A management framework to improve the exchange and flow of information in the heavy haulage road freight industry

D Botha
25736426

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Supervisor: Mr JC Coetzee

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Abstract

Information exchange and flow is critical in the supply chain industry. Accurate and timeous exchange of information is needed to make decisions, resolve disputes and to adapt business strategy to changing client needs and wants. The heavy haulage road freight participants of South Africa have been using a standard framework for the exchange and flow of information for a very long time. Whilst companies in the courier and other transport mode industries have improved and applied innovative ways to exchange information, the companies in the road freight industry have been very slow to adapt and improve the manner in which they exchange information. Technology and innovation has seen huge advances of late but still it is not applied to improve the current framework.

Exchanging relevant information with key partners is vital to the success of a company in the heavy haulage road freight industry and could provide a competitive advantage and increased value proposition. The aim of this study is to propose a management framework to improve the exchange and flow of information in the heavy haulage road freight industry.

A literature review was conducted of the current framework used, available technology that has the potential to improve the current framework and the risk as well as laws and regulations governing the exchange and flow of information was assessed. Surveys were developed from the literature review and used as a measuring tool, unstructured interviews were also used to gather information from respondents.

The needs and want of clients must be satisfied by their suppliers, these suppliers must continuously adapt to these changing wants and needs. Information within the heavy haulage road freight industry must be protected, flow at a faster pace, be accurate and reach the intended recipient in good time.

Empirical research was conducted and the results together with the findings in the literature review were used to conclude the study and make recommendations regarding a managerial framework to improve the exchange and flow of information in the heavy haulage road freight industry. Improved information exchange and flow create various benefits.
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LIST OF ABBREVIATIONS
CPK: Cents per kilometer
JSE: Johannesburg stock exchange
KPI: Key performance indicator
MSM: Mobile supply chain management
MRM: Mobile resource management
POD: Proof of delivery
SCM: Supply chain management
CHAPTER 1: NATURE AND SCOPE OF THE STUDY

1.1 Introduction

The supply chain has been the focus of many studies in the past and it continues to be the centre of interest for many researchers and companies alike. Road freight has increased significantly since the 1980’s and has become a popular choice amongst manufacturers, suppliers and distributors etc. because of its flexibility and convenience. The collapse of the rail infrastructure played a big part in the growth of road freight. The objective of all freight transport is to achieve economic efficiency in the movement of goods. Freight transport must be primarily directed at creating conditions that support this objective (Department of Transport, 2015:7-2). Rail freight used to be the preferred method of transport but has steadily declined in recent years. In 2013, 1.53 billion tons of freight were transported by road in South Africa, representing 76% of the total amount of freight, with the balance of freight in the country being transported through ports (13%), by rail (10%), pipelines (1%) and airports (0.02%) (Department of Transport, 2015:7-2). Road is currently the primary mode of transport for various reasons, with rail taking the backseat due to this sector being characterized by significant constraints (Department of Transport, 2015:7-2). Rail and rural road infrastructure has been neglected and/or badly maintained for a couple of decades. This is in part due to the transport sector competing for funding from the fiscus with other government/public sector services and national priorities. Poor infrastructure is also an important factor limiting accessibility in rural areas (Department of Transport, 2015:1-7).

Whilst innovation and technology application has flourished in the courier sector, little has changed in the way heavy haulage shipments are delivered as well as the process used for the exchange and flow of information. Systems and standard operating procedures have remained the same over the years and very little innovation, especially in the flow and exchange of information, has occurred since the huge influx of heavy haulage vehicles on South African roads. It is anticipated that the number of road freight vehicles will rise from 400 000 to more than one million in 2050 (Department of Transport, 2015:1-7). The heavy haulage industry has been very slow to adapt and to use available technology in order to improve the functioning of the
sector in terms of efficiency and productivity, especially in regard to information exchange and flow.

Proof of delivery documents spend a lot of time on vehicles as these vehicles travel across the country (and often the continent) for weeks at a time before they arrive back at their company depot/yard. Documents often get lost, stolen or damaged. This imposes a risk for both consignor and carrier as both their payments are at risk if documents are not in order. Clients can legally withhold payment until a signed & original proof of delivery document is produced. It seems that courier companies have been the only players to successfully explore more innovative and exciting ways to improve the exchange and flow of information within the transport sector. Current paperwork procedures impose a big constraint regarding the flow of information within the industry and the fact that it is not environmentally friendly complicates the matter even further. The industry needs viable change as soon as possible.

Supply chain management has played an increasingly important role in the economy and companies aim to improve this part of the business to gain a competitive advantage and increase organizational performance according to Li et al. (2006:107). Companies may add significant value to their current propositions by improving the efficiency of their supply chains in both the upstream and downstream segments especially in the manner and speed with which information is exchanged. This could benefit a firm’s strategic competitiveness considering the perspective that supply chains compete instead of firms (Christopher, 1999; Cousins and Spekman, 2003).

Supply chain management (SCM) has been considered as the most popular operations strategy for improving organizational competitiveness in the twenty-first century Gunasekaran et al. (2008:549).

This study will center on the downstream segment of the supply chain, more specifically on the flow and exchange of information in the heavy haulage road freight sector. The aim of the study is to propose a new managerial framework that will improve the exchange and flow of information within the said industry, together with the benefits and limitations of such a framework. The general attitude of manufacturing companies and that of transport companies towards such a managerial framework will be assessed. The level of willingness to adopt a more technological and advanced way of doing business will be evaluated and all relevant parties will be approached e.g. owners, managers, drivers and admin staff to name a few. The legality
surrounding the use of electronic documents and the proposed framework for the exchange and flow of information will also be researched.

The aim is to find an African solution for an African problem. It is also important to note that by resolving this issue through the use of technology, a transport company can create value for a consignor and increase its own value proposition in the market.

Innovation and available technology could be applied to the heavy haulage sector in order to improve the exchange and flow of information and thus bring about profound future effects on standard operating procedures in the industry. Efficiency and productivity will be two areas that may benefit hugely from the use of an improved framework to facilitate the exchange and flow of information within the sector. This study aims to create a new managerial framework for this specific reason.

**1.2 Context**

The study will be conducted in the transport industry, more specifically the long-distance portion of the supply chain that relies on road transport and which makes use of heavy haulage vehicles. The focus will be on the use of super link vehicles with a load capacity of thirty-four tons to thirty-eight tons. The aim is to assess the current framework used and to then propose an improved managerial framework in order to eliminate current constraints and enhance the exchange and flow of information in an environmental friendly manner.

The study will be conducted in the greater Gauteng area of South Africa. Manufacturing and any other businesses that utilize super link vehicles to distribute their products with via the current road infrastructure as well as transport companies that own their own fleet of vehicles will form part of the sample population. These two target groups are critical to the exchange and flow of information and a proposed managerial framework will include both of them. The managerial framework will be developed whilst keeping the current South African limitations, constraints and problems in mind.

**1.2.1 The current framework used for the flow and exchange of information**

Myburgh (2016) states that the current framework used for the exchange and flow of information is old fashioned and is the reason for the big delay in the exchange and
flow of information between consignor, consignee, transport supplier, transport broker and any other relevant parties.

There are two situations in which the current framework is used.

- **Where a consignor uses his own vehicle**
  1. A client places an order/load with his preferred transport supplier.
  2. A vehicle is booked with a load and the truck is dispatched to the loading point.
  3. The driver receives a physical proof of delivery document from the client after the cargo is loaded.
  4. The driver delivers the cargo to the delivery address and the consignee signs the paperwork.
  5. The vehicle is dispatched to the next available load with the least possible empty kilometres.
  6. After various deliveries are done the driver returns to the company depot where the documents are handed over to the admin staff.
  7. The admin office invoices each load and the invoices together with the proof of delivery documents are sent to the different clients to reach them before monthly cut of dates.

- **Where the primary consignor uses the vehicle of a secondary transport company (known as transport broking).**
  1. A client places an order/load with his preferred transport supplier.
  2. In the event that this preferred supplier does not have a vehicle available he will hire a vehicle from one of his suppliers; companies often collaborate to increase their service network.
  3. This hired vehicle will load under the name of the primary supplier.
  4. The driver is dispatched and receives a physical proof of delivery document after the cargo is loaded.
  5. The driver delivers the cargo to the delivery address and the client signs the paperwork.
  6. After various deliveries, the vehicle returns to the company depot where the documents are handed over to the admin staff.
  7. The admin office invoices each load and the invoices together with the proof of delivery documents are sent to the different clients to reach them (primary transporter) before their monthly cut off dates.
8. The primary transporter receives the invoices via a courier service or the post office.

9. The secondary transporter's invoices are processed by the primary transporters admin staff and the invoice of the primary transporter together with the signed POD's are sent to the client.

The above-mentioned process is often aggravated by the fact that there are two or more broking companies in the supply chain. All the different companies in this chain must invoice one another before the POD's (which contain all the information) reach the client. Unacceptable delays in information flow and increased security risks are evident when using this process.

Information is needed to make decisions and to justify them. Without information, companies are moving around blindly. People and business want information more readily available and they want it to move at a faster pace. The supply chain is no exception and accurate information is critical to its proper functioning. This study will focus on the information flow between customer and transport supplier and the objective is to develop a management framework to improve the exchange and flow of information in the heavy haulage road freight industry.

Information systems can add great value to the business proposition of a transport supplier and it can provide the client with a competitive advantage in the business environment.

1.2.2 Causal factors

The current framework used for the exchange and flow of information within the heavy haulage road freight industry is slow and it poses many risks to both the consignor and the transport supplier in terms of data protection. Vehicles often travel and work for a whole month without returning to the depot. The result is that the driver accumulates a large amount of paperwork throughout the month and has to keep each individual proof of delivery document safe and in a good condition.

It is very important that the driver take good care of the paperwork as consignors only pay once a signed proof of delivery document is attached to an invoice and sent to reach their office before their cut-off date. If the document or a part of a document is lost (which often happens) then the hauler must try and get a copy from the consignee which is a tedious and frustrating process. The current framework used in the
exchange and flow of information within the heavy haulage road freight industry causes a huge processing bottle neck for administrative staff as they receive normally a large amount of paperwork close to their monthly cutoff date.

Haulers are given a physical proof of delivery document (POD) from the consignor with every single load collection. POD's could stay on a vehicle for a prolonged period of time for various reasons. Vehicles travel all over the country delivering loads and often only return back to the company depot at month end. Information stored on these POD's remain unused in the vehicle. These documents could get lost or damaged which create additional problems in the flow of information. POD's do not flow in on a regular basis throughout the month, the rush by administrative staff to process all of the POD's before month end causes errors and a huge bottle neck. The flow of information is slowed down by the use of the current framework used in the industry.

A POD document usually contains the following information: (See annexure 1.1 as an example)

- Date of collection
- Quantity and description of the goods being transferred.
- Order numbers
- Client account information
- Driver signature
- Acceptance signature
- Endorsements (where any goods are damaged whilst in transit)

1.2.3 Casual factors summarized

Slow movement of proof of delivery documents as these documents remain unused on the vehicles, the time it takes these documents to be processed are too long and delays the flow and exchange of information between haulier and consignor

Data in the form of proof of delivery documents are often lost or badly damaged due to travelling on the vehicle for an extended period of time

Administrative bottlenecks for processing staff occur which lead to errors as all the paperwork for the month is received shortly before month end and has to be processed without delay
Claim and endorsement disputes arise as the consignee may claim for damaged or undelivered goods from the consignor before the haulier has been able to send the relevant data and paperwork to the consignor as the documents are still on the vehicle which result in further delays the dispute resolution process.

As mentioned before, very little prior research has been done on this research topic. Most studies have focused on other modes within the transport industry i.e. air and ocean freight. There are many interesting studies that focus on the exchange and flow of information, specifically by making use of electronic documentation in the ocean freight industry. Courier companies have also been the focal point of many studies.

The flow and exchange of information and the use of electronic documentation in this industry has been successfully adopted and is currently being implemented and used by bigger courier companies. Unfortunately, the road freight industry has not enjoyed the same level of interest from researchers. Some studies however do centre around road freight but was either done in Europe or the United States of America.

1.3 Importance of this study

This study aims to develop an improved managerial framework for the exchange and flow of information within the heavy haulage road freight industry, specifically between consignor and haulier. The research will focus on the greater Gauteng area due to various constraints. Rao et al. (2011:207) explains that the exchange and flow of information is used as a metric to measure supply chain performance and fulfills a vital role in providing the consignor and haulier with a competitive advantage within the business environment.

The current exchange and flow of information framework being used is slow and tedious, furthermore it creates bottlenecks and leads to administrative errors and a excessive frustration. Consignor and haulier may both increase their value proposition in the market by developing a new managerial framework for the exchange and flow of information. Technology to accomplish this goal is currently available, this study aims to provide insight into the legitimacy and legality in the use of such technology. Perceptions of relevant staff members will be clarified and their desire for change will be determined. The dispute resolution process is often delayed due to the slow flow of information exchange and the process is often a frustrating one. The framework will
aim to resolve endorsement claims and disputes within a faster and more efficiently framework.

Other modes of transport i.e. ocean and air freight, have successfully implemented technology to improve their exchange and flow of information. The heavy haulage road freight industry will benefit by developing a new and improved framework for the flow and exchange of information, which will lead to an enhanced efficiency.

1.4 Problem Statement

The focus of this study is to develop a new managerial framework within the heavy haulage road freight industry by implementing more innovative processes and to utilize the available technology to improve the exchange and flow of information. Resulting in the reduction of the current constraints experienced by industry participants. The aim of this study is to investigate current frameworks used in the exchange and flow of information within the heavy haulage road freight industry and propose a managerial framework in order to improve the exchange and flow of information.

The traditional system (although very simplistic and easy to understand) creates numerous problems for both the consignor and carrier.

The consignor needs the documents signed and returned back to him as soon as possible as these documents are required to invoice the consignee. Proof of delivery documents or waybills often double as an invoice from consignor to consignee and payment may only be facilitated once these original documents are returned to the consignor by the hauler. Proof of delivery (POD) documents, with or without endorsements, are essential to facilitate payment between consignor and consignee. These documents serve as proof that the goods were delivered in good order and to the correct consignee. As stated above, vehicles don’t return to their depots very often. These documents remain with the driver on the vehicle and it could take weeks or in certain cases more than a month to reach the consignor. The consignor, more often than not, has to wait an extended period of time for the return of the paperwork which in turn delays payment from its debtors and affects cash flow negatively. Proof of delivery documents are at times lost or misplaced which slows down or halts the process of information exchange and flow. Where this happens the hauler then has to contact the delivery point (consignee) to request a copy of the documents. In turn the
consignee then has to search for that particular delivery’s documents and send them to the hauler. Consignees are not always very helpful in assisting as this takes time and extra effort by their administration staff.

Transporters face much of the same problems as consignors. The transporter requires the original copy, signed and stamped by the consignee, in order to invoice the consignor for the transport service rendered for that particular load. The administration staff of the transport company must make a copy of the original proof of delivery documents, be it either an electronic copy or a physical copy. Most of the bigger transport companies have shifted from a hard copy filing system to an electronic one. The administrative staff creates an invoice for the load done, attaches it to the proof of delivery documents and holds it in an envelope designated for that particular client. Once enough invoices have been compiled the envelope is sent to the client via the post office or a courier company, the latter being a lot more expensive albeit more reliable. Only one envelope is sent a month, the client receives all the different invoices & POD’s of the loads done during the month simultaneously which creates a bottleneck. Once these invoices reach the consignor/client they process the invoices for payment and discuss any queries on loads if necessary. Payment by the consignor to the transporter will only take place thirty days after date of statement, permitting there are no disputes on the paperwork or delivery of these loads. It is once again very clear that the flow of information between consignor, carrier and consignee is labour intensive, tedious and slow.

Payment from debtors may take as much as two months after the load has been done and this can directly be attributed to the slow exchange and flow of information between the relevant parties. South African law states that fuel may only be purchased on a current account basis resulting in a negative cashflow for the hauler. In other words, the fuel for the load is paid in the current month while the payment from the debtor is only received the following month or even later (depending on the speed of information exchange and flow). If the documents are lost it creates an even bigger administrative problem for the hauler. These constraints place a huge amount of pressure on the cash flow of the transport company. Stefansson and Woxenius (2007:1) state that most haulers are small and trading at small profit margins. A large amount of working capital is needed to cover running expenses and to keep the
company operating. The cashflow of the bulk of the smaller hauler companies suffer because of these constraints.

The speed of information exchange and flow is not up to standard and very slow, this causes additional problems i.e.:

- Delayed payments;
- Decreased cash flow;
- Administrative bottlenecks and increased admin errors;
- Delayed response to endorsements and claims;
- Decreased value proposition.

The speed of information flow can greatly be improved by applying available technology to the current framework.

The time has arrived for the heavy haulage road freight industry to adopt a more innovative manner of conducting business. Not only is the current framework outdated and environmentally unfriendly, but is also exasperates inefficiency and productivity. A new framework to increase the efficiency and speed of information exchange and flow is urgently required and recommendations for further research must be provided.

1.5 Objectives of the study

1.5.1 Primary objectives

The primary objective of this study is to establish a managerial framework to improve the exchange and flow of information in the heavy haulage road freight industry.

1.5.2 Secondary objectives

- To determine how the current information framework and information process in the heavy haulage road freight industry is conceptualized within the literature;
- To determine the need for change towards an improved framework.
- To determine if the proposed framework will enhance the speed of the dispute resolution process on endorsed loads between client and hauler;
- To determine if the proposed framework will reduce administrative errors by both the drivers and the administrative staff;
- To determine if the proposed framework will increase the value proposition of a hauler;
• To propose other fields of research in the heavy haulage road freight industry.

1.6 Research methodology

1.6.1 Literature Study

A literature review will form the basis of this study and will lay down a strong foundation from which a managerial framework will be developed. Although there is a limited amount of literature available on the research topic (as at 1 Nov 2016), additional information will be gathered. Similar research and topics that were conducted in other countries will be investigated and insight into different viewpoints will be researched. The primary source of information will be from online journals and internet articles. The internet, text books and industry experts will form the basis of my secondary information source. These sources will be consulted and investigated in order to gain a better understanding of the industry as well as to gain insight into the available technology which can contribute to an improved information exchange and flow framework.

1.6.2 Empirical Study

The research population will consist of manufacturing and other companies that utilize super link vehicles to transport and distribute their products. The second target group will be transport companies who operate their own fleet of long distance super link vehicles. This group is a supplier/creditor to the first group and delivers an important service in the good quality functioning of the supply chain. They represent the client at the off-loading point and invoice the client with the proof of delivery documents after each load. Therefore, the research population will consist of two target groups (consignor and hauler). An information exchange and flow framework does not function correctly without the efficiency of one of these two participants. Both play a very important role in the exchange and flow of information.

The study will focus on companies situated in the greater Gauteng area. The reason for focusing on this area is due to time and cost constraints. Furthermore, Gauteng is the biggest contributor towards South Africa’s gross domestic product and has a big concentration of manufacturing companies as well as well-developed industrial hubs. A random sample will be drawn from a data base of hundred and twenty manufacturing companies and 80 transport companies (already compiled).
A questionnaire will be developed after an in-depth literature review and participants will respond in the form of a five point Likert scale. Both target groups will receive the same questionnaire. Semi-structured interviews will be held with respondents who has time constraints and who are unable to complete the questionnaire. Free dialogue will encourage recommendations and opinions. The questionnaire will be short and to the point ensuring that the participants remain engaged and stimulated. The questionnaire will centre around competitive advantage, organizational performance, efficiency and current procedural constraints.

A general perception of the respondents will be gathered during these interviews. Limitations from a client point of view will be identified and explored. A framework for the exchange and flow of information between consignor and hauler will be constructed and recommended to industry participants.

A qualitative as well as quantitative approach will be followed and descriptive statistics will be used to explain the findings of the questionnaire. Internal consistency and reliability of the results will be measured.

1.7 Limitations of study

The research contains various limiting factors:

- The research is limited to the geographical area of Gauteng due to a time and cost constraint.
- The results of the questionnaire might be biased as the intended participants (staff) are accustomed to the current standard operating procedure and framework currently dealing with the exchange and flow of information.
- Very little prior research had been conducted, especially in a South African context within the heavy haulage road freight sector as at 1 November 2016.
- Non-response of the sample population.

1.8 Layout of the study

CHAPTER 1: NATURE AND SCOPE OF THE STUDY

Chapter one will focus on the nature and scope of the study. An introduction will provide a background on the industry. A problem statement will highlight the problems
experienced with the current exchange and flow of information model between consignor and hauler within the heavy haulage road freight sector. The importance of the study will be emphasized and limiting factors regarding the study will be pointed out. The objectives, both primary and secondary will be listed. The chapter will be concluded with a summary.

- Chapter one will consist of the following elements:
  - Introduction
  - Context
  - Casual factors
  - Importance of the study
  - Problem statement
  - Objectives
  - Layout of the study
  - Conclusion
  - Chapter summary

CHAPTER 2: LITERATURE REVIEW

Chapter two will consist of an in-depth literature review. All cohorts, relevant terms, objectives and populations will be defined and discussed. The Electronic Transmissions Act as well as the Land Transport laws will be elaborated upon. A managerial framework must be developed within the laws of South Africa and be legitimate even in unusual circumstances. The literature review will be used to develop a managerial framework to improve the exchange and flow of information within the heavy haulage road freight industry.

A literature study will include the following topics:

- Electronic Transmissions Act;
- Land transport laws and regulations;
- Current framework
- Risk in terms of misplaced or illegible proof of delivery documents;
- Responsibility of protecting information;
- General transport industry in South Africa;
- The importance of information communication within the supply chain.
• Mobile resource management
• Mobile supply chain management

CHAPTER 3: EMPIRICAL RESEARCH

Chapter three will consist of an empirical study in which the findings of the study will be discussed. The results will be interpreted and used in the development of a managerial framework for the exchange and flow of information in the heavy haulage road freight industry. Theoretical and managerial implications will be discussed.

CHAPTER 4: CONCLUSION AND RECOMMENDATIONS

Chapter four will consist of a conclusion and recommendations regarding the outcome of the study. This chapter will consist of the following topics:

• Introduction
• Conclusions regarding the current framework used for the exchange and flow of information
• Risks associated with the processes of the current framework
• Comments
• A paradigm shift towards digitizing the information framework
• Recommendations
• A proposed management framework to improve the exchange and flow of information in the heavy haulage road freight industry.
• Benefits and spin offs of the proposed managerial framework to improve the exchange and flow of information within the heavy haulage road freight industry.
• Equipment and training needed for the use in the proposed managerial framework for the exchange and flow of information within the heavy haulage road freight industry.
• Legality surrounding the use of the proposed information framework and electronic documentation.
• Comments
• Limitations and implications for further research
• Recommendations for further studies
• Conclusion
• Evolution and future direction
1.9 Conclusion

The exchange and flow of information between key players in the supply chain play a critical role in the success thereof. The objective of this study is to develop a management framework to improve the exchange and flow of information in the heavy haulage road freight industry. An increasing number of goods are being transported on road as many companies have moved away from rail transport due to the collapse of infrastructure. Many companies compete on the strength of their supply chains and they often focus on this aspect to gain a competitive advantage. Companies are dependent on the accuracy and speed of their information flow in order to make the correct decisions and to be more competitive. The current framework used is out dated and has not evolved to keep up with technological changes. The current process creates administrative bottlenecks and contributes to important information being delayed or misplaced. The problem statement clearly highlights the short comings of the current process being used in the industry. There is place for a new managerial framework to be developed in order to improve the process of information exchange and flow. Limitations regarding the research were identified and listed. The layout of the study is clearly set out as to provide the reader with a clear direction of the research.

1.10 Chapter Summary

The introduction provides a brief description of the current transport modes used in South Africa as well as the growth of road freight in recent years. The importance of the supply chain and the correct management thereof is discussed together with the potential competitive advantage it holds for companies. The advantages of available technology and the benefit it may provide in the exchange and flow of information within the heavy haulage road freight industry is discussed.

The context provides the background in which the study will take place and emphasizes the reason why this study aims to develop a framework to improve the exchange and flow of information within the heavy haulage road freight industry.
Causal factors are discussed to provide reasons behind the aim of the study. It provides substance and justifies the reason as well as the importance of the study. Specific focus areas and constraints this study is likely to experience are pointed out. The problem statement elaborates on these constraints and emphasizes numerous problems with the current framework used in the exchange and flow of information. The problem statement leads on to the primary and secondary objectives of this study and point the research into a specific direction.

The research methodology will consist of an in-depth literature review. Topics to be covered include the Electronic Transactions Act as well as Land Transport Laws of South Africa to ensure that the new managerial framework to improve the exchange and flow of information in the heavy haulage road freight industry will be compliant and legal. Current framework and the need for change will be assessed. The literature review will gather information pertaining to the objectives stated in Chapter 1. An empirical study will follow the literature review, quantitative as well as a qualitative approach will be followed together with descriptive research statistics to explain the results.

Limitations of the study were summarized and the layout was explained, the study will consist of four chapters.
CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This literature study provides an understanding of the important issues surrounding the exchange and flow of information within the heavy haulage road freight industry. A thorough search was made of appropriate publications and databases relating to the research topic. Keywords such as Information Flow, Information Exchange, Information Framework, Freight Industry, Heavy Haulage, Road Freight, Technology and Supply chain were used to search available electronic and hard copy databases. After obtaining these journals a filter was used to further refine the search for relevant articles. Articles were reviewed between the years of 2005 and 2016. Some older articles were reviewed as recent academic literature on the subject is limited.

Literature pertaining to the secondary objectives of this study were also explored. These include how the different current information frameworks and information processes in the heavy haulage road freight industry are conceptualized as well as other secondary objectives as discussed in chapter one.

The following aspects were discussed and elaborated upon in the literature study:

- The transport sector of South Africa (History, statistics and current environment).
- The current framework used for the exchange and flow of information (Standard operating procedure).
- Mobile supply chain management.
- Mobile resource management.
- The risk attached to misplaced and/or illegible POD's & the responsibility of protecting information.
- The forward flow of goods and backward flow of information.
- The importance of innovation and technology application within the industry.
- The Electronic Transmissions Act.
- The Land Transport Laws and Regulations.

The use of road freight has become very popular due to its flexibility and service reliability especially when compared to rail freight. Accurate and consistent information flow is a critical contributing factor to the proper functioning of an efficient supply chain.
The expedient exchange and flow thereof will enable a competitive advantage and increase a companies' value proposition. According to Kaipa (2009:149) information quality is defined as the degree to which the information meets the needs of the organization. The business environment is continuously changing and haulers must change and adapt to satisfy specific client needs and wants. Customers’ needs change frequently and the adaptability of supply chains become a critical success factor (Sherer, 2005:78). Available technology and processes must be adapted and applied to satisfy these customer needs and wants. There are many available options to accomplish this. Mobile technology applications together with the Internet are changing the landscape of business and introducing new concepts for integrated supply chain management (Eng, 2006:684).

Puzey (2015) states that in today’s supply chain landscape, technology is becoming the key driver of an organization's success, innovation and competitive edge. Because of the above, many companies are investing in transport management software (TMS) systems.

According to the Barlow survey (2014:50) it is important to note that with the growing impact of technology, organizations are more able to design, implement and interpret a growing amount of data and information. There are, however, concerns that technology developments are not aligned to the realistic needs of business and in some instances, are proving to be inhibitors to fulfilling strategies such as customer centricity.

The above references, highlight the positive as well as the negative impact that technology may have on a company. It is important to keep the productivity paradox in mind when considering the implementation of technology.

Companies must add value to their services and travel on a continuous path of improvement in order to stay relevant and competitive. According to Li et al. (2006:107) effective supply chain management (SCM) has become a potentially valuable way of securing competitive advantage and improving organizational performance since competition is no longer between organizations, but among supply chains.

According to Myburgh (2016) the main information concerns between consignor and transporter in the heavy haulage road freight industry are:
- Location of the vehicle at all times and real time updates on load status.
- Safe acceptance and delivery of the load from consignee by means of a signature.
- Any endorsements (claims) on the load.
- Order numbers, dates and other load specifics.

All the concerns mentioned above are printed on the proof of delivery (POD) document. These documents are supplied by the consignor to the driver of the vehicle. The timely return of these signed PODs are critical, but this is not always possible for reasons previously stated in the chapter one under causal factors.

Competition is increasing due to factors like globalization and improved telecommunications etc. If we do not satisfy the needs and wants of our customers, then another competitor will. Convergence plays an important role in the integrated supply chain. According to McCrea (2015), supply chain convergence allows shippers to break through the “difficulty or inability” barrier to coordinate and synchronize end-to-end supply chain processes and as result to better synchronize their processes across different functions. Customers seek more value at a smaller cost. Companies are increasingly looking to improve their efficiency whilst keeping costs down and many are looking directly at their supply chain in order to achieve this goal. This thinking links with one of Michael Porter’s generic competitive strategies namely cost leadership and therefore it is important to notice that the supply chain plays an important function in the competitiveness of a company. Integrated supply chain management has become a tool used by business and industry to improve their efficiency as they look to it to gain a competitive advantage in the market.

According to the Barlow survey (2014:51) many businesses in South African i.e. manufacturing companies that make use of heavy haulage road freight has been slow to adopt and utilize available technology in order to enhance the functioning of their supply chain frameworks. Both the upstream and the downstream segment of the supply chain have been stagnant and set in old systems and processes. Very little innovation has taken place in the way business is conducted, especially in the case of information exchange and flow.

Competitive priorities of a supply chain are described by Roh et al. (2008:367) as being cost, quality, flexibility and innovation. Managing competitive priorities requires
focusing more on particular goals and deploying organizational resources according to these priorities. Internal and external capabilities must be created in order to achieve these competitive priorities. For this reason, it is important that the industry keeps on evolving and improving itself to become more efficient.

Trends that will drive supply chain management going forward will include becoming digital and collaboration will take centre stage (Robinson, 2016b). Organizations need to become digital in order to capitalize on the unprecedented opportunities brought about by the next wave of the internet - the internet of things. The best way to accomplish the two fore mentioned objectives is by applying technology and innovation.

Robinson (2016b) states that despite new tech advances, forthcoming changes to supply chain execution will revolve not around the technology itself but rather the convergence of the multiple systems and the teams that enable it.

### 2.2 The current state of the transport in South Africa

The "State of logistics" survey by the CSIR (2014:3) states that South Africa’s economic setup is highly transport intensive. The total number of persons employed in the transport and storage industry at the end of June 2013 was 299 850. According to StatsSA (2016) freight transport had the largest number of employees (93 279 or 31%), followed by railway transport (55 910 or 19%) and activities of other transport agencies (28 903 or 10%).

The road freight industry has seen a huge expansion from the early eighties onwards. One reason why this expansion has occurred is because of new legislation and very strict policy, restricting the growth of our local and cross border rail network. The Department of Transport (2015:7-2) indicated that the rail market share declined due to operational policy constraints on the rail service provider, resulting from the transport policy decisions of the Government as a major shareholder. The table below illustrates the causes of reduced efficiency in rail freight.
Table 2.1: Freight rail causes for reduction in efficiency (Source: Department of Transport, 2015:7-5).

<table>
<thead>
<tr>
<th>CAUSE FOR REDUCTION IN EFFICIENCY</th>
<th>DESCRIPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced accessibility</td>
<td>Rail stations started to close in the 1980s and 1990s as a result of abandonment and disuse in response to rapid expansion of the road freight transport industry. Siding to siding rail transport is generally only available for more than 10 wagons in a consignment - i.e. a minimum of approximately 400 tonnes per consignment; this is too much for most farmers and small businesses. This policy has resulted in several million tonnes of coal, chrome, timber, etc. being delivered over long distances by road, all over the country.</td>
</tr>
<tr>
<td>Safety and damage</td>
<td>In addition to the effort required to resolve claims for the high levels of damage and theft, the high costs of meeting railway packaging requirements and double handling from road to rail and back to road for delivery make rail unattractive by comparison with direct road haulage. The problems are aggravated by derailments, collisions and criminal actions such as cable thefts and vandalism.</td>
</tr>
<tr>
<td>Reliability</td>
<td>For many industries the reliability of service is as important as cost, and erratic provision of empty wagons and uncertainty of delivery schedules make rail transport uncompetitive. Failure to provide timely funding to acquire and maintain adequate rolling stock and locomotives has resulted in unreliability of rail services. The cause for the delay in funding can be ascribed to the misalignment of planning cycles.</td>
</tr>
<tr>
<td>Time from collection to delivery point</td>
<td>Travel speed is only crucial for a limited amount of cargo but, for some specific loads - e.g. containers to meet new stack schedules; timing is essential; for other goods, payment is only released when deliveries are completed so speed is important and therefore road is generally the preferred mode.</td>
</tr>
<tr>
<td>Costs, rates &amp; tariffs</td>
<td>Railway tariff increases for timber, sugarcane and grains, have exceeded the rate increases for road transport - in many instances forcing industries to turn to road haulage, despite their preference for rail.</td>
</tr>
</tbody>
</table>

Many factors, including the unreliability of rail and the time interval it takes from collection to delivery point makes this mode of transport an unpopular option. This is further exaggerated by the fact that railway tariff increases for timber, sugarcane and grains have exceeded the tariff increases for road transport. The mentioned causes for the reduction in efficiency have increased the need for road freight. Currently road is unavoidably the default freight transport mode, absorbing whatever traffic cannot be accommodated by other modes. The road industry is an extremely competitive one and its future will be influenced by policy and related successfully implemented developments envisaged for other modes (Department of Transport, 2015:7-12). The more competitive an industry is the more individual companies must explore technology, methods, innovation and processes to stay ahead of the curve in order to establish a sound competitive advantage and secure sustainability.

Many products which in the past were transported by rail is now moved using road freight. This expansion covers high-value commodities and other goods which are normally regarded as suitable commodities for rail haulage - such as maize, fuel, coal, vehicles, containers, and cement (Department of Transport, 2015:7-2). According to Allix (2013) South Africa’s freight transport sector relies heavily on road transport, with 70% of total metric tons a kilometer being transported by road last year. Thus, it is evident that the road freight industry plays a very important role in the growth of the
economy of South Africa. Below is a scorecard of efficiency and service reliability which compares the different transport modes in South Africa.

Table 2.2: Score card of efficiency and service reliability (Source: De Villiers (2014:3)

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>Ports</th>
<th>Rail</th>
<th>Road</th>
<th>Border Posts</th>
<th>Air Freight</th>
<th>Intermodal Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Productivity</td>
<td>Productivity</td>
<td>Payload</td>
<td>Productivity</td>
<td>Bi-Laterals</td>
<td>Poor Inter-Connectivity</td>
</tr>
<tr>
<td></td>
<td>17 TEU's/Hr vs. 35 TEU's/Hr</td>
<td>515 000 ton.km per wagon vs. 1000 000</td>
<td>Decline in peak cost per ton.km</td>
<td>Inexperienced staff, 45% new.</td>
<td>Reduces capacity and increases cost.</td>
<td>Poor planning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service Reliability</th>
<th>Service Levels</th>
<th>Reliability</th>
<th>Service Levels</th>
<th>Reliability</th>
<th>Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestion problems</td>
<td>45% trains late, 25% no shows</td>
<td>Better than in Europe</td>
<td>Manual process time, 2 x longer than electronic</td>
<td>12-72 Hrs clearance time</td>
<td>Delays due to multiple handling</td>
</tr>
</tbody>
</table>

From the above table, it is evident that road transport is the most efficient and most reliable mode of transport in South Africa. The delivery capability of the rail and port sector as well as their customer focus is poor when compared to the road sector. Ports experience congestion problems whilst trains are often late or a complete no show.

The road freight industry has had to cope with massive demand from existing users of road freight as well as new entrants that used rail transport in the past but is now forced to use road freight. People and companies saw this as a gap to start a transport company or to expand their operations. The sector experienced a big influx of new entrants and the market was quickly saturated. The "State of logistics" survey by the CSIR (2014:2) indicates that 83% and 54% of respondents respectively ranked “Growth and expansion into new markets” and “Introduce new products and services into my business”, as business objectives – indicating a keen drive from South African freight industries to expand their business.

The rapid expansion of the road freight industry between 1980 and 1990 resulted in an over-supply of transport - reducing profitability, and decreasing quality standards (Department of Transport, 2015:7-2).
Twenty-five years later and the transport industry is still expanding, the increasing number of heavy haulage vehicles on the roads serve as evidence to this fact. The data presented in the Figures and Tables reflect that road carries the majority share of freight distribution in the country and confirms that road is a major role-player in freight transport. The only exclusion is bulk mining, where rail has the advantage in terms of market share (Department of Transport, 2015:7-12). Bulk mining relates to chrome, iron ore and any other minerals that are mined and transported without being bagged.

![Percentage split between respective freight modes](image)

**Figure 2.1: Percentage split between respective freight modes (Source: Department of Transport 2015:7-2)**

The above pie chart indicates that road is by far the preferred transport mode (75.86%) with ports (13.09%) and rail (10.41%) lagging behind. This emphasizes the case that the road freight industry must run more efficiently.

South Africa currently permits some of the largest vehicle combinations in the world for general freight haulage - an overall combination length of 22 meters and load heights of 4.3 meters, permitting a load area of 124 cubic meters and 38 tones payload and 56 tones Gross Vehicle Mass (GVM). The carrying capacities and dimensions of these vehicles are undoubtedly a contributory factor in attracting large volumes of bulk commodities (Department of Transport, 2015:7-12). As most product is transported and distributed by road, any increase in the cost of road transport, will influence product price and therefore inflation, especially in the food sector and other elastic price products. The CSIR "State of logistics" survey (2014:2) affirm that the performance of the logistics industry – specifically the cost of logistics – has a bearing on the global competitiveness of South African industries.
Figure 2.2: National logistics cost and components 2003 to 2014. (Source: CSIR, 2014:8)

With the increased use of road freight there is a bigger need for the effective flow and exchange of information and if the current growth trend continuous the need will become bigger over time. Different role players within the supply chain act as facilitators of information and directly influence and control the speed and manner in which information flows within the system.

Holistic information handling is a big concern within the transport sector. The "State of logistics" survey 2013 reports that the total logistics cost of 12.8% in terms of GDP also remains a challenge as indicated by the figure above. It is evident from the information reflected in the chart that although the cost is high it has been relatively stable from 2011 (12.5%) to 2014 (12.8%). Factors including but not limited to a weakened currency, upward fluctuations in the oil price and increased interest rates may increase this cost dramatically which is bad news for a country like South Africa which is heavily dependent on road freight. The focus of this research study is to explore a managerial framework within the road freight industry to implement more innovative ways as well as utilizing available technology to improve the current exchange and flow of information processes in order to reduce current constraints and make it more efficient, thus adding value whilst keeping costs down.
The main objectives of the supply chain and logistics industry over the next five to ten years include improving the flow of business intelligence, aligning with key players in the supply chain and outsourcing functions for cost and service improvements as indicated above.

The inherent cost of transport, ineffective processes and systems and reluctance or lack of foresight to change and supply chain information and intelligence are a few of the constraints the road transport industry will face in the future. Below is a list of the major constraints the industry will face over the next five years as communicated by companies currently operating within the industry.
It is important to note that transport is one of the largest cost factors that manufacturers and consumers of road freight face. The largest cost component of total logistics costs during the past decade has always been transport costs (CSIR, 2014:9).

It is important that this industry changes continuously in order to become more efficient and more effective. The evolution of companies together with industry is critical. The constraint in terms of reluctance to innovate and the lack of foresight to change must be overcome and business owners must think outside the box in order to stay relevant and accommodate the growing need for road transport.

2.3 Mobile supply chain management.

According to Eng (2006:683) mobile supply chain management (mSCM) refers to the use of mobile applications and devices to aid the efficient conduct of supply chain activities, and to ultimately help businesses to achieve cost reductions, supply chain responsiveness and create a competitive advantage. Supply chain management relates to almost any business activity and has, in effect, been a key element in overall business strategy. It necessitates the management and optimization of resources and
business processes to meet specific business objectives e.g. customer satisfaction, greater efficiency, reduced risks, etc. (Barlow, 2014:2).

Technological advancements and innovation have increased tremendously over the last decade and businesses are looking towards the Internet to give them a competitive advantage within the market. Improvements in I.T, Internet security, and bandwidth availability spurred the growth of wireless technology or mobile applications for supply chain management in industries. An ever-improving wireless computing environment is presenting both opportunities and challenges for creating mobile supply chain management (Eng, 2006:683).

The Internet together with wireless technology enables companies to better integrate and collaborate with each other. Integration and collaboration is becoming more important due the fast pace of globalization. Eng (2006:683) states that the increasing use of the Internet in a business-to-business context has further improved supply chain management through real time collaboration, 24/7 availability, online procurement and access to worldwide markets. Mobile supply chain management is fast gaining recognition as a major source of cost reduction and improved supply chain performance (Eng, 2006:682). Meaningful innovation takes place when costs are reduced, convenience for employees are increased or delivers customer satisfaction.

Eng (2006:682) states that the use of mobile supply chain management systems is focused on the following critical areas of the supply chain:

- Competitive advantage based on the notion of value chain analysis in supply chain management.
- Relationship management for successful collaboration along the supply chain including strategic partnerships.
- Co-ordination and integration of disparate functions and activities to enhance overall supply chain performance.

By implementing a mobile supply chain management system that integrates with the current enterprise resource planning software, a company and its users are able to take advantage by exchanging information in a real-time environment and link business processes between different functions within the company and between companies at remote locations. This allows for real time updates across all functions of the supply chain. Sherer (2005:78) states that Information that is shared with many
nodes at once can result in faster, more accurate, and nimble supply chains. This will directly increase a company's value proposition and give it a competitive edge in the market. Mobile technology provides real time and on-demand response (Eng, 2006:683). According to Sherer (2005:79) the one flow that provides competitive advantage is often the information flow, not the physical flow. Today we should be focusing on networks, not linear chains. This applies to the physical process and even more so, the movement and sharing of information. Information has become the key driver of advantage (Sherer, 2005:81). A lot more focus is around the flow of information within the modern-day market context instead of the physical flow of goods as it used to be in the past. The efficient exchange and flow of critical information creates an opportunity to gain a competitive edge in the market. Very little information is currently exchanged by means of a mSCM system.

Eng (2006:85) describes many benefits of using mobile supply chain management systems:

- Integration of real time events using wireless technology provides a constant flow of up-to-date information from both inside and outside the organization.
- Real time information eliminates response lag time, delays in transaction processing and customer service and missed market opportunities such as order to demand.
- Supply chain services (product information in transit) can be requested at any location without reaching a certain stage of logistics location based services. Automatically matching services according to customer profile in specific locations without relying on initiation of demand from the customer.
- mSCM can be used to deliver personalized services to users in the supply chain and to customers.
- mSCM will enable long lasting and profitable customer relationships.
- Possibility of personalizing services to increase customer satisfaction

Above mentioned points one, two and six are especially important in this literature review. There are however some conditions which must be fulfilled before the successful implementation and use of mSCM systems may take place. Sherer, however, (2005:77) states that its implementation will be stalled if trust mechanisms and metrics are not developed to support this new focus on value network advocacy.
Integration of mobile supply chain applications with the current ERP system of a company would be the ideal solution to increase the speed and accuracy of information flow between driver, the admin staff of a transport company and the consignor. Unfortunately, this will be very expensive and it will require complete trust between consignor and hauler. There are more simplistic methods in which such an integration may be accomplished. An integration through email is one such method. According to Sherer (2005:79) it is assumed that competitive advantage came from improvements in internal operations. Internal resources play a very important role in the proper functioning of business processes and the market environment should be the catalyst and provide the foundation for a firm’s strategy.

By implementing the correct process, resources and other internal operations, a company may establish a competitive edge by converting to a technologically advanced framework in order to enhance the exchange of information and the flow thereof. Personalization and customization is available and serves as another benefit of mSCM, these applications may be customized to fit the needs of each different company and market situation it finds itself in. The possibilities of personalization and customization are endless.

Eng (2006:687) lists three propositions in his research for the successful implementation of mobile supply chain management technology in his research:

1. Mobile supply chain management may be enhanced where the firm adopts a process approach to interacting with its supply chain participants due to an increase in knowledge through socialization.

2. Mobile supply chain management will be enhanced where more companies share resources with members in the supply chain due to an increase in trust and commitment.

3. Mobile supply chain management will be enhanced where supply chain participants possess cross functional knowledge of disparate supply chain functions and activities. Increased coordination and integration success in mSCM depends on an embedded knowledge of systems.

The use of better and more tailored made enterprise resource systems have become increasingly popular and companies are ever more looking to incorporate such systems into their businesses. In a recent survey of 196 executives done by Sherer
(2005:80), enterprise resource planning systems topped the list of supply chain system investments at 71 percent, followed by inventory and warehouse management (54 percent), order management (40 percent), supply chain execution systems (37 percent), advanced planning systems (31 percent), and marketplaces and exchanges (26 percent) (Bacheldor, 2003).

It is very important that customers listen to the needs and wants of their clients and ensure that they are geared towards pleasing these needs and want. Change occurs every day. Customers can be served, listened to and valued, but they can’t always be controlled. While relationships with customers can be managed somewhat, customer needs may not always be controllable. What may be controllable is the adaptability of the network to adjust to changing needs (Sherer, 2005:80).

### 2.4 Mobile resource management

According to Cisco's Visual Networking Index Mobile Forecast 2014-2019 (Cisco, 2015) mobile data traffic will grow twice as fast as South African fixed IP traffic. This indicates a clear shift from stationary connectivity to mobile connectivity.

Dhanani (2008) defines mobile resource management (MRM) as products or services used to manage mobile fields workers and assets, such as vehicles, delivery trucks and/or trailers. Mobile resource management is a tool that can be applied to the supply chain in order to increase productivity, customer centricity and decrease costs. The productivity, customer service and cost benefit of mobile resource solutions are becoming increasingly clear and forward-looking businesses are turning to MRM solutions to establish a competitive gain in their respective industries (Dhanani, 2008).

Mobile resource management enables electronic data interchange which is an accurate and efficient way to speed up business operations. According to Bakshi (2015) electronic data interchange creates a value-added network which acts as an intermediary between organizations. Not only does this minimize paper use but diminishes the possible occurrence of errors caused by the human factor. These benefits must be kept in mind when proposing a new framework for the exchange and flow of information in the heavy haulage road freight industry. Bakshi (2015) explains that electronic data interchange will decrease errors, increase accuracy, improve operational efficiency and enhance visibility.
Dhanani (2008) Mobile resource management is a technology enterprises one can turn to in order to more effectively manage mobile assets and reduce overhead expenses. Corporations can take advantage of technology’s features that can increase revenue, reduce churn and keep employees content. From the above reference it is evident that mobile resource management may have a positive effect on both turn over and employees. This kind of technology will have a good fit within the researched industry as drivers and their vehicle can both be seen as mobile workers and mobile assets. By managing these mobile resources correctly and through the technology available it may increase the efficiency of the supply chain and add value to current supplier propositions. The application of these functions will improve the value chain of a company and provide it with a competitive edge if the benefits as described by Bakshi (2015) and Dhanani (2008) materialize.

2.5 Importance of innovation and technology application within the supply chain.

Barloworld composes a foresight document every two years in which industry experts discuss the current state of the transport industry as well as where the industry is heading. This document emphasizes the importance of the transport sector, specifically the heavy haulage industry, to evolve with its customer base. The advent of available technology will be a necessary requirement and service in the future. The application and implementation of technology, to improve the exchange and flow of information, is already used in the courier industry and the heavy haulage mode will soon have to catch up. The Barloworld survey (2014:63) states that supply chain visibility increases the agility, flexibility, reliability and responsiveness of a company to operate more effectively in an unpredictable and ever-changing environment. It is imperative that transport haulers change their service offerings to align with the needs of their clients. Technology will play an important role in this regard. According to the CSIR survey (2014:15) South African companies are realizing the importance of being more customer-centric. To achieve this, alignment is needed between overall business strategy and supply chain strategy. According to the Barloworld survey (2014:60) this supports the belief that the speed of change continues to escalate as a result of increasingly competitive global markets and advanced communication technologies. Managers must be able to react to change and respond to it in the correct manner.
Managers are by and large unable to control the changes, only the responses to the changes (Sherer, 2005:81).

The application of technology in the supply chain must focus on accomplishing specific functions and on improving identified constraints and limitations. It is about how organizations capture and integrate data to extract critical information and business intelligence. Readily available data across the supply chain improves the speed of decision making, reduces bottlenecks, assists in foreseeing potential challenges and generally assists with identifying process improvements and leveraging growth opportunities. Ultimately, greater visibility across the supply chain enables greater Customer Centricity (Barloworld, 2014: 58). The CSIR survey (2014:2) states that end-to-end integration of supply chain functions is the next major shift required in South Africa to make business more customer-centric and competitive.

This literature study concentrates on the exchange and flow of information within the supply chain. Technology and process change can add a lot of value in this regard. According to Barloworld's survey (2014:60) this supports the belief that the speed of change continues to escalate as a result of increasingly competitive global markets and advanced communication technologies. Currently there are various technologies available to increase the efficiency, speeds and reliability of information exchange. Some of these products are expensive but most are affordable and cost effective. Sherer (2005:81) states that value network advocacy requires new metrics of customer agility. The co-opting of customers in the exploration and exploitation of opportunities for innovation and competitive action in the value network is quant essential. Where there is not a spontaneous change in the adoption of technology then the industry will soon be forced to change, especially if they want to stay relevant and competitive. The goal of SCM is to integrate both the information and material flow seamlessly across the supply chain as an effective competitive weapon. The Apics Supply Chain Council (2014:6) states that the lack of updated information technology contributes to the chronic disruption in the supply chain.

The application of technology has the potential to create competitive advantage. Available technology and the implementation thereof will also play an important role in the implementation of Porter's generic strategies concerning competitiveness. Competitive advantage invariably creates improved margins and market share and improved financial returns. Other benefits are greater internal and external integration,
enhanced flexibility, agility and responsiveness to changing customer needs. These are the key benefits sought through a more customer-focused supply chain (Barloworld, 2014:44). Differentiation and cost leadership is achieved by the use of technology to improve the exchange and flow of information within the supply chain. Gunasekaran et al. (2008:549) states that by contrast, cost is given a great deal of attention in SCM, which focuses on the integration of suppliers and customers to achieve an integrated value chain with the help of information technologies and systems.

Time may also be used as a means to accomplish a competitive advantage Gunasekaran et al. (2008:549). By improving the efficiency of the informational exchange and flow, time will be saved by eliminating constraints and bottlenecks. The management of time is important. Vardabasso (2005) states that Pace Farms, a company in Australia is a perfect example of this. Pace Farm was losing profits through lost proof of delivery dockets or delays in getting a copy of the signed documents from the clients. Their receivables were getting longer and longer and the company ran into serious cash flow problems. Clients could legally withhold payment until a signed copy of the pod was produced, when these documents were lost, be it due to human error or any other event, the company was placed in a very difficult position. To regain the lost information and the lost acceptance signature of the consignee is not easy, as previously stated.

According to Vardabasso (2005) Pace Farms turned their attention to technology as a tool to solve these problems. They needed a system that could enable instant delivery of the signed proof of delivery (pod). Immediate access to proof of delivery documents were important in turning the company’s success around.

Damaged documentation poses difficulties of its own. To withdraw information from a badly damaged document is just as difficult as solving the problem of a lost document. To scan these documents are not easy, and the possibility of extracting incorrect information is increased. Documents are often damaged, ripped or stained due to the nature of the environment in which they are used. Sending a badly damaged pod compromises the reputation and the image of the company. Untidy documentation does not send out a good message.
There is no doubt that the current framework is vulnerable to the same risks and difficulties mentioned in the previous paragraph. The framework currently used delays the flow of paperwork and information, increases the risk of lost or damaged proof of delivery documents (pod's) and may impact the cash flow of a company negatively. Technology has the potential to eliminate this if applied correctly.

It must be kept in mind that only specific information must be shared, technology poses the risk of an information overburden. This must be kept in mind when proposing a new managerial framework.

Below are examples taken from Vella (2012) of companies that implemented additional technology in order to improve their supply chain efficiency and effectiveness:

- The John Deere Company’s use of SmartOps logistics management software has helped the equipment supplier increase its on-time shipments to dealers from 63% to 92%, while reducing its inventory by nearly $1 billion.
- Working with DHL Supply Chain, athletic footwear and apparel giant Nike implemented radio-based product monitoring for warehousing and distribution purposes and also introduced real-time delivery notification. The supply chain improvements have been credited with reducing costs and boosting efficiency.
- Long renowned for its supply chain management processes, Wal-Mart incorporates state-of-the-art technology and network systems to predict demand, track inventory levels and plan efficient transportation routes.
- With dozens of distribution centres worldwide handling millions of products, Amazon.com must frequently fine-tune its supply chain. In 2012, for example, the online retailer announced it would buy Kiva Systems Inc., a manufacturer of robots and other automated technology for distribution centres.

In supply chain execution, it is less about what new technologies will soon be arriving than it is about when existing technologies will become viable and helpful to everyone in the supply chain, so supply chain professionals can take advantage of all new technologies and apply them to their individual needs (Puzey, 2015).

Digitization is still a foreign concept within the supply chain operations of South Africa. Although the term is used on a more regular basis currently than in the past, little is
known about the concept of supply chain digitization. Robinson (2016a) refers to digitization as the process of using technology advancements linked with physical and digital assets to redefine and reimagine current business practices to create a significant competitive advantage.

Robinson (2016a) describes the following benefits of digitization:

- A more forward looking supply chain – A digital supply chain offers the opportunity to become forward looking and changing together with customer needs and wants.

- Connecting and relating data source – The “internet of things” have become a very popular concept and people are starting to realize the potential of such technology as it responsible for the improvement of processes, preventative maintenance and the identification of a better way to move products.

- Generating data driven plans through data visualization – Big data will present the opportunity of advanced analytics.

- Improved collaboration – Collaboration between the physical and the digital supply chain will present opportunities to create a competitive advantage as well as facilitate collaboration between consignor, haulier and consignee.

- Digital products and services – The age of the paper-based, silo based supply chain is dying and the need to embrace the digital supply chain will increase in the future.

Technology and innovation have had a positive impact on all of the above-mentioned companies. It many cases it has led to companies being more effective and more efficient. Technology and innovation may also be applied in order to improve the exchange and flow of information and not just the goods flow within the supply chain.
The above Figure is a summary of the benefits which technology can add to a supply chain as proposed by (Bakshi, 2015).

2.6 Directional flow of goods and information.

Goods flow from the manufacturing or distribution site forwards towards the consignee whilst the information flows backward from the consignee to the haulier and then back to the consignor. According to Sarkis (2012:203) the supply chain can generally be described with upstream, downstream and internal organizational activities. The speed and accuracy with which the information flows backward is often a problem and creates many other bottle necks and risks concerned with the exchange of information. By speeding up and improving the consistency with which information flows backward can greatly increase the value proposition of a company. Tang and Musa (2011:29) states that value adding activities in a supply chain are often triggered by information flow. One may also look at information flow as the bonding agent between material flow and financial flow (Tang & Musa, 2011:30).

Transport companies and their employees act as the facilitators of information and the responsibilities and duties fall into their hands to exchange information correctly and
timeously. Unfortunately, the current framework used has various limitation that are out of the control of these employees, time being the most important limitation.

By changing some aspects of the current framework and incorporating affordable technology hardware and software a new framework can be developed. These changes must primarily first start at the haulier as these companies ignite the flow and exchange of backwards information flow. It was assumed by Sherer (2005:79) that competitive advantage came from improvements in internal operations. Consignors often complain about paperwork (therefore information contained in the paperwork) taking too long to return back to them and when it eventually returns they receive a lot of POD’s all at once, creating a massive bottle neck. It is imperative that organizations listen to the needs and wants of their client. Organizations are needed that center around customer advocacy, employing people who are advocates for adding value for the customer and information systems to support these advocates (Sherer, 2005:81).

Robinson (2016b) states that in a metaphorical sense, the DSN (digital supply network) enables people and data - as well as materials, products and supplies to travel together across the extended enterprise.

2.7 Informational risks.

Managing information risks in the supply chain is critical to the success of a transport business. Ajay and Maharaj (2010:1) states that information is considered an integral component of a supply chain network because it is the connection between all its components, activities and operations. There are many risk situations in which information may be delayed, destroyed or lost. McHarg (2016) states that whilst the increasing use of technology and connectivity may enable customer intimacy and competitive advantage it adds extra risk in protecting sensitive information.

2.7.1 Risk of information loss.

The current framework used for the exchange and flow of information within the heavy haulage road freight industry is exposed to numerous risks regarding the loss or damage of documents containing very important information. According to Karaman and Duymaz (2006:2) flow risks could be listed as information risks, commodity risks, financial risks, and legal risks. This study deals with the exchange and flow of information, thus the emphasis will be placed upon this topic.
As previously stated, drivers accumulate a lot of different proof of delivery documents from various clients. These documents travel with the driver from his first delivery of the month until he returns to the depot at month end. Drivers most commonly store these documents in a file that travels with them on the vehicle and they accumulate a lot of these documents in a months’ cycle. It is important to understand that these documents contain very important information for both transporter and consignor i.e. collection and delivery dates, unit of measure, amount transported, order numbers, breakage amounts and acceptance signatures. Client invoices often accompany these proof of delivery documents, the amounts, prices and quantities are sensitive information and can be very beneficial to competitors. Transport suppliers have a responsibility towards their clients to protect this information and make sure that it is kept private.

According to Goelst (2016) there are many different situations in which paperwork can get lost, damaged or mixed up.

**Situation 1:** If the driver accidently loses the file then the whole month’s delivery documents are lost. This poses a huge problem for the transport company as they have no proof of the deliveries done for that specific month. The transport company will not be able to invoice their different clients and payment will be put on hold until such time that they can gather copies from each of the off-loading points. This is a very difficult task and consignee companies are not very helpful in this regard.

**Situation 2:** A proof of delivery document that contains more than one page might get mixed up with documents from other deliveries and thus will result in the transport company sending incorrect documents to two companies. One company will have too much documents and the other will short some pages. Again, this will result in nonpayment as the delivering documentation is not correct.

**Situation 3:** The vehicle might get involved in an accident. If this happens the documents might get lost and the transport company will experience the same difficulties as in situation 1.

**Situation 4:** Drivers often become disgruntled with their employees and upon resignation they deliberately throw away the proof of delivery documents as they know the value of these documents. This situation happens often within the industry.
Situation 5: Drivers often damage the paper work by not filing it immediately or by not looking after it as they should. Administration staff often receive proof of delivery documents that are torn or crumple to the extent that they cannot see vital information on these documents.

Wagner and Bode (2008:312) describes some of the risks regarding information loss as local human centered issues such as vandalism, sabotage, local strikes and industrial accidents. Logistics firms are confronting with various risks today. These risks can either emanate from the firm or the environment in which the firm operates (Karaman & Duymaz, 2006:1).

2.7.2 Responsibility of protecting confidential and sensitive information within the supply chain.

It is the responsibility of every employee within the supply chain to protect and safeguard the information of his or her customers. Proof of delivery documents travel with the driver on route and these documents are vulnerable to loss, damage or theft. These documents and other confidential information must be kept safe and private. The South African law commission (2005:5) reports that the concern about information protection has increased worldwide since the 1960’s, in protecting a person’s personal information consideration should, therefore, also be given to competing interests such as maintaining law and order, and protecting the rights, freedoms and interests of others, including the commercial interests of industry sectors.

A transport company will increase its value proposition by delivering on customer expectations in this regard. The South African law commission (2005:5) states that although the expression of information protection in various declarations and laws varies, all require that personal information be dealt with according to specific principles known as the “Principles of Information Protection” which form the basis of both legislative regulation and self-regulating control.

As mentioned before, if a proof of delivery document (POD) is lost or damaged then it will be difficult to regain the information contained on the POD, especially the acceptance signature, it is important that this information is protected at all times.
2.7.3 Informational risks concerned with the use of technology.

It is important to note that by using technology to increase the speed and efficiency in the exchange and flow of information, a business will expose itself to other threats and challenges. Although technology may add a lot of benefits regarding the exchange and flow of information and facilitate the ease with which this happens, it also poses a unique set of risks inherent to the technology itself. Wagner and Bode (2008:312) states that problems are highly relevant to supply chain management since many supply chain management functions are built on information processing and sharing. In the last years, organizations have become increasingly technology-dependent and, consequently, vulnerable to IT problems or breakdowns. Wagner and Bode (2008:312) explain these risks as the events resulting from malicious actions by individuals or groups (cyber-attacks, virus attacks), software bugs and hardware failures. Moreover, modern Enterprise Resource Planning (ERP) systems force firms to open their internal processes and databases both to their suppliers and customers, thus increasing their exposure to IT-related threats (Wagner & Bode, 2008:312). Fast changes in the economy and technology create uncertainties and risks (Karaman & Duymaz, 2006:6).

According to Kaipia (2009:149) some writers have pointed out a new challenge which arises from frequent and wide information sharing practices: companies may face difficulties surviving the overabundance of data.

It is important to remember that technology application or implementation and process change offer a complete different set of risk when compared to the current framework used in the exchange and flow of information within the heavy haulage road freight industry. Each firm intends to maximize its benefits in an environment with a certain level of risks. In other words, it wants to create a certain level of benefit with minimum level of risks Karaman & Duymaz (2006:2).

However, many factors are forcing the industry to comply with customer needs, the benefits seem to outweigh the associated risks. The increasing expectations and requirements of customers’ force both the parties who are responsible for logistics function and the logistic service providers to be more provident against the possible risks (Karaman & Duymaz, 2006:1). Insufficient information exchange and flow will decrease customer satisfaction and also the value proposition of a firm.
2.7.4 Managing informational risk:

Whilst technology poses other risks concerning the flow and exchange of information there are certain methods and ways in which these risks can be decreased and managed. Karaman & Duymaz (2006:3) lists these methods as: organization of consistent processes, use of efficient information techniques, efficient / effective cooperation with suppliers, customers and logistics companies.

In the logistics chain, the material/information flow should be uninterrupted or should be handled with minimum interruption. Therefore, the flow risks should be given special importance. To minimize the flow risks, the processes should be established and operated in a transparent manner, and the number of interfaces in the process should be minimized (Karaman & Duymaz, 2006:2). There is a constant emphasis on simplicity and transparency.

Communication within the supply chain is extremely important, the manner in which information is communicated is even more important. Information must be exchanged and conveyed in an accurate and consistent manner and eliminate confusion at all costs. Information exchange and flow risks must be decreased whilst the benefits of a more technologically advanced framework must be enhanced and promoted.

When developing a managerial framework for the exchange and flow of information within the heavy haulage road freight industry the following aspects must be taken into consideration to eliminate as many risks as possible (Karaman & Duymaz, 2006:4):

- Provision of compliance of the business to the legal, cultural, economic and technical standards in relation with its control and transparency.
- Determination and finding out of risk bearing developments timely and systematically, avoiding from/protecting against them.
- Increasing inner business transparency and improving the consciousness of risk for all employees.
- Preventing avoidance of managers against business targets and potential responsibilities.

The proposed managerial framework for the flow and exchange of information must be as simplistic as possible. It is important to find an African solution for an African problem. By developing a simplistic framework, many of the associated risks will be eliminated. The success of a new framework will be determined by the efficiency with
which the correct information is accurately exchanged between relevant parties. One has to keep in mind that any new framework designed for the exchange and flow of information must adhere to certain laws and regulations.

2.8 Laws and regulations governing road freight.

Business has a responsibility to comply with statutory, common and any other law imposed on it by government. Any economy, independent of its size, operates within the framework of government policies. The CSIR survey (2014:15) states that planned business strategies must be taken into account and adhere to government policies.

When proposing a managerial framework for the exchange and flow of information it must be kept in mind that it must comply with and promote all laws and regulations governing the road transport environment.

Below are some laws taken from the Electronic Communications and Transactions Act as well as the Land Transport law and regulations which are relevant to the exchange and flow of information and documents.


The Electronic Communications and Transactions Act 25 of 2005 was developed to provide for the facilitation and regulation of electronic communication and transactions; to promote universal access to electronic communications and transactions and the use of electronic transactions; to prevent abuse of information systems; to encourage the use of e-government services; and to provide for matters connected therewith.

This act was designed to promote electronic transactions and communications in South Africa. From the above listed objectives of this act it is evident that Government is promoting the use of electronic documentation in order to assist various aspects and role players i.e. small to medium sized enterprises, the use of technology, access of underdeveloped areas, e-business and e-commerce etc. The act understands the importance of information sharing and the application of technologies in order to assist the population and the economy. They are also committed to ensuring the highest quality of electronic transactions which conform to international standards.

Many retail companies are moving towards the online platform in order to improve customer wants and market accessibility. The act aims to add validity and authenticity
to electronic signatures and electronic documents and below it states that electronic information carries the same legal force as original documents and that all requirements in law are met if a document or information is in electronic format.

The Act (25 of 2005) lists the following legal requirements for data message:

- Information is not without legal force and effect merely on the grounds that it is wholly or partly in the form of a data message.
- A requirement in law that a document or information must be in writing is met if the document or information is - in a form of a data message and accessible in a manner usable for subsequent reference.

The act covers the use of electronic signatures are well and gives the same legal force to electronic signatures that it does to an original signature when certain requirements are met.

**Signature:**

- Where the signature of a person is required by law and such law does not specify the type of signature, that requirements in relation to a data message is met only if an advanced electronic signature is used.
- Subject to the above an electronic signature is not without legal force and effect merely on the grounds that it is in electronic form.
- Where an electronic signature is required by the parties to an electronic transactions and the parties have not agreed on the type of electronic signature to be used, that requirement is met in relation to a data message if - a method is used to identify the person and to indicate the person's approval of the information communicated and having regard to all the relevant circumstances at the time the method was used, the method was reliable as was appropriate for the purposes for which the information was communicated.
- Where an advanced electronic signature has been used, such signature is regarded as being a valid electronic signature and to have been applied properly, unless the contrary is proved.

Electronic information is also covered and given the same legal force as original information if certain requirements are met as prescribed by this Act

**Original:**
1. Where a law requires information to be presented or retained in its original form, that requirement is met by a data message if:
   • the integrity of the information from the time when it was first generated in its final form as a data message or otherwise has passed assessment in terms of subsection (2); and
   • that information is capable of being displayed or produced to the person to whom it is to be presented.
2. For the purpose of subsection 1(a), the integrity must be ased –
   • by considering whether the information has remained complete and unaltered, except for the addition of any endorsement and any change which arises in the normal course of communication, storage and display;
   • in the light of the purpose for which the information was generated; and
   • having regard to all other relevant circumstances.

The act weights data messages to have the same validity as original messages and states the following regarding admissibility and evidential weight of data messages:

**Admissibility and evidential weight of data messages:**

1. In any legal proceeding, the rules of evidence must not be applied so as to deny the admissibility of a data message, in evidence:
   • on the mere grounds that it is constituted by a data message; or
   • if it is the best evidence that the person adducing it could reasonably be expected to obtain, on the grounds that it is not in its original form.

2. Information in the form of data messages must be given due evidential weight.

3. In assessing the evidential weight of data messages, regard must be had to:
   • the reliability of the manner in which the data message was generated, stored or communicated;
   • the reliability of the manner in which the integrity of the data message was maintained;
   • the manner in which the originator was identified; and
   • any other relevant factor.
Retention pertains to documents that are filed in either a hardcopy or an electronic format. It is a requirement of law that proof of delivery documentation (POD) for every single load is filed, either in hardcopy or electronic format for at least five years. Documents must be filled and stored for future use if need be.

**Retention:**

1. Where a law requires information to be retained, that requirement is met by retaining such information in the form of a data message, if:
   - the information contained in the data message is accessible so as to be usable for subsequent reference;
   - the data message is in the format in which it was generated sent or received, or in a format which can be demonstrated to represent accurately the information generated, sent or received, and
   - the origin and destination of that data message and the date and time it was sent or received can be determined.

The act enables electronic documentation to carry just as must weight in circumstances where the law requires a person to produce original documents, these two documents are equal when the following requirements are met:

**Production of document or information:**

1. Subject to section 28, where a law requires a person to produce a document or information, that requirement is met if the person reduces, by means of a data message, an electronic form of that document of information, and if:
   - considering all the relevant circumstances at the time the data message was sent, the method of generating the electronic form of that document provided a reliable means of assuring the maintenance of the integrity of the information contained in that document; and
   - at the time the data message was sent, it was reasonable to expect that the information contained therein would be readily accessible so as to be usable for subsequent reference.

2. For the purpose of subsection (1), the integrity of the information contained in a document is maintained if the information has remained complete and unaltered, except for:
   - the addition of any endorsement; or
• any immaterial changes, which arises in the normal course of communication, storage or display.

Other requirements include:
1. A requirement in law for multiple copies of a document to be submitted to a single addressee at the same time, is satisfied by the submission of a single data message that is capable of being reproduced by that addressee.

The above laws make it evident that electronic signatures, messages and retention documents are just as valid as original documents, therefore an electronic document is just as authentic as an original document if certain requirements are met. Electronic documents can be a convenient replacement of original documents in a managerial framework pertaining to the exchange and flow of information within the heavy haulage road freight industry.

The electronic communications and transactions act is not the only act relevant in this literature study, attention must also be given to the Land transport law and regulations as it plays an essential role in the proper functioning of the industry. These laws and regulations are discussed below.

2.8.2 National Land Transport Act 5 of 2009.

The National Land Transport Act (5 of 2009) regulate and govern the vehicles on the road and describe the requirements and responsibilities of truck owners and their employees regarding their loads and documents. Below are laws and regulations applicable to this study:

Article 330A: Offering and acceptance of goods on overloaded vehicle prohibited

1. A consignor of goods shall not offer goods or accept goods if the vehicle in which it is transported is not loaded in terms of the provisions for the loading and transportation of goods as prescribed in this act.

2. A consignor shall require from the operator of the vehicle in which the goods he or she offers for transport and in which the goods will be transported, a written submission as to the payload of such vehicle and the distribution of such load on a vehicle.
3. If a consignor is responsible for the loading of a vehicle of an operator, he or she shall take such steps as are necessary to ensure that the vehicle is loaded as contemplated in subregulation 1 and 2.

The Electronic Communications and Transaction Act makes provision for the above mentioned written submission to be in an electronic format. An electronic document or data message meeting all the requirements a previously mentioned will be suffice and hold the same legal force as a written document.

**Article 330B: Consignor to have a method of mass**

2. A consignor shall keep a record of the mass of every load transported from his or her premises as contemplated.

3. The record as contemplated in sub regulation 2 shall be put at the disposal of any traffic officer or person appointed as contemplated in section 50 or authorized as contemplated in Section 82 of the act.

Once again the Electronic Communications and Transactions Act (25 of 2002) provides for the information required in article (330B) to be in electronic format if the consignor wishes to keep it in such a manner.

Article 330C highlights the information that a consigner must carry with him regarding the goods he is transporting. Point two, three and four being the most relevant to this literature study. The information regarding the nature of the goods being transported on the vehicle is specified on the proof of delivery document supplied by the consignor to the transporter. The Electronic Communications and Transaction Act once again provides for the transporter to carry this information in an electronic format if he so wishes.

**Article 330C: Goods declaration to be carried on a motor vehicle**

A person operating on a public road a motor vehicle which carries goods shall be in possession of a declaration containing the following information:

1. The license number of each vehicle in the combination of vehicles;
2. The nature and quality of goods transported;
3. The particulars of the consignor and consignee of the load or in the case of loads collected at and delivered to more than one consignor and consignee, the particulars of every consignor or consignee.
4. The consignor and operator shall conclude a written agreement for the transportation of goods stating:
   - the nature of the agreement;
   - the loading instructions;
   - the responsibilities of the parties.

The above two sections (Electronic Communication and Transmission Act and the Land Transport law and regulations) govern and guide the heavy haulage road freight industry and serve to establish what is acceptable and expected regarding the subject of documentation. This expectation encompasses load/cargo documentation (PODs) and vehicle documentation required by law.

2.9 Conclusion.

The transport industry plays an important role in South Africa's economy and without it our country can neither grow nor function correctly. Road freight has become very popular due to its flexibility, cost efficiency and reliability. There has been a big increase of trucks on the national roads and South Africa has become dependent on this sector serve many industries. Supply chain management delivers a very important function in the industry and plays a major part in the competitiveness of many companies. South Africa will have to improve and invest in other modes of transport, especially rail transport, if it wants to stay competitive on an international level. The Department of Transport (2015:7-1) indicated that freight movement by road has a significant impact on the national road network which results in high transport cost in the logistics value chain and damage to road infrastructure, this prevents South Africa from being competitive in a global market and to attract sufficient international investment in supporting economic growth.

Many supply chain functions have been left stagnant, very little innovation and technology application has taken place, especially in the area of information exchange and flow. The current framework in use is outdated and contributes to the constraints currently experienced within the sector. More emphasis must be placed on information exchange and flow.

According to Sherer (2005:80) the limiting factors of current SCM systems include:
- information systems (IS) applications that support sequential rather than network flow of information;
- separate IS applications for customer demand analysis and supply analysis;
- implementation of IS applications without process change; assuming software supports the physical supply chain in place.

The current framework and processes used pose various risks concerning the loss and damage of information, the efficiency with which information is currently exchanged is also of concern. The possibility exists of developing a new managerial framework in order to improve the exchange and flow of information within the heavy haulage road freight industry as well as to facilitate a better customer experience. Customer wants and needs must be looked after if companies want to stay relevant. Supply chain service providers deliver a critical function in the competitiveness of their customers. Since the late 1990s leading companies have placed greater emphasis on cost reduction and innovation at the supplier end of the chain rather than the customer end (Sherer, 2005:79). According to Sherer (2005:82) actions should be not just around fulfilling demand, but responding to changing customer value p82. Today however the technologies exist to support a broader concept: the value network advocacy (Sherer, 2005:82).

To sum up, there are many benefits regarding information sharing between consignor and transport haulier. Technology has the ability to improve this information sharing process. Unfortunately, there are also some risks regarding the use of technology in order to facilitate the exchange and flow process. Sherer (2005:149) indicates that the level of information sharing, which may also be described as the volume of information shared, should be adjusted according to the decision-making situation. Many studies found information sharing beneficial, but they describe somewhat different levels of benefit from information sharing, depending on the assumptions and features of the model used. Typically, only the benefits are considered, not the associated costs.
CHAPTER 3: RESEARCH METHODOLOGY AND FINDINGS

3.1 Introduction

The literature review in chapter two of this study provided an overview of the current situation regarding the current information exchange and flow framework used in the heavy haulage road freight industry. Some limitations and risk factors were discussed as well as available technology that may be considered in developing a new framework. Current laws and regulations surrounding the legality and authenticity of information contained in original proof of delivery documents were compared to that of electronic copies and exchange frameworks. Numerous sources indicated that the accuracy and speed of information exchange and flow determines competitiveness and may lead to a decreased risk of information loss and administrative bottlenecks. A more efficient and effective exchange framework which is integrated with partners will provide a competitive edge as the current framework has been in use for a very long time and has not changed to satisfy the changing needs and wants of clients.

The focus of Chapter 3 was on the research methodology followed to assist in meeting the research objectives as set out in chapter one. The statistical analyses of this study were done by the Statistical Consultation Services of the North-West University, on the Potchefstroom campus using the SPSS Inc. (2016). IBM SPSS Statistics Version 23, Release 23.0.0 software.

A quantitative research approach as well as a qualitative research approach was followed. According to Welman et al. (2005:8) the purpose of quantitative research is to evaluate objective data consisting of numbers while qualitative research deals with subjective data that are produced by the minds of respondents or interviewees. Qualitative research was used to gain an insiders views whilst quantitative research was use to measured internal consistency, validity and reliability of many respondents. Another reason for using a quantitative research approach was to gain access to a larger sample as a quantitative approach is easier and more cost effective when collecting data from a large population area.

3.2 Procedure and scope of the quantitative research
A questionnaire was compiled using information gathered in the literature review of this study. Questionnaires were sent to managerial and administrative staff of manufacturing and distribution companies that make use of heavy haulage vehicles to transport their product with as well as to the managerial and administrative staff of transport companies that own their own fleet of heavy haulage vehicles and supply a transport service to the aforementioned companies. This research was gathered in the province of Gauteng and only respondents based in this area were considered. The demographics of the respondents were determined. Perceptions, relevance and satisfaction levels regarding the current framework used for information exchange and flow were determined as well as the need for change. Technology availability, alignment and responsiveness, especially available technology pertaining to mobility, were determined together with risk factors regarding information loss. See Annexure 3.1 for an example of the questions asked in the quantitative surveying instrument.

3.3 Procedure and scope of the qualitative research

Unstructured interviews were held with managers and administrative staff of large companies who were too busy to complete the questionnaire. Risks regarding information loss were discussed and concerns were pointed out. Although all respondents were interviewed in an unstructured manner they were asked the same questions by the interviewer. These interviews were noted and analyzed in a qualitative manner to add value to the quantitative research as well as gather additional information. Each interview lasted between thirty minutes and one hour with notes being made by the interviewer.

3.4 Sample group and size

The population is the study object and consists of individuals, groups, organizations, human products and events or the conditions to which they are exposed (Welman et al., 2005:52). The population of this study consisted of two groups, the first group focused on administrative staff of manufacturing & distribution companies that make use of heavy haulage vehicles to transport their product with and the second group focused on owners and administrative staff of transport companies that own a fleet of heavy haulage vehicles. The second group delivers a service to the first group mentioned. These companies work very closely together and both play an important
role in an information exchange and flow framework. The population encompasses the total collection of all units of analysis about which the researcher wishes to make specific conclusions (Welman et al., 2005:52).

Probability sampling was used to ensure that every member of the population had a probability of being included in the sample. A simple random sampling technique was used in order to ease the process of data collection as it would not be feasible or manageable to reach every person or company in the population. Simple random sampling is the basic sampling technique where a group of subjects are selected for the study from a larger group (population). Each company was chosen entirely by chance. Fifty manufacturing/distribution companies were chosen as well as fifty transport companies. Questionnaires were sent to the administration staff of these companies. Sixty surveys were received back from both groups; four surveys were rejected because they were not completed correctly.

The self-selecting sampling technique was also used as many manufacturing and transport companies were known to the author. This further eased the process of data collection. Companies in both target groups were approached and asked to participate in the study. Both probability sampling as well as non-probability sampling techniques were used in order to decrease the risk of biased data and sampling error. When determining the size of the sample, the size of the population must be kept in mind. The bigger the population the smaller the sample may be. The following formula is generally used to determine the sample size:

\[
    n = \frac{z^2 \pi (1 - \pi)}{e^2} \quad ... \text{Equation 1}
\]

\(n\) — Sample size required for given parameters

\(z\) — Number of standard deviations for the given accuracy

\(\pi\) — Proportion of sample of interest

\(e\) — Error allowable

Accurate data regarding the population size of the heavy haulage road freight industry of Gauteng was difficult to obtain. A possible reason for this is that the industry size is
continuously changing. There are new entrants every year whilst many also close down. The size of the heavy haulage road freight industry is very dependent on the cyclical phase of the economy. Moodley (2014) states that South Africa’s growing economy has led to an increased demand for road transport whilst the contrary would be true of a weak economy.

Some members in the sample group were non-responsive as was expected. Non-response is due to four inter-related problems:

- Refusal to respond
- Ineligibility to respond
- Inability to locate respondents
- Respondents located but unable to make contact

Non-response may also be attributed to members in the sample being very busy and therefore did not have time to complete the questionnaire as asked.

3.5 Survey instrument

Both a quantitative as well as a qualitative approach was used to capture research information in this study. A questionnaire was designed using information gathered from the literature review in chapter two. The questionnaire served as a tool to gather quantitative data from the sample and was sent to members who primarily function within the current information exchange and flow framework. These members were all literature and well educated. A questionnaire was chosen as a surveying instrument as they are relatively inexpensive, easy to administer and quick to deliver. Questionnaires were sent both electronically and hand delivered depending on the geographic area of the targeted members. Most of the completed questionnaires were sent back electronically as this gave the respondent more time to complete the questionnaires. The identities of all respondents were protected and confidentiality was guaranteed. This increased the probability of respondents being honest.

The questionnaire consisted of 61 questions and all were closed ended questions. A five point Likert scale with a scale from 1 (Strongly disagree) to 5 (Strongly agree) was used. Question 1.1 to 1.7 determined the demographics of the respondents whilst question 2 to 7 evolved around the current framework used, technology, mobility and risk. Technology, mobility and risk were incorporated into the questionnaire in order to
determine the functional relevance in the development of a new managerial framework for the exchange and flow of information.

Unstructured interviews (see annexure 3.2 for an example of the unstructured interview questions) were used as a tool to gather qualitative information from members who do not directly function within the current information exchange and flow framework of a company. These members are primarily facilitators of information within this framework. All interviewees were literate and well educated and had a good understanding of the standard operating procedures used in the current information exchange and flow framework of their companies. Unstructured interviews were also held with managers and administrative staff from bigger companies, many of them whom are listed on the Johannesburg Stock Exchange. The reason for this was that many of these respondents were simply too busy to complete a questionnaire but were eager to participate in the study. Unstructured interviews saved time and respondents were able to better understand the questions and objectives concerning this study.

3.6 Demographical profile of respondents

The gender profile of the respondent was evenly matched with 55.8% male respondents and 44.2% female respondents.

All the respondents (100%) were based in the Gauteng area as set out in the title of this research. 89.3% of the respondents were employed in an administrative position whilst 10.7% were company owners or general managers who had responsibilities outside of the administrative scope but were also involved in certain information

![Figure 3.1: Gender of respondent](image)
exchange and flow tasks. Below is a graphical representation of employee experience and of the company size the respondents work for.

![Graphs showing company size and employee experience](image)

Figure 3.2: Demographical profile of respondents

### 3.7 Empirical study and results
3.7.1 Frequency analysis and descriptive results

Descriptive statistics were used to describe the basic features of the data in this study. Graphic analyses were used in conjunction with the descriptive statistics to form the basis of the quantitative data (Trochim, 2006). Descriptive statistics were used to condense the data; it was also used to determine the central tendency and variability of the data. Welman et al. (2005:230) explains that the mean is the average score for a group and which is equal to the total of individual scores divided by the number of scores, whilst the standard deviation is used to determine if the scores on a parametric test are evenly distributed and cluster closely around the mean. See annexure 3.3 for a complete analysis of the questionnaires.

3.7.1.1 General information exchange and flow, current framework and the need for change

78.6% of the respondents were not satisfied with their current framework used for the exchange and flow of information whilst 21.4% of the respondents were satisfied. 87.5% indicated that their current information exchange and flow framework needed to be improved and 94.6% indicated that they will benefit from such an improved framework. Most respondents, 92.7%, preferred to work with transport suppliers (partners) who could deliver information more accurately and timely. 91.1% of the respondents believed that an improved framework would decrease disputes on proof of delivery documents (question 2.6 had a mean of 4.25 and a standard deviation of 1.1). Questions 2.7a to 2.7d had means of between 2.71 & 3.57; this was an indication that most respondents were neutral to how their frameworks compare to that of competitors. In question 2.8 (with a mean of 4.5 and a standard deviation of 0.505) 100% of the respondents indicated that an improved framework for the exchange and flow of information would provide them with a competitive advantage.

Question 5.3 had a mean of 2.69 indicating that respondents felt the current framework did not allow for the accurate flow of information between partners whilst question 5.4 had a mean of 2.20 indicating the current framework did not minimize the risk for information loss. 80% of respondents felt that technology used in the current framework was not up to date (question 5.5 with a mean of 2.04) and that by implementing available technology the following may be achieved:

- 6.3a - Efficiency will be increased (92.7%).
• 6.3b - Improved customer relationships (96.4%).
• 6.3c - Gain competitive advantage (94.5%).
• 6.3d - Optimize operations (94.5%).
• 6.3e - Improved decision making (96.4%).

The above results were supported by the literature review done in Chapter 2 and leads to the conclusion that the respondents were not satisfied with the current information exchange and flow framework and that it must be improved.

3.7.1.2 Technology alignment and responsiveness

Question 3.1.4 (mean of 2.18) and 3.1.5 (mean of 2.22) both indicated that the companies for which respondents worked did not give adequate attention to develop or implement technology to improve the exchange and flow of information. Most of the respondents were unhappy with the use of the current framework but none of them invested or developed new ways to resolve this problem. This was confirmed by the literature review in Chapter 2 and the conclusion can be made that many companies expect an unaffordable capital layout with the implementation of new technology, which is not necessarily the case.

One of the common themes throughout the questionnaire was that technology would improve the exchange and flow of information. Question 3.1.8 stood out in the sense that 100% of the respondents indicated that they would benefit by receiving and sending information electronically, this question had a mean of 4.70 and a standard deviation of 0.461. The literature review in Chapter 2 confirmed the benefits of sending and receiving information electronically and it is also important to note that electronic data transmission carried the same authority and legality as information on hardcopy documents, a literature review regarding the laws and regulations confirmed this.

Question 3.2.1 with a mean of 2.51 indicated that respondents were not well aligned with their partners in terms of technology and that very little of them were actually investing in methods in order to be well aligned, only 20% indicated that they invest in technology to align with their partners whilst 100% of the respondents indicated that their value proposition would be improved if they were aligned with their partners. This was once again confirmed by the literature review in Chapter 2.

72.7% indicated that their supply chain does not effectively change with clients wants and needs while 81.8% indicated that their companies do not develop new products
effectively in order to satisfy these client wants and needs. This was once again in contradiction with question 3.3.4 in which 90.9% of the respondents indicated that being more technological responsive with their clients would improve their value proposition, this was also confirmed by the literature review in Chapter 2.

3.7.1.3 Mobility

Mobile resource management and mobile supply chain management were the two main themes focused upon regarding mobility with the framework. 92.7% indicated that mobile supply chain management will improve the exchange and flow of information within their companies & 96.4% said that their clients would benefit by them using such technology. A dominant theme within the results was that mobile resource management and mobile supply chain management would increase both their value proposition and provide them with a competitive edge. Only 1.8% of the respondents felt that mobile resource management would not play a bigger role in the exchange and flow of information in the future with 5.5% being neutral. The ability of mobile resource management to reduce cost was also indicated in this segment of the questionnaire.

3.7.1.4 Risk

94.5% of the respondents agreed that drivers often lose valuable information and that they often receive proof of delivery documents which are incomplete (98.2%). Respondents indicated that drivers lost information due to the following reasons.

- Theft, question 7.3a had a mean of 3.23 and a standard deviation of 1.154
- Negligence, question 7.3b had a mean of 4.2 and a standard deviation of 0.779
- Accidents, question 7.3c had a mean of 3.73 and a standard deviation of 0.660

Negligence stood out as the most common reason why drivers lost valuable information. Question 7.4 had a mean of 4.75 and a standard deviation of 0.440 whilst 100% of the respondents indicated that receiving information straight after delivery will decrease the risk of losing valuable information.

3.8 Qualitative analysis
The questions in the unstructured interviews (qualitative) were both open-ended and closed ended. The questions analyzed quantitatively focused on the following themes:

- Current information exchange and flow framework used
- Technology
- Need for change
- Risk

3.8.1 Current information exchange and flow framework used

A figure of the current information exchange and flow framework was showed to the interviewees (see attached annexure 3.2) whilst asking them if they agree that the representation is accurate regarding the framework they currently use. All respondents agreed. None of the respondents were satisfied with the current framework as the exchange and flow of information provided no competitive advantage, was too slow, posed to many risks regarding the loss and accuracy of information and was outdated, no new technology was employed to improve this framework and although many saw the potential of using an improved framework very little in terms of investment and new product development was done.

3.8.2 Technology

Most of the respondents indicated that they knew the definition of both mobile resource management and mobile supply chain management but did not have an in-depth understanding of the technology. This was once again an indication that respondents were not acutely aware of new and available technology that could improve the exchange and flow of information within the heavy haulage road freight industry. None of the respondents were currently using mobile resource management or mobile supply chain management technology. All respondents believed that both previously mentioned technologies will play a bigger role in the future but none of their companies actively invested in any of the available technologies or were technological aligned with their partners. A common theme regarding the technology aspect of the unstructured interviews was that all respondents believed that the use of electronic documentation will improve their current exchange and flow of information.
3.8.3 Need for change

All respondents indicated that there was room for improvement within their current framework used and that improvement was required in order to benefit from faster information exchange and flow, relieve current administrative constraints i.e. bottlenecks and decrease the risk of information loss and inaccuracy. All respondents indicated that they required their partners to send information more regularly and at a faster pace.

3.8.4 Risk

Respondents indicated that information is lost mainly due to driver negligence and to a lesser degree theft. Accidents did not happen regularly enough for respondents to see this as a big risk in terms information loss. Respondent indicated that the immediate exchange of information (after a delivery) would decrease the risk of information loss, increase accuracy and enhance the decision-making process in difficult situations i.e. damaged goods and endorsed proof of delivery documents.

3.9 Conclusion

The results of the empirical research study were presented and analyzed in this study. The demographic profiles of the respondents were explained as part of the research results. The findings indicated that 61.1% of the respondents surveyed worked for a company with an annual turnover of more than 10 million whilst 46.3% were employed by a company employing between 21 and 50 employees. This is consistent with the population as transport as well as manufacturing companies typically have very large turnovers whilst not employing so many people. The conclusion can be made that these companies are big enough to assess their current information exchange and flow framework used and to invest in the framework to facilitate a competitive advantage and increase their value proposition. 80.4% have been employed in the industry for longer than 5 years and 58.2% were employed for longer than 5 years at the current company they were working for. This is a good indication that employees had enough experience within the transport industry and an intricate understanding of the current processes and operating procedures at their current employers to answer the questionnaire fairly and accurately.
Respondents indicated that the use of available technology within their information exchange and flow framework will increase their competitive advantage as well as increase their value propositions within the said industry but very few respondents indicated that their companies actually invest in technology and products to align and respond to customer needs and wants in order to realize these benefits. Many respondents indicated that they are neutral regarding the use of technology by their competitors in their information frameworks indicating that they do not know what systems or processes their competitors are using and they do not know if they have a competitive advantage regarding technology employed in their informational framework. This implicates that although many respondents believe that technology may present a competitive advantage they do not presently see the exchange and flow of information as a means to achieve this business goal.

Respondents indicated that by receiving and sending information straight after delivery the following benefits will be realized:

- An improved dispute resolution process
- Improved decision making capabilities
- Decrease of bottle necks and other constraints
- Improved accuracy of information
- Decrease in information loss

Unfortunately, the current framework for the exchange and flow of information used did not allow this to happen and therefore the most of the respondents indicated that they were not satisfied with the use of the current framework.

Findings from the qualitative research together with the literature review reiterated and confirmed the above results. Interviewees voiced their concerns regarding the current framework and the constraints it posed. All interviewees were of the opinion that the framework must be improved and can be improved by deploying available technology to realize benefits in terms of adding to their current value proposition and competitive advantage.
3.10 Chapter Summary

This chapter focused on the research methodology and findings of the empirical study. There was a definitive correspondence between the qualitative results and the quantitative results, both research methods indicated that respondent groups agreed that technology will play an ever-increasing role in the exchange and flow of information framework within the heavy haulage road freight industry in the future and all agreed that by sending and receiving information electronically will unlock many benefits and relieve current constraints.

Quantitative and qualitative procedures were discussed as well as the sample size and survey instrument. The research methodology as a whole was discussed and the demographic profile of the respondents were analyzed.

Descriptive statistics were used to analyze the results from the survey instrument (questionnaire) and these results were reported on. The standard deviation results were acceptable with the highest being question 6.1 (1.343) and the lowest question 7.4 (0.440) Results regarding the current framework, as pointed out in the literature review, were reported on as well as certain technology, mobility and risk aspects that might be incorporated into a new managerial framework for the exchange and flow of information within the heavy haulage road freight industry. The results analyzed included the quantitative research (questionnaire) and qualitative research (unstructured interviews). All results were reported on.
CHAPTER 4: CONCLUSIONS AND RECOMMENDATIONS

4.1 Introduction

The primary objective of this study was to propose a new managerial framework to improve the exchange and flow of information in the heavy haulage road freight industry. Technology has developed tremendously over the last decade and innovation has taken place at a very fast pace, unfortunately very little technology adoption has taken place within the heavy haulage road freight industry as is evident from the results in chapter three. Sanghvi (2016) states that more and more traditional companies must start to leverage technology to gain competitive advantage.

Secondary objectives included testing the need for change with regards to the current information exchange and flow framework used in the heavy haulage road freight industry as well as to determine if the proposed framework will add value by:

- Enhancing the dispute resolution process between the client and the transport supplier
- Reducing administrative errors from administrative office staff and drivers
- Increasing the value proposition of a transport supplier by creating a competitive edge

Part of the secondary objectives were to conceptualize the current information framework, the information process as well as explore and discuss available technology in the heavy haulage road freight industry, and lastly to propose other fields of research in the heavy haulage road freight industry.

A questionnaire was designed in order to determine the need for change regarding the information exchange and flow framework currently used. According to Robinson (2016b) technology and digitalization will lead to a new standard of productivity and will become invaluable in order maintain a competitive advantage within the supply chain business.

The following topics were covered in the literature review of this study: the current state of transport in South Africa, technology that may facilitate mobility, the importance of innovation and technology application within the supply chain, directional flow of goods and information, informational risk as well as laws and
regulations in terms of the Electronic Communications and Transactions Act 25 of 2005 and the National Land Transport Act 5 of 2009. A questionnaire was designed using information obtained from the literature review in Chapter 2 and constructed to accomplish the primary and secondary objectives as stated in Chapter 1.

As stated in §1.7; Chapter 4 will consist of a conclusion and recommendations regarding the outcome of the study. This Chapter will be devoted to drawing conclusions from the literature study in Chapter 2 and the empirical study as reported on in Chapter 3. Recommendations regarding an improved managerial framework for the exchange and flow of information within the heavy haulage road freight industry will be put forward.

4.2 Conclusions regarding the current information exchange and flow framework used.

The following conclusions were reached after completing a literature review in Chapter 2 as well as analyzing the results from Chapter 3.

The current framework and operating procedure used is old fashioned and causes a big delay in the exchange and flow of information between consignor, consignee, transport supplier, transport broker and any other relevant party. This framework does not support the immediate exchange and flow of information within the heavy haulage road freight industry and therefore increases the risk for information loss and damage. This framework has many other limitations and constraints in terms of the decision-making process, creating administrative bottlenecks and complicating the dispute resolution process. Respondents indicated that they were unsatisfied with the use of the current framework and that it needed to be improved.

This framework is widely used within the heavy haulage road freight industry and is by far the most popular. Unfortunately, as seen from the results in Chapter 3, this current framework does not accommodate the supply chain and logistics objectives for the next five to ten years as set out by the Barloworld survey (2014:13), especially not:

- Improving the flow of business intelligence.
- Integration of technology.
- Improving visibility.
- Aligning with key players in the supply chain.
Rather, this framework accommodates some of the major constraints as listed by the Barloworld survey (2014:15) and contributes to:

- Internal and external silo based mentality.
- Ineffective processes and systems.
- Lack of supply chain information and intelligence.
- Reluctance/Foresight to change.

The below mentioned framework (as discussed in Chapter 1) is most often used in the heavy haulage road freight industry and is the most popular within the industry.

![Diagram](image)

**Figure 4.1: The current framework used for the exchange and flow of information within the heavy haulage road freight industry**

Above diagram of the current information framework used in the heavy haulage road freight industry explained:

**Step 1 – Client places an order.**

- The client places an order via email instructions or a purchase order that is sent via email.
- The operator who receives the order then confirms if he will be able to transport the load and provides the client with an estimated time of arrival for the vehicle.

**Step 2 – Vehicle is booked and dispatched.**
• The operator then books a vehicle closest to the loading address (this is done to limit empty kilometres as no monetary value is received from the client for empty kilometres), details are provided to the driver telephonically and then backed up by a text message.

**Step 3 – Driver receives a POD at the loading point from the consignor.**
• The driver receives a proof of delivery document (POD) which contains all the relevant information concerned with the load e.g. product type, quantities, load weight, pick-up and delivery address etc.

**Step 4 – Cargo is delivered to consignee.**
• The load is shipped and delivered to the given address.

**Step 5 – Consignee signs POD and returns it to the driver.**
• The consignee makes sure that the POD corresponds with the load and that there are no damages or shortages.
• Once the consignee has checked the load he signs the hardcopy POD. The consignee then hands the POD back to the driver who stores the paperwork in his vehicle.

**Step 6 – Vehicle is dispatched to his next load.**
• The vehicle is then dispatched to his next loading point to collect an available load that must be shipped.

**Step 7 – Various deliveries take place on the same principle.**
• Steps 1 to 7 is then repeated throughout the month.

**Step 8 – Truck returns to yard at month end.**
• The vehicle is ordered to return to the yard at month end in order to deliver paperwork, check the vehicle for any repair and maintenance issues and sort out any concerns that might be raised by the driver.

**Step 9 – Admin staff receives POD’s of all the loads done by the vehicle for the month.**
• The driver delivers the paperwork of all the loads done for the month to the administrative staff members. Staff members ensure that all documents are present, undamaged and neat. Each POD is sorted to match the client order.
Step 10 – Each POD is invoiced separately.

- It is critical that the correct POD is allocated to the correct load in order to ensure that the correct rates are invoiced and attached to the correct invoices. Each load is invoiced separately. Huge bottlenecks occur at this step as many drivers return to the yard at the same time which lead to admin staff being inundated by paperwork. Admin staff have a big responsibility to ensure that all the loads are invoice accurately before month end. Loads with problem POD’s are placed aside until they can be adequately attended to. POD’s which are incomplete or unsigned will not be invoiced until the problems are resolved. Even though these problems are usually simplistic in nature, they take a long time to sort out and get the relevant information which is required.

Step 11 – All POD’s are scanned and filed.

- After each load is invoiced the POD’s are scanned and filled electronically or in a hardcopy format. POD’s are filled according to customer name and reference number. Law requires that these copies be kept for a minimum of five years.

Step 12 – Invoices with corresponding POD’s are couriered to the client.

- Each client’s invoices (which are attached to the POD’s) are compiled in an envelope and sent to them using a courier service. Some companies use the postal service instead of a courier service as it is a cheaper option.

Step 13 – Lost, damaged and problem POD’s stay behind until they are sorted.

- Lost, damaged and problem POD’s are kept behind until their problems can be resolved. Often the consignee needs to be phoned in order to get individual pages that were left behind, in other instances POD’s need to be sent back to get them signed. These problems take a very long time to sort out.

From the above explanation one can realize that the current framework used for the exchange and flow of information within the heavy haulage road freight industry must be improved as it currently impedes the flow of information. Not only does the current framework have a lot of limitations, it will also not allow stakeholders to reach their objectives as stated by the Barloworld logistics foresight survey of 2014, rather, the current framework contributes to the constraints currently experienced by the respondent who part took in the said study.
4.2.1 Risks associated with certain steps of the current framework

Specific risks in terms of information loss were identified in the following steps:

**Step 5** – The consignee might not sign all the pages of the POD as many consignors have POD’s which consist of multiple pages. In most cases this happen accidently but in some instances the consignees may take chances and argue that they did not receive the stock listed on that particular page. The consignor will either hold back the full payment of the load or process a claim for lost goods even though everything was delivered. As long as the argument persists no payment is processed. The dispute resolution process can take up to three months which translates to a transporter only getting paid in the 4th month after delivery was done, this delayed dispute resolution process has implications on cash flow and increased administrative costs per load.

After the consignee, has signed the POD the driver stores the paperwork on his vehicle together with all the other POD’s of loads that have been done. Paperwork might get mixed up, lost or damaged if they are not stored properly. Results from the empirical study in Chapter three indicated that drivers lose paperwork regularly and the biggest reason for this is driver negligence. Lost or incomplete information will lead to delayed or in some cases non-payment.

**Step 7** – Various deliveries take place throughout the month. The vehicle may be involved in an accident which in most instances lead to all the paperwork being lost. Theft of the vehicle or of goods inside the vehicle poses the same risk. Information lies idle on the vehicle which decreases the productivity of administrative staff as they cannot process the load before they have not received the information on the POD. This leads to a complete halt of information flow and exchange within the heavy haulage road freight industry (outbound).

**Step 8** – Information might get lost in the hand over process from the driver to administrative staff.

**Step 12** – Once each load is invoiced and the POD’s are attached to invoices an envelope of all invoices are sent to the client via a courier service or the postal service. Although using a courier service is more reliable than using the postal service both modes pose the same risk that the envelope might get lost or delivered to the wrong address. This will have a further implication on the cash flow of a transport supplier as well as the consignor. Lost documents lead to a damaged reputation of both parties.
are they are seen as incompetent or unprofessional. If the documents arrive at the consignor after month end (or the relevant cut-off date) the haulier will not receive payment the following month which will further place stress on the cash flow of the business. Courier companies and especially the postal service often deliver packages late.

Some steps within the current framework used pose great risk for consignor, haulier and consignee. Both tangible and intangible damage may be caused using this framework, reputational and relationship damage will both have a devastating effect between consignor and haulier.

4.2.1 Comments

The current framework used for the exchange and flow of information within the heavy haulage road freight industry is insufficient and unreliable, respondents indicated that this framework must be improved. Risks associated with the use of this framework should be decreased or all together eliminated.

The Barloworld survey (2016:1) suggests that the industry has moved into a period of higher market disruption and greater economic and political uncertainty in South Africa, the ability of an organization to sustain market position through its traditional business model and strategy has become increasingly challenging, indeed adaptation is now critical for survival. The framework has been unchanged and used for a very long time and must be adapted to accommodate customer wants and needs, facilitate a competitive advantage and increase the value proposition of participants within the industry. The Barloworld survey (2016:1) explains that the role of supply chains and logistics came to the fore as a means to create competitive advantage and sustainable business models to satisfy the needs of extended markets, therefore creative and innovative solutions must be explored in order to accomplish these goals. Further the respondents indicated that current key focus areas for their business are: managing rising operating costs, pursuing their customer related strategies and addressing ongoing technological developments (Barloworld, 2016:8). All the more reason why a paradigm shift towards accomplishing these goals must be made.
4.3 A paradigm shift towards digitizing the information framework.

From the literature review in Chapter 2 it was evident that technology is available in order to minimize the risks as explained in §4.2.1, not only will this technology minimize the risks as explained but it will also facilitate mobility and improve the exchange and flow of information within the heavy haulage road freight industry. Participants within the industry must undergo a paradigm shift and look to digitization in order to facilitate change to improve the current information framework used. Appropriate technology is available and will not require a huge capital layout to implement.

Conclusions taken from the literature review in Chapter 2 as well as from the empirical results in Chapter 3 point to the following focus areas in order to improve the exchange and flow of information within the heavy haulage road freight industry:


3. Technology innovation and implementation. The Apics Supply Chain Council (2014:6) states that the lack of updated information technology contributes to the chronic disruption in the supply chain.


Two other surveys that carry a lot of weight within the industry made the following recommendations regarding the direction of a paradigm shift.

4.3.1 Barloworld foresight recommendations (Embracing change for a sustainable future 2016)

66% of the respondents in the Barloworld survey (2016:22) said their companies needed to adapt significantly to changing conditions. This is an indication that industry participants are aware that change is needed but are not yet willing to undertake or
implement the change. This reiterates the need for a paradigm shift regarding information exchange and flow within the heavy haulage road freight industry. The foresight survey (2016:22) explains that many companies are moving into new markets facilitated by technology, new business models and co-operation, causing disruption across many industry sectors.

Logistics and supply chain management strategies and functions are increasingly being embraced in service industries as they begin to recognize the extent of their supply chains and the related logistics processes involved in managing business systems, outsourced partners and the increased flow of information (Barloworld, 2016:2). The survey also found that future opportunities could be gained from elements such as new technologies, improved demographics and enhanced business intelligence (Barloworld, 2016:51)

### 4.3.2 CSIR recommendations (10th State of logistics survey for South Africa, 2013)

Integration and collaboration will hold key benefits in providing companies with a sustainable competitive advantage, the State of logistics survey by the CSIR (2014:2) is of the opinion that end to end integration of supply chain functions are the next major shift required in South Africa to make business more customer-centric and competitive. Companies have realised significant gains in profitability by being more responsive to volatile customer demand (CSIR, 2014:3). To accomplish this, change is required in the current standard operating procedures used and change will have to occur regarding the framework used for the exchange and flow of information. The survey (2014:3) states that radical change in how supply chain partners collaborate and how information technology is leveraged to provide end to end visibility and real time decision making.

Companies are beginning to see their partners as a network rather than a chain with valuable insight that can lead to mutual benefit. Courage and innovation from both the private and public sector are needed (CSIR, 2014:84)

The above recommendation from the CSIR report and the Barloworld foresight survey are parallel to the findings of the literature review in Chapter 2 as well as the findings from the empirical results in Chapter 3.
4.4 Recommendations

4.4.1 A management framework to improve the exchange and flow of information in the heavy haulage road freight industry.

There is no doubt that technology will play a central role in the recommendations for a management framework in order to improve the exchange and flow of information within the given industry. The incorporation of available technology should also reduce the probability of information being lost or damaged due to driver negligence as this was the most likely reason why drivers lost information as pointed out by the results in question 7.3 of the questionnaire. This was confirmed by the results of question 4.6 in Chapter 3 where respondents indicated that mobile resource management will play a bigger role within the transport sector in the future. Information needs to move faster and be more accurate as was indicated by the respondents.

The majority of respondents indicated that their company will benefit from sending and receiving information in an electronic format. It is important that the proposed managerial framework relieve the current constraints and bottlenecks experienced by administrative staff and other stakeholders within the industry. It is imperative that this proposed managerial framework will enhance the exchange and flow of information.

Respondents also indicated that they will benefit from the use of both mobile resource management and mobile supply chain management. According to the literature review done in Chapter 2, mobile supply chain management will aid firms’ in cost reduction, supply chain responsiveness and to gain a competitive advantage whilst mobile resource management will aid in productivity, customer centricity and facilitate electronic data interchange. Both these two technologies will add to mobility as well as enhance visibility. Errors will be decreased and accuracy will automatically improve. Considering the conclusions made from the literature review in Chapter 2 and the empirical results obtained from Chapter 3 the following managerial framework for the exchange and flow of information in the heavy haulage road freight industry is proposed:
Figure 4.2: A new managerial framework for the exchange and flow of information within the heavy haulage road freight industry.

Above diagram of the proposed managerial framework to improve the exchange and flow of information within the heavy haulage road freight industry explained:

**Step 1**
- The client places an order either by giving instructions via email or sending a purchase order.

**Step 2**
- An operator books a vehicle closest to the loading address. Details are provided to the driver telephonically and is then backed up by a text message. A pin can also be dropped straight onto the vehicles’ GPS system depending on the tracking software used.
Step 3

- The driver receives a proof of delivery document (POD) which contains all the details of the load e.g. product type, quantities, load weight, pick-up and delivery address etc.

Step 4

- The load is shipped and delivered to the given address.

Step 5

- The consignee makes sure that the POD corresponds with the load and that there are no damages or shortages.
- Once the consignee is happy he signs the POD (hardcopy) and makes an electronic signature on the driver's device.
- The consignee hands the signed POD back to the driver.

Step 6

- The driver captures all the relevant load information i.e. location coordinates, consignee information and any endorsements if there are any. The POD is scanned and then filled by the driver.

Step 7

- The POD together with all the load information is then emailed by the driver to the administrative office.
- Load information include general notes, problems encountered on route and problems encountered at delivery site.

Step 8

- The signed POD is received (electronically) by the administrative staff straight after delivery.

Step 9

- The POD’s are checked (by administrative staff) for any endorsements or claims. If claims arise the administrative staff is able to inform the client immediately. This places all the relevant staff members of the consignor, transporter and consignee in a position to make better and informed decisions. All problems can be attended
to whilst the driver is still at the delivery point and administrative staff can point out if there are any documents missing. The driver will then be able to rectify any problems or shortages regarding all information.

**Step 10**
- The load is invoiced by the administrative staff using the electronic copies sent by the driver.

**Step 11**
- The electronic POD’s together with the invoice are sent to the consignor straight after delivery.

**Step 12**
- The consignor receives the POD’s immediately after delivery is completed
- See annexure 4.1 (Delivery Note) as an example. This document can be generated by using this proposed managerial framework to improve the exchange and flow of information within the heavy haulage road freight industry.

**4.4.2 Benefits and spin offs of the proposed managerial framework to improve the exchange and flow of information within the heavy haulage road freight industry.**

There are various advantageous spin offs coupled with this improved framework:
- The risk of losing or damaging POD’s are significantly reduced.
- Information exchange and flow is increased, specifically with regards to the speed and accuracy thereof.
- Proof of delivery is further strengthened by GPS coordinates and delivery photos of the delivery location. **See annexure 4.1 (Delivery Note).**
- The administrative bottleneck of receiving all the month’s paperwork at once is relieved. Efficiency and productivity are both increased as administrative staff receive the relevant information immediately after the load is completed and can therefore immediately invoice, send and file the paperwork. Deliveries will be invoiced as they are completed.
- Companies will experience increased cash flow as there are less administrative errors and lost paperwork. As mentioned above, deliveries will be invoiced as they are completed and companies will be entitled to payment the following
month. Vardabasso (2005) states that electronic proof of payments will aid in cashflow.

- Decision making will be improved as administrative staff will immediately be aware of any load endorsements of damages. Clients can be informed and issues can be resolved timeously. The disputes resolution process will be indirectly enhanced as clients are made aware of any discrepancies whilst the vehicle is still at the consignee.

- Competitive capabilities will be increased. Li et al. (2006:111) describe a research framework for competitive capabilities and defines the following five dimensions: competitive pricing, premium pricing, value-to-customer quality, dependable delivery, and production innovation. This will enable the heavy haulage road freight industry to adapt and align with client needs, value to customer and product innovation will be improved by using a more practical, technology driven framework. According to Sherer (2005:79) the synergistic term, just like the separate component terms, has not conveyed an emphasis on a web of connections between partners and customers, particularly for information sharing, nor has it focused on customer needs.

- Value over cost – The capital layout of purchasing the equipment needed to facilitate the proposed managerial framework will be affordable and add additional value to the offering of industry participants. The value will outweigh the cost. Barloworld survey (2016:25) explains that the real opportunity lies in a company’s ability to ensure costs are managed in relation to creating value going forward.

- Mobile technology enables firms to provide their customers with real time updates of new or changed information. Eng (2006:682) states that the most obvious advantage of using mobile technology in supply chain management is that it enables firms to provide service to customers wherever they are located at the time they need them.
4.4.3 Equipment and training needed in the use of the proposed managerial framework to improve the exchange and flow of information within the heavy haulage road freight industry.

As previously mentioned, the implementation of technology in order to facilitate the proposed framework will not have a big capital layout and be very feasible. Equipment needed are as follows:

- Either a tablet or a smart phone. Most drivers already possess a smart phone as they have become affordable to the mass market. Companies are also providing their employees with smart phones as the benefits of using these phones exceed their cost. Vodacom has a very good tablet which is also priced very reasonably, these tablets are durable, very rugged and built for the South African market. They are priced at a R1000.00 per tablet. Details of these tablets may be viewed at www.vodacom.co.za/c/serp/#/vodacom?step=1

- A Scanner application (iscanner) can be downloaded on a tablet or a smart phone. These applications are free and very easy to use. If the mobile scanner application is not sufficient then a mobile scanner can be purchased; they are generally priced at around R600.00 and easy to operate. They are readily available at any technology outlet i.e. Incredible Connection.

- Internet connectivity will be essential in order to transmit the data message from delivery site to the administrative office.

- Training can be done in-house as it is a very easy process to learn. Training can be done in 30 minutes as the concepts in the proposed framework are not new or foreign.

The equipment and training mentioned above is readily available and basic. It is not necessary for big adjustments and will improve the exchange and flow of information within the heavy haulage road freight industry. The total capital layout will be in the region of R1700.00 per vehicle and there after only be needed to purchase data on a monthly basis.

4.4.4 Legality surrounding the use of the proposed information framework and electronic documentation.

From the literature review in Chapter 2 it is evident that the use of electronic data transmission and communication is just as legal as the use of information on an
original document or a hardcopy document. Electronic data messages carry the same weight and authority as data messages in its original form as long as these messages conform to the rules imposed by government as prescribed in the Electronic Communications and Transactions Act 25 of 2005 and the National Land Transport Act 5 of 2009.

The Electronic Communications and Transactions Act 25 of 2005 was designed to promote electronic transactions and communications in South Africa. The literature review in Chapter 2 elaborated upon topics such as the signature, the original, admissibility and evidential weight of data messages, retention and production of document or information.

The National Land Transport Act (5 of 2009) regulate and govern the vehicles on the roads and describe the requirements and responsibilities of truck owners and their employees regarding their loads and documents.

Both the above-mentioned acts make provision for the use of electronic data transmission. The proposed framework will therefore operate within the prescribed rules and regulations as set out by government and function within statutory law. The proposed framework will therefore improve information exchange and flow as well as operate within the legal requirements.

4.4.5 Comments

The secondary research objectives as identified in §1.6.2 were realized as a result of the literature review in Chapter 2 and supported by the empirical results in Chapter 3.

1. Conceptualization of the current framework and information process – The current framework used for the exchange and flow of information was identified and explored.

2. The need for change – Respondents indicated that they require a change in the current information framework used. From the empirical results, it was evident that the respondents were not satisfied with their current information exchange and flow framework used.

3. Enhancing the dispute resolution process between the client and the transport supplier – Respondents indicated that the dispute resolution process will be enhanced as a result of improved information exchange and flow. Receiving information straight after delivery will improve the accuracy of the information
and inform all relevant stakeholders if there is a problem that deviates from the norm. This will improve the decision-making process as the relevant parties will be well informed and problems will be resolved whilst the driver is still at the delivery point. Decisions are made based on available information, in the proposed managerial framework for the exchange and flow of information within the heavy haulage road freight industry, information will be readily available and at the access of consignor, hauler and consignee.

4. Reducing administrative errors by administrative office staff and drivers – The results from the empirical study indicated that administrative errors from drivers and staff will be reduced as information is more readily available. An improved information exchange and flow framework will relieve some of the constraints and bottlenecks currently experienced with the use of the present information exchange and flow framework. This will result in staff making less errors.

5. Increasing the value proposition of a transport supplier – From the empirical results, respondents indicated that their business unit preferred to use a transport supplier who can provide information more accurately and timely, consignors attach value to their transport suppliers in this regard. Respondents indicated that technology integration, alignment and responsiveness between consignors and transport supplier will increase the value proposition to their clients.

6. Recommendations for future studies were identified and discussed in §4.6.

4.5 Limitations and implications for further research

Very little prior research regarding the exchange and flow of information within the heavy haulage road freight industry of South Africa has been done. There is not much data relating to the research title. The cost of doing a bigger study is expensive and time consuming. Participation within the industry is not good and respondents are reluctant to complete questionnaires and share information. There is very little data available regarding the size of the industry. Stats SA and independent researchers are able to provide information regarding the total size of the transport industry but they are not able to provide data regarding the size of transport modes within a specific province, it is therefore difficult to determine the population and sample size. The size
of the heavy haulage road transport industry is continuously changing with many new companies entering as well as many closing down or exiting each year.

4.6 Recommended future studies

Future studies may focus on the following topics:

- **Cost benefit analysis** – A cost benefit analysis can be done in order to determine the benefit of using the proposed managerial framework in relation to the capital expenditure needed to implement the framework.
- **Integration of an Enterprise Resource Planning (ERP) systems within the complete supply chain study (paperless system)** – A study can be conducted regarding the integration of the proposed managerial framework with a company ERP system. Integration will provide added benefits to the process and may be coupled to a cloud based storage systems. These benefits should be explored.
- **The degree of responsiveness and visibility facilitated within the supply chain by using this proposed managerial framework for the exchange and flow of information.** A qualitative study can be conducted to determine this.
- **Cash flow implications** – Most of the running expenses within the transport industry are current whilst payment for loads that have been done are only received 60 days after delivery. The 60 days waiting period is often extended if information has been lost. Invoicing a client straight after delivery should decrease the average aged receivables of a transport supplier.
- **Integrated fleet management** – Telematics could be integrated within the proposed frame work and provide a holistic view on the performance of a vehicle in terms of running expenses, kilometres travelled, empty legs, fuel usage and CPK performance. CPK (cents per kilometre) is a KPI (key performance indicator) used to determine the income of a vehicle per kilometre. The total turnover of an individual vehicle is divided by the empty and loaded kilometres travelled. This will provide company owners and fleet managers with a bench mark in order to determine financial performance of assets.
- **Willingness of technology adoption** – Although there is concrete evidence, as per the literature review, that technology can add value and many other benefits to companies operating in the supply chain many owners and managers are
still slow to adopt the available technology. The reasons behind this must be explored.

4.7 Conclusion

4.7.1 Evolution and Future Direction

The aim of this study was to propose a new managerial framework to improve the exchange and flow of information within the heavy haulage road freight industry.

The current framework for the exchange and flow of information used in the heavy haulage road freight industry was determined and researched. Short comings of the current framework as well as methods to improve the framework were identified.

The literature review in Chapter 2 and the empirical results in Chapter 3 were used to make conclusions and recommendation regarding a new managerial framework to improve the exchange and flow of information within the heavy haulage road freight industry.

The Barloworld survey (2016:8) states that the true determination of the sources of profit and/or profit erosion within a business is clearly a growing need, coupled with the ability to use technology effectively to convert data and information into actionable intelligence. There is no doubt that the future direction of information exchange and flow within the supply chain will depend on technology and innovation. Change must occur for good reason and the goals behind the change must be realistic and achievable. Change for the sake of change is not good enough and should rather function as a tool (with good strategic fit) to accomplish the predetermined goals. Leaders are responsible to create a sustainable competitive position and provide a constant advantage. According to the Barloworld survey (2016:8) great strides have been taken to bring South Africa companies to accept and embrace the changing world, changing markets and changing technologies.

Key recommendations taken from Chapter 4 included:

- Making use of electronic data transmission (as explained in §4.4.1) to facilitate the immediate exchange and flow of accurate and complete information.
- Implementing available technology in order to be able to transmit data electronically and equipping relevant staff (i.e. drivers) with the correct tools to accomplish this goal.
• Providing an improved framework within the current laws and regulations for the exchange and flow of information within the heavy haulage road freight industry.

• Methods to digitize and facilitate a competitive advantage through improved value proposition.

4.8 Chapter summary

In chapter 4 the findings of the literature review as well as the questionnaire results were summarized in order to conclude this study and make recommendations. The primary objective of this study was to recommend an improved managerial framework for the exchange and flow of information in the heavy haulage road freight industry.

Conclusions with regard to the secondary objectives were made and discussed. The questionnaire was compiled from the literature review in Chapter 2 which was then used in the survey as well as to lay a foundation for a proposed managerial framework in order to improve the information exchange and flow within the heavy haulage road freight industry. The proposed framework includes the use of technology in order to digitize the supply chain and to facilitate mobile resource management and mobile supply chain management. Recommendation for the use of a new managerial framework were made. The limitations of the study as well as suggestions for future research were made.

In this chapter, the findings of the literature review as well as the survey used in the empirical research were summarized. Conclusions and recommendations were made towards a paradigm shift regarding a new managerial framework to improve the exchange and flow of information within the heavy haulage road freight industry.
REFERENCE LIST


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http://cerasis.com/2016/02/05/digital-supply-chain/  Date of access: 01 Aug. 2016.


http://tech.firstpost.com/news-analysis/technological-
Date of access: 31 Aug. 2016


ANNEXURE 1.1 PROOF OF DELIVERY EXAMPLE
**INVOICE TO**
CASHBUILD MOXOPANE
P.O. BOX 90115
DIV 16
TELEPHONE: 0112481507
FAX: 

**ACCOUNT NO.**
A0001132

**CUSTOMER**
CASHBUILD MOXOPANE

**VAT NO.**
4910101080

**COMPANY REG. NO.**
1996/006531/07

**TRUCK REG. NO.**
4490160064

<table>
<thead>
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<th>PRODUCT NO.</th>
<th>PRODUCT DESCRIPTION</th>
<th>BATCH INFO</th>
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<th>QTY Dispatched</th>
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</table>

**NOTES RECEIVED IS UNDERLAY WHITE 1.8M X 30 M**

**SECURITY CHECK**

**DATE OF DELIVERY**
3585665

**BRANCH CODE**
08/11/17

**MOONEY**

**DELIVERY NOTE**
B855779

**CASES**
4260

**AV NO.**
G855779

**PRINT DATE:**
01/08/2016

**G.S.T. SIGNATURE:**
daniel
# Brits Branch

Coverland Monier Coverland (Pty) Ltd.

**PIERCE RASTENBACH STREET**
**BEATON INDUSTRIAL**
**(012) 230-2218**

---

**ACCOUNT NO.** 8270004972

**DESPATCH NO.** C807519

**REQUIRED DATE** 01/08/16

---

## INVOICE TO

**CASHBUILD MARAELERING**

**P.O. BOX 90115**

**DIV 16**

**TEL:** 01122481624

**FAX:**

---

## DELIVER TO

**CASHBUILD MARAELERING**

**CNR DURU MADISHA & NIL**

**MARIAELERING SHOPPING CENTRE**

**MONOPANE**

**015 483-2536/2317**

---

**TRANSPORTER DETAILS**

**SPEC-DELIVERY**

**Truck Reg:**

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**ACCOUNT NO.** CASHBUILD MARAELERING 4910101209 C807519

**VAT REG NO.** 1996/006531/07 4490160084

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<td>BA</td>
<td>81</td>
<td>WOODEN PALLETS</td>
<td>8.00</td>
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</tbody>
</table>

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**PROOF OF DELIVERY RECEIPT**

**Cashbuild**

**Code 3888159**

**Supplied:**

**Monier**

**Delivery Note No. C807519**

**AV No.**

**Date:** 08-08-2016

**Driver:**

**Observer:**

**KAGES PROOF**

**ALL DELIVERED PRODUCTS RECEIVED IN GOOD CONDITION BY**

---

**SIGNATURE**

E&OE: OUR STAND-CONDITIONS OF SALE APPLY, A COPY OF WHICH IS AVAILABLE FROM OUR OFFICES ON REQUEST.

**Print Date:** 01/08/2016 15:52

---

SANS 542: 2012

---

**90**
ANNEXURE 3.1 - QUESTIONNAIRE AND COVER LETTER
Questionnaire cover letter

Contact details of Researcher:

• **Name:** David Botha  
• **Student number:** 25736426  
• **Contact number:** 082 875 6657  
• **Email address:** davey@fhsa.co.za

**Title of the research:** A management framework to improve the exchange and flow of information in the heavy haulage road freight industry.

**Aim:** The aim of this study is to gather information concerning the use of available technology within the heavy haulage road freight industry in order to improve the exchange and flow of information between relevant role players and partners in the heavy haulage road freight industry. The information will be used to design a new management framework in order to improve the exchange and flow of information within the stated industry.

**Confidentiality:** No information regarding the respondents will be distributed to any other party. The confidentiality of each respondent is guaranteed and their identity will not be revealed in the reporting of the results.

**Expected benefits:** The research aims at gather information in order to design a new managerial framework for the exchange and flow of information in the heavy haulage road freight industry. The aim of the new framework is to decrease the risk of informational loss, improve decision making, decrease administrative errors, eliminate administrative bottle necks and speed up the exchange and flow of information in order to add value and provide a supply chain company with a competitive advantage.

**Feedback:** The results of the study will be made available to all the respondents as well as to the management of the companies who's employees take part in this questionnaire. This study will also be made available to researchers/students who wish to take the research further.

**Additional information:** The current framework referred to in this questionnaire is illustrated below and relates to information contained on proof of delivery documents. The framework regarding the exchange and flow of information centers around the
loading client, driver and transport company and how fast and accurate information relating to the POD is exchanged between these partners.

Current framework used for the exchange and flow of information within the heavy haulage road freight industry as per literature study.

### 1. General information and demographics:

<table>
<thead>
<tr>
<th>1.1 Gender</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Size of the company (Revenue)?</td>
<td>Less than 5 mil</td>
<td>5 -10 Mil</td>
</tr>
</tbody>
</table>

A management framework to improve the exchange and flow of information in the heavy haulage road freight industry.
<table>
<thead>
<tr>
<th>1.3 Number of people employed by the company?</th>
<th>1-20</th>
<th>21-50</th>
<th>More than 50</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1.4 Are you based in the Gauteng area?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1.5 Are you employed in an administrative position within the heavy haulage industry?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1.6 How long have you been working in the industry?</th>
<th>0-5 years</th>
<th>5-10 years</th>
<th>More than 10 years</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1.7 How long have you been working at the current company?</th>
<th>0-5 years</th>
<th>5-10 years</th>
<th>More than 10 years</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>2. Information Exchange and Flow</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>2.1 The current information exchange and flow framework used works well for our company.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>2.2 Our current information exchange and flow framework must be improved.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>2.3 Our company will benefit from improved information exchange and flow.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>2.4 Our business unit prefers to use a transport supplier who can provide information more accurately and timely.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>
2.5 Our company requires an information framework which will improve the flow and exchange of information between us and our transport supplier.

2.6 Improved speed of information flow will decrease disputes on proof of delivery documents.

2.7 Relevant to competitive companies, our company:

<table>
<thead>
<tr>
<th></th>
<th>a) exchanges more information with our partners.</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>b) benefits more from information exchange with our partners</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>c) conducts transaction follow up activities more efficiently</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>d) has reduced coordination costs regarding information exchange and flow</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.8 Improved business information flows will provide our company with a competitive edge.

<table>
<thead>
<tr>
<th></th>
<th>1 2 3 4 5</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

3. Technology

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
</table>
3.1.1 I understand the concept of mobile resource management.  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3.1.2 Our company can benefit from using mobile resource management in order to improve the exchange and flow of information between our business and its partners.  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3.1.3 Relative to our competitors our information exchange and flow framework is more advanced.  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3.1.4 Our company is always first to use new IT technology for the exchange and flow of information in our industry.  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
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<td>1</td>
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<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3.1.5 Our company is regarded as an IT leader in our industry regarding the exchange and flow of information.  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
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<td>4</td>
<td>5</td>
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</tbody>
</table>

3.1.6 I believe the use of technology will improve the information visibility in our supply chain.  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3.1.7 The use of technology will improve information flow between our company and our partners.  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3.1.8 Our company will benefit from receiving and sending information electronically.  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3.1.9 Being more technologically integrated with our partners will increase our value proposition.  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3.2 Technology alignment with partners  

3.2.1 Our company's information framework is well aligned with that of our partners.  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
3.2.2 Our company invests in information technology in order to align our technology with that of our partners. 

3.2.3 Both our company and our partners always work together for the best information technology alignment.

3.2.4 IT advances for information exchange and flow between our company and our partners are well aligned for best supply chain performance.

3.2.5 Being more technologically aligned with our partners will increase our value proposition?

<table>
<thead>
<tr>
<th>3.3 Technology responsiveness</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3.1 Compared to our competitors, our supply chain respond more quickly and effectively to changing customer and supplier needs.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3.2 Compared to our competitors, our supply chain develops and markets new products more quickly and effectively.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3.3 The relationship with our partner has increased our supply chain responsiveness to market changes through collaboration.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3.4 Being more technologically responsive will increase our value proposition to clients?</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Mobility</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Mobile supply chain management will improve the information exchange and flow within our company.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.2 Our clients will benefit from us using mobile supply chain management.  

4.3 Using mobile supply chain management will increase the value proposition of our company.  

4.4 Using mobile supply chain management to improve information flow will provide our company with a competitive edge.  

4.5 Mobile supply chain management will improve the efficiency of our information framework.  

Mobile resource management (MRM) is defined as products or services used to manage mobile fields workers and assets, such as vehicles, delivery trucks or trailers. Mobile resource management enables electronic data interchange which is an accurate and efficient way to speed up business operations.  

4.6 Mobile resource management will play a bigger role within the transport sector in the future.  

4.7 Mobile resource management will lead to cost reduction.  

4.8 My competitors use mobile resource management to facilitate information exchange and flow.  

4.9 Mobile resource management will lead to my company being more competitive?  

4.10 Mobile resource management will improve information flow between our partners?  

<table>
<thead>
<tr>
<th>5. Current framework</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
</table>
5.1 I am satisfied with the current information exchange and flow model used in our company.  

5.2 The current framework is productive and efficient.  

5.3 The current framework allows for accurate information exchange and flow.  

5.4 The current framework minimizes the risk of information loss.  

5.5 The technology used in the current information exchange and flow framework is up to date.  

5.6 The current framework allows our company to achieve a competitive advantage regarding the exchange and flow of information between our partners.  

6. Need for change

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Our company needs to change its current information exchange and flow framework.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6.2 Our company will benefit by using an improved information exchange and flow framework.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6.3 By implementing available technology to our current framework our company will:</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>a) Be more efficient.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>b) Improve customer relationships.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c) Gain a competitive advantage.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d) Optimize our operations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e) Improve our decision making.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6.4 We receive information to slow from my partners.</td>
<td>1</td>
<td>2</td>
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</tr>
<tr>
<td>6.5 We often have to ask for information from my partners.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
6.6 Receiving information faster from my suppliers will increase my productivity.  

6.7 Receiving information more regularly from our partners will improve our value proposition to our clients.  

6.8 Our clients require information more regularly and at a faster rate.  

6.9 Receiving information straight after delivery will make our business unit more productive.  

7. Risk

| 7.1 Drivers often lose valuable information. | 1 | 2 | 3 | 4 | 5 |
| 7.2 We often receive documents from our partners which are incomplete. | 1 | 2 | 3 | 4 | 5 |
| 7.3 Drivers lose information due to: | | | | | |
| a) theft | 1 | 2 | 3 | 4 | 5 |
| b) negligence | 1 | 2 | 3 | 4 | 5 |
| c) accidents | 1 | 2 | 3 | 4 | 5 |
| 7.4 Receiving information straight after delivery will decrease the risk of losing valuable information. | 1 | 2 | 3 | 4 | 5 |

Thank you for participating in this study, it is greatly appreciated!
ANNEXURE 3.2 - UNSTRUCTURED INTERVIEW QUESTIONS
1. CURRENT INFORMATION EXCHANGE AND FLOW FRAMEWORK USED

1.1 Do you agree that the above framework is accurate regarding the current framework for the exchange and flow of information used within your company?

1.2 Are you satisfied with this framework, provide reasons for your answer?

1.3 Does the current framework provide your company with a competitive advantage within the road freight industry or any other benefits?

1.4 Does the current framework use relevant and up to date technology?

2. TECHNOLOGY

2.1 Do you understand the concept of mobile resource management (MRM)?

2.2 Do you understand the concept of mobile supply chain management (MSM)?

2.3 Do you currently use any of the previously mentioned technologies?

2.4 Do you believe that MRM & MSM will play a bigger role in the supply chain in the future?

2.5 Does your company invest in technology to improve the information exchange and flow?
2.6 Do you believe that technology may assist in this regard?
2.7 Would receiving information electronically improve your information flow and provide your company with a competitive advantage?
2.8 Is your company technologically aligned with your partners?

3. NEED FOR CHANGE
3.1 Does the current information framework used need to be changed and why?
3.2 If any, in what sense will your company benefit by using an improved information framework?
3.3 What will the benefits be if the information framework is improved?
3.4 Do you require your partners to send information at a faster speed and more regularly?

4. RISK
4.1 Do you often receive information which is incomplete?
4.2 Why do drivers or transport suppliers lose information?
4.3 Will receiving information straight after delivery improve your productivity, accuracy and decrease despite resolutions?
ANNEXURE 3.3 - RESULTS AND STATISTICS
<table>
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<tr>
<th>Descriptive Statistics</th>
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<tbody>
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<td>n7n3c</td>
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<td>n7n4</td>
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</tbody>
</table>
ANNEXURE 4.1 - EXAMPLE OF A DELIVERY NOTE FROM THE NEW MANAGERIAL FRAMEWORK
Delivery Report: SUNDRY GOODS & SERVICES
Submitted by: Pieter Seroka
Submission timestamp: 2016-10-05 15:58:21 -02:00 Submission ID: 14601707

Date delivered: 2016-10-03 05:27:57
Driver name: Pieter Seroka
Delivery vehicle: ROOF 38 GP ERF

Client Name: TIMBA GARDENS PRODUCTS
Supplier del note: 47
Delivery note date: 2016-10-03

Loaded at: Farms White
Delivered to: GADISI HARDWARE MAN
HAMANSKRAAL
Received by: Artwell

Description of goods loaded:
TIMBERS

Tons loaded: 33000 TONS
Quantity loaded: 18880

Delivery location (Cell / GPS):

Note:
Problems Encountered on Loading: Time loading two days
Problems Encountered on Routes: Not
Problems Encountered on Delivery: Not

Directors:
AW Pretorius
ATTACHMENTS

Proof of delivery (loaded truck):

Proof of delivery (offloaded goods):

Photo of the delivery address / site details:
Proof of delivery (delivery note issued):

Signature Client: 

Signature Driver: 

Directors: 
AW Pretorius
THIS REPORT IS GENERATED BY LCP TRUCKING ONLINE AND ON-SITE AND INDICATES DETAILS AS NOTED AND THE STATUS OF THE SITE AT TIME OF DELIVERY

PLEASE DIRECT ALL QUERIES TO YOUR LCP TRUCKING REPRESENTATIVE