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Value chain management as a strategy to achieve competitive advantage in the railway industry: A case study of Swaziland Railway

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ABSTRACT

The concept of value chain management for competitive advantage is not new in the railway business. However, competition from other modes of transport such as road transportation, has created fierce competition, and as a result some railway companies are still finding it difficult to be sustainable in the industry. The aim of this study was to examine how the value chain systems in the railway sector could be integrated in an organisation mainframe, to gain and maintain competitive advantage within the railway transport sector – using the case of Swaziland Railway (SR). This study adopted a descriptive quantitative research design using the population size of all the managers and technical supervisors at SR. This cohort group was involved in the designing and implementation of a value chain management strategy for the company. A random sampling technique was used and the sample size was forty five (45) employees. Data were collected using a questionnaire and were analysed through a descriptive data analysis technique which projected the findings on a histogram, in terms of frequencies. The findings of the study indicate that most employees (56%) showed a positive response – indicating that technology, train efficiency and rail infrastructure had an impact on the company's value chain management system. The main recommendation of the study is continuous improvements through engagement of other efficiency-driven service delivery technologies. Introduction of sophisticated electronic measures in respect of the safety and security of customer cargo, and improvements in the adequacy of rolling stock in order to increase capacity, efficiency and effectiveness. Improve safety and reliability of the rail network infrastructure to meet customer demands, provide cost effective and efficient service.

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

The relevance of value chain management has remained one of the most highly contested issues in organisational management practices. The rail transport industry has not been an exception with this form of service delivery. The understanding has been based on the cross-sectional transformation of several industries, including transport, as a result of the currently adopted dynamic trends of value delivery in various industries, inclusive of transportation (Chotekorakul & Nelson, 2013).

Value chain management for the competitive advantage concept has however become a global phenomenon, where firms have engaged in redesigning the entire structuring process in the quest for attaining expected results. Yaacob (2014), Anaza and Rutheford (2012), and Chotekorakul and Nelson (2013), all point to the fact that through the formation of a strategic value chain management practice, every organisation can yield to a high level of productivity, which will in turn result in the formation or establishment of its competitive advantage.

Furthermore, the concept of value chain management has been considered as not being only a management function – but rather a form of operations' function due to its applicability across the entire functionality of the firm (Chotekorakul & Nelson, 2013). At every level of organisational functionality, value chain management has become the generic concept of strategic value delivery and competitiveness. Through value chain management practices – as a holistic organisational practice – the need to evaluate value chain management performance is paramount for any functioning management.

At a strategic level, value chain management has given senior management enough leverage to consider and determine the strategic direction of the entire firm. Value chain management has allowed management to decide effectively about the nature and form of resource allocation,

while maintaining high volumes of organisational performance. The reduced degree of operational costs, however, gives way to a more robust and effective nature of organisational performance.

With regard to the middle management level, the value chain management practice has enabled the development of an effective employee practice that has enabled the development of a more productive labour force that delivers effective results. The understanding of the entire practice and development of value chain management in several industries, including the one under focus in this research, has helped firms to prepare for internal and external forces that would otherwise destabilise the entire functionality of a given firm.

1.2 Background of the study

The railway industry is under immense pressure to deliver a service that is reliable, of high quality, free of damage, which offers a competitive price and accurate statements and status reporting, and has quality equipment and electronic data interchange (International Heavy Haul Conference, Cape Town, 1997). It is therefore imperative that railway value-chain creation is embedded with these customer requirements in order to sustain competition and financial stability.

1.3 Motivation for the study

The motivation behind this study was based on the notion that value chain management was to be considered as a form of universal organisational development. Senior management of SR will be able to refer to the findings, conclusions, and recommendations of this study. Furthermore, this study will contribute to the body of knowledge in the field of performance management and to the research sector. The research methodology adopted in this study will offer a platform for other researchers to establish similar studies.

1.4 Focus of the study

The focus of this study is guided by the notion of performance management through value chain management. It brings into focus the interplay between operations and structural management, in the context of the rail transport sector – particularly the Swazi Railway system. The study seeks

to evaluate the internal capacity of the human resource management faculty at all levels – from strategic to operational levels – with regard to service delivery.

1.5 Problem statement

At SR, the value chain was introduced in 2013 in a quest to bring about improved service delivery from the organisation to its customers. The company faced poor performance records as per annual operation reports for the 2012 and 2013 financial years. The downward trend on performance was characterised by a series of customer complaints about the delivery time, as well as the handling section, since some of the commodities that were in transit or import and export, were reported to have reached their final destinations relatively late. Several issues have been associated with the degree of poor service – though some have been assumed to have been ownership, since the organisation was under the control of the Swazi government as one of the parastatals. The problem however, might have been because most of these firms depend highly on government support of infrastructure development in order to support sustainable operations. However, there has been a negative trend due to continued financial instability experienced by the Swazi government over the past decade, and this is why this study seeks to assess the implications of the introduction of value chain management as an interventional strategy for effective organisational performance.

1.6 Aim and objectives of the study

The aim and objectives of the study are:

1.6.1 Aim of the study

The aim of this study was to examine how the value chain systems in the railway sector could be integrated into an organisation's mainframe to gain and maintain competitive advantage within the railway transport sector – using the case of SR.

1.6.2 Objectives of the study

The research objectives for the study were to:

- Examine the influence of information technology in value chain management at SR;

- Assess the degree of train operations' efficiency with regard to customer focus in value chain management at SR;
- Determine the relevance of railway infrastructure and rolling stock safety and reliability in value chain management at SR; and
- Recommend how to improve the current value chain management system at SR.

1.6.3 Research questions

The research questions for the study were:

- Does information technology influence value chain management at SR?
- Is there any degree of train operations' efficiency with regard to customer focus in value chain management at SR?
- How relevant is railway infrastructure and rolling stock safety and reliability in value chain management at SR?
- How the study can help to improve the current value chain management systems at SR?

1.7 Methodology

This study was conducted by using a descriptive quantitative research methodology that involved the inductive approach. A post-positivist paradigm was employed as a philosophical framework for the study. The study used a survey approach by being focused on Swazi Railway in the Kingdom of Swaziland. Data were sampled using random sampling and this focused on employees that played a role in the implementation of the value chain at SR.

Data were collected using the questionnaire, and were analysed using Microsoft Excel. The study findings were tabulated in the form of tables and the figurative manner of bar charts. The logical order used in obtaining the study findings included the following, as presented in chapter three: introduction, research aim, research design and methods, research paradigm, population and study sample, data collection, data analysis, reliability and validity of study, bias, and ethical considerations.

1.8 Justification of the study

The research was conducted to help SR achieve a competitive advantage in the railway industry through value chain management – by responding to the above research objectives and questions, and by applying the above methodology.

1.9 Delineation of the study

The value chain is a broad subject that includes both primary and supporting activities in an organisation. Minimal literature was found on the topic, and the literature that was found relates to mainly the railways of European and Asian countries. Since the topic was broad, the study was narrow and concentrated on activities identified in the literature review in respect of a railway organisation. The study population was derived from SR staff from supervisory level – who were directly involved in strategy planning and the implementation of value chain activities.

1.10 Chapter outline

The chapter outline for this study is as follows:

- *Chapter One: Introduction.* This comprised the following key issues: background information on the research topic, motivation for the study which includes a meaningful justification of the need for all the research, and the focus of the study. The problem statement, research objectives, and chapter outline are also covered.
- *Chapter two: Literature review.* The literature review for this study considered the theoretical framework for the study, a technical definition of value chain, general value chain processes, revolution of the railway system, as well as an assessment of the influence of technology in value chain management in the railway transport industry, an assessment of the degree of train operations and efficiency, and determination of the relevance of railway infrastructure and rolling stock safety in the railway transport industry.
- *Chapter three: Research methodology.* The following key issues were addressed: the research aim, research design and methods, research paradigm, population and sample of

the study, data collection**,** data analysis, reliability and validity of study, bias, and ethical considerations.

- *Chapter four: Presentation of results.* The findings of the survey are presented in this chapter through two approaches: The demographic information where the following issues were addressed: gender distribution, employment status, work position, level of education, and work experience. The technical section includes the following factors: analysis of the degree of influence of information technology in value chain management at Swazi Railway, determination of the degree of train operations' efficiency in value chain management at SR, and assessment of the relevance of railway infrastructure safety and reliability in value chain management at Swazi Railway.
- *Chapter five: Discussions.* This chapter presents the discussion of the study results according to each objective. It compares and contrasts the research findings between those from the primary data sources and those from the secondary ones – so as to give a valid set of conclusions and recommendations in the next chapter.

  Chapter six: conclusions and recommendations of the study. This chapter is an epilogue of the entire study, as it presents the conclusions and recommendations of the entire study, after a compare and contrast technique was used in previous chapters.

- **Summary**

This chapter presented the introduction for the entire dissertation, particularly by covering the following key notions: background information on the research topic, motivation for the study which includes meaningful justification of the need for all the research, and the focus of the study. The problem statement, research objectives, and chapter outlines were also covered.

The next chapter presents a literature review of the primary sources.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter presents the literature review of value chain, as guided by the research objectives. In particular, critical issues such as the theoretical framework of value chain are presented, such that they give a broader understanding of all the subject matter of the study. Technical definitions of value chain and its best practices are also presented in this chapter. The technical process of value chain is also discussed, giving an informed analysis of the entire logistical framework for SR. Other issues discussed in this chapter include an empirical review of value chain that gives a historical spectrum of the value chain concept dating back to as early as the 19th century, with a focus on the composition of the industry until the present.

The literature identified on the subject matter included: evolution of the railway industry and competition, investigating business models used by the railway industry, the use of information technology in the railway industry to promote competitive advantage, the adequacy of the level of investment in the railway sector, tariffs or rate competitiveness compared to road travel, blue ocean strategy initiatives by both railways and road haulers where both sectors complement each other rather than competing, and examining key performance indicators of train operations – i.e. efficiency, reliability, cost effectiveness, safety, customer care, and best practices. The reliability and uptime keeping of railway infrastructure, the availability and maintenance of rolling stock, dry port initiatives, and legal initiatives or reforms to promote the use of rail against the backdrop of green initiatives are also discussed.

2.1 Theory on value chain

Arthur *et al.* (2015) describe the theoretical or conceptual framework on **value chain**, as the primary activities in an organisation that are important in creating customer value and the requisite supporting activities that enhance the performance of primary activities – as we know that the creation of customer value is a competitive advantage.

According to Yanfang (2012), the theoretical framework on value chain for competitive advantage was first introduced by Potter in 1985, in the book entitled 'Competition advantages". The railway industry was characterised by high capital, operations and maintenance costs, against a backdrop of diminishing profit margins – and hence value chain management became a strategic tool for a turnaround strategy to drive competitive advantage.

The theoretical reference that every competition strategy is produced for value that exceeds its costs and the differential between the value chains of a competitive organization, are a key source of competition strategy (Yanfang, 2012). Ravald *et al*. (2007) described the concept of value as a mind-shift from the activity of attracting customers to activities orientated toward customer concerns and looking after them. The ability of the organisation to provide superior value to customers becomes a competitive advantage in the railway industry.

2.1.1 Definitions of value chain

According to Arthur *et al.* (2015), all organisations' business entails the gathering of activities with the sole purpose of designing, producing, marketing, delivering and supporting products or services that create value for customers. All the activities done internally by an organisation, when put together, form a value chain.

According to Jacobs *et al.* (2008), value chain refers to the importance that every step in the supply chain is aimed at ensuring value creation, and if it doesn't create value then it must be eliminated from the process and those that create value must be leveraged. Customer value can be defined as something the customer is willing to pay for. This is, however, related to Kirkulak *et al.* (2013), who define value chain as the process of changing inputs to outputs. The value chain is the chain of actions that sets out to produce value at minimum costs – thus creating profit. The creation of profit margins depends on effectiveness and efficiency in the performance of the value chains.

2.1.2 Value add and best practices

The most common value addition approach to customers is that the supplier or service provider includes technical product enhancement with the core product or supportive services with the main solution, in order to increase the total value of the product offering. The paradigm has shifted, and instead of putting effort into what we give to the customer, but take into account the

customer sacrifice for the product. Most companies perceive that value add has nothing to do with customer needs, they presenting extra features on a product or service which are not customer driven (Ravald *et al*., 2007). According to Jacobs *et al.* (2008), value-adding activities convert resources and information into what is desired by the customer and thus eliminate non value-add activities. Hines *et al.* (2009) describe value adding operations as the transformation or treating of raw materials or work in progress products, through use of manual labour – i.e. the assembly of parts, forging raw materials, and body painting.

Hansen *et al*. (2014) calls for business executives to think innovation value chain. In order to improve innovation, business leaders need to have a clear sight of the process of converting ideas into commercial outputs as a unified flow. This is possible through a business unit, or outside the company. Secondly, to convert ideas for financing and to develop them to products, and lastly, to diffuse those products to the entire organization.

2.1.3 Value chain process

According to Jacobs *et al*. (2008), value chain processes can be outlines by way of value-stream mapping – by first showing the current state of affairs in the organisation, followed by the future state, which eliminates waste and brings competitive advantage.

The value-chain process can be described as all the steps in the supply chain (Jacobs *et al*., 2008), as per the supply chain diagram below (Figure 2.1):

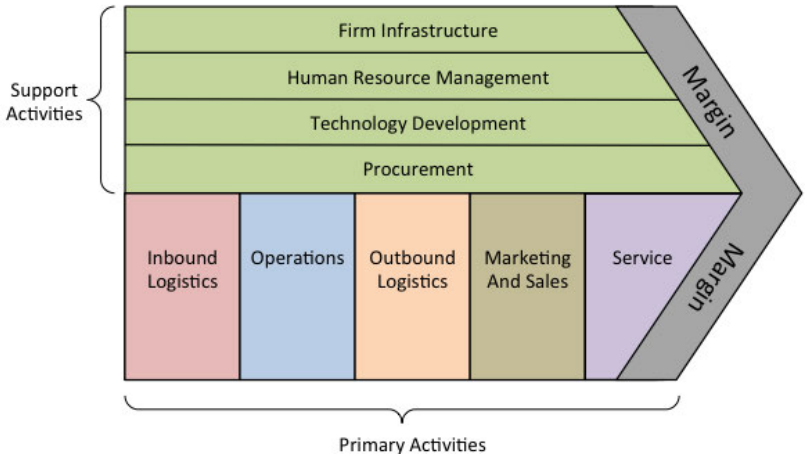

Figure 2.1: Illustration of a company value chain

Primary and support activities are evident in Figure 2.1:

Primary activities

- Inbound logistics or supply chain management – refers to costs and activities associated with acquiring raw materials or supplies.
- Operations – refers to costs, and activities related to converting inputs to finished products.
- Outbound logistics – refers to activities and costs related to the actual distribution of the product to its customers.
- Marketing and sales - refers to activities and costs' sales efforts, e.g. advertising, promotions.
- Services – refers to costs and activities related to giving assistance to buyers of the final product – i.e. repairs and maintenance, technical assistance.

Supporting activities

- Human resource management – refers to activities and costs associated with human capital, i.e. staffing.
- Product R&D, technology and systems development – refers to costs and activities related to *inter alia* product R&D, process R&D, and equipment design.
- Firm infrastructure – refers to costs and activities related capital to investments and the maintenance thereof.

All the value chains (primary and supporting activities) above, are more inclined toward the manufacturing and production of goods. However, the same principles can be applied in the service industry, like the railway business, for competitive advantage.

2.1.4 Competitive advantage

According to Arthur *et al*. (2015, competitive advantage refers to superior performance relative to other competitors in the same industry, or superior performance relative to the industry average. It can be measured by higher profit margin, greater return on assets, and market share. However, it is very important that every company must have at least one advantage to successfully compete in the market. There are many ways to achieve competitive advantage.

However, the two most common types are cost or differentiation advantage. A company that can achieve superior costs or differentiation can offer consumers products at lower costs or with greater differentiation – and hence are able to compete with rivals. An organisation that is able to outperform its competitors over a long period of time, has a sustainable competitive advantage. The railway industry uses cost advantage over its road competition rivals, because rail is bulky and traverses long distances and can leverage on economy of scales to reduce unit costs.

2.1.5 Swaziland Railway (SR) context

SR is a category A state-owned enterprise (SOE) established by the SR Act of 1963. Its mandate is to provide efficient transportation of imports, exports and transit goods through rail.

The railway industry is highly specialised, capital intensive, and accompanied with high maintenance costs compared to the road competitor. The playing ground between the two transport sector competitors is not level. Road transporters do not incur the costs of road construction and maintenance, and cause road carnage through accidents and overloading without incurring the costs - as opposed to rail transport. Hence they enjoy a substantial market share compared to rail and with good margins. SR is not an exception, with about 70% of cargo being on the road.

Arthur *et al*. (2015) separate an organization's operations into primary and supporting activities, and this helps executives understand the internal cost structure, which invariably helps reduce all the none value-add costs and creates a cost advantage over rival firms. All the activities outlined in the company value chain above, can be redefined and applicable to SR in order to gain a competitive advantage over road competition – by streamlining all primary and support activities that add value to customers in the transportation business and by eliminating the none value-add activities.

2.1.5.1 SR process interaction map

The process interaction map below (Figure 2.2) was designed by SR to identify all activities that, when done properly, will bring customer satisfaction and add value to customers and thus create a competitive advantage.

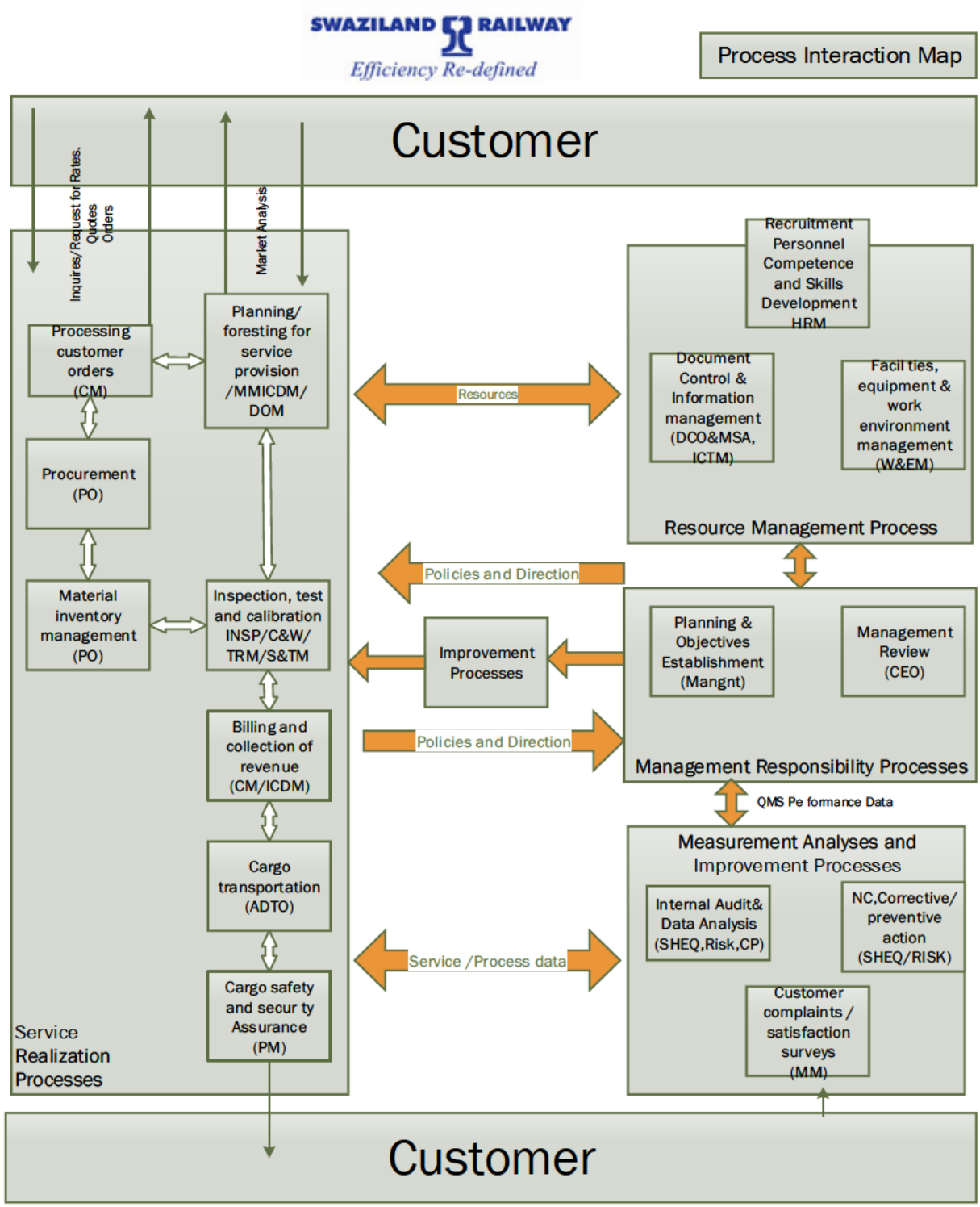

Figure 2.2: Process interaction map for SR (*source*: the researcher, 2017)

The SR process interaction map can be defined in the following four main catagories:

- The service realisation: maps all processes or activities that need to happen and be delivered to a happy customer – i.e. processing of customer orders, planning and forecasting of service provision, inspection and testing of equipment, cargo transportation, and safety.
- Resource management process: maps all the activities required to service the customer – i.e. recruitment of personnel and skills required, availability of equipment and infrastructure, document control, and information technology.
- Measurement analysis and improvement processes: maps and measures all the performance activities through internal audit, customer surveys and non-conformance measures.
- Management responsibility processes: maps all the activities required from executives to keep oversight over value-chain management and continuous improvement initiatives, in order to meet customer requirements.

2.2.0 Empirical review

There is little empirical evidence published on comprehensive value chain activities in the railway industry for competitive advantage. However, an effort was made to consolidate as much literature on key primary and secondary activities that shaped the industry to gain a competitive advantage as much as possible. Some of the literature is discussed below:

2.2.1 The evolution of the railway industry

Railways started in the 19th century, changed the way of doing business, and became the main inland transportation mode that significantly stimulated industrialisation. The railway business could attract significant capital injection and became very profitable. Railway networks significantly expanded and integrated vast territories where there were opportunities. They thus offered a differentiated service to all customers and created unrivaled value. The business could significantly reduce unit transport costs, which created an unmatched competitive advantage. The decline in investment in this sector and loss of market share was observed in the twentieth century due to dynamic performance of the road and air sectors (Tome, 2008).

Rail has played a significant role in the last two centuries in stimulating economic growth in the provision of transport services. However, over the last three decades there has been an

unprecedented loss in market share in both passenger and cargo freight to predominantly the road transportation sector. The loss of competition has been attributed to the sector being rigid and unable to change to new business models – while being heavily subsidised by states, according to Pelkman *et al*. (2004).

According to Havenga *et al*. (2014), efficient freight transport is a catalyst for national competitiveness and is relevant to South Africa where transport contribute 61% of logistics costs. Road haulers occupy 90% of corridor tonne-kilometres (ton-km) market share and 40% of the costs is made up of fuel costs – with more than two thirds of the country's crude oil imported. The mind-shift toward intermodal freight is more appealing, with the American Truck Association project that intermodal rail will continue to be the fastest growing mode of transport over the next decade.

Havenga *et al*. (2014) state that the failure by South African freight rail to capture this market, is mainly correlated with a lack of policy direction on the role of the two modes – mainly due to poor market intelligence in terms of influencing policy. Government's role is to enhance the development of long-term logistics strategy that will ultimately leverage on demand and supply. The underlying purpose of a national network of road and rail infrastructure with its intermodal connection will take precedence – taking into account all relevant social, environmental, economic and land-use factors. This will be preceded by a clearly defined policy on freight, a single source of funding and the establishment of proper regulatory and institutional mechanisms to enable execution. The absence of policy direction on the role of the two modes in the context of South Africa, has stalled vertical separation for the national railways.

2.2.2 Competition in the railway industry

After extensive restructuring and reforms in the rail sector in Australia, it continued to lose market share to the road industry through, *inter alia*, new technologies – which has resulted in below capacity, unsatisfactory and unreliable service, mainly due to a lack of adequate capital injection. The rail business is fixed-cost driven and therefore it is heavily reliant on volumes to cover the fixed costs (Department of Transport, 2008). Railways around the globe have experienced intense competition that has required decreased tariffs, which has compelled them to increase axle loading in heavy haul operations, increase the height of wagons and double

stacking, and also increase speed, paper presented by Van der Meulen at International heavy haul conference, Cape Town (1997). Developed countries are now looking at possibilities to move away from competition to co-operation in intermodal transport, by using all modes of transport to complement each other comparative advantage, as a blue ocean strategy.

2.2.3 Information Technology in the railway industry

Global competition eliminate non-competitive transport modes, information technology shapes value chains and change the traditional business models and forces railways to re-check their competitive edge and add value to their traditional model (van der Meulen at Heavy, 1997). The railway business requires invincible competitive to survive other modal shift competition.

The introduction of e-business technologies anticipated the creation of a more effective and efficient rail transportation system, which includes scanning, data warehousing and data mining, real-time data access and intelligent management information systems (Tetther *et al*., 2004). Tetther *et al*. (2004) revealed that rail was regarded as an effective solution for just-in-time, short distance and time-sensitive goods, due to: lack of reliability, inflexibility and double handling challenges. However, it was stated that rail was most suitable for heavy-haul long trips of over 800 km, where the reliability confidence level could be increased. Technology was viewed as a tool for creating competitive advantage through an increase in control and efficiency – thus gaining market share in the heavy haul.

The internet of things (IoT) is another new phenomenon in the railway business; it is viewed as the third wave of the global information industry preceding the computer and the internet, and is usually called the next trillion dollar communication service. The core of IoT is based on the internet, but in essence it is the extension and growth of the internet, which goes beyond the traditional use of the internet and expands the communication links between things and things to recognise the content and content of information automation (Dandan *et al*., 2014). However, in China, there is still a challenge with the unified logistics system platform, and currently the system obtainable is solely for two extension services: Freight picking and delivery. Therefore there is a need for the railway operators to build their logistics systems platform in conjunction with advanced IoT, which would integrate resources and develop a comprehensive railway logistics industry.

According to Lovell *et al*. (2010), improvements in the UK railway network are very important for the industry to grow and prosper in order to meet its intended targets on capacity, carbon emissions, and operating efficiency. The ultimate goal is to double its current level of passenger and freight volumes, while decreasing the carbon footprint – thus adding to environmental improvements. It is therefore assumed that information technology and innovation have a big role to play in that regard. However, the question is – what are the institutional arrangements and commercial and regulatory incentives that will play a positive role on the outcome? And what is the innovation that can help ascertain the correct technologies at an early stage and obtain the necessary funding to implement them?

According to Finger *et al*. (2015), digitalisation is leading the transformation of the railway industry in a more profound way. Drawing from previous experience in other sectors, digitalisation has impacted more positively on the basic functioning and business model of the entire sector, as railways are trading with technological transformations in operations, rolling stock, infrastructure management, customer service and ticketing distribution. According to Finger *et al*. (2015), the 11th Florence Rail Forum, which is comprised of industry captains, unanimously agreed that digitalisation offers more opportunities than problems for the industry and significantly changes the role of regulators. It was agreed that both rail operators and regulators have to enact rules for the management of data and for the functioning of an even more digital transport industry.

Digital transformation can be categorised into four features when combined to make digitalisation. First, physical states or characteristics can be replicated digitally – i.e. voice, pictures, sound, images, temperatures and smell can be digitalised and hence produce digital data of the above. Second, computing power allows storage and analysis of a large source of data by more advanced algorithms. Third, connectivity refers to the ability to access data remotely anywhere in the world at high speed – which talks to the telecommunications progress in both mobile and fiber optics. Finally there is geo-localisation, in the space of satellite technology, so that movements can be digitalised, analysed and accessed (Finger *et al*., 2015).

Digitalisation makes possible the duplication of any physical value chain from production to distribution. Hence, digitally duplicated value chains become globally accessible electronically.

As a result, the customer interface changes from being physical to becoming electronic, and the customer becomes a digital customer even though he consumes a physical good. The nature of the business changes from being a traditional physical business to a new business model that interfaces the owner of the electronic value chain and the digital customer (Finger *et al*., 2015).

2.2.4 Train operations' efficiency

The value-chain creation from the primary and support activities should be able to deliver the following to the customers to create a competitive advantage: on-time and quality delivery of cargo, a reliable and on-schedule train service, above average transit time, minimal damage, competitive prices compared to road travel, accurate billing, quality customer care and electronic data interchange capability (van der Meulen, 1997). The railway business has been reinvented to try to meet the above customer value-add. The service processes of train have been re-engineered into coordinated, discipline-integrated systems that are closer to road hauler reliability. There is proper scheduling and planning of trains to arrive on time, train coupling, and also sharing initiatives.

Among the objectives of the railway business is to regain its competitive edge to reduce inefficiencies and introduce the highest level of transparency in cost and business practices (Pietrantonio, 2014). Railway companies should put their energy into the development of higher performance, productivity and efficiencies – to increase their market share and growth. Timetable flaws or too much congestion of trains also pose the risk of an increase in unscheduled stops and conflicts. It is therefore important for the train operations unit to monitor train delays regularly and log the delay causes – so that root causes can be investigated and corrected so promoting continuous improvement in train service delivery. The lessons learned are also used as feedback to all. Achieving and improving high reliability and punctuality requires that problems in operations must lead to actions, by feedback of realization of data, timetable design, infrastructure design and control design, according to Deming's Plan-Do-Check-Act cycle of quality management (Pietrantonio, 2014).

Train delays often come at a cost to the rail operators, which can be classified as primary or secondary delays. Primary delays are usually associated with an initial source of disruption like equipment or infrastructure failure. Secondary delays are caused by interdependence between

trains – where a train delay causes other trains to be delayed. Therefore it is imperative that train timetables are robust enough, regardless of primary delays, without causing secondary delays to other trains (Anderson *et al*., 2013). It is critical that when designing train timetables, margin time should be built in, in order to maintain robustness in the timetable. SR is no exception with train delays, which can be associated with train timetable robustness. Hence, the robustness of the timetable has to be measured so that corrective action can be taken.

The key performance indicator for a freight railway business is punctuality. However, delays are still experienced in the industry for various reasons. Prediction of train delay has always been an interesting area of research (Hu *et al*., 2016). Due to the unique characteristics of railway transportation, the timetable suffers from weakness of the transport process, and hence delivery time is out of control meaning that production suffers.

According to Goverder *et al*. (2011), the provision of a reliable and punctual train service is the number one undertaking of any rail operator and infrastructure managers, and this directly translates into customer satisfaction. The key performance of infrastructure managers is in terms of the timely availability and reliability of rail infrastructure for rail operators, as train delays negatively impact on the capacity, punctuality, reliability and safety of infrastructure. High infrastructure usage requires continuous feedback of operations data, in order to improve planning and the control of train movement. Train delays are supposed to be monitored and recorded in an electronic data-management system to promote diagnosis and management decisions. However, the accuracy is insufficient for process enhancements. Attaining and enhancing high reliability and punctuality requires that challenges in operations must translate into action by feedback of realisation data to timetable and infrastructure designs and control, in accordance with Deming's Plan-Do-Check-Act cycle quality management.

The railway track on line of train delays system for operational control and performance statistics. However, the data are sufficient for aggregate statistics on national punctuality, but are not good enough for performance analysis and process improvements at individual train level, due to a disparity between measurement and stop location Goverder *et al*., 2011). Putting a figure on a cause for delay is complicated by the fact that delays at stations are measured after the fact.

This means after the delay was caused, e.g. route clash, and is very difficult to distinguish afterwards although they are a major contributor to lack of punctuality.

2.2.5 Customer focus

Customers are now the centric focal point for railways, unlike in the past when producers were dictating to the market controlled by customers. Competition has changed to logistics chains instead of bulk cargo transport, where goods are mixed and delivered door-to-door to customers at more regular intervals, so creating value - i.e. a truck load will deliver a variety of vegetable sets to a supermarket, unlike having one truck deliver one set of vegetable and a second another set of vegetables (Gasparik *et al*., 2010). Railways should focus their energy on improving the higher performance of networks, productivity in moving full-capacity volumes of cargo, and also efficiencies in service.

One of the core customer value propositions by the railway business it to provide reliable and on-time service, at all times, to the customer. The engineering unit has to deliver train paths to the train operations unit, and time distance routes on available infrastructure. The operations unit coordinates the network and provides a train scheduling timetable free of conflict. Minimal deviation of trains from the scheduled timetable should be a rare exception, rather than the rule in train operations, as it may lead to unnecessary stops and delays along the railway network – thus increasing transit time and congestion.

According to Hong-chang *et al.* (2008), the Lean Production (LP) concept was mainly applicable to manufacturing industries and rarely to service industries, and was made famous by Toyota Production Systems (TPS). Hence, there was a need to test this concept in the railway industry. LP was regarded as the managerial way of an enterprise production organisation that implemented pull instead of a push management thorough value chain engineering – to efficiently assign scarce resources and help the organisation achieve cost reduction, increased revenue, improved customer value proposition, and organisational core competence establishment. URB in China piloted LP in the Hami Railway at the railway bureau, station zones, and depot levels.

There was very little literature on the application of the LP principle and methodology to railways, and hence a shortage of analysis of LP in relation to railway applicability and

implementation methods, where Hong-chang *et al.* (2008) were trying to break new ground. Hong-chang argued that since industrial essential competence establishes managerial structure and the relationship of production factors in the component of time and space, it is important to syndicate those features of railway transportation with LP to draw conspicuous results in cost savings and value creation. According to Hong-chang *et al.* (2008), LP is embedded on socio-technical systems that provide tools like JIT, Kanban, no inventory, flexible production according to demand, teamwork, visualisation and flat structure that enhance enterprise production, and supplier co-ordination and satisfactory customers – by eliminating non value-adding activities and waste (muda in Japanese). The LP is based on five principles, some of which I believe can be replicated in the railway industry as follows: Eliminate waste, satisfy customer demand, release initiatives of employees, establish partnerships with suppliers, and create a culture of continuous improvement. The LP can be applied to the railway business to improve on production costs and customer satisfaction and to build enterprise core competence using the pull system.

According to Nedeliakova (2014), service quality rating is very important in the rail business for gauging the level of customer satisfaction with regard to the service offered by the railway operator. However, the service quality rating should conform to the following: unrepeatability, impalpability and are used correctly to provide more information especially changeability which is crucial in rail transportation. The methodics as a broadminded method toward a service quality rating that allows detecting the current service quality rating – which allows identification of the current service offered to find reasons for the dissatisfaction of customers and other stakeholders, including company employees. The methodics of identifying levels of quality service can be divided into two parts. The first part is basically calculating the intricate indicator of quality for the conforming process of the delivery of service, using questionnaires for customers and process cards for the company auditor. The second part is mainly focused on three approaches: customer, employee and supplier-orientated.

2.2.6 Railway infrastructure safety and reliability

Railways systems are multi-disciplinary practices involving business, train operations and engineering solutions that form part of a railway value chain. The business requires maximum use of the infrastructure to its full capacity, at minimum costs, to achieve financial viability of

the business and to satisfy customer demand. Engineering is concerned with safety, reliability and maintenance of the infrastructure (Ho *et al*., 2004).

The business and engineering activities that ultimately create value for customers include: demand from the customers by placing their requirement with the service provider for the transportation of cargo through rail. The rail operator should ensure that safety along the track is guaranteed, that the line is adequately maintained either internally or by being outsourced to external parties, and that there is adequate rolling stock to transport cargo to its destination through maximum use of the rolling stock at all times. The operations' team has drawn up a comprehensive train crew schedule and crew availability to run the trains. The network service timetable is available to slot the trains into the network, in order to avoid unnecessary delays, conflicts and bottlenecks in the rail network. Trains adhere to all speed and operations' regulations and deliver to the customers in terms of reliability, efficiency and cost effectiveness to promote competitive advantage (Ho *et al*., 2004).

According to Leena (2017), the railway mode of transportation was regarded as being the most preferred, safe and cost-effective mode of transport, and therefore it is imperative to sustain and advance the current level of safety. A safe railway is a more efficient and appealing transport source, which enables society to focus on other areas of higher importance – including the economy and environmental matters. Most railway accidents happen at level crossings, where many people have lost their lives and there is damage/spillage of goods. One of the major contributors of rail accidents is dilapidated rail infrastructure and track, which has resulted in many speed restrictions along the rail network. Negligence and errors by employees is another major contributor to rail accidents, as a consequence of failing to attract and retain talent in the sector. Rolling stock technology is outdated and the system is overwhelmed with excessive staff that are behind in terms of up skilling themselves with the latest technology. Hence the operators cannot handle the increased demand in traffic volumes and the lower unit costs of operation.

Most of the rail network is single line, which has its limitations as a result of poor or lacking investment in rail infrastructure. Initiatives to reduce accidents in unmanned railway crossings are the introduction of automated gate control systems at crossings. The arrival of a train at a crossing is calculated and the information is relayed to staff of the rail operator through GMS,

which will enable a lesser closing time of the gates for road users. Similarly, a fault in the track will trigger a message to the stationmaster when there is another train on the same track.

According to Budai *et al*. (2004), a railway system requires a significant amount of scarce resources for maintenance in order to circumvent unexpected breakdowns or infrastructure failure, and hence scheduled preventative maintenance is not an option. Preventative maintenance reduces costs and inconvenience for operators and customers. The quality of the rail infrastructure has a direct correlation with the reliability of the rail network as a whole. Therefore it is imperative that there is adequate preventative maintenance on the infrastructure. However, because of resource constraints, maintenance is very expensive to undertake and the maintenance budget is always under strain. For example, the Dutch government significantly reduced maintenance costs and this had a very negative impact on the punctuality and reliability of the rail system a few years down the line. Hence, it is very imperative to reduce maintenance costs without having to reduce the maintenance itself.

According to Hokstad (2004), there are two types of rail infrastructure failure: shock failure which is instant failure without a warning, and critical failure which is a result of a continuous degradation process of the infrastructure where cracks occur first. Here are various types of inspections and maintenance performed on the line, including inspection by Ultra Inspection Cars (UIC) to try and discover acute failures where the destruction above a certain level is witnessed so triggering a need for repair. Critical failures like broken rail can be viewed as shocks or gradual degradation where the line gets eroded with time, until it reaches critical failure stage. The UIC perform inspections on fixed intervals; however, there is a probability of q spotting a degraded where q is estimated to be between 0.4 and .7, and where a dangerous failure happens the area has to be repaired to maintain consistent traffic.

According to Pawlik (2015), safety of the railway infrastructure and its operations can be attributed to various safety-critical components that have to be designed, constructed, assembled and maintained in a fashion to ensure safe operations. The components include: Wheel/rail contact must be stable to guard against derailment at authorised speed restrictions zones. The limits of brake equipment must be able to stop within a certain braking distance from an authorised speed limit. All mechanisms of the infrastructure and rolling stock, including all kinds

of interfaces, must be able to withstand all possible stress conditions during their whole life cycle, so that possible failures are mitigated timeously.

According to Pawlik (2015), all equipment and devices used for the operation of rail personnel and passengers must be designed not to compromise safe operations and the safety of users. Electrical equipment must not compromise the safety and operations of the control-command and signaling installation. The control-command and signaling system and devices, together with important procedures, must guarantee active protection during normal and tainted operations. The rolling stock including traction and no-traction vehicles and specialised vehicles like track maintenance equipment, must be designed such that they protect all people in the event of derailment or collision.

2.2.7 Customer cargo safety and security

Safety of customer cargo is one of the key attributes that adds value to railway customers, which makes it imperative and an obligation to guarantee it. The railway plays an important role in freight logistics. The railway is the most cost-effective due to the economies of scale and is the most desirable among hinterland land transportation systems, because of the big size of cargo capacity that can be carried at any one time. For countries covering vast geographical areas and with long distances coupled with large-scale economic activity – i.e. manufacturing and mining – rail becomes the most feasible mode of transport. A train can become very long and consist of more than 75 wagons, which makes it heavy, and therefore it becomes slow. The slow speed makes the train a soft target for theft and robbery while on the track. Physical deployment of security personnel has however proven to not be the whole solution to the problem – and is more often reactive rather that pro-active. This has led to railway operators applying technologies like Container Security Devices (CSD), which detect any illegal tempering of the cargo (Kim, 2014).

The CSD can record violations of the containers that happened during marine transportation and then encrypt transmitted notifications for security. If a container is forcefully opened without authority during transportation, the record is stored in the CSD until it is investigated in the port of destination with appropriate corrective action. As this is reactive rather than proactive, it is not good enough for the safe transportation of cargo. Therefore there is a need for real-time reporting

rather than keeping the report until it is read by an interrogator, and hence the CSD tags attached to the cargo should create a network (Kim, 2014).

The conditions for a CSD chain network should have: a quick report, reliability, fair energy consumption, and low-power. A CSD Chain Network Protocol (CCNP) can deliver more power-saving and dependable communication for safety of train transportation. CCNP should possess the following qualities to promote the safety of cargo: preparation of a counter-measure to the Chain-Broker Issue, guarantee of even power dissipation, reduction of the message overheads, provision of upper bound on the problem reported, and a practical service for current railway transportation (Kim, 2014).

2.2.8 Inland container depot strategic importance

Introduction of the Inland Container Depot (ICD) increased the efficiencies of rail transportation by providing a total service to inland customers. The ICD is basically a sea port that is located inland and connected to the sea by rail, and is where containers are dealt with in the same manner as they are dealt with at sea. Dry ports can be classified into three categories: distant, mid-range and close. Dry ports brought relief to sea port cities and towns by reducing congestion and the long lead times of containers at sea ports – a modal shift from road to rail, thereby helping with green initiatives and improved logistics solutions (Roso *et al*., 2008).

ICD operations, because of their key strategic role in the clearance and transportation of customer cargo, seek to strike a balance between ship-to-shore, yard and landside operations – thus creating a seamless operation free from bottlenecks (Bentolila *et al*., 2016). The sporadic arrival of trucks to deliver or pick up customer cargo complicates ICD operations, and hence compromise the full capacity usage of the terminals. Therefore, the objective was to maximise gate capacity at terminals without having trucks queuing and creating congestion by: physical capacity increase by adding more gates and lanes, and increasing truck turnaround time by using technology solutions and dispersing the arrival time of trucks to control the number of trucks that arrive at a terminal at any given time (Bentolila *et al*., 2016). SR has a an Inland Container Depot at Matsapa, which is responsible for handling all container business to run the economy of Swaziland. It faces similar challenges in its operation and this model could help alleviate some of the challenges.

2.2.9 The railway business and environmental consideration

Rail transportation is considered environmental friendly compared to road. A study by the Commission for Integrated Transport in Europe reported that rail transport has the following advantages over road transport: energy consumption (at least 50% lower than road), emissions (10 to 20% of road), accidents (less than 0.5% of road), and congestion (one train can carry over 100 heavy goods vehicles or trucks). These provide incentives for a modal shift from road to rail for sustainable economic growth based on the economy, and environmental and social conditions. However, despite all the benefits associated with rail, there has been a steady decline in rail transportation in some parts of Europe, and a decline in market share. It is therefore imperative that significant investments are made on rail infrastructure in order to attract growth in the sector, improve quality and productivity, and the regulatory framework that encourages the use of rail in an open market system. The Swiss government introduced fees for heavy vehicles based on the polluter pays principle, and undertook modernisation of rail infrastructure that was half funded by the above fees, and reforms directed at improving productivity and competition in the rail sector (Joanicjusz *et al*., 2006). From the SR perspective, the problem is around government initiatives in terms of empowering road to rail migration.

Road freight has resulted in significant environmental and social burdens like traffic congestion, air pollution, infrastructure degradation, road carnage, and accidents. There was a shift in developed countries in terms of policies and legislation toward the modal shift from road to rail. Modal shift was regarded as the most important means of freight transportation of social economy and industry, and hence there was a need to upgrade conventional freight stations to provide facilities to support a modal shift (Guoquan *et al*., 2007). Probably, such initiatives could be adopted by the Swaziland government in terms of policy and legislation change, leaning toward rail after environmental depletion by road trucks carrying bulk mining products to the ports of Maputo and Richards Bay.

Renewable energy on the rail track is one of the green initiatives to bolster our environment, where power is generated by harvesting energy – by simply running on the rail track for power applications. The is need for a non-conventional energy system to the society, as there is no need for fuel as an input to generate electrical power, as this is obtained by using a simple gear drive mechanism (Bhusate *et al*., 2017). The power harvested from the railway track is used to power

all the track-side equipment (e.g. signal lights, communication gadgets) which use 8 to 10 watts. The mechanics are very simple; when the train moves on the track, the tracks bounce vertically due to the load applied by the train bogies get connected to regenerative devices like a vibration energy harvester.

2.2.10 Rolling stock acquisition and maintenance

According to Clayton *et al*. (2009), with the capital intensiveness and high maintenance cost associated with rolling stock, governments have adopted what is called whole-life, a whole-system cost approach to exploiting opportunities though public-private partnerships or private finance initiatives. Both the public enterprises and private enterprises partner each other design, build or refurbish, finance and operate new or improved equipment and facilities to the public. This includes the financing, procurement and delivery of new rolling stock and related services, and this approach has the potential to change the landscape of the railway industry – provided it can covet itself to deliver a whole-life service offering throughout the value chain. The operations and maintenance of railway vehicles is a complicated procedure that needs communication among participants – i.e. train operators, component suppliers, and maintainers. The interactions are not standard but depend on the type of maintenance contracts between operators, the lessor of rolling stock and maintainer. The general feeling is that the traditional approach of operations and maintenance is too expensive and risk averse – resulting in an adverse effect on margins and expected growth by management. The operations and maintenance extended enterprise are very important in the service support value chain, where the maintainer adds value by ensuring contracted levels of availability and reliability.

2.2.11 The supply chain in the railway industry

Espito *et al*. (2009) remind us of the evolution of the supply chain in the Italian railway industry that underwent a series of deep changes caused by two major contributors: technological origin linked with the arrival of high-speed trains and liberalisation introduced by the EU reform 90/440. Both had a huge impact on the organisation of the supply chain in the railway industry. The purpose of the study was try to respond to the questions about how the role of different players in the supply chain is changing and it further interrogates the evolution of the supply chain in line with other industry sectors.

Customer-supplier engagement has been through massive changes at both national and international levels since 1960. There has been more emphasis on different forms of supplying – i.e. capacity, specialisation, and supply-type supplying. During the 1980s, the emphasis was more on inter-firm relationships, particularly on vertical relationships and hybrid forms of management,the main driver influenced by the transaction costs theory. During the 1990s, there was a shift in customer-supplier interactions to become more inclined toward strategic partners with more emphasis on the theory that supply systems are embedded in an intense network of collective customer-driven relationships between firms. The association can be represented by a selection of actions that inspire the dissemination of technology within the system, influence theinnovation process and minimise the opportunism of individual suppliers. The 2000s saw customer-supplier relationships positively influenced by globalisation, which has helped large multinational and international firms compete in the global space without geographic location limitations and use of virtual enterprise. Firms regard worldwide procurement as an opportunity to take advantage of opportunities provided by their suppliers, with more emphasis to control things – so prompting procurement, processing and distribution by means of a suitable information system.

According to Gangwar *et al*. (2015), dwindling budget support and increased fuel cost prices with a limitation in raising tariff charges, has challenged the railway industry to think out of the box in order to make their systems more efficient, have the right staff complement, and critically examine procurement, manufacturing and maintenance practices to eliminate obsolete procedures. Considering the volumes and value of goods or services procured, re-engineering supply chain management to reduce fruitless and wasteful expenditure is not an option, in order to give it a ‘lean and mean’ look.

According to Gangwar *et al*. (2015), supply chain management has become useful for efficiently right-sizing an organisation. Procurement of products can be reworked in a more scientific manner to effectively manage inventories, exploit backward integration with suppliers, and satisfy the needs of end users – hence achieving a good balance between utilisation and availability. Non value-add activities are eliminated and there is a releasing of manpower to value add activities that satisfy customers. As a consequence, cost reduction is achieved through the chain by eliminating unnecessary expenses, movement, and handling.

The Management Direction and Control (MDC) system used by the India Railway was found to be old and obsolete; it was time for the railway to review its supply chain and procurement system to align with the latest procurement concepts in order to leverage on the benefits of inventory control and technology advancement. The shift in mind-set and regarding vendors as experts in their field and using their expertise synergistically thus creates a win-win situation (Gangwar *et al*., 2015).

2.3 Conclusion

The gap identified was the lack of a specific value chain or rather primary and supporting activities that railway businesses should effectively manage to derive customer value for competitive advantage. The literature identified came in bits and pieces for each activity – not as a comprehensive package that can be sold to the railway industry. Therefore, the researcher's role in this research is to package all the different activities in the literature, and test them in the SR context to see if they can be successfully managed and applied for competitive advantage.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodology used in this study. Critical areas addressed include the research aim, research design and methods, research paradigm, population and sample of the study, data collection, data analysis, reliability and validity of study, bias, and ethical considerations.

3.2 Aim of the study

The aim of this study was to examine how the value chain systems in the railway sector could be integrated in an organisation mainframe to gain and maintain competitive advantage within the railway transport sector with the case of SR.

3.3 Research design and methods

A research design as defined by Ponelis (2015) is a logical form of conducting a research activity by enabling the researcher to answer the research questions. This process is the procedure for empirical data collection, and data analysis – so as to give a conclusive understanding about the entire matter under study. Additionally, Al Kindy *et al*. (2016) define a research design as a form of laid down plan used as a guide for the researcher during execution of the research activity. The research design is therefore a key determinant of the level and manner of answering the research questions (Saunders *et al*., 2012).

However, on a more practical basis, authors such as Al Kindy *et al*. (2016), Creswell (2013) and Saunders *et al*. (2012) argue that research designs can be classified into five types: descriptive (e.g. case study, survey, naturalistic observation); correlational (e.g. case-control study,

observational study); experimental (experiments); semi-experimental (e.g. field experiment, quasi-experiment); meta-analytic (meta-analysis/an-depth review of related literature); and the review research design or literature review or systematic review research design (De Vaus, 2001).

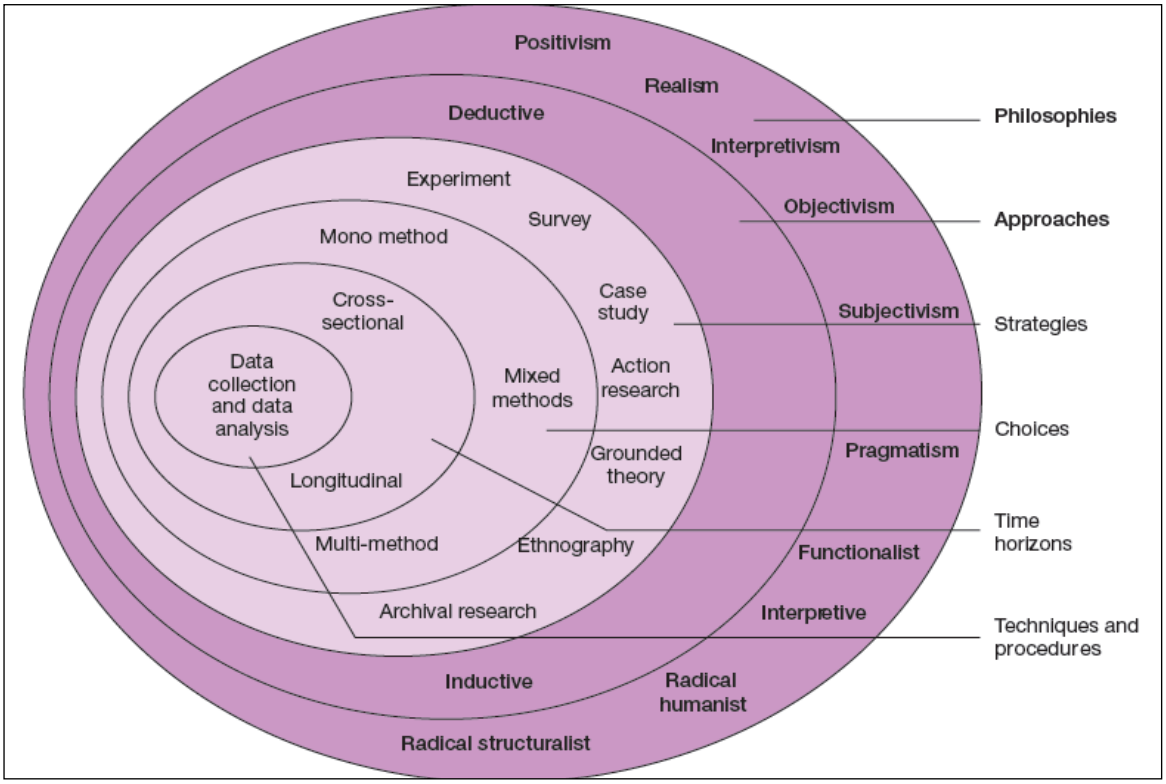

Figure 3.1: Procedure of the research design (*source:* adapted from Sounder *et al*., 2012)

These research designs can therefore be categorised into three basic research methodologies: quantitative (more numeric, deductive in nature, theory testing); qualitative (more non-numeric, inductive in nature, focuses on theory building); and mixed methods (a combination of the two research methodologies) (see Creswell, 2013; Saunders *et al*., 2012).

This study adopted a descriptive research design with the quantitative research methodology. Data were analysed following a logical procedure of problem definition, research objective and question construction, data collection, data analysis, validation, and interpretation.

3.4 Research paradigm

Khan (2014) defines a research paradigm as "a structure or a set of suppositions and ideas that provides a pathway to see what the world looks like when its scientific aspect is related to its assumptions". Additionally, Savin-Baden *et al*. (2013) argue that research paradigms can also be referred to qs "models or frameworks that are derived from a worldview or belief system about the nature of knowledge and existence. It is for this reason, it can be argued that research paradigms are shared by a scientific community and guide how a community of researchers act with regard to inquiry". Based on the given notions about research paradigms, it can be argued that these philosophical points of view give a researcher an advanced perspective of the entire research design. This happens through the collection of assumptions about a given set of knowledge, and how it was acquired in reality.

As a world view of reality, research paradigms are categorised by Antwi *et al*. (2015) as qualitative (positivism paradigm as it is focused on the observed tendencies of human behaviour and at same time gives us true knowledge about reality which is also based on an experience of the human senses, although this can be obtained by observation and experiment as a way of ensuring that the study was scientific) or quantitative orientated (post-positivist paradigm whose key notion is focused on the degree of interpretivism to the degree of reality). Additionally, Antwi *et al*. (2015) believe that since the interpretive paradigm is underpinned by observation and interpretation, it gives the researcher a broader understanding of the entire research context, as the collected data are analysed from the interpretive perspective. Therefore, inferences are dawn as a critical means to establish organised trends of research activities.

This research adopted a post-positivist research philosophy in the sense that the research adopted a quantitative approach that enabled a more interpretive approach toward the research findings. This is since the study focused on examining the degree of influence the value chain system had on the railway sector in Swaziland. However, the form of assessment was obtained from the employees involved in the implementation of the entire value chain programme.

3.5 Study setting

The study setting is contextualised at SR in Swaziland. This organisation is a state-owned enterprise (SOE) that falls under category 'A' and was established under the SR Act of 1963. The mandate of the firm is to provide commercialised and efficient transportation of the country's import, export and transit goods through the rail network. The firm has national coverage with several depots at strategic geographical locations, such as Matsapha were the receiving loading bay is situated, and Mpaka where the service department is and where other logistics are done. However, the firm has a mandate of establishing a value-driven function through value chain management in all is operations, in all the various stations of its operations. This considers the degree of the employee's level of functionality in respect of efficiency through value chain management.

3.6 Population and sample of the study

3.6.1 Population

Harvey *et al.* (2015) define a research population as a general collection of units. Ilker *et al.* (2016: 2) define a population as the total quantity of things or cases that are the subject of research. Based on the two definitions of population, it can be argued that before the sampling takes place, a general definition of units that can be people or non-humans should be well defined – so as to have a well-informed inference for the study. This study's population was all the 50 managers and technical supervisors involved in the designing and implementation of the value chain management strategy for SR. The SR payroll was used as the source of information. The target population of management and supervisory staff was the appropriate source of data because of their involvement and participation in the crafting of strategy for SR, and they would therefore give the most appropriate representation of the study findings.

3.6.2 The sampling

Al Kindy *et al*. (2016) define a sample as a set of respondents (people) or variables selected as being representative of the general population. Singh and Masuku (2014) argue that sampling denotes a form of systematic process of selection of variables from the general population using

probability (quantitative) or non probability (qualitative research design) techniques or approaches (Saunders *et al*., 2012). For this study, the sample was selected using random sampling, where each employee had an equal chance of being selected to participate – using the payroll systems as a sample frame.

The study was focused on determining the application of value chain management principles among managers and supervisors at SR in various departments. The criterion used to determine the sample size was a confidence level of 95% and an interval of 5 from a population of 50 managers involved in SR value chain management.

Population	Value chain managers and supervisors at SR
Population size	50
Sample type	Random sampling
Sample size	45

Table 3.1: Summary of the sampling framework

3.7 Data collection

Data for this study were collected using self-administered questionnaires that were structured in nature. McMillan and Schumacher (2010) point out that a questionnaire is an effective tool for data collection when using a quantitative research design. This is based on some of the perceived advantages of using this tool (as given by Callegaro *et al*., 2014) – see below:

3.7.1 Advantages of using a questionnaire

- Highly objective, and hence the researcher can meet the defined nature of the research objectives with minimum effort;
- Is fast in distribution and collection; and
- Is relatively cheap and cost-effective to use (Callegaro *et al*., 2014).

3.7.2 Disadvantages of using a questionnaire

On the other hand, there were some perceived disadvantages of using questionnaire for this study:

- The high likelihood of most participants forgetting to complete the questionnaire; some employees at SR were reminded several times to complete the questionnaires, which delayed the data analysis process for the entire study; and
- Incomplete records of questionnaires – some of the questionnaires were not completed, hence leaving gaps for data analysis. This made the researcher embark on a follow-up process that was challenging and time-consuming.

The questionnaires were administered at the SR head office in Mbabane, where the respondents had come for a strategic session meeting for all managers and supervisors. There were 45 questionnaires, per the sample size, which were randomly distributed to participants after a brief explanation of the study. All 45 distributed questionnaires were completed by participants and were returned immediately after their completion in the meeting room (it took about 10 minutes to complete and return all of them). The questionnaires were kept in a safe place for both data analysis and future reference, in case the need arose.

The development of the questionnaire must ensure that bias is minimised, and that appropriate scales and scaling techniques are used in measuring the concept – including assessment of reliability and validity of the measure used. Where possible, interval and ration scales should be used in preference to nominal and ordinal scales once the data have been obtained. The goodness of data should be attained through validity and reliability tests. A Likert scale was adopted to examine how strongly the respondent agreed with a statement – from strongly agree = 1, to strongly disagree = 5.

3.8 Data analysis

The data collected in this study were analysed using a descriptive statistical method using the Statistical Package for the Social Sciences (SPSS). The findings of the study were analysed and tabulated in frequencies and tables. Fereday and Moore (2015) argue that descriptive statistics in

quantitative research enable the researcher to make an in-depth description of the key features of the study through data tabulation, and organisation and display of the variables. Furthermore, the graphical data and table representation technique was used to bring about a more informed nature of the study findings through total variance factor analysis, reliability statistics using Cronbach's alpha, and an inter-item correlation matrix from SPSS.

3.9 Reliability and validity of the study

The relevance of reliability and validity in quantitative research are mentioned by Saunders *et al.* (2012) as validation techniques to ensure the maintenance of research quality. This can be done by ensuring that both the instruments used and the nature of the entire research process are according to the research principles of ensuring a high level of consistency and dependability of all the research findings.

3.9.1 Reliability

Reliability is defined by Al Kindy *et al*. (2016) as the extent or degree to which variables or a set of variables are consistent with what they are intended to measure. Therefore, through reliability, the researcher can measure the degree of reliability of variables with regard to the nature of consistency in their values by maintaining the outcomes. This was done by using the internal consistency reliability technique that enabled the researcher to determine the level of consistency of results across all items in the study (Angell, 2015).

The reliability tests were done using Chronbach's alpha on each research objective, for all the items being tested on the research objective, as demonstrated in chapter 4.

3.9.2 Validity

Validity is defined as follows: Creswell (2009) points out that it is a technique used to determine the level of meaningfulness of a study, while Noble and Smith (2015) argue that through validity the researcher can attain high levels of precision, in which the findings of the research accurately reflect the data. For this study, validity was an empirical approach since the study was quantitative in nature and the data were analysed using descriptive statistics. The validity test

was done using the inter-item correlation matrix per research objective, with its components to test correlation as demonstrated in chapter 4.

3.10 Bias

The following types of bias were encountered during the study: compromised validity and level of confidentiality. Most participants did not take the research seriously, since it related more to academic findings than technical aspects. However, the researcher ensured that respondents took considered the value of the research by aligning it to the possible benefits of the entire organisation, since it was contextual. In terms of confidentiality, bias was avoided through the engagement of the one-on-one aspect – as the researcher also had a participant list for easy follow ups.

3.11 Ethical considerations

Ethical considerations were guided and observed by the university through the HSSREC Office, and ethical clearance was approved (attached as Appendix 3). A consent letter from SR was signed off by the Chief Executive Officer and a copy was attached to each research questionnaire. The participants had the right to withhold their identity during data collection, and to withdraw from participation at any time.

3.12 Summary

This chapter presented the research methodology for the study in this order: research aim, research design and methods, research paradigm, population and sample of the study, data collection, data analysis, reliability and validity of the study, bias, and ethical considerations.

The next chapter presents the research findings based on the descriptive statistics.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.0 Introduction

This chapter presents the findings of the study in a descriptive analytical form. Two sections are presented: demographic information on the background of the participants in the study and the technical information that is guided by the research objectives in chapter one.

4.1 Response Rate

The researcher distributed 45 questionnaires across the entire sample frame, in order to achieve the objectives: 45 responded and returned the questionnaires, which represents a 100% response rate

4.2 Section A: Demographic information

4.2.1 Gender distribution

Figure 4.1 (below) shows that males represented the majority – accounting for 82% of respondents and females 18%. The conclusion was reached using the mode as a measure of central tendency.

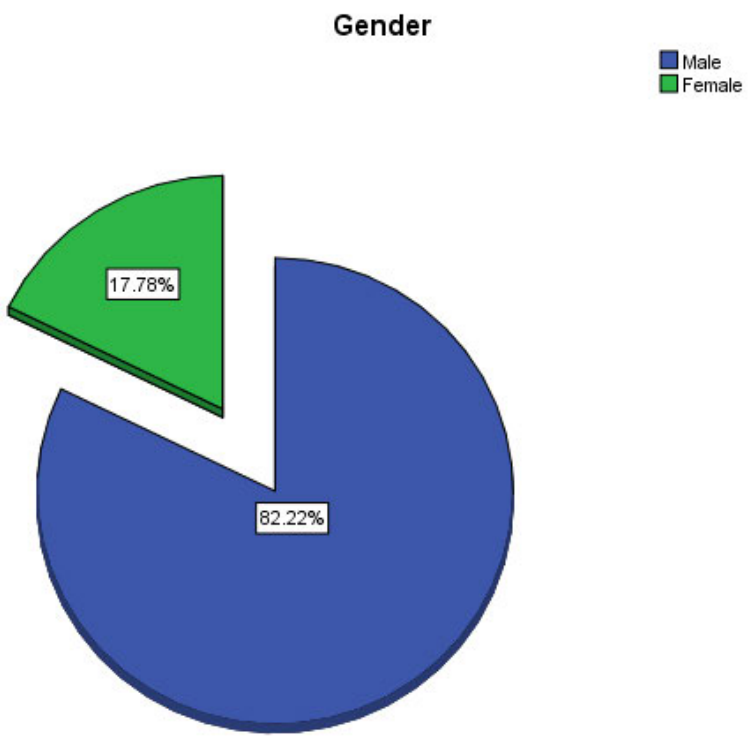

Figure 4.1 Gender (*source*: research data, 2018)

4.2.2 Employment status

The employment status of participants included permanent and fixed-contract employees, as indicated in Figure 4.2 (below)

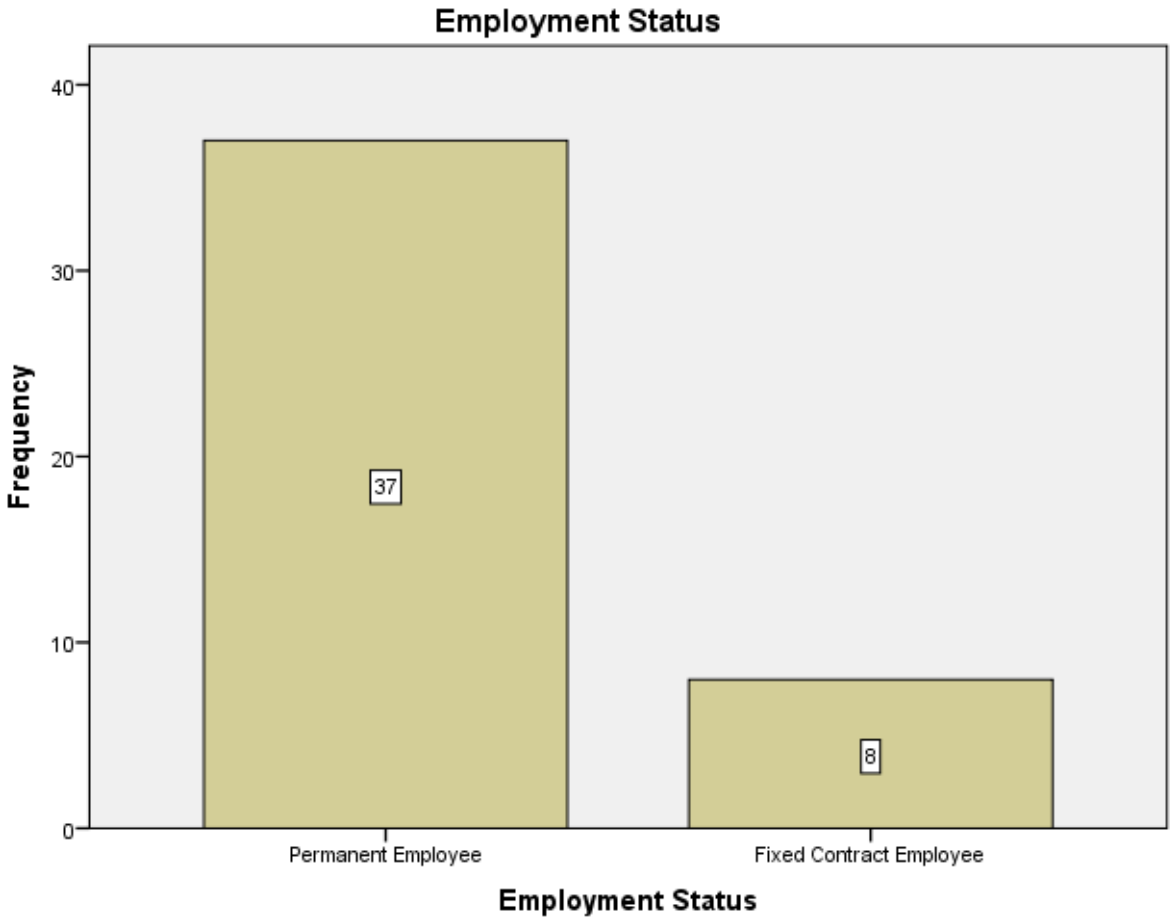

Figure 4.2: Employment status (*source*: research data, 2018)

The findings indicated that most employees at SR were permanent employees as compared to fixed-term contract employees. The conclusion was reached using the mode as a measure of central tendency, as the permanent employees have the highest frequency of thirty seven (37), whereas fixed contract employees account for the remainder (8) – as represented in the Figure 4.2 (above).

4.2.3 Work position

Work position was another area of focus in this study. There were three constructs: Heads of department (HOD), Managers, and Supervisors (see Figure 4.3, below).

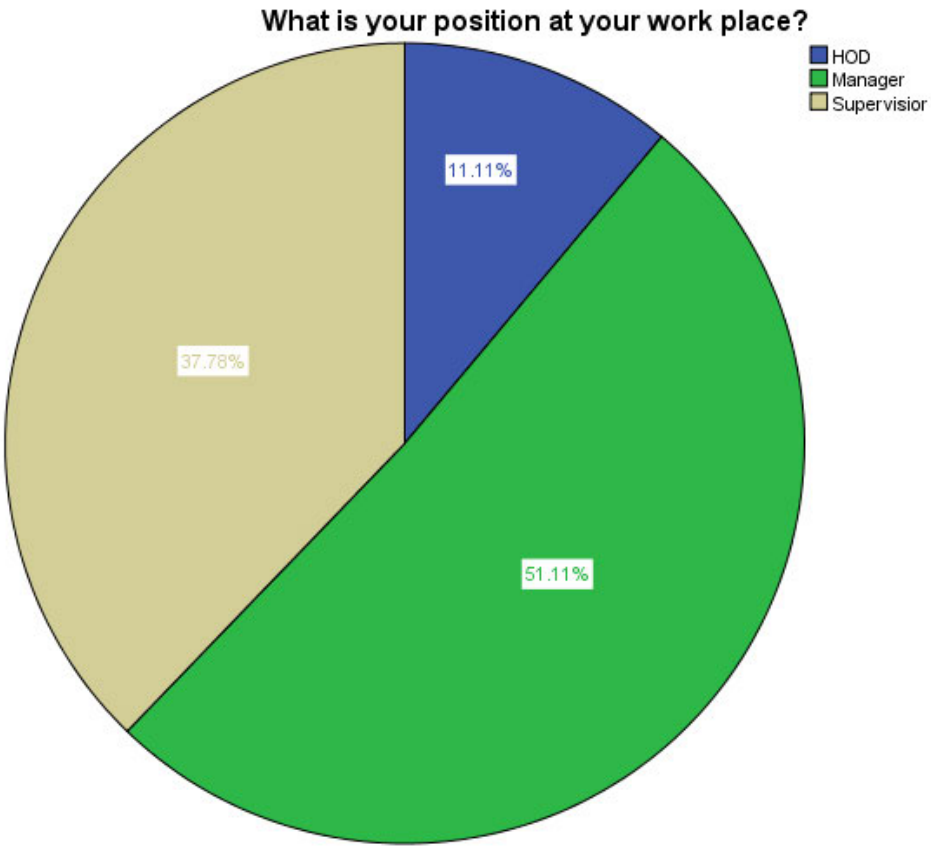

Figure 4.3: Work position (*source*: research data, 2018)

The study findings indicate that most participants were managers (51% of respondents), followed by supervisors (38%) and Heads of Departments (11%) – as shown in Figure 4.3 (above).

4.2.4 Level of education

Level of education was assessed during this study. Various levels of participant qualification were examined – high school, diploma, degree, and master's degree (see Figure 4.4, below).

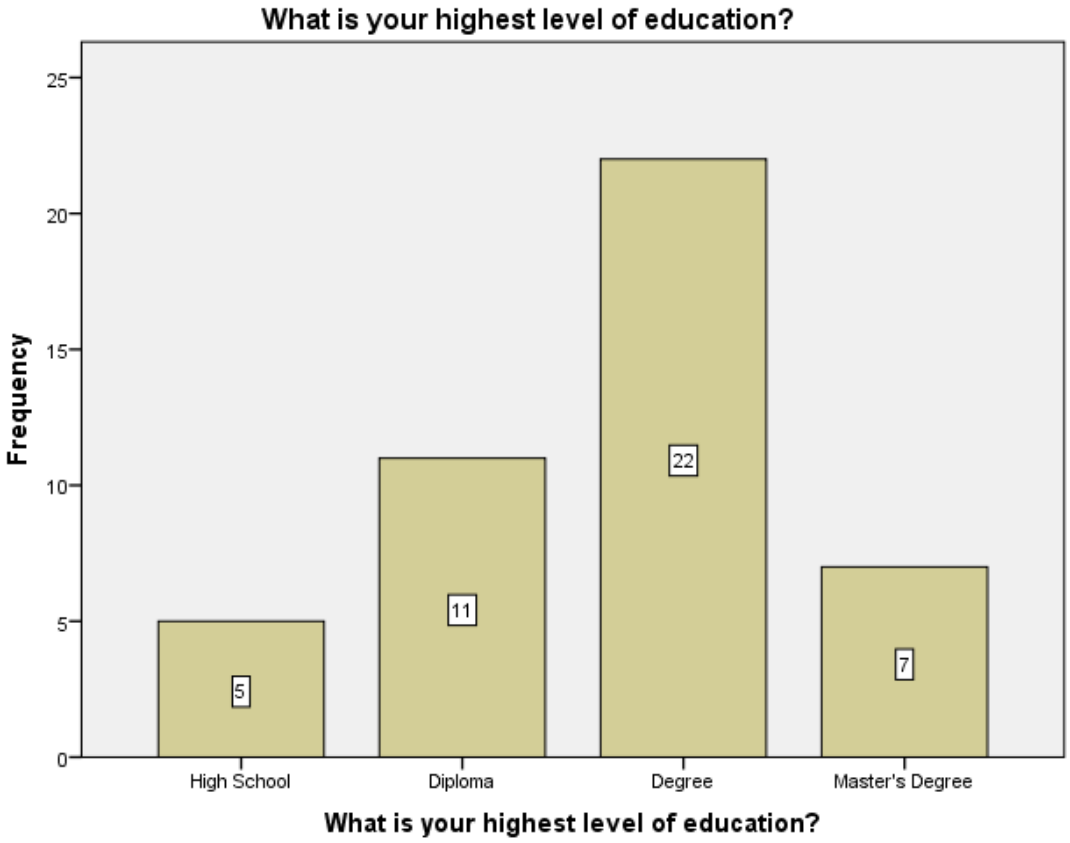

Figure 4.4: Level of education (*source*: research data, 2018)

Figure 4.4 (above) shows that most respondents were degree holders, followed by diploma holders, master's degree holders and high school certificate holders, in descending order. This conclusion was reached using mode as the measure of central tendency. The general findings indicate that since the study evaluated a technical issue of value-chain management at management level, degree holders were the majority when consolidated, as they had more information regarding the subject being studied – which in turn enhanced validity and reliability of the conclusions reached.

4.2.5 Work experience

The last element considered under demographic information for the study, is work experience (see Figure 4.5, below).

		Frequency	*Percent*	*Cumulative Percent*
Valid	5 to 10 years	5	11.1	11.1
	11 to 15 years	19	42.2	53.3
	16 to 20 years	8	17.8	71.1
	21 to 25 years	5	11.1	82.2
	26 to 30 years	4	8.9	91.1
	31 to 35 years	2	4.4	95.6
	36+	2	4.4	100.0
	Total	*45*	*100.0*	

Table 4.1: Work experience (*source*: research data, 2018)

From Table 4.1 above, most respondents fall into the range of 11 to 15 years of experience (42%) and a minority fell in the range of 31 to 35 years and 36 years (4.4% each). In reaching the above conclusion, the statistical measure used was the mode.

4.3 Section B: Technical iinformation

This section presents the findings of the study, as guided by the research objectives in chapter one. The key focus areas include analysis of the degree of influence of information technology in value chain management at SR, examination of the influence of information technology in the value chain at SR, determination of the degree of train operations efficiency in value chain management at SR, and assessment of the relevance of railway infrastructure safety and reliability in value chain management at SR.

4.4 Degree of influence of information technology in value chain management at SR

The influence of information technology in value chain at SR, was assessed from two perspectives namely the improved business processes and train operating systems.

4.4.1 Factor analysis

Total Variance Explained

Component	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.916	95.812	95.812	1.916	95.812	95.812
2	.084	4.188	100.000			

Table 4.2: Factor analysis (*source*: research data, 2018). Extraction method: Principal component analysis.

A factors analysis was done for two components – improved business processes and train operating systems influence value chain processes at SR. From Table 4.2 (above), improved business processes (component one) was retained as the significant component that affects the value chain at SR with a percentage of variance of 96%. Train operating systems, the other variable, was dropped since their Eigenvalues are below one (1).

Figure 4.5 (below) portrays the same, factor analysis results above which means that improved business processes is the factor that significantly affects value chain processes at SR.

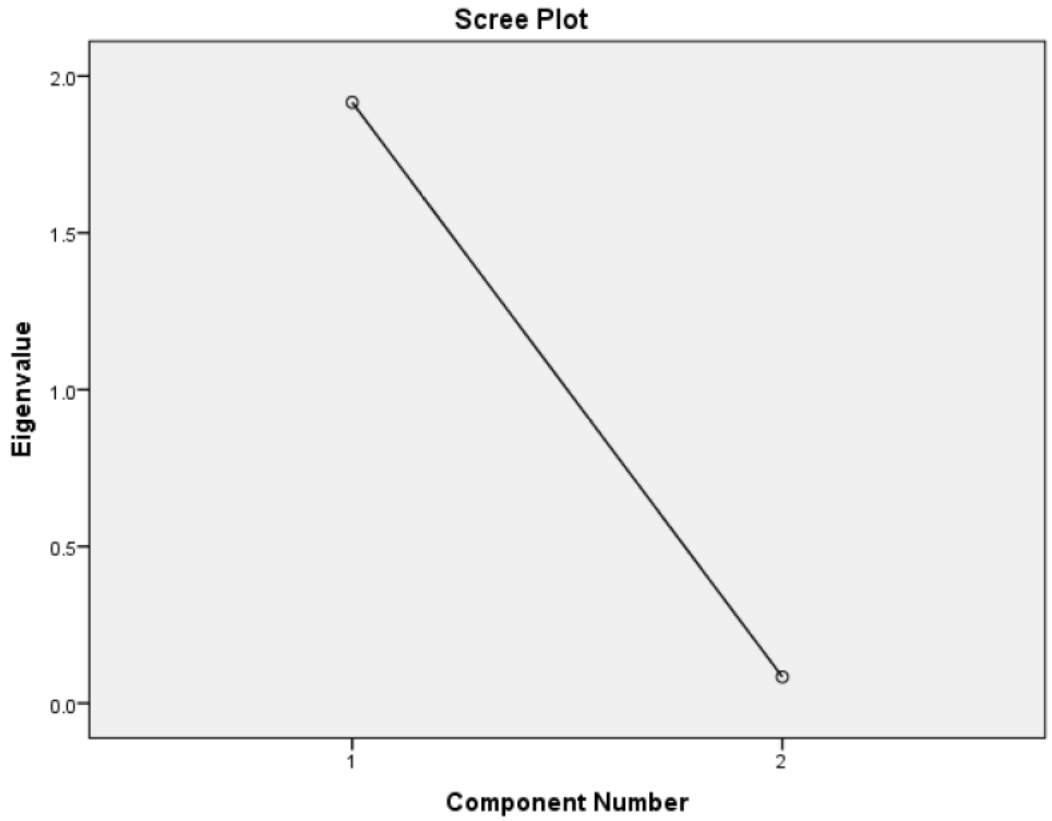

Figure 4.5: Scree plot (*source*: research data, 2018)

4.4.2 Reliability test (Cronbach's alpha)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No of Items
.956	.956	2

Table 4.3: Reliability test (*source*: research data, 2018)

A reliability test was performed between the components to test the internal consistency reliability, and a Cronbach's alpha of 0.956 was computed, which implies that the variables are correlated.

4.4.3 Inter-item correlation

Inter-Item Correlation Matrix

	SR has taken advantage and leveraged on ICT to improve business processes	The train operating system is adequate, efficient and effective in running trains
SR has taken advantage and leveraged on ICT to improve business processes	1.000	.916
The train operating system is adequate, efficient and effective in running trains	.916	1.000

Table 4.4: Inter-item correlation (*source*: research data, 2018)

From Table 4.4 (above), it can be seen that correlation between the two components ranges between 0.9 and 1.0.

4.5 Degree of train operations' efficiency in value chain management at SR

Another objective of this study was to determine if train operations' efficiency has an influence on value chain management at SR. The details of the factor analysis are shown below:

4.5.1 Factor analysis

Total Variance Explained

Component	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.612	53.722	53.722	1.612	53.722	53.722
2	.876	29.187	82.909			
3	.513	17.091	100.000			

Table 4.5: Factor analysis *(source*: research data, 2018). Extraction method: Principal component analysis.

A factor analysis was done for three components – improvement in customer demand, SR as customer centric, and customer complaints, to test the factors that have an impact on the degree of train operations' efficiency in value chain management at SR. From Table 4.5 (above), improvement in customer demand through service efficiency, which is component one, was retained as the significant component that affects value chain management at SR, with a percentage of variance of 54%. All other variables were dropped since their Eigenvalues are below one (1).

Figure 4.6 (below) portrays the same per above factor analysis that improvement in customer demand through service efficiency which is component one ,was retained as the significant component that affects value chain management at SR.

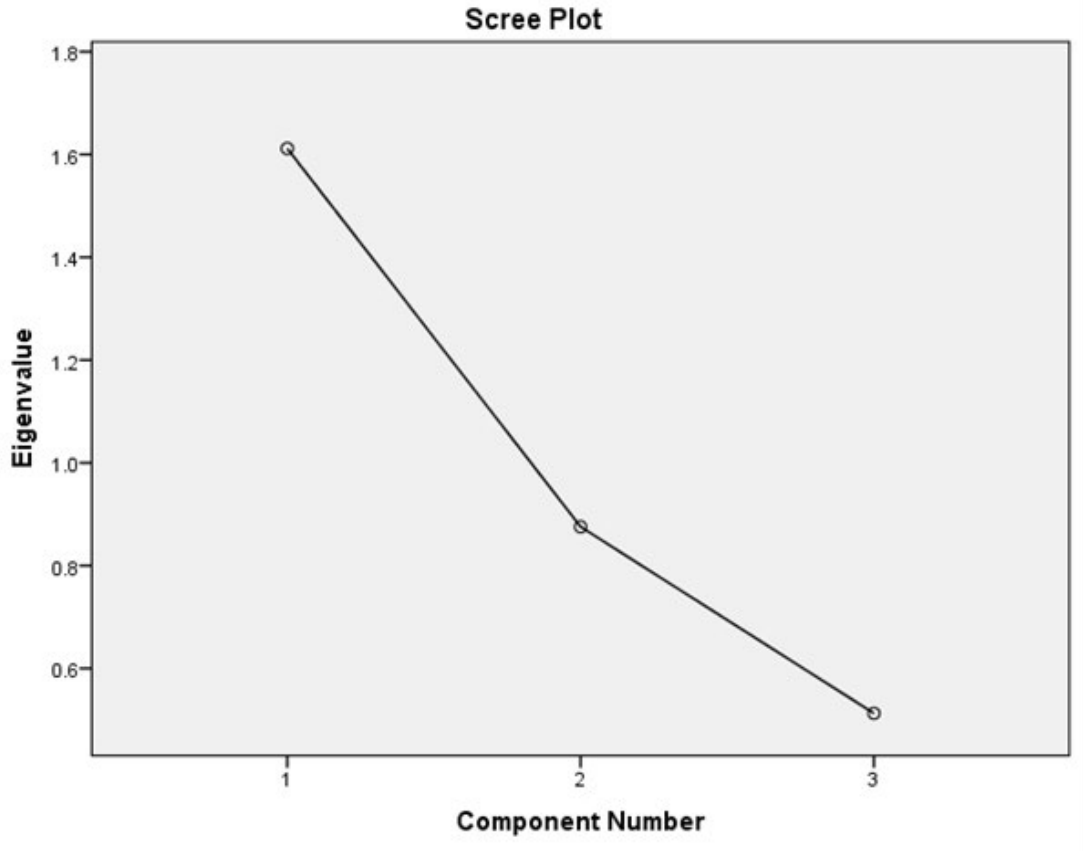

Figure 4.6: Scree plot (*source*: research data, 2018)

4.5.2 Reliability Test (Cronbach's Alpha)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No of Items
.246	.554	3

Table 4.6: Reliability statistics (Cronbach's alpha) (*source*: research data, 2018)

A reliability test was performed between the components to test the internal consistency reliability and a Cronbach alpha of 0.246 was computed.

4.5.3 Inter –Item Correlation

Inter-Item Correlation Matrix

	SR trains are operated efficiently and effectively to meet customer demand and improve turnaround time	SR is a customer-centric or customer-focused organisation embedded in its culture	There are no customer complaints about delayed trains
SR trains are operated efficiently and effectively to meet customer demand and improve turnaround time	1.000	.487	.199
SR is a customer-centric or customer-focused organisation embedded in its culture	.487	1.000	.191
There are no customer complaints about delayed trains	.199	.191	1.000

Table 4.7: Inter-item correlation matrix (*source*: research data, 2018)

From Table 4.7 (above), it can be seen that the correlation between the three components ranges between 0.2 and 0.5. This implies that the components are less correlated, but do affect the value chain at SR.

4.6 Relevance of railway infrastructure safety and reliability in value chain management at SR

The last objective of the study was on the relevance of railway infrastructure safety and reliability in the value chain four components: infrastructure safety, infrastructure reliability, customer cargo safety and rolling stock recapitalization.

4.5.1 Factor analysis

Total Variance Explained

Component	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.606	90.149	90.149	3.606	90.149	90.149
2	.217	5.421	95.570			
3	.105	2.629	98.199			
4	.072	1.801	100.000			

Table 4.8: Factor analysis (*source*: research data, 2018). Extraction method: Principal component analysis.

A factor analysis was done for four components to test the factors that impact on the relevance of railway infrastructure safety and reliability. From Table 4.8 (above), one component – standadisation of SR safety standards – was retained as the significant component that affects the value chain management at SR, with a percentage of variance of 90%. All other variable were dropped since their Eigenvalues are below one (1).

Figure 4.7 (below) portrays the same, which means that standadisation of SR safety standards was the component that was retained as the significant component affecting value chain management at SR.

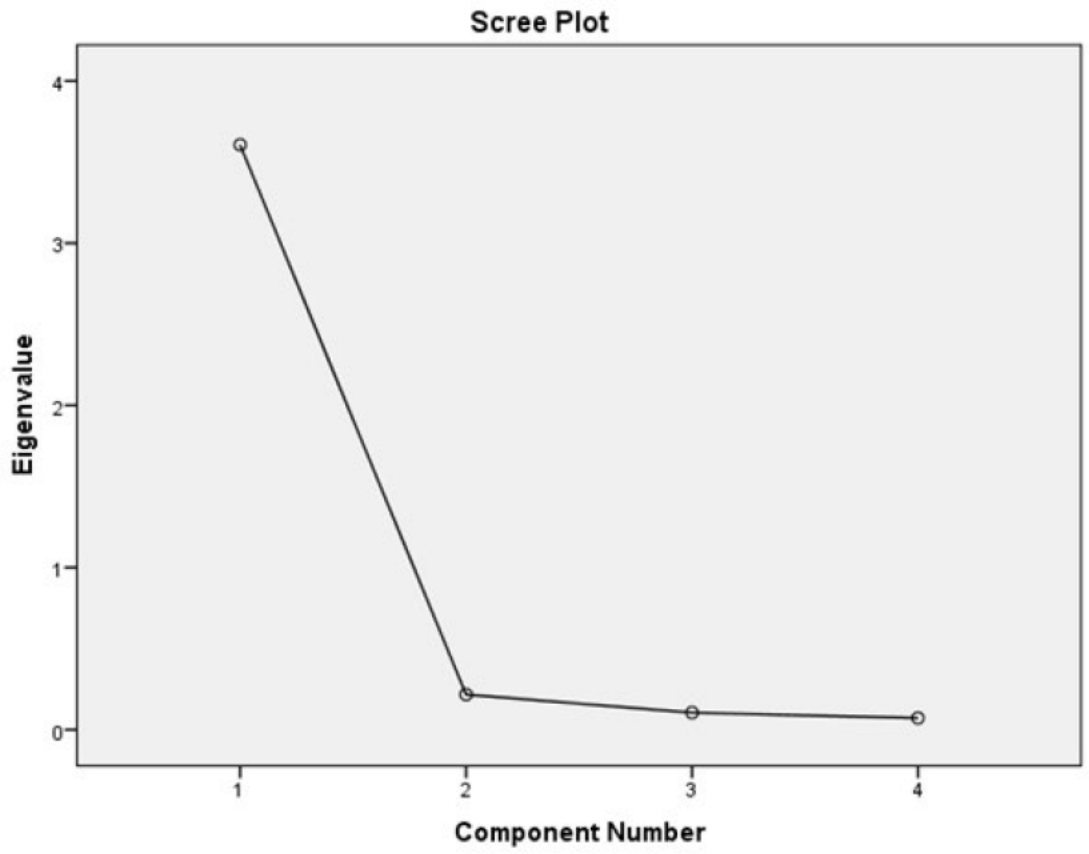

Figure 4.7: Scree plot

4.6.2 Reliability Test (Cronbach's Alpha

Reliability Statistics

Cronbach's Alpha	*Cronbach's Alpha Based on Standardised Items*	*No of Items*
.962	.964	4

Table 4.9: Reliability statistics (*source*: research data, 2018)

A reliability test was performed between the components to test the internal consistency reliability, and a Cronbach's alpha of 0.897 was computed – which implies that the variable are correlated.

4.6.3 Inter –Item Correlation

Inter-Item Correlation Matrix

	SR Rail infrastructure is safe and in accordance with high safety standards	SR rail infrastructure is reliable and up most of the time	Customer cargo safety and security are at the required high standard	The SR rolling stock recapitalisation programme is adequate
SR rail infrastructure is safe and in accordance with high safety standards	1.000	.924	.874	.827
SR rail infrastructure is reliable and up most of the time	.924	1.000	.886	.818
Customer cargo safety and security is at the required high standard	.874	.886	1.000	.882
The SR rolling stock recapitalisation programme is adequate	.827	.818	.882	1.000

Table 4.10: Inter-item correlation (*source*: research data, 2018)

From Table (4.10) above, it can be seen that the correlation between the three components ranges between 0.8 and 0.9. This implies that the components are correlated and affect value chain management at SR.

Summary of Reliability Statistics

Constructs or Research objectives	Cronbach's Alpha	Number of Items
Influence of information technology	0.9	2
Degree of train operation efficiency	0.2	3
Relevance of railway infrastructure safety and reliability	0.962	4

Table 4.11: Summary of reliability statistics (*source*: research data, 2018)

Table 4.11 (above) presents a summary of the reliability tests of the constructs. From the table, it can be seen that the relevance of railway infrastructure safety and reliability has the highest Cronbach's alpha value of 0.962, followed by influence of information technology with a Cronbach's alpha of 0.956. The degree of train efficiency has the lowest Cronbach's alpha value (0.246). Hence, only two variables have a strong reliability and validity of the scale of measurement – as evidenced by Cronbach's alpha coefficients that are above 0.7.

4.7 Summary

This chapter focused on the presentation of the research findings from primary and secondary data. Data from questionnaires, interviews and document reviews were analysed and presented in narratives, charts, graphs and tables.

The next chapter presents the discussion of the study – as drawn from both secondary and primary data sources.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter presents discussions as per the research objectives given in chapter one, which focus on: examination of the influence of information technology on value chain management at SR, assessment of the degree of train operations' efficiency with regard to customer focus in value chain management at SR; and determination of the relevance of railway infrastructure and rolling stock safety and reliability in value chain management at SR.

5.2 Discussion

The discussion considers the combination of the two data sources – secondary sources which included the literature review of the study and primary data sources that involved the findings of the focused study at SR. These data sources were however guided by the research objectives, as listed in chapter one.

5.2.1 Research objective one: Examine the influence of information technology in value chain management at SR

Determining technological influence in value chain management was considered a vital element in the successful operations of an organisation. The findings at SR indicated that information technology plays a major role in value chain management at the organisation, and hence can be used to gain competitive advantage over rivals. Information technology had a significant impact on improved business processes as compared to train operating systems, as part of the value chain process. However, SR has invested many resources in information technology to enhance train operating systems (i.e. on board computer technology), in order create efficiency in the value chain. The introduction of e-business technologies anticipated the creation of a more efficient and effective rail transportation systems (Tetther *et al.*, 2004).

The understanding is based on the notion that global competition eliminates non-competitive transport modes, that information technology shapes value chains and changes the traditional business models, and forces railways to re-check their competitive edge and add value to their traditional model. For this reason, positive trends have brought about the development of the railway business against competition from other modal shift in the transportation industry. (Renner *et al*., 2010)

5.2.2 Research objective two: Assess degree of train operations' efficiency with regard to customer focus in value chain management at SR

Improvement in customer demand had a significant impact on the degree of train operation efficiency in the value chain management at SR. However, the other two components, SR being a customer-centric organisation and customer complaints, had an insignificant impact. Failure by SR to leverage on being a customer-centric organisation and address customer complaints in time, may be a significant risk to value creation for competitive advantage at SR. Hence the performance statistics need to improve.

The high degree of variance among the respondents at SR demonstrates the findings of researchers such as Pietrantonio (2014), who argue that in the transport sector, regardless of the form of transportation, one of the objectives that would remain key is the need to bring about higher levels of competitiveness, so as to reduce inefficiencies and introduce the highest level of transparency in costs and business practices.

For this reason, most researchers such as Hu *et al*. (2016) believe that in order to maintain higher values of performance in the transport industry, the need to establish key performance indicators is vital, since this would enable the development of a higher degree of operational efficiency in terms of punctuality and service delivery. However, delays are still experienced in the industry due to various reasons, such as the implementation of traditional operational scales due to the high cost of establishment in expensive industries such as the rail industry. Most of the study's secondary findings maintain the view that prediction of train delays has always been an interesting area of research (Hu *et al*., 2016). Therefore, due to the unique characteristics of the railway transportation, its timetable suffers from the weakness of the transport process, and hence delivery time is out of control and production suffers.

However, scholars such as Nedeliakova (2014) believe that service quality rating in the transport industry will remain one of the key issues that would have been addressed, so as to maintain higher levels of efficiency and competitive advantage. In the rail business sector, customer satisfaction would have depended on the degree of quality of service, in order to remain competitive. Therefore, it can still be argued that technicalities involving technical issues such as the methodics as a broadminded method toward service quality rating, which allows detecting the current service quality rating that allows identification of the current service offered – to find the reason for dissatisfaction of customers and other stakeholders, including company employees (Hu *et al*., 2016).

According to Hong-chang (2008), the need to address the demand element through introducing the efficiency-based concept of Just- in-Time, where the lead time between demand and supply was limited so as to accommodate the demands of the consumers in the shortest and most ideal time frame to deliver the goods or service at minimum costs.. In this regard, SR might have maintained a higher degree of operations and the possibilities of having remained in the entire industry were higher than before, and it could have been argued that introduction of the value chain management system possibly had positive results.

The third component addressed in this study is the level of customer complaints after the introduction of the value chain management system at SR. The objective behind this concept was that introduction of the strategic models of operations such as the value chain management in an organisation made it was necessary to have an improved system of operations. The established empirical evidence had an insignificant impact on the objective. However, the frequency of customer complaints, without being properly addressed, is an indication of a failing organisation in terms of its value chain management.

This coincides with Nedeliakova (2014), who argues that service quality rating is very important in the rail business for gauging the level of customer satisfaction with regard to the service being offered by the railway operator. This would eventually bring about an improvement in the manner of having the actual objectives of an organisation to be achievement, since the ideal behind the promotion of improved service delivery would bring about the higher degree of a firm's competitiveness and vice versa.

5.2.3 Research objective three: Determine relevance of railway infrastructure and rolling stock safety and reliability in value chain management at SR

Determination of the relevance of the railway infrastructure safety and reliability in value chain management at SR took the perspective of four elements: the standardisation of SR safety, reliability of SR rail, safety of customer cargo, and adequacy of SR rolling stock. The overall objective results indicated that standardisation of SR safety was the significant component that affected the value chain management at SR. The other three components did not have any significant influence on value chain management at SR.

The object of the study was to assess the degree of influence that standardisation of SR safety had on its level of efficiency. The findings demonstrated that this component had a significant effect on SR value chain management. Safety standards are always the first priority in the railway industry, and the target is always 100% at SR; any safety standard deviations are investigated and corrective measures are taken.

The finding at SR however demonstrates that the secondary data findings are a form of improving the infrastructure of the entire organisation, with the notion of promoting the improved nature of the business engineering process that would bring about improved customer demand through the development and placement of the necessary requirement of the service provider, in this case would be SR, in order to maintain a higher competitive advantage (Ho *et al*., 2004).

Reliability of SR infrastructure was another area of concern that the primary data for this study established. The empirical findings of the study indicated that that this component had an insignificant impact on value chain management; however, infrastructure reliability at SR is key in delivering a service to customers. According to Leena (2017), the railway transportation system had a higher level of reliability, on the basis that this mode of transportation was regarded as the most preferred, safe and cost-effective mode of transport, and therefore it is imperative to sustain and advance the current level of safety. Therefore, the need to bring about improved operations such as the value chain system, would remain the best consideration for companies such as SR. This is because an improved alternative transportation network like road transport

had given the traditional rail system much competition – until the introduction of an alternative but productive means of operation that brought about a higher degree of reliability.

Leena (2017) stared that a safe railway was a more efficient and appealing transport source, bearing in mind that the right mechanisms such as the value chain systems were in place. This eventually enables society to focus on other areas of higher importance, including the economy and environmental matters. Most railway accidents happen at level crossings.

The third component of this study was analysis of the safety of customer cargo, which was also found to have an insignificant impact on the objective. However, according to Kim (2014), the safety of customer cargo is one of the key attributes that adds value to railway customers, which makes it critical and there is an obligation to guarantee it. The importance of having the right measures to ensure that customer cargo was in absolute safety is key in the railway business Physical deployment of security personnel has proven not to be the whole solution to the problem, which more often is reactive rather than pro-active. This has led to railway operators applying technologies like Container Security Devices (CSD), which detect any illegal tampering of the cargo and pro-actively produce reports

Additionally, it was mentioned in chapter two (section 2.2.7) that the safety of cargo in the railway industry would remain one of the key elements since usually the train becomes very long, comprising more than 75 wagons, which makes it heavy and therefore it becomes slow. The slow speed makes the train a soft target for theft and robbery while on the track. Physical deployment of security personnel has proven not to be the whole solution to the problem, which more often is reactive and not pro-active. One of the measures would be the avoidance of this intervention would have led to railway operators applying technologies like Container Security Devices (CSD), which would then be used to detect any illegal tampering of the cargo and pro-actively produce reports (Kim, 2014).

The forth component or thematic area of the objective of this study, particularly in terms of engagement with the value chain management, is that of the adequacy of SR rolling stock – which was found to insignificantly affect value chain management at SR. The study findings

indicate a common problem in the secondary literature review, being that rolling stock was to some degree a challenge in relation to the performance of the railway system. Hence Clayton *et al*. (2009) argue that capital intensiveness and high maintenance cost associated with rolling stock, have been considered such as government's adoption of an ideal costing approach such as finding alternatives that would bring about higher levels of efficiency at a lower cost of ownership and operation of the entire railway system as a commercial mode of transport (Espito *et al*., 2009).

5.3 Summary

This chapter presented a discussion of the research findings from the secondary and primary data sources regarding the research objectives on value chain management at SR – particularly a compare and contrast approach on the following key thematic areas: examination of the influence of information technology in value chain management at SR, assessment of the degree of train operations' efficiency with regard to customer focus in value chain management at SR, and determination of the relevance of railway infrastructure and rolling stock safety and reliability in value chain management at SR.

The next chapter presents the conclusions and recommendations of the study.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the conclusions and recommendations of the study. These are drawn from comparisons of the facts from the secondary and primary data sources.

6.2 Conclusion

The need to introduce value chain management in the railway transport industry remains one of the key issues in terms of promoting a high level of competitiveness in the industry. However, to achieve that, there are several factors such as the firm's level of technological influence through promotion of technical approaches such as focusing on business organisational processes and improvement in the entire train operational system. Other fundamental factors that influenced the degree of operations of the value chain management in most organisations, especially those in the transport industry, are the degree of the train's operational level of efficiency with regard to customer focus in value chain management at SR, and determination of the relevance of railway infrastructure and rolling stock safety and reliability in value chain management at SR.

However, on the technological aspect of organisational performance, this study has established that technology was one of the key factors that brought about a higher degree of organisational development efficiency. The findings show that through technological means, an organisation stands a better chance of achieving a higher competitive edge compared to those organisations faced with technological challenges. Through the study it was established that introduction of the technological system in an organisation brought about higher levels of performance and efficiency.

The degree of efficiency in an organisation established that this kind of development would bring about other improved responses from the consumers of train services – such as the improvement of customer satisfaction that would bring about a higher demand of services offered by the improved train services. This would particularly have been a result of having a cost-effective, customer-centric manner of achieving all the demands of an organisation. In other words, this might have been achieved in the event that a certain performance hindrance was avoided, because through the value chain management system the need to have achieved the desired results would have remained one of the biggest challenges of an organisation.

Still under the promotion of efficiency in the transport industry, the need to address customer complaints might have been one of the critical issues bringing about an effective and higher degree of competitiveness in the industry. The understanding on this concept holds that the more reduced the number of customer complaints, the most likely that the organisation was delivering quality to the intended set of customers. The fact that the value chain management system might have been developed, would also mean that the degree the development of the entire value chain mechanism would have addressed the actual demands of the firm through a reduction in customer complaints and vice versa.

The third concept in respect of the influence of the value chain management system in an organisation such as SR, was the relevance of firm infrastructure in terms of safety and reliability. This particularly determined several key elements such as the standardisation of SR safety, reliability of SR rail, safety of customer cargo, and adequacy of SR rolling stock. The key element was that as long as these factors were addressed effectively, the more an organisation would have been effective n meeting its intended goals. Therefore, one of the key understandings of this element would then bring about the establishment of a more balanced value chain management system that would holistically address the demands of the entire organisation strategically.

The bottom line regarding the need to address the issues of standardisation of the railway system would, however, imply that that entire system operated under a given set of principles that would to some extent give the clients a much higher degree of certainty regarding the operations of the railway system. This is because the whole idea behind the establishment of the entire system was

to both create a more competitive system that would give targeted clientele a more favourable set of services, while at same time remaining competitive within the industry.

6.3 Recommendations

The following recommendations are made:

6.3.1 Need for continuous technological improvement

There is a need to focus on the improvement of the technological business operation processes. This is mainly influenced by the evolution of new information technology-driven solutions for competitive advantage, as automation of train operation systems remains key in railway operations.

6.3.2 Improve customer demand

Responding to customer demand, ensuring that SR is a customer-centric organisation that delivers value to its customers and promptly attends to and addresses customer complaints, remains key in value chain management for competitive advantage. It is therefore imperative that SR management introduce new solutions and innovations to grow the business by retain existing customers while also recruiting new customers who currently are predominantly using road transportation.

6.3.3 Introduction of sophisticated electronic measures for safety cargo transportation

SR would become effective if there was much applicability of modern safety measures such as Container Security Devices (CSD) that would be used to safeguard customers' cargo, since most trains in Swaziland were engaged in the transportation of longer wagons that were in turn prone to all sorts of crime such as vandalism, hijack, and theft.

6.3.4 There is a need to improve the adequacy of Swazi Railway rolling stock

The empirical findings of the study were that rolling stock is key in value chain management in relation to competitive advantage – for delivering value to customers and creating competitive advantage. SR has to focus on finding alternative means of improving the facilities to promote higher performance, and introduce robust infrastructure and a rolling stock re-capitalisation

programme backed by the state, in order to serve its customers well and improve the economy of the country through a cost-effective total logistic solution.

6.4 Summary

This chapter presented the conclusions and recommendations with regard to the research objectives of the study. The chapter established a conclusive dimension regarding matters of value chain management within the railway transport industry – giving enough direction about certain techniques that would bring about an effective transport system in any organisation within the industry. Recommendations were also given as a demonstration of a clearer means of adding continuous improvement regarding the degree of organisational improvement.

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APPENDICES

Appendix 1: Informed Consent

Informed Consent Letter 3C

UNIVERSITY OF KWAZULU-NATAL
GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

Dear Respondent,

MBA Research Project
Researcher: Sifiso Zubuko (+268 7602 7288)
Supervisor: Dr M. Hoque (031-2608690)
Research Office: Ms P Ximba 031-2603587

I, Sifiso Zubuko, am an MBA student at the Graduate School of Business and Leadership, of the University of KwaZulu-Natal. You are invited to participate in a research project entitled 'Value chain management as a strategy to achieve competitive advantage in the railway industry'. The aim of this study is to examine how the value chain systems could be integrated in an organisation mainframe to gain and maintain competitive advantage within the railway industry.

Through your participation I hope to understand how organisations could leverage on value chain management systems to gain competitive advantage. The results of the focus group are intended to contribute to increased efficiency and profitability of the railway sector.

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time, with no negative consequence. There will be no monetary gain from participating in this survey/focus group. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.

If you have any questions or concerns about completing the questionnaire or about participating in this study, you may contact me or my supervisor at the numbers listed above.

The survey should take you about 10 minutes to complete. I hope you will take the time to complete this survey.

Sincerely

Investigator's signature_____ Date_____

This page is to be retained by participant

UNIVERSITY OF KWAZULU-NATAL
GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

MBA Research Project
Researcher: Sifiso Zubuko (+268 7602 7288)
Supervisor: Dr M Hoque (031-260 8690)
Research Office: Ms P Ximba 031-2603587

CONSENT

I……(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

SIGNATURE OF PARTICIPANT DATE

……

This page is to be retained by researcher

Appendix 2: Letter of Authorization

SWAZILAND RAILWAY

Efficiency Re-defined

Ref : PF No. 2384

The Graduate School of Business

University of KwaZulu Natal

Westville Campus

Dear Sir/Madam,

RE - PERMISSION TO UNDERTAKE A DISSERTATION RESEARCH AT SWAZILAND RAILWAY ON THE TOPIC: VALUE CHAIN MANAGEMENT AS A STRATEGY TO ACHIVE COMPETITIVE ADVANTAGE IN THE RAILWAY INDUSTRY

Permission has been granted to Mr Sifiso M. Zubuko, who is an employee of Swaziland railway to conduct research on the above topic at Swaziland Railway.

Regards

[redacted]

Stephenson Ngubane

Chief Executive Officer

Swaziland Railway Building
Dzeliwe Street, Mbabane
Website: www.swazirail.co.sz

Tel: +268 2404 2486 / 7 / 8
Fax: +268 2404 5009
Email: info@swazirail.co.sz

P.O. Box 475, Mbabane
Hhohho, H100
Kingdom of Swaziland

Appendix 3: Questionnaire for data collection

VALUE-CHAIN MANAGEMENT QUESTIONNAIRE

INTRODUCTION

Please kindly assist by completing this questionnaire, which is a data-collection instrument for a study on value chain management as a strategy to achieve competitive advantage in the railway business. Permission was obtained from the SR CEO Office to conduct the study at SR, and the information obtained will be treated with strict confidentiality and no individual's names will be mentioned.

SECTION A – DEMOGRAPHIC INFORMATION

PLEASE TICK NEXT TO THE ANSWER APPLICABLE TO THE QUESTION

1. Gender [state your gender] *[Tick where applicable]*

Participant gender distribution	√
Male	
Female	

2. What is your employment status? *[Tick where applicable]*

Employment status	√
Permanent employee	
Fixed Contract employee	
Casual employee	

3. What is your position at your place of work? *[Tick where applicable]*

Position	√
HOD	
Manager	
Supervisor	

4. What is your highest level of education? *[Tick where applicable]*

Qualification	√
Less than high school	
High school	
Diploma	
Degree	
Master's degree	

How long have you worked with SR? *[Tick where applicable]*

Years	5-10	11-15	16-20	21-25	26-30	31-35	36 +
Frequency							

SECTION B: TECHNICAL INFORMATION

Construct one: Influence of Information Technology in value chain at SR

Thematic area	Descriptive statement	Scale				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Improved business processes	SR has taken full advantage and leveraged on Information and Communication Technology (ICT) to improve business processes.					
Train operating systems	The train operating systems are adequate (voice logging systems, sprint system, OBC systems), efficient and effective in running trains.					

Construct two: Degree of train operations efficiency in value chain management at SR

Thematic area	Descriptive statement	Scale				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Improvement in customer demand	SR trains service is operated efficiently and effectively to meet customer demand and improve turnaround time.					
SR as customer-centric	SR is a customer-centric or customer-focused organisation embedded in its culture					
Customer complaints	There are no customer complaints on delayed trains					

Construct three: Relevance of railway infrastructure safety and reliability in value chain management at SR

Thematic area	**Descriptive statement**	**Scale**				
		Strong Agree	Agree	Neutral	Disagree	Strongly Disagree
Standardisation of SR Safety	SR rail infrastructure is safe and in accordance high safety standards.					
Reliability of SR rail	SR rail infrastructure is reliable and up most of the time.					
Safety of customer cargo	Customer cargo safety and security is at the required high standard					
Adequacy of SR rolling stock	The SR rolling stock re-capitalisation programme is adequate					

END OF PARTICIPATION

Appendix 4: Ethical Clearance

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

29 November 2017

Mr Sifiso Zubuko 215067636
Graduate School of Business & Leadership
Westville Campus

Dear Mr Zubuko

Protocol reference number: HSS/2145/017M
Project title: Value Chain Management as a strategy to achieve competitive advantage in the railway industry: A case study of Swaziland Railway

Approval notification – Amendment Application

This letter serves to notify you that your application for an amendment dated 3 November 2017 has now been granted **Full Approval** as follows:

- **Change in Supervisor from Dr A Kader to Dr M Hoque**

Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

Best wishes for the successful completion of your research protocol.

Yours faithfully

[redacted]
.....
Dr Shamila Naidoo (Deputy Chair)
Humanities & Social Sciences Research Ethics Committee

/pm

Cc Supervisor: Dr Muhammad Hoque
Cc Academic Leader Research: Dr Muhammad Hoque
Cc School Administrator: Ms Zarina Bullyraj

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/4557 **Facsimile:** +27 (0) 31 260 4609 **Email:** ximbap@ukzn.ac.za / snymanm@ukzn.ac.za / mohunp@ukzn.ac.za
Website: www.ukzn.ac.za

Appendix 5: Turnitin Report

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	Sifiso Zubuko
Assignment title:	Dissertation for turnuitin 2017
Submission title:	Value Chain Management as a Stra..
File name:	tegy_to_Achieve_Competitve_Adva..
File size:	638K
Page count:	63
Word count:	16,422
Character count:	91,832
Submission date:	23-Nov-2017 11:37AM (UTC+0200)
Submission ID:	884449604

Value Chain Management as a Strategy to Achieve Competitive Advantage in the Railway Industry

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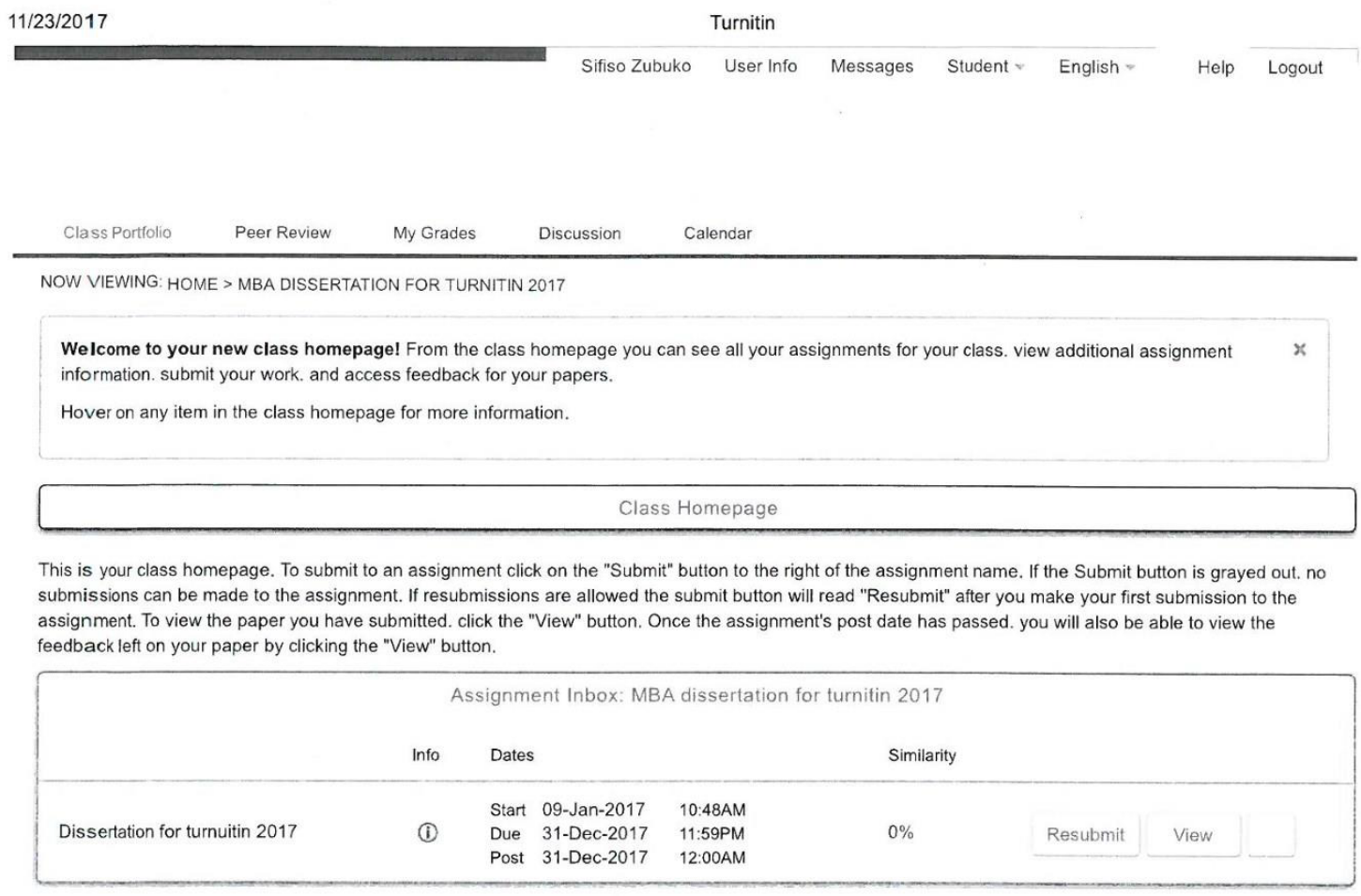

11/23/2017 Turnitin

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Assignment Inbox: MBA dissertation for turnitin 2017

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Appendix 6: Language Editor Certificate

COPY-WRITING
Specialist Consultants

Date: 20/09/2018

Client: Sifiso Zubuko

I, **David Barraclough** - an academic editor of more than 20 years' standing - did a *substantive language edit* of an MBA dissertation by Sifiso Zubuko:

Value chain management as a strategy to achieve competitive advantage in the railway industry: A case study of Swaziland Railway

My amendments related mainly to grammatical and other linguistic aspects. This was in order to improve the clarity/readability of the document, but other changes were also made. Comments and queries were made in Word track changes (a total of 81), to help the author to improve the document further (it was his responsibility to resolve all the issues raised in track changes).

The responsibility for the actual academic content lies with the author and not the editor.

Yours Sincerely,

Dr D.A. Barraclough
Member: South African Translators' Institute (SATI)
Full Member: South African Professional Editors' Guild (PEG)

12A Alfred St, Observatory 7925; cell 082-0766862; fax 086-2186461; david.barraclough@copy-writing.co.za www.copy-writing.co.za