

Supply Chain Management Practices in the Petroleum Industry of Zimbabwe

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Abstract: Supply chain management is one of the contemporary management philosophies that have spurred companies that seek competitiveness. Supply chain management focuses cost efficiency and customer satisfaction. In the case of the petroleum industry of Zimbabwe opacity has kept petroleum companies' supply chain strategies weak and company competitiveness at bay. This study presents supply chain management practices of the petroleum industry namely: procurement, inventory, logistics, information technology and customer service. Petroleum companies in Zimbabwe are uncompetitive because the above supply chain management practices are ineffective. Therefore, uncompetitiveness of petroleum companies is associated with the fact that the companies have not embraced the supply chain management philosophy or that the philosophy is not properly managed. The study uses concurrent parallel mixed methods research design to simultaneously and independently collect qualitative and quantitative data from 102 petroleum industry supply chain practitioners. This design was chosen in order to have a wider and detailed in-depth understanding of petroleum companies' critical success factors, supply chain performance factors and petroleum industry challenges. Qualitative research results show that, petroleum industry supply chain challenges emanate from poor industry structure, strategy, technology and environmental issues. Quantitative research results identified the need for collaboration, support, strategic partnerships and development of supply chain management strategies as the industry's critical success factors. A regression analysis on supply chain performance established that developing effective supply chain management strategies and staff motivation, training and development were the two determinants of supply chain management performance. Both qualitative and quantitative research identified common petroleum industry challenges namely, high cost of product, Government regulation, lack of communication and cooperation among supply chain members and lack of support from associative organisations. The study recommends the development of effective supply chain management strategies at national, industry and company levels. Such strategies can focus on stabilising the business environment, identifying and removing bottlenecks along the supply chains, prioritising predictors of supply chain management performance in the allocation of resources and embarking on more supply chain management research benchmarking with international best practices.

Key words: Supply chain management, competitiveness, customer satisfaction, supply chain collaboration, supply chain integration, performance

INTRODUCTION

Supply chain management is a management philosophy that can integrate all linkages in the supply chain into a seamless system (Loedolff, 2014). The supply chain management philosophy is therefore, implemented by companies that wish to enhance their competitiveness (Azfar *et al.*, 2014). Research shows that 80-90% of operating expenses in most companies is attributable to supply chain management system activities

(Fawcett *et al.*, 2008). Effective management of petroleum industry supply chains is important because fuel is a strategic commodity in an economy. However, the petroleum industry of Zimbabwe has been the country's Achilles heel, since, the attainment of independence in 1980, owing to the inability of authorities to bring sanity in the sector. When fuel supply challenges are at peak, motorists wait in endless queues for several hours, the entire economy is grounded in a short while and fuel trading goes to the black market. Therefore, the goal of

supply chain management is to remove inefficiencies, excess costs and excess inventories from the supply chain (Bala, 2014).

Adopting the supply chain management philosophy in the petroleum industry is meant to address the industry's uncompetitiveness. Supply chain management encourages flawless supply of goods at competitive prices, backed by supportive policies and regulations to minimize the petroleum company problems (Braziotis *et al.*, 2013). Thus, the petroleum industry's uncompetitiveness is driven by opacity which means lack of clear, accurate, easily discernible and widely acceptable practices covering the industry's supply chain (Collins and Troilo, 2015). This study is structured around supply chain management's critical success factors, performance measurement factors and challenges. It aims to identify factors that contribute to the lack of competitiveness of the Zimbabwean petroleum industry's supply chain. The paper's specific objectives were to identify critical success factors required for implementing supply chain management in the Zimbabwean petroleum industry, evaluate supply chain management performance measurement attributes relevant to the Zimbabwean petroleum industry's supply chain and identify the Zimbabwe petroleum industry's supply chain management challenges.

Fuel importers, companies operating service stations, the government and customers could derive different benefits from the study. A mixed methods research design methodology was used to ensure coverage of qualitative and quantitative aspects of the petroleum industry's supply chain. The chosen convergent parallel mixed methods design allows concurrent but independent collection of both qualitative and quantitative data. Results from the two sets of data can be compared for congruency or identification of variations. This is important because determining real factors that impact supply chain management implementation must inform future national, industry and company policies and strategies. Therefore, future supply chain decisions can be based on accurate information generated by the study. The current petroleum industry's supply chain strategy does not give clear policy guidance, responsibilities and accountabilities to supply chain members. This weakens decision making processes, kills investment confidence and breeds uncooperativeness among the supply chain members. It also limits the volumes of fuel imports and leaves the national assets such as the pipeline and storage facilities underutilised. In terms of the industry structure the key observation is that there are no limits for registered companies who can operate at any level of the supply chain. This causes both legislative and administrative challenges for industry because the system restricts entry and operations of local and

small companies. As result associative organisations, Government of Zimbabwe, Zimbabwe Energy Regulatory Authority, National Oil Infrastructure Company and petroleum companies have poor working relationships. As a result, the industry experiences perpetual supply chain problems which make petroleum companies uncompetitive.

Literature review: Researchers contend that, the competitor that is best at managing the supply chain is probably going to be the most successful competitor over time and supply chain management is a condition of success (Babatunde *et al.*, 2016). Literature on supply chain practices including procurement, inventory control, logistics, information and communications technology and customer service will be reviewed. Supply chain management imperatives such as success factors, performance measurement and challenges will also be reviewed. Since, effective management of a company's supply chain involves internal and external supply chain members and third parties a review of the above issues goes beyond the focal company. Research indicates that individual businesses no longer compete as autonomous entities but rather as supply chains (Horn *et al.*, 2014). Therefore, the firm's continuous interaction with other players becomes an important factor in the development of competitiveness (Gichuru *et al.*, 2015). Badenhorst-Weiss *et al.* (2017) observe that, supply chain management oriented management should aim to have flexible organisations, information sharing, joint problem solving and trust, coordination internally and externally, smooth flow of materials, products and information, outsourcing of non-core components and effective cost control.

The working definition for this study is that supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners which can be suppliers, intermediaries, third party service providers and customers. In the essence supply chain management integrates supply and demand management within and across companies (Council of Supply Chain Management Professionals (Anonymous, 2015)). Thus, the key tasks of supply chain managers include focusing all supply chain member's efforts towards customer satisfaction, observing that a supply chain is a process environment with inputs, processes and outputs (Trkman *et al.*, 2015) and recognizing that effective supply chain management can lead to a reduction in overall system costs without compromising service level requirements (Braziotis *et al.*, 2013).

The objectives of supply chain are to optimize performance of the chain, add as much value as possible for the least cost possible and link the supply chain agents to jointly cooperate to maximize productivity and deliver the most benefits to all related parties (Fawcett *et al.*, 2008). Important things that the supply chain system needed to address include quality leadership, customer focus, collaborative partnerships and trust, integrated information systems, information sharing, performance measurement and people empowerment (Fawcett *et al.*, 2008). Effective supply chain management is based on effective management of its key practices of procurement, inventory, logistics, ICT and customer service (Horn *et al.*, 2014).

Research shows that, procurement costs account for 50-60% of the total cost of goods sold in a manufacturing company and the percentages could be higher for service organisations hence companies need sound procurement strategies. Procurement management is the part of supply chain management that plans, implements and controls the efficient, effective acquisition of all raw materials, semi-finished goods, finished goods, services and information in order to support the core operations and ancillary activities of the organisation (Stevenson, 2012; Pienaar and Vogt, 2016). Benefits of sound procurement strategies include improved quality, improved service to end customer, cost reduction, cost improvement, cash flow improvement and development of process technology (Kruger *et al.*, 2013; Hugo and Badenhorst-Weiss *et al.*, 2016).

The procurement strategy is performed and implemented at different levels of the company. The three levels of the procurement strategy are strategic procurement management, tactical procurement management and operational procurement management (Stevenson, 2012). Implementing procurement strategies requires procurement practitioners to create time to interface with appropriate levels of external supply chain members in order to maximize the benefits from procurement (Tay *et al.*, 2015).

In inventory management, effectiveness means the ability to not miss a single order because of stock outages and efficiency means incurring minimum ordering costs, inventory carrying costs and shortage costs (Adoga and Valverde, 2014; Horn *et al.*, 2014). Simultaneously meeting both efficiency and effectiveness involves skillfully balancing a number of competing requirements and staying alert to changing external factors (Stevenson, 2012). The challenge requires management to improve on stock management, demand management (forecasting), cost of inventory and inventory control (Sohel *et al.*, 2016). Good inventory control can reduce the need for

safety stock, lead time, supplier uncertainty, forecast error and increase service level (Adoga and Valverde, 2014; Tay *et al.*, 2015). Scientific methods of managing fuel inventory at national, industry and company levels are a critical component of the petroleum industry's supply chain and they need to be managed well (Babatunde *et al.*, 2016; Yunus and Tadisina, 2016).

Logistics management is the part of supply chain management that plans, implements and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customer requirements (Council of Supply Chain Management Professionals (Anonymous, 2015)). The key objective of any logistics operation is to ensure that the logistics strategy delivers maximum cost benefits and is in line with the corporate strategy (Loedolff, 2014). Bala (2014) and Gichuru *et al.* (2015) agree that, logistical competency of a firm can be measured by its flexibility or how well it is able to adapt to unpredictable situations.

Zhang *et al.* (2016) assert that, inter-organisational and intra-organisational Information and Communication Technology (ICT) are key drivers of effectiveness of supply chains and improving supply chain performance. Inter-organisational ICT acts as a conduit for facilitating transactions, sharing information with trading partners, coordinating activities and establishing governance structures between firms (Pienaar and Vogt, 2016; Zhang *et al.*, 2016). Intra-organisation ICT refers to information technology and/or practices used to share information within a firm including the data bases and applications which facilitate integrating financial, accounting and supply chain operations with the particular focus on logistics systems (Sweeney *et al.*, 2015; Pienaar and Vogt, 2016). Creating, accessing, processing and using information has always been the goal of information and communications systems and use of advanced technology ensures availability of adequate, current and accurate information which allows companies to make effective decisions and craft winning strategies (Braziotis *et al.*, 2013). Information and communication technology allows companies to gather, capture and analyse information to solve company problems (Rajaguru and Matanda, 2013).

Research shows that an organisation provides quality service to its customers when customer's expectations are either met or exceeded (Havenga and De-Bod, 2016; Loedolff, 2014; Evans and Lindsay, 2017). Ascertaining if customer's expectations have been met can be based on service quality dimensions such as reliability, assurance, tangibles, empathy and responsiveness (Havenga and De-Bod, 2016). Customers

want more quality, design, innovation, choice, convenience and service and they want to spend less money, efforts, time and risk (Bala, 2014; Pienaar and Vogt, 2016). According to Scott, Lundgren and Thompson, companies can build customer service ambassadors by recruiting new people with the required skills, redeploying people from one role to another, removing people who are unable to display the required skills and training and coaching people to improve their skills. Survey research results about customer complaints concluded that 68% of consumers say they are willing to pay up to 20% more to stay with an organisation that offers exceptional service, 60% of customers are willing to complain about products, 46% are prepared to make a complaint about services, 89% of customers are more likely to tell others about bad service experiences and only 60% are likely to talk about good experience.

Critical Success Factors (CSFs) call for special and continuous attention to improve company performance. Identification of critical success factors leads to the identification of specific financial and non-financial attributes the company can use to measure its supply chain management performance. Researchers advise that in order to achieve maximum profit, robust sales revenue and increased market an oil company requires to concentrate on supply chain success factors which they identified as vendor managed inventory, collaboration, customer relationship management and information sharing (Tay *et al.*, 2015; Babatunde *et al.*, 2016). In a study of German enterprises, Leyh and Thomschke (2015) identified top management support and involvement, compatibility of supply chain management systems with other information systems and IT infrastructure, cooperation with supply chain partners, effective communication, involvement of end users and stakeholders, skills, knowledge and expertise and supplier and customer relationships support as the most important critical success factors for implementing supply chain management systems and suggested that these factors must correlate with the performance of the company. Every company will have different critical success factors depending on its structure, strategy, industry position, geographical location, environmental factors and time factors (Leyh and Thomschke, 2015; Arora *et al.*, 2016).

Supply Chain management Performance Measurement (SCPM) is the procedure of quantifying the efficiency and effectiveness of an activity (Balfaqih *et al.*, 2016). Issues discussed under critical success factors for implementing a supply chain management philosophy were used as part of the measurement attributes of supply

chain performance in the petroleum industry of Zimbabwe. According to Bala (2014) analysing supply chain performance leads to the identification of problems and opportunities associated with are supply chain's critical success factors. Research about evaluating petroleum supply chain performance listed the following reasons for supply chain performance measurement: identifying successes, checking if companies are meeting customer requirements, identifying problems and waste, bottlenecks, areas that needed improvements, helping companies understand their processes, ensuring decisions are based on facts not suppositions, emotions or intuition and showing if improvement planned actually happened (Tay *et al.*, 2015; Osoro, 2015).

Lack of top management commitment, incompatible corporate cultures, regulatory and political considerations, reluctance to share or use relevant data and incompatible information systems were identified as key barriers to supply chain management performance (Kimani, 2013; Bala, 2014; Talavera, 2015). Further, studies revealed that sharing information, coordination of physical goods flow, Supply Chain Integration (SCI), increasing complexity in business processes and the need for new methodologies to handle complexity and Supply Chain Collaboration (SCC) were the major challenges of implementing the supply chain management strategy (Trkman *et al.*, 2015; Arora *et al.*, 2016; Balfaqih *et al.*, 2016). In a study of factors affecting performance of supply chain systems in an oil company in Kenya, stricter government controls, political risk, competition, emergent new comers and political hostilities were identified as the main challenges (Osoro, 2015). Still in Kenya, a study at the National oil Corporation of Kenya showed lack of strategic stocks, high petroleum prices, frequent fuel shortages, substandard products and diversion of products destined for exports back into the country, lack of developed information technology, poor supply chain design, people issues such as culture and behavior and poor partnerships or collaboration among supply chain members as main challenges (Livohi, 2012; Kimani, 2013; Osoro, 2015).

MATERIALS AND METHODS

To the best of our knowledge, to date, there is no published study about supply chain management practices among Zimbabwean petroleum companies. Owing to the petroleum industry's complex supply chain terrain the mixed methods methodology was chosen for the study. Mixed methods research is a procedure for collecting, analysing and combining (mixing) both quantitative and qualitative data at some stage of the

research process within a single study or a series of studies to understand a research problem more completely (Creswell, 2014; Bryman *et al.*, 2014). Mixing is usually done to obtain breadth and depth of understanding, perspective, complexity and difference and/or corroboration (Terrell, 2012; Bazeley, 2015). Combining quantitative and qualitative research methods has potential to provide comprehensiveness and greater knowledge yield which cannot be achieved using quantitative research or qualitative research alone (Farquhar *et al.*, 2011; Ngulube and Ngulube, 2015; Maree, 2016).

Proponents of the mixed methods research approach suggest that, owing to the complex nature of issues that researchers investigate and the need to have comprehensive knowledge and deeper understanding of such issues researchers nowadays believe that there is no major problem area that should be studied exclusively with one research method (Teddle and Tashakkori, 2012; Maree, 2016). Using the mixed methods entails consulting people working in the right disciplines at different levels of the supply chain using different approaches and tools (Cameron *et al.*, 2013; Ngulube and Ngulube, 2015; Evans and Lindsay, 2017). The advantages of combining quantitative and qualitative methods are gaining in-depth understanding of trends and personal perspectives, explaining the relationship among variables and how their linkage works, measuring and understanding outcomes in an experiment, developing an in-depth case analysis, identifying and taking action to improve a parallel problems, evaluating both the development and outcomes of a programme and advancing social justice based on multiple perspectives (Creswell, 2014; Maree, 2016).

The convergent parallel mixed methods design was adopted for the study. Convergent parallel mixed methods is a mixed strategy in which a researcher collects both quantitative and qualitative data, analyses them separately and then compares the two results to see if the findings confirm or disconfirm each other (Creswell, 2014). The timing of the two methodologies is the same, the two methods have equal priority and both play equally important roles in addressing the research problem both are independent during the data collection and analysis phases and both qualitative and quantitative results must be merged during the overall interpretation (Cameron *et al.*, 2013; Maree, 2016). The merging of the parallel methods can be done to compare and contrast findings from the two methods for the purposes of corroboration or validation and this gives the researcher a more complete understanding of a phenomenon (Cameron *et al.*, 2013).

Farquhar *et al.* (2011) contend that, complementarity mixed methods design is used to investigate different

aspects or dimensions of the phenomenon to deepen or broaden the interpretations and conclusions. The convergent parallel mixed methods design combines unique sets of data collected at the same time but could not be collected across both the qualitative and quantitative paradigms owing to the fact that the different sets of data needed could not be generated solely from either associative organisations or from petroleum companies' supply chain manager because these supply chain members have different mandates in the petroleum industry of Zimbabwe.

However, the study did not include some organisations that are part of the petroleum industry's supply chain such as suppliers, customers, logistics service providers owing to time and economic constraints. Any impact of this exclusion was considered insignificant to affect the objectives of the study. The sample of 96 was rather small for the survey research. Therefore, the views expressed in the survey research cannot be a solid base for generalizing study findings beyond the investigated company and its distributorship. Companies trading in commodities use undifferentiated management strategies in product pricing, promotion, distribution and so on (Evans and Lindsay, 2017). This makes the study beneficial even to petroleum companies which did not participate in the study. Bimha (2001) observed that attitudes and perceptions change over time. Therefore, improving accuracy of attitudinal studies requires studies that are done in a phased approach over a period of time. The limited time frame for the current study was not long enough to implement follow up interviews and surveys. Therefore, the current research results can only be accepted as a basis upon which further detailed studies can be done, over time.

RESULTS AND DISCUSSION

Only executives from the trio of Ministry of Energy and Power development, ZERA and NOIC had direct access to the petroleum industry's supply chain management information. Therefore, in-depth interviews for the study were limited to 6 executives who were purposively selected from these three organisations. The 6 were selected based on their experience and knowledge of supply chain issues of the Zimbabwean petroleum industry. The qualitative research revealed that the state of the petroleum industry's business environment, supply chain strategies and structure have a number of supply chain issues that needed to be fixed for the industry to be competitive.

Government through the Ministry of Energy and Power Development was in charge of ZERA which regulates the industry and NOIC the National Logistics

Company. The petroleum retail sector is dominated by private players including Multinational Corporations (MNCs) like Engen, Total and Puma. Few indigenous companies which dominate the industry include Sakunda, Zuva, Redan and Petrotrade which is 100% owned by government. Under the prevailing structure petroleum companies can operate at retail wholesale and importer level with no restrictions other than the normal registration and licencing fees. This created tension along the supply chain because players with capital can invest at all the three levels and begin to undercut genuine players who did not have adequate capital. Different players could also collude and form cartels to muscle out the weaker companies, mostly, indigenous companies who were undercapitalised. The implication is that the so called small players in the supply chain felt they were caught in between the wrath of government regulation and unfair competition from the MNCs. This forced them to behave unethically and sometimes illegally as a means of surviving.

The study revealed that, Anonymous (2010a) created the indigenisation and empowerment policy to promote affirmative action and to correct historical inequalities that economically disadvantaged indigenous people before the attainment of independence in 1980. However, the ZERA Compliance Director and NOIC operations director concurred that the policy actually posed supply chain challenges to petroleum industry players. The policy did not protect indigenous companies owing to the fact that a licenced petroleum company can operate as an importer or a wholesaler or a retailer concurrently without any limitations. This supports an observation by NOCZIM that, only established multinational corporations who could afford to invest at the different tiers of the supply chain benefitted from the arrangement (Anonymous, 2010b). Government regulation was also cited as one of the petroleum industry's main challenge. This was exacerbated by the fact that regulation and policy implementation enforcement for the petroleum industry was weak.

The regulator (ZERA) was under resourced and did not have capacity to combat illegal practices such as quality violations, smuggling, product adulteration and other related practices that affected company competitiveness. Despite the fact that Zimbabwean economy was dollarized in 2009 petroleum companies faced serious foreign currency shortages and struggled to finance fuel imports. As a result, lack of investor confidence kept investors out of the petroleum industry and customer's frustrations rising. Economic

de-industrialization had shrunk the country's economic activities fast and this affected the fuel companies' competitiveness. At the time, the study was carried out the country had 23 registered petroleum companies only compared to forty companies that existed in 2011 (Anonymous, 2017). Malpractices by companies as a reaction to unfavourable economic and trade policies have been cited in other studies as a hindrance to company competitiveness (Collins and Troilo, 2015; Tanco *et al.*, 2015). This study shows that other challenges emanating from economic constraints include cost of stock, government regulations and excessive duties. The implication to this observation is that government policies needed to be long sighted and must also look at the downstream effects they had across the entire economy.

Current research results show that, there was an opportunity for Zimbabwe to become an exporter of fuel to countries like Zambia, DRC and Botswana based on the country's geographical location. However, the Director Petroleum in the Ministry of Energy and Power Development indicated that government had not put in place strategies to upgrade the assets and equipment it had in order to penetrate the regional market which was reported to be readily available. The implication of this was that investment in modern facilities, equipment and technology had eluded the Zimbabwean petroleum industry for a long time owing to lack of resources (Anonymous, 2012a). Innovation technology is heavily quoted as one of the strategies to achieve collaboration and integration which both drive competitiveness of companies and companies that did not invest heavily in technology found it difficult to implement an effective supply chain strategy in order to be competitive (Ettlie, 2014; Collins and Troilo, 2015; Rajaguru and Matanda, 2013; Arora *et al.*, 2016). Results of the study showed that, there was modest investment in technology, yet technology can guarantee lower costs of product, distribution while insuring viability and competitiveness.

The Finance Director of NOIC cited the Land Locked, Less Developed Country (LLLDC) status of Zimbabwe as another challenge for the industry because petroleum companies' activities were restricted to downstream, inbound and outbound supply chain activities alone. The study revealed that although the Beira Port which was Zimbabwe's nearest outlet to the sea was only 673 km away it had a shallow harbour which limited the size of ship containers that docked at the Beira port. As a result, restricted import volumes and the country's landlocked

Table 1: Supply chain management critical success factors in petroleum industry

Items	NI (%)	SI (%)	I (%)	VI (%)	EI (%)
Strategic partnerships and trust	3.5	1.8	35.1	22.8	36.8
Top management support and commitment	5.3	14.0	26.3	31.6	22.8
Development of effective SCM strategy	-	7.0	33.3	43.9	21.1
Prioritizing SCM activities in resource allocation	-	19.3	29.8	35.1	15.8
Development of reliable sources	3.5	14.1	10.5	49.1	22.8
Information sharing with supply chain members	5.3	8.8	38.6	31.6	15.8
Support from associative organisations (Government, ZERA and NOIC)	-	3.5	22.8	40.4	33.3
Delivery efficiency/speed/flexibility	9.1	20.0	34.5	25.5	10.9
Collaborative partnerships	-	1.8	21.0	38.6	38.6
Responsiveness to customer inquiries	-	7.0	43.9	35.1	14.0

NI: Not Important; SI: Slightly Important; I: Important; VI: Very Important; EI: Extremely Important; Fieldwork, 2017

Table 2: Supply chain management performance measurement

Changes noticed after the company adopted supply chain management are	SD (%)	D (%)	NO (%)	A (%)	SA (%)
The company's supply chain management strategy is driven from the highest office	-	12.5	7.1	41.1	39.3
The flow of information, funds and materials has improved	3.6	8.9	12.5	58.9	16.1
There has been a positive improvement in company competitiveness	5.3	10.5	15.8	42.1	26.3
Supply chain management activities are being prioritised when resources are allocated	-	14.3	23.2	50.0	12.5
There has been a decrease in cost of products	14.0	31.6	22.8	22.8	8.8
The company has been able to resolve customer complaints	1.8	14.3	14.3	46.4	23.2
There has been greater ability in implement technology	7.1	12.5	8.9	55.4	16.1
Employee relations have improved	5.3	12.3	15.8	45.6	21.0
The company has increased its distribution outlets	1.8	7.0	7.0	47.4	36.8
There has been greater supplier relationships and support	7.1	8.9	16.1	53.6	14.3
There has been more customer service satisfaction	-	7.0	22.8	57.9	12.3
Relationships with associative organisations (NOIC and ZERA) has improved	3.6	5.4	19.6	48.2	23.2

SD: Strongly Disagree; A: disagree; NO: No Opinion; A: Agree; SA: Strongly Agree; Fieldwork, 2017

and less developed status made the importation of products and costs along the supply chain to be relatively high (Teravaninthorn and Raballand, 2008; Arvis *et al.*, 2010). Implementing and enforcing Safety, Health, Environmental and Quality (SHEQ) programmes also drained cash from the supply chain. Both Governments and the petroleum companies were required to fund the SHEQ programmes (Anonymous, 2012b).

Thus, the qualitative research identified availability of foreign currency, adequate and well maintained infrastructure, affordable product cost and cooperation as the petroleum industry's main critical success factors. It also identified performance measurement issues like limited outlets, supply chain bottlenecks and poor product quality, product shortage, poor industry structure, poor strategy and environmental and technical variables as the industry's main challenges.

For the quantitative survey, out of the 96 questionnaires distributed among petroleum companies there was an overall response rate of 59.38% and only 7. The 3% occupied the head of department position. This result shows that, supply chain management staff was not given strategic positions in the petroleum companies they work. The following sections present results based on frequency, correlation and regression analyses performed on the collected quantitative data.

In Table 1, respondents identified factors that make up the petroleum industry's critical success factors. Based on frequencies of responses, the top five critical success factors were collaborative partnerships (98.2%), support from associative organisations (96.5%), strategic partnerships and trust (94.7%), development of effective supply chain management strategy (93%) and responsiveness to customer inquiries (93%).

Table 2 shows perceived changes that respondents experienced, since, their companies implemented supply chain management. Results show that, after the introduction of supply chain management respondents noted significant, marginal and no changes to the evaluated variables. Responses show that distribution outlets increased (84.2%), the company's supply chain strategy is now driven from the top (79.4%), improvement in the flow of information, funds and materials (75%), greater ability to implement technology (71.5%), improved relationships with associative organisations (71.4%) and there has been more customer satisfaction (70.2%). Results also show there have been modest changes in resolving customer complaints (69.6%), company competitiveness (68.4%), supplier relationships and support (67.9%), employee relationships have improved (66.7%) and prioritisation of supply chain activities when resources are being allocated (62.5%). However, 45.6% of the respondents disagreed that there has been a decrease

Table 3: Challenges of the Zimbabwe petroleum industry

Items	IR (%)	MI (%)	I (%)	C (%)	MC (%)
Cost of trading stock	-	-	31.6	22.8	45.6
Government regulations	3.5	3.5	14.0	31.6	47.4
Product quality	5.3	5.3	22.7	35.1	31.6
Top management support and commitment	1.8	-	28.6	35.7	33.9
Cost of transportation	-	10.5	22.8	42.1	24.6
Collaboration with stakeholders	1.8	9.1	23.6	43.6	21.8
Infrastructure with storage facilities	-	7.0	26.3	50.9	15.8
Trust among supply chain members	3.5	5.3	22.8	45.6	22.8
Intra-organisational conflicts	5.3	7.0	26.2	40.4	21.1
Fast and efficient decision making systems	1.8	-	25.0	37.5	35.7
Staff resistance to change	7.0	5.3	17.5	52.6	17.5
Poor relations with associative organisations (Ministry, NOIC and ZERA)	7.1	5.4	12.5	28.6	46.4

IR (Irrelevant), MI (Minimum Importance), I (Important), C (Critical), MC (Most Critical); Fieldwork, 2017

Table 4: Pearson correlation analysis

Supply chain variables	Level of significance (p)
Strategic partnerships and trust and development of effective supply chain management strategy	0.000
Development of effective supply chain management strategy and the flow of information, funds and materials	0.000
Company competitiveness and collaborative partnerships	0.001
Staff knowledge and acceptance of supply chain management and supplier relationship management	0.000
Supply chain management strategy being driven from the top and the flow of information, funds and materials	0.000
Increased transaction processing speed and prioritising supply chain management activities when resources are being allocated	0.003
ICT management and IT integration with suppliers and customers	0.001
Employee relations have improved and customer service and linkages	0.000
Customer satisfaction and staff motivation, training and development	0.000
Transport and distribution and company competitiveness	0.002
Supplier relationship management and customer relationships management	0.001

in the cost of product, 22.8% are not sure if there has been product cost improvement and only 31.6% say there has been a product cost improvement.

In Table 3, respondents identified the supply chain challenges faced by petroleum companies and the most important five petroleum industry challenges were the cost of trading stock (100%), lack of top management support and commitment (98.2%), lack of fast and efficient decision making systems (98.2%), government regulations (97%) and lack of infrastructure (93%).

Correlation analysis is used to identify relationships between variables and this can provide information on ways to improve competitiveness (Lind *et al.*, 2012). The study identified relationships between supply chain management variables in Table 4. Management required knowledge about any relationships to improve cost management and customer satisfaction. Correlation analysis is the most widely used method of studying relationships between inter-related phenomena. The correlation analysis measurement is called the correlation coefficient which is a quantitative measure of the strength of the relationship between two variables (Wegner, 2012).

A correlation coefficient is interpreted in terms of “p-values” which represents the level of significance of the established relationship between two variables. A strong correlation exists whenever the $p < 0.05$ (Lind *et al.*, 2012). This indicates that one variable

affects the performance of the other variable. A low level of significance which is achieved when the $p > 0.05$ means that the measured variable does not necessarily affect the other variable. When $p > 0.05$ it statistically means that, there will be no evidence to conclude that the variables are associated (McHugh, 2013). From this study’s correlations analysis, all the tested variables have significant levels of < 0.01 representing a strong association between each pair of variables. Management have to make decisions based on the evaluated strength of the association between variables.

However, correlation analysis offers very little in terms of understanding how two variables might be causally related. This assumes spurious correlations because when 2 variables have a strong correlation it means there is a relationship or association not that a change in one variable causes a change in the other variable. It also assumes a linear relationship between the variables even though it may not be there (Wegner, 2012). In real life, environmental conditions change and invalidate previous research findings. Therefore, there will be need to reappraise the data that achieved certain results. The method is liable to be misinterpreted because a high degree of correlation does not necessarily mean very close relationships between the variables and it is tedious to calculate (Lind *et al.*, 2012).

Table 5: Multiple regression analysis results summary table

Parameters	R	R ²	R ²	B	β	t-statistics	p-values
Development of effective supply chain management strategy	0.532	0.283	0.283	0.439	0.532	4.256	<0.001**
Staff motivation, training and development	0.707	0.500	0.217	0.359	0.467	4.424	<0.001**

Constant = 2.048, standard error = 0.081, adjusted R² = 0.478, *p = 0.005, **p = 0.001; Fieldwork, 2017

From the results in Table 4, the correlation coefficient values show there was a substantial association between strategic partnerships and trust and the development of effective supply chain management strategy (p = 0.000), development of effective supply chain management strategy and the flow of information (p = 0.000), company competitiveness and collaborative partnerships (p = 0.001), staff knowledge and acceptance of supply chain management and supplier relationship management (p = 0.000), supply chain management strategy being driven from the top and the flow of information, funds and materials (p = 0.000), increased transaction processing speed and prioritising supply chain management activities when resources are being allocated (p = 0.003), ICT management and IT integration with suppliers and customers (p = 0.001), employee relations have improved and customer service and linkages (p = 0.000), customer satisfaction and staff motivation, training and development (p = 0.000), transport and distribution and company competitiveness (p = 0.002) and supplier relationship management and customer relationship management (p = 0.001).

Multiple linear regression analysis was used to augment the correlation analysis findings. Multiple linear regression analysis is a predictive statistical technique used to describe the relationship between two or more predictor variables which could be both continuous and categorical and a continuous dependent variable. In multiple regression analysis several variables are used to predict the dependent variable (Wegner, 2012). In the study, the use of the multiple regression analysis was limited to evaluating supply chain management performance, identifying explanatory factors and predictor variables of supply chain management performance in the petroleum industry. To run the multiple regression test, performance measurement factors in Table 2 were combined and used as the dependent variable which was then tested against all the remaining variables (independent variables). Interpretation of a regression analysis results is based on the resultant p-values. The output shows only the variables that can influence supply chain management performance (predictors of the dependent variable). It does not report anything on all the other independent variables and this is one of this approach's weaknesses.

The summary of the regression test is represented in Table 5 which indicates that in the study, the development of effective supply chain management strategy (p = 0.001) and staff motivation, training and development (p = 0.001) were the only predictors of supply chain management performance. One can therefore safely conclude that although, there are relationships between several supply chain management variables tested under the correlation analysis, only two variables, the presence of an effective supply chain management strategy and staff motivation, training and development are good predictors of supply chain management performance contributing 28.3 and 21.7%, respectively.

For the quantitative research's critical success factors noted are the need for collaboration, partnerships and trust an effective supply chain strategy and responsiveness to customer's inquiries. Performance measurement issues include that there has been no change in product cost, a modest changes in company competitiveness, resolving customer complaints and employee relations. Challenges noted under quantitative research include product cost, lack of top management support and commitment, lack of fast and efficient decision-making systems, government regulation and lack of infrastructure.

CONCLUSION

Owing to the identification of supply chain management's critical success factors, performance measurement attributes and challenges faced by the petroleum industry of Zimbabwe it can be concluded that several petroleum industry activities needed to be improved in line with supply chain management's goal of cost minimisation and customer satisfaction.

Critical success factors: Attainment of industry competitiveness remained a challenge owing to the business environment which did not strongly support effective management of the industry's critical success factors identified as collaboration and partnerships, support from associative organisations, strategic partnerships and trust, effective supply chain management strategies and responsiveness to customer inquiries. Achieving industry competitiveness becomes a big challenge when authorities are not willing or unable to direct resources towards the industry's

critical success factors (Kuiken, 2014). However, the behaviour of industry operators like engaging in illegal practices such as smuggling, over blending of petrol, product adulteration and the mushrooming of illegal vendors at the border towns did not make the industry's situation simpler. Another study on the use of a supply chain management for promoting competitiveness in the fast moving consumer goods in manufacturing industry in Nigeria concluded that lack of adequate staff training hindered efficiency and could result in redundancy along the supply chain (Ogunlela and Lekhanya, 2016).

Supply chain performance attributes: The trio of government, ZERA and NOIC showed a lot of determination in achieving the industry's competitiveness but its vision remains a dream in the presence of inadequate foreign currency which was poorly managed, limited and inefficient fuel distribution facilities, supply chain practices that were mired with illegal and unethical practices and poor collaboration, cooperation and integration among supply chain members. The competitiveness of the whole supply chain requires commitment, team work and cooperation by all parties at all the different levels of the supply chain and the supply chain needs to be managed as a unit or system (Fawcett *et al.*, 2008; Gichuru *et al.*, 2015; Arora *et al.*, 2016; Soheli *et al.*, 2016). Ineffective management of the industry's supply chain activities can lead to lack of competitiveness, exorbitant cost of product, poor employee relations, lack of supplier relationships and support and many unresolved customer issues (Chima, 2010; Bala, 2014). Ultimately, lack of cooperation among supply chain members and lack of decisiveness on the part of authorities all compound to the problem of lack of competitiveness at national, industry and individual company level. The multiple regression analysis identified effective development of supply chain management strategies and staff motivation, training and development as determinants of supply chain management performance. Therefore, the two must be key components of the decision variables that are given preferential treatment during the budgetary processes. The same also applies to the supply chain variables tested under correlation analysis and obtained a $p < 0.005$ showing they had significant association. This means that, considering one variable and disregarding the other one it is associated with may not achieve the best results for management. For best results to be obtained, related supply chain variables needed to be treated equally when resources are being allocated.

Challenges: It can be seen that there are many challenges facing the industry including expensive product, lack of top management support, slow and inefficient decision making, government regulation and lack of infrastructure. This can be aggravated by the nonexistence of a petroleum industry association which makes it difficult for petroleum companies to speak to authorities such as policy makers with one voice. In the absence of an industry association the wishes of those with power to influence decisions and not necessarily those who need genuine support prevailed. It is also clear that the lack of a robust industry structure and guidelines makes planning difficult for authorities because plans and decisions were not based on accurate information. Good supply chain management strategies and effective implementation of strategies required accurate information (Rajaguru and Matanda, 2013; Zhang *et al.*, 2016). Consequently, the low ratings given by respondents to supply chain management performance measurement attributes such as employee relations, prioritisation of supply chain activities and customer complaints, actually confirm that implementing supply chain management in the Zimbabwe petroleum industry achieved modest changes. As a result, the problem of uncompetitiveness in the petroleum industry's supply chain remains unresolved owing to inability or unwillingness by supply chain members to cooperate and share information with others.

RECOMMENDATIONS

Supply chain practitioners must be able to incorporate some of the research findings to improve their companies' competitiveness. They should be able to replace bad supply chain management practices with good ones to increase their companies' chance of becoming competitive. Those with good practices can be motivated to continuously improve and strengthen their practice. Entrepreneurs perform effectively when they are operating in an environment which is predictable and stable (Azfar *et al.*, 2014). Therefore, the Zimbabwean petroleum industry requires policy certainty to give confidence to both existing and would be investors. For example, the government's commitment is yet to be proven towards implementing its pronouncement, in November 2017 in the 2018 national budget statement that it was removing the restrictive, not more than 49% shareholding for foreign investor's policy (Anonymous, 2017). Implementation of the following recommendations needs to be done

with the cooperation, involvement and participation of all relevant stakeholders particularly petroleum companies.

Petroleum industry stakeholders including policy makers and petroleum industry executives need to collaborate around the most important critical success factors of the industry to achieve the goals of effective supply chain management which are cost minimization and customer satisfaction. Government regulation must seize to be a critical petroleum industry challenge. Government, ZERA and the petroleum companies must agree on principles of good practice, professionalism and business ethics and forge alliances at country, regional and global levels to spruce up industry assets and rationalise the operational environment. For example, policy must be clear on what should happen if there are international fuel price movements. The country requires a clear policy on price trigger mechanisms and fuel price determination. Ministry of Energy and Power Development and ZERA need to put in place research backed policies and regulations which are benchmarked with international best practices. For example, benchmarking specific industry practices or operations such as the harmonisation of tax collection based on other successfully managed systems. Similarly, ZERA could embark on studies on petroleum industry regulation and its enforcement.

The formation of an industry centre of excellence and an industry association can be a vehicle for developing an effective platform for research based information and information sharing which could improve collaboration and cooperation among supply chain members. The study did not find any reasons why petroleum companies resisted the formation of a petroleum industry association. In organised markets such as South Africa and Kenya the petroleum industries are structured in such a way that the industry associations are central to key petroleum industry decisions at national, industry and company levels (Ng'anga, 2017). It is recommended that government pushes for the formation of these two institutions but they should not be another extended arm of Government.

Collaborative planning, forecasting and replenishment, joint procurement and cooperative inventory management throughout the entire supply chain can drastically reduce costs. In the short term the collaboration can be extended to contribution by all players towards financing dead stock, interface, buffer stock and strategic stocks which can be broadened to more capital intensive projects in the long term. Research in Kenya and Nigeria indicates the

existence of strategies and potential solutions for some of the problems faced by the Zimbabwean petroleum companies (Livohi, 2012; Kimani, 2013; Osoro, 2015; Babatunde *et al.*, 2016). It is a matter of benchmarking these empirical studies.

For the medium to long term, collaboration can take the form aggressive marketing activities to penetrate the regional market by importing fuel for exportation to regional markets. In order to supply fuel to the regional market the pipeline needs to be extended from Harare to Bulawayo. Project feasibility studies are required for this to happen and they should identify funding options. The proposition can help address product cost which is one of the biggest challenges identified by the study. Some of the practical funding options that could make the country realise its regional fuel distribution hub dream a reality are Build-Operate-and Transfers (BOTs), Build-Own Operate and Transfers (BOOTs) and Public Private Partnerships (PPPs) arrangements.

Parallel activities being perpetuated by smugglers and fly by night-brief case petroleum companies who do not comply with industry regulations were threatening viability of bona fide petroleum companies' businesses. Government lobbying strategy is recommended to make the Government realise the urgent need for reorganising the entire petroleum supply chain and to enforce regulations about licensing and operating limitations. However, sound lobbying requires petroleum companies to speak with one voice, hence the need for a functional petroleum industry association.

The study results show that, petroleum companies were not enjoying any economies of scale owing to depleted procurements and non-transparency in the management of foreign currency which was one of the petroleum industry's critical challenges. Changing the industry's overall procurement strategy, so that, the industry can have a sole importer who does not participate in the petroleum industry's downstream activities is recommended. With the sole procurer strategy the allocation of foreign currency for the petroleum industry will not be subjective and the sole importer will be able to place large orders that attract quantity discounts which must be passed down the supply chain.

Empirical evidence has shown multitudes of benefits of supply chain management including increased cooperation, collaboration competitiveness and increased market share (Fawcett *et al.*, 2008; Chima, 2010). From a strategy point of view, rushing into the supply chain management mode is not necessarily the panacea of every petroleum company's

problems. Implementing supply chain management is an expensive long-term investment process that requires resources and proper planning. There is a lot of give and take to be made by different members of the supply chain for it to be successful. Based on that, a gradual or phased approach to implementing the supply chain management strategy is recommended as it gives the company time to learn how best to implement the programme and time to monitor and assess progress being made (Oakland, 2014). For example, you cannot start implementing supply chain management when your staff has not been inspired to develop the right attitudes, commitment, team work and to identify and benchmark with international best practices.

Research is needed to identify other determinants of supply chain performance apart from the need for effective supply chain management strategy and motivation, training and development which was the outcome of the multiple regression analysis of the study. Technical Director at ZERA highlighted that product quality challenges are not an issue in the upstream area of the supply chain but quality is seriously compromised in the supply chain downstream. The study did not establish reasons for this. Further studies may be required to establish the petroleum industry's retail sector's behaviour and handling of product and why the sector fails to uphold and pass on the goodwill received from the upstream to fuel customers. There is need for further examination of supply chain management issues in the petroleum industry based on the fact that this research did not pin point and determine the specific contributions of supply chain management to company competitiveness and that the current study had a very small sample which made it impossible to generalize the study findings.

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