

Evaluating Operational Challenges of Road Freight System

Stephen A. Akinlabi, *Member, IAENG* and Charles Mbohwa, *Member, IAENG*

Abstract— This study evaluates operational challenges of road freight during the transportation of goods in Transnet. South African roads are congested with trucks on every highway across the country leading to an increase in traffic congestion, damaged roads and air pollution. The results of this work reveal some of the operational challenges such as the poor state of the road infrastructure, traffic congestion, poor maintenance schedule and strategy, and also work absenteeism. All these consequently affect the optimal delivery of goods to customers as required.

Index Terms— Operational Challenges, and Road Freight

I. INTRODUCTION

TRAVELLING by road remains the dominant mode of transportation system in the urban cities, the industrial layout are not left out in the road patronage as a means of transportation. However, other means of transportation such as rail, air and ship when necessary remains very relevant to different types of cargo of products. For example, Transnet engages the services of both road and railway systems for the haulages of exported products.

It has been reported that cargo logistics is very important to every country because this service is responsible for transporting most consumer products such as food, drinks and other consumer goods to the point of sales in the shops. In addition, it also includes how consumers get petroleum products for motor vehicles and other commercial purposes. Having a logistics services also demonstrate how a growing country like South Africa is able to participate in global economic trade through import and export [1].

The railway system is almost exclusively responsible for the haulage of exported coal and iron ore because of its robust system and ruggedness. However, it is a common phenomenon to have competition between the two types of transportation system for the general freight. It is important to highlight that road and rail transportation systems often compete in the area of the commercial freight transport [2]. Based on the 2004 statistics, road transportation carried 140 million tons of corridor freight and 210 million tons of rural freight; and the

railway only carried 40 million tons of corridor and 30 million tons of rural freight. According to Van der Mescht [3], this means that about 82% of general freight was conveyed by road, and only 18 % by the railways.

It is important to highlight that the transport logistics industry in Africa, and particularly in South Africa, is developing at a faster rate compared to other African countries, providing different opportunities, even though faced with tough challenges. Some of the areas of concern identified in the 10th state of logistics survey for the Republic of South Africa are to focus on (i) improving transport logistics infrastructure, (ii) the high cost of logistics services (iii) the lack of skilled workers in the cargo logistics industry. If all these are not addressed in a fast growing economy like South Africa, there could be major issue that may affect the logistics sector and other companies that rely on cargo logistics for their business [1].

In South Africa, establishments and organisations in railways, ports, pipelines, and aviation provide a very large proportion of freight transport systems. The annual tonnages for 2013 handled by major freight transport infrastructures was reported to be 1.53 billion tons, which was transported by road in South Africa, this represent about 76% of the total amount of freight transported, with other means of transportation shared between the port with about 13%, rail with about 10%, pipeline with about 1% and airports about 0.02% [4].

The record confirm that the road carries the majority of the freight when compared to other means of transportation, then we have the shipping, followed by railways. Both NATMAP 2050 and Transnet aim to redistribute the proportion of usage of the different modes of transport in order to maximise the efficiencies of each type of transportation system in support of socio-economic development. This initiative supports the objectives defined in the Medium Term Strategic Framework of 2014 to 2019 and the Road to Rail Strategy and Transnet's Market Demand Strategy [4].

The Road Transportation Act was introduced in the 1930s to restrict the development of road freight transport in South Africa. This was in order to develop the rail network of South Africa. In 1987 the road freight industry was deregulated since the road freight industry had developed sufficiently in that it can provide services effectively to the whole country. The South African Transport Services (SATS) was therefore relieved from the corporate carrier responsibilities. A

Manuscript received August 03, 2016; revised August 13, 2016.

Mr Stephen A. Akinlabi is with the Department of Mechanical Engineering Science, University of Johannesburg, South Africa. Private Bag X3 Johannesburg, South Africa, 2006. Phone Number: +27783160281; Email: stephenakinlabi@gmail.com

Prof Charles Mbohwa is a Full Professor with the Department of Quality and Operations Management, University of Johannesburg, South Africa. Phone Number: +27782071516; Email: cmbohwa@uj.ac.za

prerequisite for these policy changes was the successful implementation of the Road Transport Quality System (RTQS) that is embodied in the National Road Traffic Act 93 of 1996 [4].

II. MOTIVATION/PROBLEM STATEMENT

It is important to highlight that the department of transport in South Africa has the prerogative of regulating the road and railways transportation system. Transnet's operational inefficiencies are impacting the customers negatively, hence, it demand to proffer solution to the inherent challenges with the focus of proving customers with good quality service that they deserve.

III. HYPOTHESIS

Hypothesis one: There is a relationship between customer satisfaction and the following:

- Challenges encountered during the transportation of products to customers,
- Challenges experienced in organizations, and the management of the challenges.

Hypothesis two: Most employees in the road companies are less concerned about the challenges experienced and the management of the challenges in the organization when compared to the rail employees.

IV. LITERATURE REVIEW

Roads are primary means of transporting people and goods. It is important to have a reliable road transportation system in order to support a growing economy. CAGTC [5] report reveal that the United State of America (USA) import and export is seen to multiply in every ten years, hence freight transportation is given good priorities. In addition, Bureau of transportation Statistics (BTS) [6], also revealed that the USA transportation system support over seven million business that transport their products to the market through the means of trucks. About 6.4 million makes the USA highways, which represent about 38% of the transportation capital stock in 2005 (BTS) [6]. Almost 30% of all freight transportation services in the USA are attributed to the agricultural sector making it the largest single user of the USA and California freight transportation networks [7].

The 11th annual state logistics report indicated that road transport logistics consists of planning and implementation of the acquisition and use of resources for transportation on the roads [8]. Not less than 40% of the difference in economic performance of low to high-growth countries can be explained by differences in the effective use of their infrastructure [9]. This has significant relevance to the economic development of a country like Republic of South Africa. Weakening roads often lead to traffic delays, higher costs for road users, damage to vehicle and freight and more severe risk is accident on the roads. The Council of Supply Chain Management Professionals reported that transport costs represented 10.1% of the Gross Domestic Product (GDP) of the USA in 2007 [10].

It was further reported that the logistics costs in the USA once changed from 12.3% of GDP in 1985 to a low value of 8.6% of GDP in 2003, compared to 13.5% of GDP in South Africa in 2009 [11]. Total US logistics costs have risen by 52.3% over five years. Transportation costs rose to 5.9% during 2007 and now account for 6.2% of nominal USA GDP, similar to levels experienced in 20 years [12]. A challenge that is stood out to supply-chain logistics in the US is congestion on highway and delays in the port in addition to the demand for a long-term vision in highway infrastructure improvement and sustainability.

Increasing awareness that globalization and information technology affect the patterns of transport and logistics activities has increased interest in the integration of intermodal transport systems. The term "intermodal" has been used in many applications that include passenger and freight transportation. It is believed that a global reduction in the cost of transportation will be very crucial to the rapid growth of global trade in the past two decades [13].

For the purpose of this study, intermodal freight transport is defined as the use of two or more methods of moving a shipment from origin to destination. This would involve the physical infrastructure, goods movement and transfer, and other relevant activities under a single freight bill [13].

The regulation of the road and railway transportation system in South Africa is the responsibility of the department of transport. However, railways are difficult to be regulated because the development and administration have always been the result of political decision. The regulation of road transport began in the 1930s, when hauliers first began to be a threat to the established railway systems [14]. The government saw the growth of unrestricted competition between the two types of transportation system as an attack on the financial stability of the railways; and it obviously wanted to protect the railway system from the loss of traffic and the necessary rate reductions caused by an increase in the number of road hauliers.

Report according to Ittmann [14] reveal that internal logistical in the Republic of South Africa are deteriorating. Ittmann [14] further, stated that the cost of logistics in the Republic of South Africa had reached about R317 billion, or 15.9% of Gross Domestic Product (GDP) in 2007. This was a 1% increase compared to the 14.9% recorded in 2006, and 15.2% in 2005. In addition, Havenga et al. [15] reported that the South Africa's logistics cost as a percentage of the GDP is high; but when compared to the United States, it was found to be 10.1% of GDP in 2007 [16], and 10% of GDP when compared with that of Japan [15].

Havenga et al. (2009) further reported that the South African transport costs constitute 50% of the country's total logistical costs. However, Rodrigue et al. [17] found that this is a considerably higher proportion than the world average of 39%. Surprisingly, customers have been willing to pay more by using road transport, in order to receive their goods on time.

However, from a macro-economic perspective, road freight transportation has had a poor effect on the environment.

Externalities for South Africa are estimated at R34 billion compared to the total freight bill of R171 billion. Externalities include emissions, congestion, accidents, policing and noise [15].

Freight transportation being an important arm of business that aid the movement of goods along the supply chain system and it is therefore indispensable for the supply of products and this directly impacts the productivity of the economy. Hence, transportation requirement is closely linked to economic development. McKinnon [13] show that “between 1995 and 2008 the average annual growth of intra-European Union (EU-27) freight transport was 2% and as such the freight transport grew as fast as the economy”. On the other hand, “during the economic downturn between 2008 & 2009, the GDP in EU-27 decreased by 4.2%”, hence, the freight transport likewise dropped by 11.2% [13].

The amount and character of freight transport demand is determined by logistical decisions, which aim to move products efficiently along a supply chain. Changing logistical structures, e.g. decisions, to centralise warehousing, and more just-in-time replenishment, have led to an increasing demand for the delivery of smaller units in higher frequency, and an increasing awareness of the importance of time, reliability and speed [13]. The increasing demand for small volume goods has limited the scope of rail to maintain market shares [18]. Consequently, many industries have increased their reliance on road transport. Thus, “the growing demand for freight is mainly by road; while the market share of rail fell from 21% of total EU-27 inland freight transport in 1995 to 17% in 2008” [13].

The development in the freight transportation system has contributed greatly to the growing concern for sustainability since road freight is accountable for a number of negative influences. These include influences on the environment which includes the atmospheric emissions, use of non-renewable fuels, waste and loss of ecosystems, on society (e.g. public health, accidents, noise and reduction of quality of life) and on the economy (e.g. waste of resources and congestion resulting in decreasing journey reliability and city accessibility).

Freight transportation system, finds itself contesting and in competition between efficient logistics and sustainable development. On the one hand, narrow delivery time windows and smaller consignments make it more difficult to achieve economies of scale in transport operations; while, on the other hand, there is increasing pressure to significantly reduce the environmental impact. This challenge is most significant in urban areas. Urban freight transport serves industry and trade, which are essential wealth-generating activities.

For people, urban freight ensures the supply of goods in stores; while for firms, it forms a vital link between suppliers and customers. However, the urban environment is characterized by a scarcity off access, e.g. congested roads, space constraints and limitations of infrastructure. These constraints restrict the efficiency and quality of freight operations. Urban areas constitute the living environment for

the majority of the population in Europe; while the citizens’ demand for a high quality of life increases.

Although freight transport operations in cities represent only 20% to 30% of road traffic, they account for up to 50% of the emission of air pollutants (depending on the pollutant considered) by transport activities in a city.

South Africa has a relatively good core network of national economic infrastructure; and the challenge is to maintain and expand it to address the demands of the growing economy. In the transport and energy sectors, dominated by State-owned enterprises, the economy has already been constrained by inadequate investment and ineffective operation and maintenance of the existing infrastructure.

V. METHODOLOGY

The methodology employed in this research is the collection of data and analyzing it in a way to provide reliable results. The method used to gather the relevant data was through administering questionnaires. This was distributed to employees from both road and rail organizations of which 132 respondents were contacted.

The breakdown of the 132 is 50 respondents from the rail organization being Transnet Freight Rail, 52 from road company being Barloworld logistics and 30 also from a road company namely Grindrod.

VI. RESULTS AND DISCUSSION

(a) Company Responses

The distribution of the companies employed in the administration of the questionnaires is shown in Figure 1. The Figure shows the percentages of the respondents from the different companies, Barloworld having the highest number of respondents with a percentage of 39.4%, followed by Transnet Freight Rail with 37.9%, and Grindrod with 22.7%.

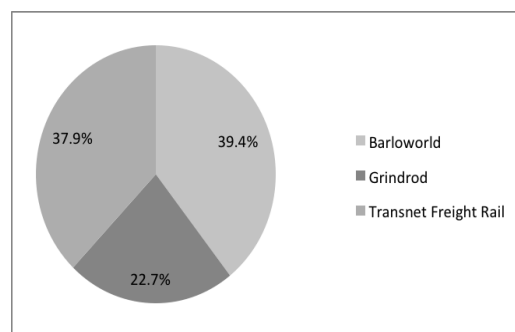


Fig 1: Distribution of companies employed and responses

(b) Company Classification

The company classification is shown in Figure 2.

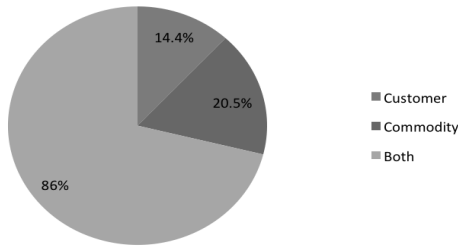


Fig 2: Company Classification

Fig. 2 shows that only 20.5 % of the respondents agreed that their company was categorized under commodities; while 14.4 % stated that their company was categorized under customers; and 86% of the respondents agreed that their company was categorized under both the commodity and the customer groupings.

(c) Transported Commodities

The percentages of the commodities that are being transported by both the rail and road companies are shown in Fig. 3. It is observed that the first three products – vehicles, cements and fuel, are readily transported by road but seems otherwise with the results presented.

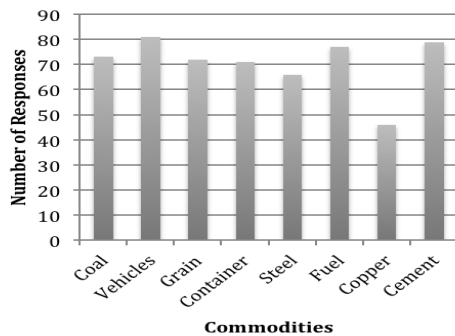


Fig 3: Different transported commodities

(d) Number of train and truck employed daily

The number of trains and trucks employed daily to service the customers are shown in Fig. 4. It is revealed that the Rail company transports most of the products based on the number of trains employed daily. This development may be due to the inherent challenges that made the road means of transportation inadequate.

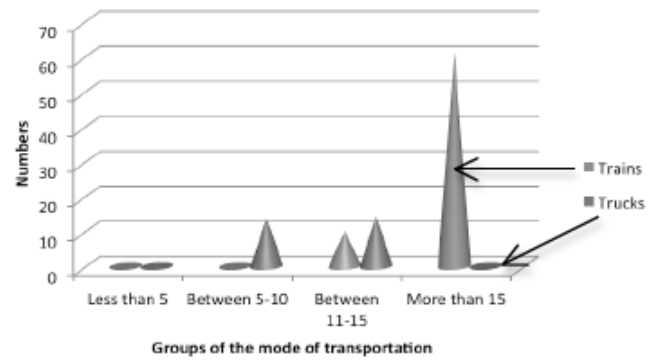


Fig 4: Number of train and truck employed daily

(e) Challenges encountered during delivery

Some of the challenges encountered during the transportation of the products on the road is presented in Table 1.

Table I: Record of challenges encountered during delivery

	Not at all concerned (%)	Slightly concerned (%)	Neutral (%)	Concerned (%)	Extremely concerned (%)
Absenteeism of personnel (drivers)	13.6	18.9	22.7	25.0	19.7
Traffic congestion that delays the delivery of products	11.4	22.0	12.9	24.2	29.5
Poor infrastructure	8.3	22.7	16.7	26.5	25.8
Failure of Assests	19.1	19.8	16.0	19.1	26.0
Poor maintenance schedule on all assests	16.7	28.0	18.9	16.7	19.7

It was observed from Table 1 that as many as 25% and 20% were concerned and extremely concern about the absenteeism of personnel respectively. About 24% and 30% were concerned and extremely concerned respectively about the traffic congestions that delay the delivery of products. A total of 26.5% and 25.8% were also concerned and extremely concerned respectively with the infrastructural maintenance that is considered poor. About 16% of the respondents were neutral about the failure of the assets. About 17% and 20% were concerned and extremely concerned respectively about the poor maintenance schedule on all the assets. Condering all these statistics, the aggregate is significant enough to impact the viability and the efficiency of road transportation system as observed in this outcome.

VII. CONCLUSIONS

The literature review stated that the hauling of trucks have a major impact on the infrastructure as well as the environment, the result also confirmed this report based on over 50% aggregate respodence attestation to poor road infrastructure.

The objective of the study being to evaluate the operational challenges during road freight of products was achieved. The result show that most employees are extremely concerned with the late delivery of customer’s products because this

consequently impact customers' production activities negatively.

From the data collected, road companies' had less patronages for the transportation of the products. This may be attributed to the operational challenges faced within the road transportation system and partly with lack of commitment shown by the truck drivers through their absenteeism from work.

ACKNOWLEDGEMENTS

The authors' hereby thank all the respondents from the different companies that participated in the completion of the questionnaires during the data collection stage of the research. We also appreciate the staff members of Statkon, University of Johannesburg for the assistance with the data analysis.

REFERENCES

- [1] Addressing the Challenges of Transport Logistics in South Africa. (July 2016). Available at: <file:///Users/stephenakinlabi/Desktop/Personal/2016%20publications/2016%20papers/Un-%20Published%20Papers/WCE%202016/SAN%20FRANCISCO%2016/Juliet%20The%20Challenges%20of%20Transport%20Logistics%20in%20South%20Africa.htm>.
- [2] Lawless, R.E. (1990). Using the website in Freight transportation. *Journal of Advanced Transportation*, (vol.24):185-190.
- [3] Van der Mescht, J. (2006). *Revisiting the road versus rail debate*. Paper presented at the Southern African Transport Conference (SATC 2006): Pretoria, South Africa.
- [4] Freight Transport (June 2016). Available at: [http://www.transport.gov.za/Portals/0/ITP/NATMAP%202050/7%20Freight%20Transport%20\(v10\).pdf](http://www.transport.gov.za/Portals/0/ITP/NATMAP%202050/7%20Freight%20Transport%20(v10).pdf)
- [5] CAGTC (Coalition for America's Gateways and Trade Corridors) (September, 2008). America's competitive future. Available at: <http://www.tradecorridors.org/factsfigures.html>
- [6] BTS (September 2015) (Bureau of Transportation Statistics). Transportation statistics annual report 2007. Available at: http://www.bts.gov/publications/national_transportation_statistics/
- [7] FTA (September 2015) (Freight Transport and Agriculture) 2008. America's freight is America's future. Available at: <http://www.tradecorridors.org/factsfigures.html>.
- [8] Cass Logistics Ltd 2000. 11th Annual State of Logistics report. Missouri, US.
- [9] Rulistia, N. D. (May, 2008). Transportation undermines RI economy: Study. *The Jakarta Post*, Jakarta, 16 April 2008. Available at: <http://www.thejakartapost.com>
- [10] CSCMP (May, 2010) (Council of Supply Chain Management Professionals) 2008. 19th Annual State of Logistics report. Available at: http://outsourced-logistics.com/logistics_services/us_logistics_cost_rise_0701/
- [11] CSIR 2011. 7th Annual State of Logistics survey for South Africa 2010. Pretoria, South Africa: CSIR.
- [12] Schulz, J. D. (June, 2015). Logistics management. Available at: <http://www.logisticsmgmt.com/>
- [13] McKinnon, A. (2010). European Freight Transport Statistics: Limitations, Misinterpretations and Aspirations, Report prepared for the 15th European Automobile Manufacturers Association meeting, Brussels, 8 September.
- [14] Ittmann, H. (February 2009). Engineering news. Available online: <http://www.railwaysafrica.com/2009/04/freight-on-road-not-rail/>
- [15] Havenga, J. H., Simpson, Z.P., Van Eeden, J., Fourie, P.F., Hobbs, I. Hobbs and Braun, M. (February, 2015). Annual State of Logistics Survey for South Africa. Available online: http://www.csir.co.za/sol/docs/7th_Sol_2010_March.pdf. (Accessed 10 February 2015).
- [16] Wilson, R. (2001). *Surviving the slump*. 19th annual state of logistics report: Washington DC: Council for Supply Chain Management Professionals.
- [17] Rodrigue, J.P., Comtois, C. & Slack, B. (2009). *The geography of transport systems*. 2nd edition. New York: Routledge
- [18] Woodburn A. An Investigation of Container Train Service
- [19] Provision and Load Factors in Great Britain, EJTIR 11 (2), April 2011, pp. 147-165.