




The impact of measuring driver performance on the bulk fuel supply chain



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Background: The distribution of bulk fuel products to customers is one of the key activities in the downstream petroleum supply chain. For this activity to be effected successfully, three groups of supply chain participants, drivers, supervisors and customers, play key roles. Truck drivers are responsible for conveying the final product to the customer, whilst supervisors ensure that trucks are dispatched on time, driver performance is monitored and performance feedback is properly communicated to drivers. Customers, who purchase the final products, are the foundation of business success. Business success is only possible by meeting or exceeding customer expectations, and it is therefore imperative that the performance of employees is measured and monitored regularly.

Objectives: This study was undertaken to determine the impact of measuring driver performance on the bulk fuel supply chain and on customer service.

Method: A quantitative research methodology was conducted using structured questionnaires which were disseminated before and after the key performance indicators were implemented to three target groups.

Results: The study found that the performance of drivers improved because of the performance feedback they received from supervisors who were perceived to have improved in their performance through the effective utilisation of key performance indicators, and as a result, this increased customer service levels.

Conclusion: Whilst the research was limited to a single petroleum company, the results can provide management with guidance and insight on how to improve performance of employees through the use of key performance indicators, with a goal of providing excellent customer service.

Keywords: petroleum supply chain; bulk fuel; truck drivers; supervisors; customers; key performance indicators; performance management.

Introduction

The petroleum industry plays a key role in economic undertakings and in the lives of people (Wan Ahmad, De Brito & Tavasszy 2016). Sufficient supply of crude oil and its basic products such as petrol, paraffin, liquefied petroleum gas (LPG) is critical for economic development (Marbuah 2018). These products are used in the industrial, agricultural and transport sectors as well as for domestic purposes (Marbuah 2018).

The uninterrupted and efficient functioning of the petroleum supply chain (PSC) in South Africa is critical as the fuel sector contributes about 6% to the country's GDP whilst delivering some 18% of South Africa's primary energy needs through annual sales of 27 billion litres of bulk fuels (PR Newswire 2018). Despite its scope and importance to national and global economies, the industry is beset with problems. It is a high-risk business and the slightest of mistakes (such as lapse of concentration when loading, transporting or receiving the products can lead to product spillage or fire) can cause serious consequences to the environment, society, firms and their workforce (Wan Ahmad et al. 2016). According to Casal (2018), historical evidence reveals that approximately 40% of all major accidents in the petroleum industry take place during transportation.

Secondary distribution of fuel from depots to customers is usually done via road transport, which often encounters hazards such as road accidents and hijacking of the trucks that convey petroleum products (Lima et al. 2018). Douglas and Swart (2017) state that accidents where trucks are involved cause huge economic and social costs.

Bulk truck drivers (BTDs) are thus the cornerstone and strongest link of this bulk fuel supply chain (Dubey & Gunasekaran 2015; Lima et al. 2018). The BTDs play a critical role in ensuring that petroleum products reach customers on time, in full and in a safe manner. Given the importance of the bulk fuel supply chain, it is vital that the BTDs are skilled, well trained (Foresight Publications 2019) and remain motivated to perform their daily duties (Ingason & Li 2017).

The driver's characteristics and skills cannot, however, be considered in isolation. Driving quality is also influenced by whether or not the driver is motivated to perform the task (Batarliené et al. 2017). Truck drivers are motivated when their performance is acknowledged by their supervisors, as indicated by Shone (2018). Berberick, Lindsay and Fritchen (2017) argue that recognition encourages workers to do more and better work. Lannoo and Verhofstadt (2016) assert that drivers who perceive that their good performance at work is identified and rewarded by the employer are likely to remain in their positions and profession. Demotivated drivers lack self-esteem and are likely to cause mistakes that can lead to fatal accidents, product spillages, contaminations and labour strikes (Aguinis 2013; Business Tech News 2016; Sawyer & Roberts 2018; Schiemann, Morgan & Seibert 2013; Singh 2015). Employing and retaining well-trained and motivated BTDs can therefore ensure the safe delivery of the goods (Ingason & Li 2017).

It is therefore evident that employee recognition and motivation are critical to the success of an organisation and should be part of the employers' formal human resource management processes (Lannoo & Verhofstadt 2016). Identifying and recognising performance of truck drivers can be achieved by using key performance indicators (KPIs) that help companies manage performance (Patty 2018). Key performance indicators are measures that focus on the facets of business performance that are crucial for the present and future achievement of the corporation (Parmenter 2015). They are important because they pinpoint progress towards the company objectives (Šimková et al. 2015). Key performance indicators help organisations to manage performance, track unusual trends and give workers more power and help guide them towards company goals (Patty 2018).

There does not appear to be much research that considers driver motivation in South Africa; however, evidence suggests that this is a key issue (Goss 2015). Motivation of employees is vital for the improvement and performance of any company (Breed 2018; Lee & Raschke 2016; Singh 2015; Zamecnik 2014). This article aims to determine the impact of measuring driver performance on driver motivation, supervision and customer satisfaction in the bulk fuel supply chain. The purpose of this study is to determine whether the measurement of performance motivates BTDs and improves performance to ascertain whether supervisors' performance can be improved through the measurement of the performance of BTDs and to determine the impact on customer service.

The rest of this article is organised as follows: a literature review pertaining to the research topic, the research methodology, a discussion of the results and conclusion.

Literature review

A supply chain is defined as an alignment of activities that fulfil customers' requests (Hugos 2018). Petroleum supply chains are characteristically segmented into streams according to the activities performed (Fiorencio et al. 2015). Kazemi and Szmerekovsky (2015) and Lima et al. (2016) separated the PSC into three key sectors: upstream, midstream and downstream. The downstream sector of the PSC is defined as a multifaceted system, which is composed of refineries, distribution centres, customers and modes of transport which collaborate to ensure that petroleum products reach where they are desired (Kazemi & Szmerekovsky 2015). This sector involves activities like refining of crude oil, selling and distribution of various products to customers (Elhuni & Ahmad 2017) as well as storage (Lima et al. 2016). It is in the downstream sector that the role of truck drivers in the delivery of petroleum products from refineries to depots is critical (Benantar & Ouafi 2012). Mittal et al. (2018) argue that transporting goods by trucks provides a crucial link in modern supply chains and truck drivers are thus perceived as being central to the success of these supply chains (Dubey & Gunasekaran 2015; Leuschner, Lambert & Knemeyer 2012).

Road transport is commonly used for the distribution of petroleum products from depots to customers (Al Chukwuma & Atelhe 2015; Benantar & Ouafi 2012; Fernandes, Relvas & Barbosa-Póvoa 2014). In South Africa, as with many other countries, the secondary distribution of fuel products is heavily dependent on road transport (Benantar & Ouafi 2012; Fernandes, Relvas & Barbosa-Póvoa 2013; Truck Financing 2016). There are, however, many issues associated with the secondary distribution of petroleum products, not least of which are accidents. The consequences of an accident involving a fuel truck are far-reaching and can cause spillage of the product on the road surface which can result in fire or air, soil and water pollution (Ambituuni, Amezaga & Werner 2015; Conca, Ridella & Saporì 2016; Jafarinejad 2017; Siqueira et al. 2017; Wan Ahmad et al. 2016). Poor working conditions of drivers and salary disputes can result in discontent, which, in turn, lead to strikes and eventually disrupt the distribution of petroleum products (Simelane 2018; Truck Financing 2016). The shortage of skilled truck drivers in the PSC is also a major problem in South Africa (Staats et al. 2017). The shortage may partially be caused by factors associated with rewards and compensation, interpersonal relations and supervisor support, career development and the work environment (Goss 2015). Consequently, accidents, poor driver performance and shortages of skilled drivers can lead to a shortage of fuel products at the service stations which, in turn, can disrupt the mobility of both freight and passengers (Business Tech News 2016; Mules 2019).

Accomplished and efficient truck drivers are, therefore, required to achieve delivery responsiveness, delivery flexibility and problem and complaint handling in the distribution of fuel products to enhance supply chain performance and ensure

that customers are serviced satisfactorily (Dubey & Gunasekaran 2015; Leuschner et al. 2012). Good driver performance ultimately enhances customer satisfaction (Dubey & Gunasekaran 2015; Leuschner et al. 2012).

Motivation is the driving force in pursuing and satisfying one's needs (Breed 2018). Lee and Raschke (2016) assert that motivated workers contribute to better performance of companies. It is therefore fundamental for a company and its managers to comprehend what motivates its personnel if they aim to improve the performance of the company (Aguinis 2013; Lee & Raschke 2016). Drivers can be motivated by various factors, such as good working relations with supervisors, schedulers of loads and other drivers, appreciation of their opinions and communication (performance feedback) as well as opportunities to grow within the company (Lockridge 2008; Prockl et al. 2017). Performance is regarded as a corporation's ability to reliably achieve its goals (Vatres, Bijelonja & Pasic 2017). Low employee motivation reduces productivity and effectiveness, causing reduced organisational productivity, increased workers' dissatisfaction and the subsequent failure of the organisation (Breed 2018). Drivers play an important role in delivering value to customers, and their performance is directly linked to the quality of delivery service offered by the company (Williams & George 2013).

Leaders play an important role in fostering and promoting motivation amongst the employees (TuersFeldman 2015). TuersFeldman (2015) asserts that, to achieve this, supervisors, as leaders, must communicate with subordinates frequently in a humble and respectful manner to win their confidence so that they feel they are part of the organisation and aspire to perform exceptionally. Aguinis (2013) argues that feedback about an employee's performance increases the motivation for future performance. The ability of supervisors to measure and give performance feedback to drivers leads to healthy relationships, boosts motivation, increases the aspiration to perform better and retains employees (Berberick et al. 2017; Lannoo & Verhofstadt 2016). Moreover, customers receive improved service from motivated employees (Breed 2018; Schiemann et al. 2013; Tylana 2008). It is, therefore, important to measure performance of employees because the failure to do so may result in dissatisfied customers, inferior service quality and poor operating results (Schiemann et al. 2013).

A performance measurement system is an outline to measure the efficiency of the supply chain using various metrics to measure both the effectiveness and efficiency on an action (Reddy, Rao & Lanka 2019). Performance measurement enhances the management of the supply chain by identifying performance gaps and measuring progress or improvement (Hald & Mouritsen 2018; Reddy et al. 2019). It is argued that as companies encounter many challenges in attempting to satisfy customers in today's volatile market conditions, performance measures and KPIs are important tools to measure the effectiveness and efficiency of the supply chain for a competitive advantage (Reddy et al. 2019). Therefore, the identification and

selection of suitable KPIs are more important in the success of supply chain performance (Reddy et al. 2019).

Key performance indicators are measures that focus on the facets of corporation performance that are crucial for the present and future achievement of the corporation (Parmenter 2015). Key performance indicators provide management with effective feedback and insights to measure the performance of the entire company (Kuhfahl et al. 2018). Key performance indicators provide businesses with necessary information regarding the potential success or failure which enables the managers to intervene and move the performance of the business in the right direction (Appleton 2017).

The use of KPIs also assists in the motivation of drivers. Key performance indicators are aspects that are measured to assess progress towards goals and objectives of the company (Litman 2016). The use of KPIs enables supervisors to communicate the goals of the company to the drivers. This enables drivers to understand the relationship between what they do and organisational aspirations and can furthermore help to improve their performance to achieve those goals (Aguinis 2013). Key performance indicators can be both financial and non-financial measures that companies use to ascertain how fruitful they are in achieving durable goals (Vatres et al. 2017). According to Appleton (2017), KPIs are often used as a fundamental tool in reporting the outcomes of a balanced scorecard, where they are divided into key areas of the scorecard which measure customer satisfaction, financial performance, internal processes, employee development and satisfaction.

Transport KPIs should be pertinent and suitable to small- and medium-sized tasks and concentrate on the most important facets of the vehicle operation, driver performance and efficient distribution of products (Šimková et al. 2015). Some of the road-based KPIs found in literature are used to determine the performance of drivers and are therefore essential in the measurement of the supply chain performance (Šimková et al. 2015). Supervisors should be able to identify good and bad performance of drivers, using KPIs, so that they can guide drivers and compliment those who perform well (Lee & Raschke 2016).

Key performance indicators for drivers help to improve performance and therefore enhance customers.

When the service to the customer is exceptional, the customers become satisfied with the service (Lai & Cheng 2016; Shanka 2012; Vasumathi & Subashini 2015). For the purposes of this article, customer satisfaction is defined as the complete fulfilment of customer expectations (Ali & Raza 2017). The best-known model to measure customer service quality is the SERVQUAL model developed and refined by Parasuraman, Berry and Zeithaml (1991), Parasuraman et al. (1988), Parasuraman, Zeithaml and Berry (1985) and has been used broadly by researchers to study and measure service quality (Ibrahim & Ahmed 2019; Luke & Heyns 2017; Roslan et al. 2015; Tan, Chen & Yang 2017). The SERVQUAL model is commonly

used to measure and compare customers' perceived service quality expectations with their perceptions of actual service quality to determine levels of customer satisfaction (Ibrahim & Ahmed 2019; Luke & Heyns 2017). This model of service quality is based on establishing and measuring the gaps between expectations and perceptions in the five dimensions that may cause customers to perceive the quality of service as being poor (Amin et al. 2013; Luke & Heyns 2017; Parasuraman et al. 1985). The discrepancy between customers' perceptions of the service they receive, and their expectations of the service is regarded as the perceived service quality (Amin et al. 2013; Roslan et al. 2015). A small gap indicates that the customers' requirements are close to being met whilst a large gap could indicate customer dissatisfaction (Amin et al. 2013). SERVQUAL inspects five dimensions of service quality: reliability, assurance, tangible, empathy and responsiveness (Ibrahim & Ahmed 2019; Midor & Kucera 2018; Tan et al. 2017). The effectiveness of measuring driver performance was determined by customer satisfaction surveys before and after the implementation of the KPIs.

Research methodology

The main objective of this research is to determine the impact of measuring driver performance on driver motivation, supervision and customer satisfaction in the bulk fuel supply chain. To realise the objectives, three groups of role-players were targeted namely, BTDs, supervisors and the customers serviced by the depot. Supervisors work with drivers in shifts and are responsible for managing driver performance. Drivers play an important role of conveying petroleum products from the depot to customers; therefore, it was important to collect data from the supervisors and drivers, respectively. The customer expectations and perceptions of the service quality pre- and post-KPI implementation were also required to determine whether the implementation of KPIs helped to improve customer service or not. Other data were obtained from the company Systems Applications and Products in Data Processing (SAP) and Business Intelligence (BI) systems.

Three different questionnaires were developed and distributed pre- and post-KPI implementation to each target group, thus employing a longitudinal approach. The questionnaires incorporated both open- and closed-ended questions, which were standardised pre- and post-KPI implementation, allowing for easy comparison (Saunders, Lewis & Thornhill 2016). The questions were developed and guided by the literature review regarding the importance of measuring driver performance using KPIs, motivation of truck drivers, role of supervisors, distribution of petroleum products via road transport, the SERVQUAL model and research objectives of this study (Newman 2014). During the initial phase of developing questionnaires, a statistician was consulted for advice on questionnaire design to ensure that all questions were logical and suitable to cover all themes to eliminate ambiguity. Before the data were collected from the customers, self-completed web questionnaires were pilot tested on a sample of five respondents similar to the final population of customers, who were not going to participate in the main study. Feedback from the pre-test was used to remove some

issues of ambiguity to ensure clarity and relevance to the research topic.

To collect data from customers, the SERVQUAL model was used. This research instrument was developed by generating 22 items, distributed between the five service quality dimensions (RATER): reliability, responsiveness, assurance, empathy and tangibles under both perceptions and expectations, after a thorough consideration of service quality elements of distributing fuel products to customers. The perceptions and expectations of the service quality elements were rated on a five-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5).

A quantitative research method was considered to be the most appropriate for this research considering that respondents emanated from three groups and this involved collection of a huge volume of data that required numerical examination to be analysed comprehensively. The phenomena from respondents such as performance, attitude, activities, perceptions and expectations needed to be quantified so that the results were objective and generalisable for easier analysis and drawing of inferences to the population under study (McLaughlin et al. 2016; Van Griensven, Moore & Hall 2014). Census sampling was used to collect and analyse data from the entire population of each of the three groups of participants (Saunders et al. 2016), that is, all 33 drivers, all eight supervisors and all customers.

Data were acquired from the questionnaires that were hand-delivered to drivers, supervisors and customers before and after the implementation of KPIs. To enable analysis, open-ended responses were coded and linked to respondents via an allocated unique identification number prior to being processed for analysis whereas closed questions were pre-coded on the questionnaire (Babbie & Mouton 2014; Saunders et al. 2016). Open-ended responses in the form of opinions or comments of drivers regarding phenomena pre- and post-KPI implementation were recorded. In this analysis, the comments or opinions of drivers and supervisors were described quoting the exact words, describing the visible and obvious in the information provided (Bengtsson 2016). The analysis of numerical data was conducted using computer-based statistical analysis software, Statistical Package for the Social Sciences (SPSS) version 25. Statistics and tables were used to examine, compare pre-data with post-data, explore, present and describe trends and relationships of primary data. Data were analysed quantitatively using descriptive and inferential statistics. Supervisor data could not be analysed statistically because of a small sample size and reliability could not be measured; therefore, only frequencies are reported. This was done to ensure that the results are rigorous and trustworthy and provide comprehensive descriptions of the phenomenon under study (Bengtsson 2016).

Data from customers collected using the SERVQUAL method were coded, entered, validated and analysed using SPSS. Descriptive and inferential statistics were formulated to help

analyse the data. Measures of central tendency such as frequencies, ranking and mean item score were applied to describe the average of selected sets of scores, distribution of scores and to ascertain indications of typical tendencies and outliers. Quantitative analysis techniques such as non-parametric statistics (NPar tests) using Wilcoxon's matched pairs signed-ranks test and tables were applied to compare pre-data with post-data to determine the impact of measuring driver performance.

Secondary data retrieved from company BI and SAP systems were analysed by comparing the data for a 6-month period pre- and post-KPI implementation to determine any performance gaps caused by the KPI intervention.

Results and discussions

The first set of data to be discussed is from the drivers, followed by the supervisors, customers and finally the secondary data retrieved from the company BI and SAP systems.

Drivers

For the BTDs to perform well, there should be supervisors who are equipped with necessary skills to be able to analyse performance and help drivers improve where they are underperforming (Lee & Raschke 2016). Table 1 contains statements that show drivers' pre- and post-perceptions of the performance of supervisors. The rating scale was based on a five-point Likert-type scale, ranging from strongly disagree (1) to strongly agree (5), with a sixth option for 'don't know'. Marginal homogeneity tests were conducted to determine whether their responses after the implementation of KPIs changed or not when compared to their responses prior to the implementation.

To determine the magnitude of change, an effect size was calculated for each statement in Table 1. According to Cohen (1988), the criterion used to denote a small effect is 0.10, for a medium effect, it is 0.30 and for a large effect, it is 0.50 (Pallant 2010). The significance level is represented as Asymp. Sig. (2-tailed); *p*-value. If the significance level (*p*-values) is equal to or less than 0.05, it can be concluded that the difference between the two scores is statistically significant (Pallant 2010).

The results in Table 1 indicate that, prior to KPI implementation, drivers generally did not believe that the supervisors had the skills to lead the shift, did not give feedback or notice good performance, but were quick to identify faults. Following KPI

implementation, these results showed considerable perceived improvement, with effect size generally being relatively large. The significance level of these is 1% and 5%, respectively, implying significant improvement on the performance of supervisors. Although drivers indicated a general understanding of the KPIs prior to implementation, this also showed improvement following implementation.

The effect sizes of the last three statements are large, implying that drivers believed that the implementation of KPIs had inspired supervisors to identify good performance, provide performance feedback whilst helping them to improve on their performance. The significance level of these is at 0%, implying that there was a noticeable improvement in the performance of supervisors. The results are supported by various studies which assert that feedback about an employee's performance increases motivation for future performance and keeps employees satisfied at work (Aguinis 2013; George & Jones 2014; Sihag 2016; Wipulanusat, Panuwatwanich & Stewart 2017).

The drivers were requested to indicate the difference that implementation of KPIs made to their motivation and performance. The results are shown in Table 2. As this dealt with post-KPI implementation, there was no corresponding pre-questions. Drivers were also asked to comment on the KPIs. Reliability testing was done on the post-questions using the Cronbach's alpha. The coefficient of this scale is 0.924 implying that the internal consistency is very good (Pallant 2010).

The mean in Table 2 is greater than 4.00 for all statements, implying that the drivers generally appear to be satisfied with the implementation of the new KPIs. From the results in this table, the benefits as perceived by the drivers are:

- The drivers are motivated to work harder.
- Improvement on turnaround time.
- Improvement on truck inspection time.
- Improvement on truck loading time.
- Avoidance of unauthorised trips (Every trip has a route plan and authorised safe stops where the driver is allowed to stop. If drivers stop at any location other than the ones stipulated in the route plan, it is regarded as an unauthorised stop. Reasons for unauthorised stops have previously been identified as stops to buy food, pay bills, theft of product, truck inspection in the case of unusual sound emanating from the truck, amongst others)
- Enhancement in the performance of BTDs.

TABLE 1: Performance of transport supervisors as perceived by bulk truck drivers.

Questionnaire statements	Pre		Post		Sample size (N)	Std. MH Statistic	Asymp. Sig. (2-tailed)	Effect size
	Mean	Standard deviation	Mean	Standard deviation				
1. My shift supervisor is skilled enough to lead the shift.	2.79	1.347	3.65	0.812	33	-3.305	0.001	0.41
2. I fully understand the key performance indicators that govern my performance.	3.55	1.227	4.00	0.985	33	-1.980	0.048	0.24
3. My shift supervisor discusses my performance and helps me improve my performance.	2.47	1.261	3.76	0.980	34	-4.234	0.000	0.51
4. My shift supervisor notices my good performance and tells me.	2.09	1.264	3.71	0.836	34	-4.506	0.000	0.55
5. My shift supervisor only notices when I do something wrong, for example, spillage, contamination, accident, etc.	3.91	1.284	2.32	0.945	33	-4.246	0.000	0.52

TABLE 2: Impact of key performance indicators.

Post questionnaire	Mean	Standard deviation	N
1. Knowledge about the volume of fuel I deliver has motivated me to work harder	4.55	0.564	33
2. Knowledge about the time I spend inspecting the vehicle has helped me to spend my time wisely when doing inspections	4.58	0.502	33
3. The total pre-load time shows that I am a hard worker and I always pre-load when asked to do so	4.45	0.564	33
4. Knowledge about the time I spend when loading a truck helps me to use my time effectively and avoid wasting time when loading a truck	4.61	0.496	33
5. Knowledge about the time I spend in a trip has helped me to improve my turnaround time	4.55	0.506	33
6. Knowledge about the kilometres I travel when delivering to customers has helped me to reduce or avoid unauthorised trips	4.33	0.692	33
7. Being informed about the total number of trips I do per month encourages me to perform better	4.55	0.666	33
8. The total number of deliveries per month shows how my performance is improving every month	4.33	0.692	33
9. The knowledge about the KPIs and what it entails has made a positive impact on my performance	4.36	0.699	33

KPIs, key performance indicators.

TABLE 3: The importance of key performance indicators.

Questionnaire statements	Pre			Post		
	N	Mean	Standard deviation	N	Mean	Standard deviation
1. They will help me become a better supervisor	8	5.00	0.000	8	5.00	0.000
2. They will help me detect the performance gaps of drivers	8	5.00	0.000	8	5.00	0.000
3. They will help me check my shift's performance on regular basis	8	5.00	0.000	8	5.00	0.000
4. I don't think they will help me	8	1.43	0.787	-	-	-
5. I don't know	8	1.29	0.488	-	-	-
6. I am now a better supervisor than before because of KPI utilisation	-	-	-	8	5.00	0.000
7. I will continue using the transport reports to monitor the KPIs	-	-	-	8	5.00	0.000

KPIs, key performance indicators.

Supervisors

Data were also collected from supervisors. Supervisors are important in this research because they are responsible for ensuring that the performance of the BTDs is monitored, measured and communicated in order to motivate them to improve their performance. Before the implementation of the KPIs, supervisors were asked to indicate how motivated they believed the drivers to be. Four supervisors indicated that their drivers were highly motivated, three indicated that their drivers were moderately motivated and only one supervisor stated that the drivers in their shift were poorly motivated.

The following reasons for highly motivated drivers were provided by the supervisors:

- Drivers are always on time for their shift
- They perform their duties to the best of their abilities
- They are always compliant to safety (HSEQ) requirements
- The drivers who perform well in a month are awarded with rewards

The reasons for poorly motivated drivers:

- Bulk truck drivers are unhappy because of many changes happening in the company and they ask many questions (The changes are believed to be the installation of drivecams and smartcams in the vehicles).

The same question was asked after the KPIs were implemented and all supervisors responded by saying that their drivers were highly motivated. Reasons are summarised as:

- Drivers are motivated by receiving monthly performance feedback in the form of volume delivered, trip time, kilometres travelled, number of trips and number of deliveries.

By implication, the implementation of the KPIs provided the supervisors with a useful tool to monitor, measure and provide performance feedback to the drivers, which is, in turn, considered to be a source of motivation. The usefulness of KPIs presented to supervisors was tested. Table 3 shows the statements that reveal the importance of KPIs.

The results show that the mean in statements 1–3 is high for both pre- and post-responses implying that supervisors believed that the KPIs would help them monitor performance, identify performance gaps and help them become better supervisors, even though they had not yet been introduced. Statements 6 and 7 were not applicable pre-implementation. Post-implementation, in these two statements the supervisors asserted that KPIs have enabled them to become better supervisors and declared to continue using transport reports in order to monitor the KPIs. It is however noted that, because of the small population, the reliability of the responses could not be tested, and results should thus be read with caution.

Customers

Customers' perspectives are important because they buy the petroleum products from the depot and expect good service from the BTDs. Customers provided information at the level of customer service received, both pre- and post-KPI implementation. In so doing, it was possible to determine the impact of measuring driver performance in the distribution of petroleum products. To ascertain the internal consistency of the research tool, the reliability of the measurement scale was evaluated. Internal consistency was gauged for both the perception and expectation items pre- and post-KPI implementation. The calculated Cronbach's alpha coefficient for perception and expectation items was above 0.7,

indicating that they are reliable and hang together effectively, implying good internal consistency (Field 2013; Pallant 2010).

The respondents were asked to rate the 22 pre-implementation perception and expectation service quality level items on a five-point Likert-type scale. They were also asked to rate the same items after the KPIs were implemented. The five dimensions containing the 22 items are: reliability, responsiveness, assurance, empathy and tangibles (RATER). To determine a SERVQUAL gap score, the expectation (E) of an individual item score is subtracted from the related perceptions (P) score. The SERVQUAL gap scores, as illustrated in Table 4, show the negative gaps between perceptions and expectations pre- and post-KPI implementation, implying a less than satisfactory level of service quality, however there were some improvements in the service quality offered post-KPI implementation. (Response rates varied for the questionnaires and items; therefore, sample size is not reported in Table 4, but details are provided in Tables 5 and 6).

The comparison between two SERVQUAL gap scores shown in Table 4 indicates that there was improvement in the service offered to customers after the KPIs were implemented. The service gaps were reduced for all dimensions with empathy and responsiveness having the biggest improvements. These are followed closely by reliability dimension and assurance. Improvements in the tangibles dimension were smaller compared to other dimensions, implying that the implemented KPIs did not have a major effect on this dimension.

Table 5 shows the customers' pre- and post-perception and test statistics.

The effect sizes in Table 5 indicate that there was a significant change in all service quality dimensions after the KPIs were implemented. Responsiveness had a bigger effect size than other dimensions, even though this remains a key service shortcoming for customers. The depot should therefore focus

on improving this element. Tangibles showed the lowest effect size, indicating a minor improvement in the provision of services pertaining to tangibles. Key performance indicators implementation is unlikely to significantly affect the tangible elements such as the physical appearance of driver protective clothing and the cleanliness of trucks.

Table 6 explores the individual items associated with each of the RATER dimensions, described in Table 5, and reveals that the mean of all 22 items improved after the KPIs were implemented. The low mean pre-KPI implementation is an indication that the service quality did not meet customer expectations, however, after the KPIs were implemented the mean increased, indicating perceived improvements in service quality rendered to customers. It is therefore construed that the practical intervention appears to have improved the majority of service dimensions, however, the depot should pay particular attention to the responsiveness dimensions, as the data revealed that customers were generally dissatisfied with the response time during peak demand as well as with information regarding the order status and changes, even though there have been some minor improvements post-KPI implementation.

Business intelligence and systems applications and products in data processing systems

The data collected from BI and SAP systems indicate that there was an improvement on driver performance after the KPIs were implemented. The focus areas were the average hours per trip, turnaround time and on time in full (OTIF). On time in full means a perfect order that is delivered completely, on time, in good condition and with appropriate documentation (Fawcett, Ellram & Orgden 2014). There was a remarkable reduction of average hours per trip from 14.14 to 4 h. As no other efficiency improvement programmes were being implemented at the time, this indicates that, through the implementation of KPIs, the supervisors were able to establish that the drivers were wasting time, and, through the performance feedback, they managed to enable drivers to improve their performance in this regard. This massive reduction of trip time could also be attributed to the fact that the supervisors were scrutinising driver trip sheets and ensuring that all were captured with precision in the SAP system, a task that was not possible before the KPIs were implemented, as supervisors were not aware of the importance of capturing driver trip sheets accurately. There is a strong indication that the implementation of KPIs might have alerted supervisors to the importance of accurate capturing. The elimination of errors in capturing of trip

TABLE 4: SERVQUAL gap scores between perceptions and expectations: Gap scores.

Dimensions	Pre-perceptions and expectations: Gap (P-E) – A	Post-perceptions and expectations: Gap (P-E) – B	Results: A - B
Reliability	-1.09	-0.71	0.38
Assurance	-0.55	-0.24	0.31
Tangibles	-0.47	-0.29	0.18
Empathy	-1.37	-0.94	0.43
Responsiveness	-1.90	-1.47	0.43

TABLE 5: Customers' pre- and post-perceptions and test statistics.

SERVQUAL dimensions	Pre-mean	Pre-standard deviation	Pre-median	Post-mean	Post-standard deviation	Post-median	Z	Asymptotic significance (2-tailed)	Effect	Effect size
Reliability†	3.42	0.912	3.60	3.95	0.819	4.20	3.086b	0.002	0.39	Medium-to-large
Assurance‡	4.20	0.819	4.00	4.43	0.615	4.50	2.163b	0.031	0.27	Small-to-Medium
Tangibles†	4.06	0.905	4.00	4.27	0.817	4.50	2.070b	0.038	0.26	Small-to-Medium
Empathy†	3.37	1.096	3.25	3.80	0.973	4.00	2.936	0.003	0.37	Medium-to-large
Responsiveness†	2.73	1.107	2.75	3.30	1.164	3.50	3.350b	0.001	0.42	Medium-to-large

†, n = 64; ‡, n = 62.

TABLE 6: Depot service quality scores: Customers' perceptions of service quality (pre and post) key performance indicators implementation.

SERVQUAL dimensions (RATER)	Pre		Post		N
	Mean	Standard deviation	Mean	Standard deviation	
Reliability					
Delivery trucks are on time	2.51	1.266	3.46	1.197	51
Delivery trucks do not break down on the road	3.77	1.026	3.88	1.139	49
My orders are scheduled to my satisfaction	3.38	1.295	3.83	1.124	50
I receive the quantities that I have ordered	3.57	1.229	4.14	0.912	50
Placing an order is quite easy	4.32	1.002	4.43	0.884	49
Assurance					
Feel safe in dealing with the truck drivers who deliver my orders	4.31	0.822	4.59	0.609	51
My orders are safe during transit	4.14	0.736	4.52	0.619	49
Truck drivers from the depot are polite	4.00	0.979	4.26	0.898	51
Truck drivers have in-depth occupational knowledge of their job	4.04	0.865	4.29	0.799	51
I am satisfied with the work done by the drivers when they deliver	4.10	0.895	4.47	0.748	51
Tangibles					
Drivers' personal protective equipment (attire) is neat and smart	4.16	0.703	4.40	0.847	51
The depot's truck drivers have professional appearance	4.10	0.831	4.34	0.906	51
The depot's delivery trucks appear clean	3.86	1.02	4.14	0.944	51
The depot has all kinds of quality trucks that can manoeuvre easily in our site during delivery according to our needs	3.98	0.948	4.20	1.023	51
Empathy					
The depot drivers have customers interest at heart	3.65	0.976	4.03	0.891	51
The depot has convenient operating hours	3.37	1.131	3.94	1.187	51
Information regarding the status of my order is easily accessible	2.47	1.433	3.46	1.314	51
The depot provides me with excellent customer service	3.27	1.443	3.74	1.094	51
Responsiveness					
The depot provides me with timely and efficient services	2.98	1.175	3.66	1.187	51
I am informed about order status and changes in advance	2.49	1.302	3.00	1.328	51
I get a quick response during peak demand to avoid the site running dry	2.37	1.248	3.00	1.414	51
Communication with depot staff is clear and helpful	2.86	1.386	3.50	1.354	51

sheets can also help reduce the increase in trip hours. Reduction in average hours per trip contributed to a faster turnaround time wherein the total trip hours prior to KPI implementation for a period of 6 months were 112 880.9 but after the KPIs were implemented, these hours reduced to 29 999.7. This indicates a significant improvement in the turnaround time by drivers. This improvement would enable the company to take over some of the deliveries which were outsourced to third party contractors on an ad hoc basis before the implementation of KPIs.

The other key measure that was monitored before and after the KPIs were implemented was OTIF, which means a perfect order that is delivered completely, on time, in good condition and with appropriate documentation (Fawcett et al. 2014). Monitoring of OTIF was done in order to check if it would improve after the supervisors and drivers were introduced to KPIs. OTIF is important because it provides a measure of customer service. The results show that after the implementation of KPIs, the OTIF improved from 80% to 84%.

In summary, data collected from all target groups and company systems indicate that there was an improvement in the performance of employees after the KPIs were implemented.

Conclusion

This study has presented the results of a survey that investigated the impact of measuring driver performance in the bulk fuel supply chain. The study outlined how the data

were collated from the three target groups as well as from the BI and SAP systems of the company. Surveys were done pre- and post-KPI implementation in order to determine the impact of measuring the performance of employees.

The objective of the study was achieved by analysing the data obtained from BTDs, amongst others. The results show that the measurement of driver performance had a positive impact on their performance. The BTDs noted a change in the supervisors' approach after the KPIs were implemented. This was observed as after the implementation, good performance was identified and measured, and appropriate performance feedback was provided, as indicated in Table 1. As a result, BTDs showed increased motivation to work harder and enhance their overall work performance, as explained in Table 2. These findings are supported by various studies which assert that feedback about an employee's performance increases motivation for future performance and keeps employees satisfied at work (Aguinis 2013; George & Jones 2014; Sihag 2016; Wipulanusat et al. 2017).

Data collected from supervisors post-implementation also indicated improvements. The supervisors were generally confident and clear about the measurement of driver performance after the implementation of KPIs. This enabled them to observe that the BTDs were motivated by regular performance feedback, which the BTDs themselves attested in the results of this study. It is, therefore, concluded that the implementation of the KPIs provided the supervisors with a

useful tool to monitor, measure and provide performance feedback to the drivers, which is, in turn, considered to be a source of motivation. In Table 3 of this study, it can be concluded from the results that the implementation of the KPIs enabled the supervisors to measure performance of drivers and identify performance gaps, thereby inspiring the BTDs to perform better and consequently provide good customer service. This finding is supported by various studies which assert that the use of KPIs provides performance feedback that inspires high levels of employee performance and motivation (Berberick et al. 2017; George & Jones 2014; Lannoo & Verhofstadt 2016).

The impact of measuring driver performance was determined by analysing data collected from customers that they service. The performance of drivers is critical because it affects the service quality rendered to customers. Customers receive improved service when employees are motivated (Breed 2018; Schiemann et al. 2013; Tyilana 2008). The results of the study show that the service quality of all dimensions of SERVQUAL was sometimes poor or mediocre before the KPIs were implemented and there was a considerable gap between expectations and perceptions. However, after the KPIs were implemented, there was a significant improvement in all the service quality dimensions and the gap between expectations and perceptions was reduced as indicated in Table 4. This indicates that the implementation of KPIs had a positive impact on the performance of the depot staff (drivers and supervisors). Different statements amongst the dimensions had different magnitudes of improvement or impact. Even though there was a significant improvement in responsiveness (as shown in Table 4), customers maintained that a lot more needed to be done to meet their expectations. This is an area where the depot should allocate more resources and effort to improve the service offered. Responsiveness is the ability of a company to offer prompt service and its willingness to help customers (Kahnali & Esmaeili 2015) and customers usually demand prompt service and faster responsiveness (Varzandeh, Farahbod & Zhu 2016). Customers value elements of responsiveness to prevent stock-outs because late deliveries may cause lost sales (Kouki, Jemaï & Minner 2015; Saldanha, Hunt & Mello 2013).

The results from BI and SAP systems of the company also indicate that there was a remarkable improvement in average hours per trip and OTIF after the implementation of KPIs. In conclusion, there was an improvement in the performance of employees after the KPIs were implemented which led to improved service quality offered to customers.

The results indicate that, from a managerial perspective, organisations are likely to benefit from ensuring that performance feedback is communicated to employees (in this case, drivers) on a regular basis because the results of the study show that when employees receive performance feedback, they perform better and hence improve service quality rendered to customers.

The study also found that the role of the supervisor should not be underestimated in the performance management process, and management should, therefore, concentrate on ensuring that all supervisors are equipped with the necessary skills to use KPIs to monitor, analyse and identify good and poor performance.

The implementation of KPIs increased the performance of employees and as a result, increased the customer service levels, as measured by the SERVQUAL dimensions, and showed significant improvement. However, in this case, management was able to identify responsiveness as an area requiring attention, as the results indicate that despite some improvements, customers were of the view that there is a lot more needed to be done to meet their expectations. The measurement of the perceived and expected service quality enabled the identification of problem areas, and future focus areas.

Although the study provides an indication of issues within the petroleum industry, a limitation was that it was conducted on a single petroleum company within a single depot and therefore the results are not generalisable to other role players in the industry. Another limitation of the study was a small sample size, particularly supervisors. Although there were only eight supervisors and reliability of their responses could therefore not be established, the use of data triangulation with drivers and customers responses assisted in validating the results. The potential limitation of the small sample size was thus mitigated by using multiple data sources and analysis of data to gain insight into perspectives of respondents. The focus of the study was on drivers who deliver fuel products to local customers, implying that the sentiments of long-haul drivers were excluded. Future research could be expanded to include more petroleum companies and a wider range of depots. The perspective of long-haul drivers could also provide an additional perspective. As Health, Safety, Environment and Quality (HSEQ) are integral aspects of operational risk management in the petroleum industry (Vestly Bergh et al. 2014), future research directions could include measurement of the impact of KPIs on safety performance.

The study tested the impact of implementation of a performance measurement system within an operational environment and finds that it has a positive impact on employees and their supervisors, and a beneficial knock-on effect on customer service as well as operational performance. The study adds to the discourse on the value of performance management systems by simultaneously considering multiple effects within and external to an organisation. The success of the multipronged approach to determine the impact of performance measurement systems used in this study could be applied in future studies to determine the value of performance management systems within numerous diverse environments.

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Competing interests

L.T.S. and R.S. have declared that no competing interest exists.

Authors' contributions

L.T.S. and R.S. were responsible for the conceptualisation of the original research. R.S. also acted as a study leader. S.G.N. was the co-study leader.

Ethical considerations

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Data availability

The authors confirm that the data supporting the findings of this study are not publicly available.

Disclaimer

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