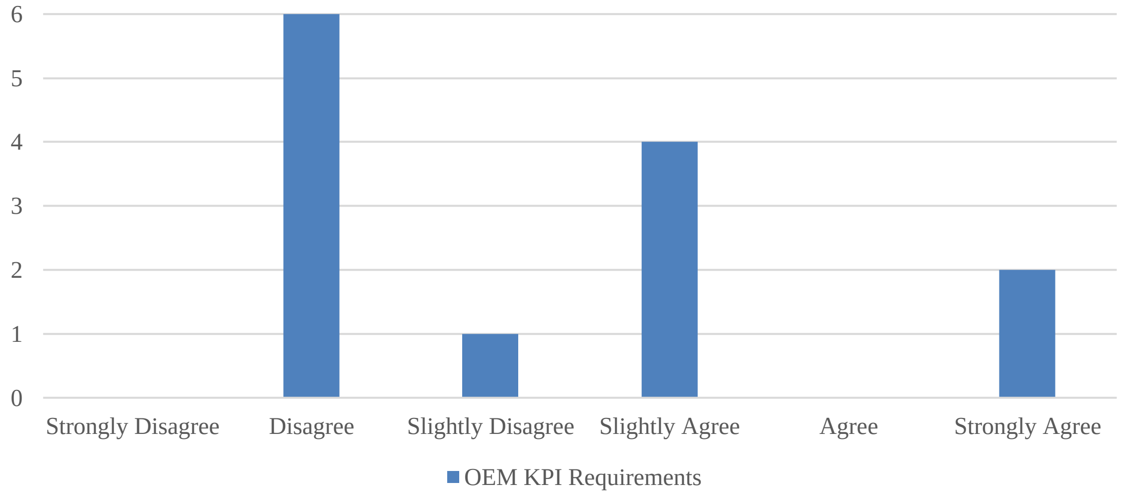

Figure 4.37 KPI Requirements Facilitate Innovation

Most respondents disagreed that the procurement strategies of the vehicle manufacturers provide their logistics service providers with sufficient resources to create and bring to market innovative solutions to challenges face by the finished vehicle logistics industry.

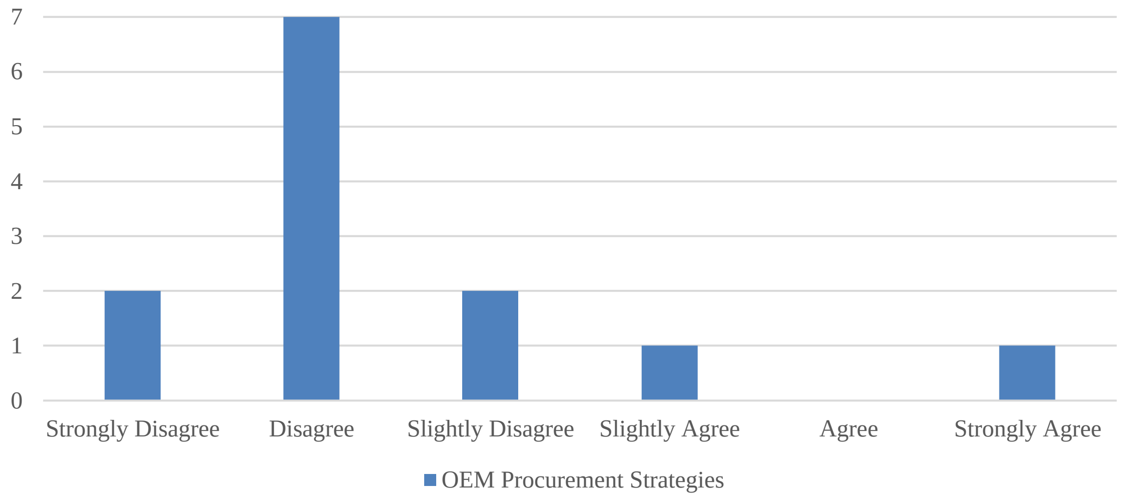

Figure 4.38 Procurement Strategies Facilitate Innovation

4.4.4. Unsupportive Organisational Structures

Respondents mostly agreed, with an emphasis of only slightly agreeing, that the structure of their organisations encourages innovation. There is a moderately positive correlation (Pearson correlation coefficient of 0,479) with the responses received on the ranking of the internal barriers to innovation, where a “restrictive organisational structure” ranked as the second most reason for the slow pace of innovation.

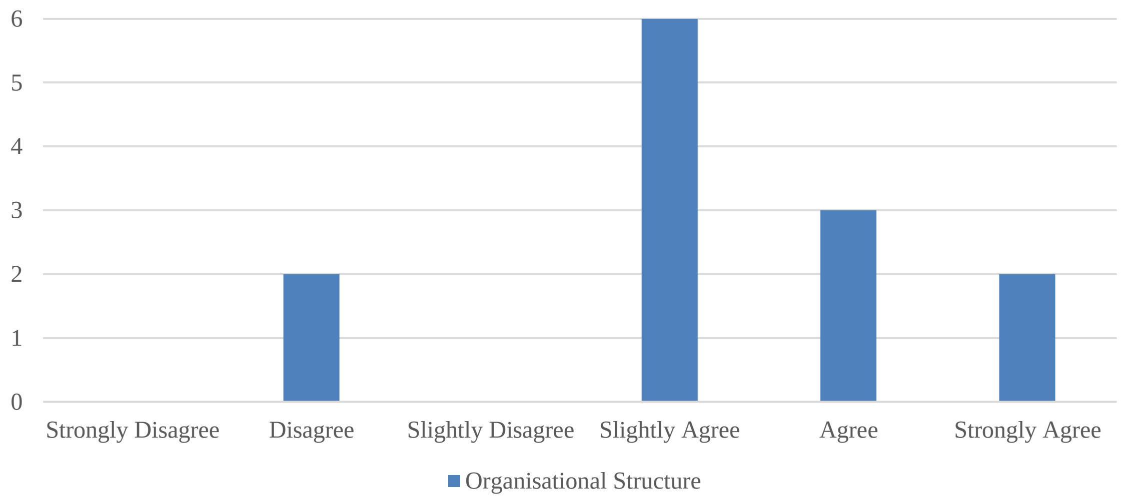

Figure 4.39 Organisational Structure Facilitates Innovation

4.5. Innovation in Finished Vehicle Logistics

Respondents were asked to rank in order of importance what they thought innovations in finished vehicle logistics was.

- Innovations in information technologies
- Innovations in providing new / expanded service offerings
- Innovations in business processes to improve efficiencies
- Innovations in business structures to reduce costs
- Innovations in business structures to satisfy legislatorial requirements
- Innovations in new technologies to satisfy legislatorial requirements

Innovations in business structures to reduce costs ranked as the most important category, followed by processes to improve efficiencies and structures to satisfy legal requirements. The least important was the innovation in new technologies to satisfy legal requirements.

Table 4.5 What is Innovation in Finished Vehicle Logistics

		Ranking (1 = Highest, 6 = Lowest)					
		1	2	3	4	5	6
Category	Information Technologies	3	1	1	3	3	2
	New Service Offerings	2	2	3	2	2	2
	Processes to improve efficiencies	3	3	4	2	1	
	Structures to reduce costs	4	4	1	3		1
	Structures to satisfy legislation		3	4	1	2	3
	Technologies to satisfy legislation	2		1	2	4	4

To determine who the main driving force of innovations in the finished vehicle logistics industry is, three similar questions were constructed. Nine respondents tended to agree that the vehicle manufacturers drive innovation, whereas eleven respondents believed the manufacturers of car carrying equipment were the driving force of innovation. Twelve respondents opined that the logistics service providers were in fact the driving force of innovation in finished vehicle logistics.

Incidentally, the four respondents that disagreed with the statement that the vehicle manufacturers drive innovation, strongly agreed that the logistics service providers drive innovation in the finished vehicle logistics industry. The inverse applies to the one respondent that disagreed that logistics service providers drive innovation, opined that the vehicle manufacturers drive innovation in the industry.

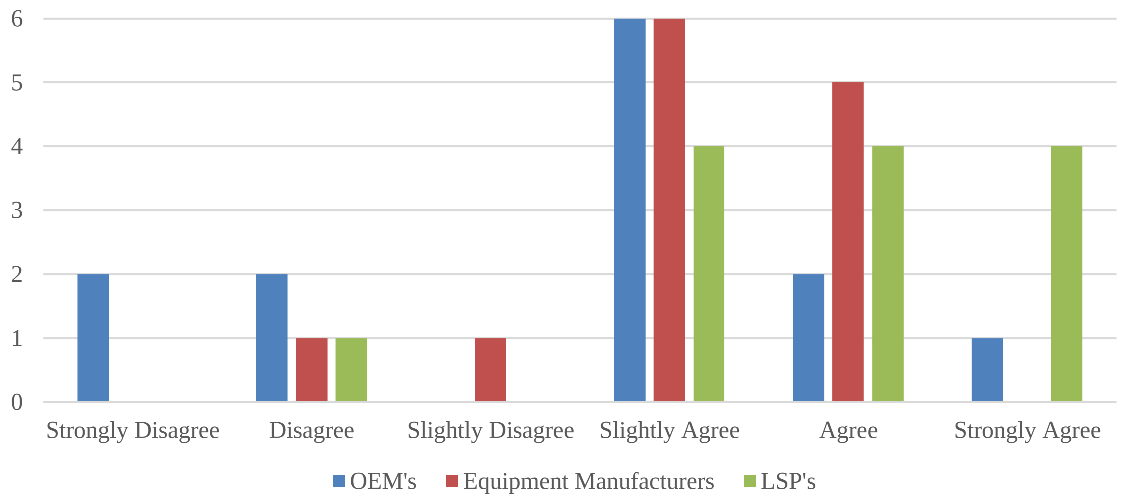

Figure 4.40 Who is the driving force of Innovation

Finally, respondents were requested to rank twelve challenges faced by stakeholders in finished vehicle logistics, on where they believe innovation is most needed. These challenges are:

- Reduce vehicle dwell times in yard, waiting for upliftment
- Improve car carrier loading velocity in yard
- Improve car carrier trip velocity in returning for the next load
- Improve visibility in the supply chain
- Improve agility by logistics service providers in responding to operational changes
- Improve utilisation of car carriers, in terms of load size
- Improve productivity of car carriers, in term of less empty kilometres
- Improve reliability in service
- Reduce damage ratios
- Increase profitability
- Greater focus on environmental issues, i.e. CO2 emissions, fuel consumption, etc.
- Greater focus on social issues, i.e. B-BBEE, small enterprise development, etc.

Responses were analysed using descriptive statistics, determining the mean and standard deviation. The challenges were then ranked according to their mean, with the highest-ranking challenge needing innovative solutions to improve the productivity to car carriers in terms of reducing empty kilometres.

Table 4.6 Innovative Solutions Needed in Finished Vehicle Logistics

	Highest Score	Frequency	Mean	Std Deviation	Rank
Improve Utilisation	1	4	3.85	2.824	1
Improve Productivity	2	0	4.77	2.920	2
Increase Profitability	1	4	4.77	3.789	2
Reduce Damage Ratios	1	1	5.08	2.783	4
Improve Supply Chain Visibility	1	4	5.31	3.966	5
Improve Agility	1	1	5.69	3.545	6
Improve Reliability	1	1	6.54	3.455	7
Reduce Vehicle Dwell	3	2	6.85	2.734	8
Improve Trip Velocity	3	1	7.15	2.115	9
Improve Loading Velocity	4	2	7.23	2.127	10
Environmental Issues	2	2	8.23	3.563	11
Social Issues	9	2	11.23	1.166	12

4.6. Summary

Using descriptive statistics and correlations, the data received from respondents was collated and analysed with a view of answering the research questions of what the barriers are to, and who the drivers are of, innovations in the South African finished vehicle logistics industry. Using the framework developed by Sandberg and Aarikka-Stenroos (2014) as the basis of this study, the results from the data analysis shows that most of the categories of internal and external barriers are applicable to the finished vehicle logistics industry, others are not.

5 CHAPTER FIVE

Discussion

5.1. Introduction

The data collated from a questionnaire circulated to the logistics service providers currently operating in the finished vehicle logistics industry in South Africa, was analysed using descriptive statistics and several findings were made. These findings are discussed in this chapter in conjunction with literature-based data sources. The findings have been applied to the framework developed by Sandberg and Aarikka-Stenroos (2014) to determine whether the barriers to innovation in their research is applicable to the finished vehicle logistics industry in South Africa. Firstly, an understanding is developed to what innovation means in terms of finished vehicle logistics, and then what innovations are needed to the challenges currently facing the industry.

Secondly, based on the challenges facing the industry, along with the understanding of what innovation means in finished vehicle logistics, the findings are applied to the framework of barriers to innovation. The barriers applicable to the finished vehicle logistics industry is highlighted and can form the basis of future research in this industry to determine the importance and impact of the barriers on innovation.

5.2. Innovations and Challenges

Logistics service providers are being put under increasing pressure to develop innovative solutions, and customised service offerings, to counteract the effects of sustaining efficient service levels at marginalised costs (Marchet et al., 2017). European studies have shown that inefficiencies are found internally within logistics service providers, and can be improved upon within the structures of the organisation (Lim and Jones, 2017). These studies also ring true in the South African finished vehicle logistics industry where inefficiencies such empty kilometres, uneconomical loads, loading and trip velocities, not only add additional cost, but also provide a smaller base for cost recovery.

Table 4.5 shows that innovations in business structures to reduce costs ranked as the most important outcome of innovation in finished vehicle logistics. This is followed by innovations in business processes to improve efficiencies. Finished vehicle logistics service providers are searching for innovative solutions to reduce overall logistics costs and improve operational efficiencies.

There are several challenges facing the finished vehicle logistics industry in South Africa, respondents were requested to rank the following twelve challenges in order of importance, for which innovative solutions are needed for:

- Reduce vehicle dwell times in yard, waiting for upliftment
- Improve car carrier loading velocity in yard
- Improve car carrier trip velocity in returning for the next load
- Improve visibility in the supply chain to aid decision making
- Improve agility by logistics service providers in responding to operational changes
- Improve utilisation of car carriers, in terms of load size
- Improve productivity of car carriers, in terms of less empty kilometres
- Improve reliability in service
- Reduce damage ratios
- Increase profitability
- Greater focus on environmental issues, i.e. CO_2 emissions, fuel consumption, etc.
- Greater focus on social issues, i.e. B-BBEE, small enterprise development, etc.

Table 4.6 showed that the top three challenges facing the finished vehicle logistics industry in South Africa are:

- Improve utilisation of car carriers, in terms of load size
- Improve productivity of car carriers, in terms of less empty kilometres
- Increase profitability

All three of these challenges or inefficiencies are found internally within logistics service providers and can be improved upon within the structures of the organisation but requires the support from external stakeholders.

5.3. External Barriers to Innovation

5.3.1. Resistance or Lack of Support from Stakeholders

Customer Resistance

Customers have the ability to either slow down the pace of innovation, or reject innovations regardless of the potential benefits that innovation holds for them (Talke and Heidenreich, 2014). Innovation has been discussed by many industry leaders at numerous finished vehicle logistics conferences held in North America, Europe and across Asia, where they have blamed the slow pace of innovation on the demands of vehicle manufacturers for lower tariffs (Hogg, 2015). Lower tariffs reduce the revenue of logistics service providers to such an extent that they become reluctant to not only invest in innovations, but also in new innovative equipment. The respondents to this research project overwhelmingly indicated that when vehicle manufacturers choose a new logistics service provider the most important aspect are either the lowest price or most competitive price (Table 4.1 and Table 4.2). Innovative solutions feature as the least important factor for vehicle manufacturers when choosing a logistics service provider in South Africa. This feedback is consistent with the opinions of industry leaders in the North American, European and Asian markets.

Dodgson (2014) determined that collaboration is a prerequisite for innovation, through a shared commitment towards a common goal. This research has shown that respondents only slightly agreed with the statement that vehicle manufacturers collaborate with their logistics service providers to encourage innovation (Figure 4.6). It can thus be deduced that collaboration between vehicle manufacturers and their logistics service providers do exist, but only a limited level of collaboration. This limited level of collaboration can be associated to the lack of understanding of what collaboration is and what it involves as discussed by (Dodgson, 2014). Another consideration could be that vehicle manufacturers cannot see the advantages that innovations in finished vehicle logistics would bring to their own organisations, which is evident in the lack of collaboration between vehicle manufacturers (Figure 4.7).

One of the biggest problems facing the finished vehicle logistics industry is the utilisation of car carriers, or the number of vehicles carrier per load, closely followed by the productivity of car carriers, in other words the number of empty kilometres travelled (Table 4.6). Both these issues are prevalent for car dealerships located in remote and rural locations. These towns only have a handful of car dealerships from rival vehicle manufacturers, that receive a limited number of deliveries for a limited number of vehicles. Quite often these dealerships receive their deliveries from rival logistics service providers. Collaboration between vehicle manufacturers, or even logistics service providers could improve both the utilisation of car carriers, and reduce the number of empty kilometres by combining, and ensuring more frequent, deliveries to these dealerships.

It can then be conclusively stated that customer resistance as a barrier to innovation (Sandberg and Aarikka-Stenroos, 2014), is also a barrier to innovation in the finished vehicle logistics industry in South Africa.

Unsupportive Government

The importance of logistics networks in emerging economies cannot be underestimated. Through the creation of policies, governments can encourage innovation (Hasnan et al., 2014), and poor policies can slow down the pace of innovation (Zanello et al., 2016). Even though the South African government does not control the logistics networks in South Africa, it does implement certain regulations and standards, to ensure compliance to its regulations, preservation of the road infrastructure and manage the safety of all road users. Sometimes these regulations, laws and standards can hinder or fail to support innovations within the logistics industry.

Respondents from the logistics service providers in the finished vehicle logistics industry overwhelmingly agreed that these actions hinder innovations in addressing the challenges facing the industry (Figure 4.9). According the data received from the industry, the greatest challenge facing the industry is the utilisation of equipment (Table 4.6) and that the current legislation in South Africa inhibits both the load size and load configuration (Table 4.3). Load configuration refers to the type of vehicle in each loading position on a car carrying truck, the direction it faces, the angle and height that the deck is adjusted to, to maximise the utilisation of that truck.

Changes in the new market for new vehicles has seen a shift in preference from smaller and more compact vehicles to larger off-road inspired vehicles. This change in preference has had an impact on the utilisation of car carrying equipment as less vehicles can now be loaded on to a truck, without the necessary adjustment in tariff to compensate for the loss in payload. Payloads can be maximised to improve the utilisation of the equipment, but current legislation is explicit on the maximum allowable length and height of car carrying trucks. These restrictions have a direct impact on the allowable load size and load configuration, which in turn results in an increase in overall logistics cost.

It can be concluded that an unsupportive government is a barrier to innovation in finished vehicle logistics, as the actions taken by government in terms of regulations, laws and standards have a direct impact on the innovations and operations of logistics service providers.

Paucity of External Finance

Car carrying equipment is specialised, it is expensive, and its economic life must be extended as long as possible. The fleet composition of a logistics service provider in finished vehicle logistics can be considered a competitive advantage over rivals, especially if their fleet is newer and more innovative than existing fleet operated by rivals. Because of the specialised nature of this equipment, it makes it difficult for external investors to invest in the business, as this equipment cannot be used as collateral (Jones-Evans, 2015). The return on investment for any innovation in finished vehicle logistics may be difficult to quantify (Mazzucato, 2013), and some have the increased risk that they might not be commercialised, which increases the risk of finance, and reduces the willingness of financiers to invest. Respondents from the logistics service providers who operate in the South African market have stated that they find it challenging to obtain external finance for innovations (Figure 4.10 and Figure 4.11). The difficulty in obtaining external finance or investment for innovation by logistics service providers, is indicative that the paucity of external finance is also a barrier to innovation in the finished vehicle logistics industry in South Africa.

Rivalry

Strategically it is important for rivals to distinguish themselves from their competitors by creating a competitive advantage (Altuntaş et al., 2013). Rivalry also has the ability to intensify innovation as rivals attempt to create their competitive advantage, or abate innovation as rivalry devalues the value of innovation (Qian and Wang, 2017). Rivals that collaborate by pooling together their knowledge and resources, could encourage innovation (DeBresson and Amesse, 1991). The sharing of knowledge is known to result in effective and continuous innovation (De Faria et al., 2010). There are yearly finished vehicle logistics conferences held across North America, Europe and Asia, where role players in finished vehicle logistics come together for presentations on the innovations taking place that could have an impact on the industry. At these same conferences, the challenges facing the industry, and their possible solutions are discussed. Respondents from the South African finished vehicle logistics industry are unanimous that there is no formal platform for role players to discuss current and future innovations (Figure 4.13). They also overwhelmingly agreed that the platform to discuss challenges in the finished vehicle logistics industry is in desperate need of attention (Figure 4.14). There is however a closed supply chain working group in the National Association of Automobile Manufacturers of South Africa (NAAMSA), which excludes logistics service providers. The lack of a formal platform for logistics service providers to discuss and present innovations to common challenges in the finished vehicle logistics industry makes it difficult for rivals to collaborate their skills and resources, and thus it is no surprise to find that the majority of respondents indicated that there is no collaboration between rivals (Figure 4.12). Rivalry is thus a barrier to innovation in the finished vehicle logistics industry in South Africa.

5.3.2. Restrictive Macro Environment

Technological Turbulence

Turbulent environments create uncertainty, and also creates the platform for organisations to innovate in response to this uncertainty (Preißner et al., 2017). Technological turbulence also makes it difficult for organisations to commit to a particular technology out of fear of the technology becoming obsolete or irrelevant (Sandberg and Aarikka-Stenroos, 2014). The advancements made in robotics, radar, LIDAR (Light Detection and Ranging) and autonomous driving technologies are slowly filtering through to car carrying equipment. Logistics service providers thus have choice to invest in new car carrying equipment featuring the most current and up to date technologies, or they can attempt to replicate some of the new technologies in their existing fleet, or they can wait for new car carrying equipment. Technological turbulence is filtering in to car carrying equipment and is making it increasingly more difficult for logistics service providers to commit to a particular technology (Figure 4.15). Additionally, continuous changes in new vehicles in terms of design and technological innovations, is making it more difficult for logistics service providers to invest in new and expensive innovative equipment (Figure 4.16). The adoption of autonomous driving, and reliance on the Internet of Things will further complicate the finished vehicle logistics industry in the future, and thus technological turbulence is definitely a barrier to innovation in finished vehicle logistics as logistics service providers struggle to commit to a particular technology on a long-term asset.

Inappropriate Infrastructure

The manifestation of innovation for logistics service providers lies in the investment in new capital equipment and technological advancements in infrastructure (Wagner, 2008). Finished vehicle logistics service providers are reliant on not only the road network, but also the loading facilities and offloading facilities. Logistics service providers in finished vehicle logistics has very limited control over any of the infrastructure it uses, unless they are loading or offloading in a storage facility designed, maintained and operated by themselves. Offloading at dealerships become even more problematic, especially in built up areas where space is limited, and traffic is heavy.

Respondents from the finished vehicle logistics industry mostly agreed with the statements that the design and location of the existing infrastructure does not inhibit their ability to develop operational innovations (Figure 4.17, Figure 4.18, Figure 4.19, Figure 4.20, Figure 4.21, and Figure 4.22). There is also an agreement among respondents that there is no reliable and cost-effective alternative to long-haul road transportation between major centres. There has been significant investment by Transnet Freight Rail in the rolling stock to transport new cars by rail, but the rail service is limited to transportation between KwaZulu-Natal and Gauteng, and between the Eastern Cape and Gauteng. Historically there was short sea shipments between Durban and Cape Town, with stops at East London and Port Elizabeth to pick up and drop off vehicle along the coast for further transportation by road. The existing infrastructure, is an opportunity for innovation and is not relevant as a barrier to innovation in the finished vehicle logistics industry of South Africa.

5.4. Internal Barriers to Innovation

5.4.1. Restrictive Mind-set

Employees may resist change as a result of their fear of change, whether this fear is manifested in sources of convenience, habits, incompetence, the loss of power, the loss of confidence, or the fear of the unknown (Ceptureanu, 2015). The fear of failure is a major contributor to human behaviour and success (Christian, 2017), and may be found in motivated employees that exhibit actions that avoid failure. Innovative organisations thus need to create an environment for employees to freely innovate without the fear of failure (Riihiaho, 2016). The fear of change and the fear of failure ranked low as the cause of the slow pace of innovation in the data collated from logistics service providers (Table 4.4).

Organisational attitudes that are risk-averse, may exhibit conservative decision-making practices (Li et al., 2014), which in turn is influenced by the governance of the organisation which cultivates conservative decision-making (Kiparsky et al., 2016). Respondents from the logistics service providers were unanimous in ranking conservative decision-making as the main reason for the slow pace of innovation in the finished vehicle logistics industry (Table 4.4). Conservative decision-making may be rooted in the external barriers to innovation such as the paucity of external finance, or the lack of support from stakeholders.

A restrictive organisational culture is characterised by formalised routines, specialised division of labour, efficiency and process orientation, and no levels of autonomy or initiative (Karo and Kattel, 2015). Restrictive organisational cultures of hierarchical bureaucracy do no innovate at the same pace as organisations with a culture of collaboration and trust (Stephen, 2015). Incidentally, a restrictive organisational culture was ranked as the second most important cause for the slow pace of innovation in the finished vehicle logistics industry (Table 4.4).

The logistics service providers are aware that slow pace of innovation in the industry can be attributed to their organisational structure and support for an innovative culture and is most definitely a barrier to innovation in finished vehicle logistics.

5.4.2. Lack of Competencies

Discovery

The discovery capability includes activities that generates, identifies, explains and communicates innovation opportunities (O'Connor and DeMartino, 2006). Innovation is thus an organisations' response to adapting to the changing needs of their customers, the first source of innovation discovery (Nicholas et al., 2015). The needs from vehicle manufacturers for logistics service providers are fairly constant, and that is to deliver their vehicles timeously, to the correct delivery site, in perfect condition. However, because of the fierce competition between motor manufacturers, there has been increased pressure on logistics service providers to deliver new vehicles to dealership in shortened window period, thus improved service levels at the expense of efficiency and increased cost. Vehicle manufacturers also require high levels of agility from their logistics service providers to respond to period of peak demand, even if it means that the capacity required to become agile is underutilised for other, longer periods of low demand.

These are the areas where logistics service providers are required to develop innovative operational solutions to satisfy the needs of not only current, but also future customers. Most logistics service providers indicated that they are able to create (Figure 4.24), recognise (Figure 4.25), develop (Figure 4.26), and articulate (Figure 4.27) innovation opportunities to meet the need of current customers. This feedback seems to be in contradiction with the conservative decision-making, and restrictive organisational culture slowing down the pace of innovation in the finished vehicle logistics industry. However, organisations that exhibit conservative decision-making and a restrictive organisational culture, sacrifice innovation for efficiency. As such it can be inferred that logistics service providers can continuously adapt and innovate to customer needs, but do not have the required structures in place to support radical or ground-breaking innovations.

Incubation

The incubation of an innovation is the evolution of an innovation into a viable business proposition, and is crucial at the early stages of an innovation when the organisation is still experimenting with various concepts (O'Connor, 2008). The success of incubation lies in the organisations' network for support, and the sharing of resources and finances (Zhou et al., 2017). Logistics service providers agree that they can pursue activities that convert opportunities into business proposals, that effectively takes advantage of an innovation's potential (Figure 4.28).

Acceleration and Commercialisation

An innovation that has shown potential to be commercialised is refined and grown to the point where it becomes part of the fabric of that organisations (O'Connor, 2008). Acceleration and commercialisation requires a culture of urgency that is responsive to changes in the market, and a supportive leadership structure that allows for autonomous decision-making (O'Connor, 2008). The data collated from the current logistics service providers in the finished vehicle logistics industry indicate the ability to accelerate and commercialise innovations (Figure 4.29). This feedback is in contradiction with respondents ranking a restrictive organisational culture as the second most important reason for the slow pace of innovation in the finished vehicle logistics industry.

The lack of competencies in terms of discovery, incubation and commercialisation are not barriers to innovation in the finished vehicle logistics industry in South Africa.

5.4.3. Insufficient Resources

The greatest concern for an organisation is whether they have sufficient internal resources to support innovations (Sandberg and Aarikka-Stenroos, 2014). The lack of internal resources should not only be seen as a barrier to innovation, as it can be the driving force of innovation to overcome the shortcomings of the available internal resources (Story et al., 2014). Responses received indicated that the access to internal resource encourage the finding of innovative solutions to challenges in the finished vehicle logistics industry. These internal resources are internal finance (Figure 4.30), internal skills (Figure 4.31 and Figure 4.32), internal experience

(Figure 4.33 and Figure 4.34), access to information (Figure 4.35) and internal capital resources (Figure 4.36).

Internal finance overcomes the barrier of the paucity of external finance, which is a valid external barrier to innovation in finished vehicle logistics. The internal skills, and internal experience available to an organisation facilitates the creation of innovative solutions based on past learnings and skills learnt over time. Access to information enables decision making and can provide data to facilitate the finding of innovative solutions to challenges in the finished vehicle logistics industry.

Figure 4.37 shows that the key performance indicators put in place by vehicle manufacturers do no provide the logistics service providers with sufficient resources to create and bring to market innovative solutions to existing and future challenges. The key performance indicators used to measure the performance of logistics service providers have become more restrictive over time and inhibits the freedom of logistics service providers to freely innovate if there is no benefit to be passed on to the vehicle manufacturer. Service level agreements between vehicle manufacturers and their logistics service providers are often seen as dictatorial and not collaborative in nature.

Figure 4.38 shows that the procurement strategies of the vehicle manufacturers do not provide the logistics service providers with sufficient resources to create and bring to market innovative solutions to existing and future challenges. The procurement strategies employed by vehicle manufacturers is centred on the lowest price, then followed by service and innovation (Table 4.1). This commoditisation of logistics service providers is reducing the internal financial resources to create and bring to the market innovative solutions to the challenges facing the industry.

Insufficient resources are currently not a barrier to innovation within the finished vehicle logistics industry, but with the austere procurement strategies and key performance measurement tools, will become more relevant as a barrier to innovation.

5.4.4. Unsupportive Organisational Structures

In their research, Sandberg and Aarikka-Stenroos (2014) found that an unsupportive organisational structure in one of the main internal barriers in large organisations. An unsupportive organisational structure can lead to weaknesses in the innovation capability of an organisation, which in turn would negatively affect the performance of innovation (Slater et al., 2014). An unsupportive structure, coupled with restrictive mind-set, has a negative impact on the exploitation of innovations (Kiparsky et al., 2016) (Das et al., 2018). Figure 4.39 indicates that the majority of respondents slightly agreed with the statement that the structure of their organisations encourages innovation. However, it is tabulated in Table 4.4 that a restrictive mind-set and conservative decision-making is holding back the pace of innovation in the finished vehicle logistics industry. The contradiction in opinions would indicate that an unsupportive organisational structure is still a barrier to innovation within the finished vehicle logistics industry of South Africa.

5.5. Summary

The framework developed to identify the barriers to innovation was discussed using the findings from a data collection and analysis process, to determine the barriers to innovation in the finished vehicle logistics industry in South Africa. The main reasons for the slow pace of innovation was highlighted, along with the innovations needed to address the challenges currently facing the industry. It was found that inappropriate infrastructure and the lack of competencies are not relevant barriers to the finished vehicle logistics industry, and insufficient resources will become more relevant as a barrier to innovation as austere service level agreements erode available resources.

6 CHAPTER SIX

Conclusions and Recommendations

6.1. Introduction

This chapter draws a conclusion of the objectives of the research with the findings of the research. The objective of this research was to identify the barriers to innovation that are relevant to the finished vehicle logistics industry. The findings of this research have implications that could affect the decision-making or strategy development of role-players in the industry. It also identifies the limitations of this study and how these limitations can be overcome in future research projects.

6.2. Conclusion

The objective of this research was to determine the barriers to innovation that are relevant to the finished vehicle logistics industry in South Africa. Using an existing framework of barriers to innovation as the basis of this research, the findings concluded with the identification of relevant external and internal barriers to innovations applicable to the finished vehicle logistics industry of South Africa. A secondary objective was to link the key challenges facing the industry, or drivers of the need for innovation, to the identified barriers to innovation. The findings of the research were able to link certain challenges to the barriers inhibiting the pace of innovation. This is particularly true where the cause of the challenge is also the barrier holding back the progress of innovation.

6.3. Implications of this Research

This research work has provided an indication of the external and internal barriers affecting innovation in the finished vehicle logistics industry in South Africa. Now that the barriers have been identified, the stakeholders can develop processes and strategies to overcome these barriers to expedite the pace of innovation in the industry.

6.4. Limitations of the Study

By far the largest limitation to this study was the reluctance from the vehicle manufacturers to participate in the research. Most of the motor manufacturers refused instantaneously, and the others after internal consultations, declined further participation. Of the three motor manufacturers that initially agreed to participate in the research, only one organisation responded. Such a small number of responses were not reliable enough to be included in the findings. The reluctance of motor manufacturers to participate in this research could be indicative of their reluctance to collaborate with logistics service providers to overcome the challenges facing the industry. This is evident in the austere, and almost dictatorial service level agreements between vehicle manufacturers and logistics service providers.

The initial purpose was to form a holistic view on the barriers to innovation in finished vehicle logistics from all stakeholders involved in the industry. The views from vehicle manufacturers, suppliers of car carrying equipment and logistics service providers could then be correlated to see if all stakeholders agree with the barriers holding back innovation. Unfortunately, the reluctance from vehicle manufacturers, and the failure of the supplier of car carrying equipment to respond to the research questionnaire, has resulted in findings that are biased towards the views of logistics service providers.

6.5. Recommendations to solve the research problem

The findings from this research project has identified what the barriers to innovation are, as well as what the challenges are that drive innovation in the finished vehicle logistics industry. Many scholars have agreed that most of the barriers to innovation can be overcome through collaboration. The South African finished vehicle logistics industry desperately needs a formalised platform where the role-players in the industry can come together to discuss the challenges facing the industry, and present innovations that can either overcome these challenges, or pose future challenges to the industry. A formalised platform will create the environment for role-players to collaborate and pool together their resources to find innovative solutions to common challenges, with the view of benefitting all.

Internal barriers affecting the mind-set of members within finished vehicle logistics service providers can easily be overcome by creating an organisational culture where members are free to innovate, without a fear of failure or change, and most importantly create a culture that is less restrictive and decision-making less conservative. Often innovations are superseded by the quest for efficiency, especially in organisations that have conservative decision-making processes, or a restrictive culture governed by strict policies and procedures. Radical operational innovations have the ability to not only create the efficiencies required, but also solve many of the challenges hampering the industry.

6.6. Recommendations for Future Studies

The biggest problem encountered when conducting this research was to include the vehicle manufacturers and suppliers of car carrying equipment. This not only limited the sample size, but also the eventual number of respondents, and does not provide a holistic picture of all the challenges facing the industry or identify all the barriers to innovation. The current study thus looked at a homogenous population and sample, working in similar organisations, performing similar functions on managerial levels. A truly representative sample would be a heterogeneous sample comprising respondents from different organisations, in different industries, that still have an interest in finished vehicle logistics, such a motor manufacturers and suppliers of car carrying equipment, who participate in their own industries, but have a vested interest in the finished vehicle logistics industry.

This current study focused on logistics service providers that provide transportation by road only. It is thus also recommended that other logistics service providers also be included in future research, such as the providers of rail, and sea transportation, as well as the logistics companies that manage the storage facilities for vehicle manufacturers. The inclusion of these service providers will provide a better understanding to the relationships and how they affect common barriers to innovation.

The reluctance from vehicle manufacturers to participate in this research was problematic, and questioning this phenomenon showed that vehicle manufacturers do not participate in research projects outside of their own organisation. This phenomenon may be problematic for future research projects, unless a formal platform, inclusive of all role-players, is created to discuss challenges and innovations. Using this platform, future research projects may be more inclusive of all the relevant stake-holders. It is also recommended that future research can focus on the root cause of the identified barriers to innovation, as the reason for some of these barriers aren't immediately visible.

6.7. Summary

The research project was to determine what barriers to innovation are relevant to the finished vehicle logistics industry in South Africa. The data collected has identified the barriers that are relevant to the finished vehicle logistics industry in South Africa, but from a logistics service provider point of view. The original research question has been partially answered, and only because there was no input from two significant role-players in the finished vehicle logistics industry. These role-players could have had differing influences on the barriers identified, or opinions on the relevance of other barriers not identified.

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