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Determining Service Quality Dimensions for Sourcing Bulk Commodities: A Case Study of the Power Utility Sector

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Abstract
This article provides the service quality dimensions for sourcing bulk commodities by power utility organisations. A web-based census survey questionnaire was used to collect the data from the employees and suppliers in the bulk commodity industry associated with the national power utility. Factor analysis was applied, and the three clusters of dimensions were identified. The identified dimensions are logistics, professionalism, flexibility, cost, quality, reliability, accessibility and capacity. These dimensions were clustered into three themes, namely, capability, product and delivery. These themes can be used as performance indicators during the execution of the contract, as suppliers deliver the commodity.
Keywords: Service quality, SERVQUAL, power utility, bulk commodities, sourcing, commodities, supply chain

1. Introduction

Service quality, since its inception in the very late eighties and early nineties, has emerged as a mechanism to measure perceived and expected services provided by the services sector. Sectors that have utilised it include, but are not limited to, health care (Lam & Woo 1997; Yesilada & Direktor 2010), tourism (Tribe & Snaith 1998), archival (Sibande 2011) and banking sectors (Broderick & Vachirapornpurk 2002; Kumar *et al*. 2010). These sectors have evolved to address service quality dimensions from a variety of angles, with a more recent assessment of the influence of information technology on service quality in these sectors (Yoo & Donthu 2001; Gupta 2016).

There have been further developments in the utilisation of service quality in other industrial supply chains. The supply chain models that seek to address service quality are focused on logistics (Seth *et al.* 2006; Mentzer *et al*. 2003), transportation (Thai 2008; Prakash 2011), distribution (Beinstock *et al*. 1997; Sinha & Babu 1998) and purchasing (Stanley & Wisner 2001). Service quality in this context looks at specific elements within supply chains and does not consider the impact of the industry dynamics on the service quality and supply chain elements. The existing dimensions to date cannot measure service quality in bulk commodity sourcing, because they do not fully consider the complex nature of strategic sourcing[1] which relates to transportation, cost efficiencies and product quality. Therefore, they cannot be holistically adopted for the strategic sourcing of bulk commodities. In the sourcing[2] of bulk commodities, transportation is invariably a large component of the total cost of ownership, as the nature of bulk commodities lends itself to larger cumbersome logistic arrangements, such as pipelines for water, large trucks for coal and tankers for heavy fuel oils. Product quality in bulk commodities is also related to costs. Such criteria need to be considered when measuring service quality for sourcing bulk commodities.

The case study for this research was Eskom, the national electricity provider in South Africa. Apart from providing electricity to 90% of all South African households, Eskom exports electricity to neighbouring Southern African Development Community (SADC) countries, with an international sales volume growth of 12.2% between the financial years 2016 and 2017 (Eskom Annual Financial Statements 2017). Eskom is the largest procurer of coal in South Africa, consuming an average of 120MT per annum. The study was done to determine the service quality dimensions for sourcing bulk commodities such as coal by power utilities.

2. Literature Review

2.1 Measurement of Service Quality

Originally, measurement of service quality was a concept that assessed the perceived versus the expected service received by customers along a quality dimension (Parasuman, Zeithmal & Barry 1985; Cronin 1992; Taylor 1994; Babacus & Boller 1992; Dabholkar 2000). A move towards measuring service quality in the services arena arose from the relative inadequacy of service quality in measuring intangible elements (Parasuman, Zeithmal & Barry 1985). This led to an increasing interest in measuring intangible aspects related to perception, and so, measurement tools were required to measure intangible elements.

As the literature broadened beyond the 1990s, more researchers investigated the applicability of service quality and the value that can be derived. European scholars such as Gummesson (1997), Gronroos (1997, 2000)

[1] Strategic sourcing is a subprocess within procurement that assists in maximising the long-term value (for business, industry and society) of every cent spent to source a tangible and intangible product (Boateng 2016).
[2] Throughout this paper strategic sourcing and sourcing shall be used interchangeably. For the purpose of this paper they should be viewed as the same.

and Brogqwicz et al. (1990) expanded on the concept of perceived customer expectation, which was the basis of Parasuraman's (1985) theory, looking at the difference between the potential and actual service that the customer received. Their model further developed the academic debate to integrate into industry; demonstrated its usefulness in the operations and marketing activities of organisations, and its ability to influence management decision-making. The traditional measurement tool that emphasises customer experiences, SERVQUAL, expanded to adopt sector-specific measurement tools (Santos 2003; Lam 1997; Yesilada & Direktor 2010).

A further influence on the tenets of service quality was the eruption of the information technology era. This gave rise to information technology alignment models from Berkley & Gupta (1994) and Zhu et al. (2002) that link service and information technology using information technology to improve service quality. With the rise in popularity of information technology in the 1990s, it was also evident that information technology can be used as an enabler in service quality as a delivery mechanism to obtain opinions and as a measurement tool.

Zhu et al. (2002) gauged the perceived information technology-based services versus the traditional services before 2002. This was further developed by Santos (2003) who considered e-service quality. E-service quality measures how customers utilise e-services in the form of e-banking and e-marketing. With electronic banking, customers interface with the internet and have limited interaction with individuals in the bank. This has an influence on the experience of service quality that is received and thus the traditional models and measures of service quality are inadequate. The traditional measures rely on the face-to-face interactions. As customers move away from face-to-face interface, the traditional measurement tools thus increasingly became inadequate.

Similarly, the marketing industry moved towards more e-marketing-related services. Through e-marketing, more options become available for customers to experience the service, as the internet has opened a whole realm of service delivery channels. The increase in options for customers results in customers being more in control of determining their experience of service quality. The electronic delivery channel also influences their experience of service quality. The increase in the e-services sector focuses on customer loyalty, as customers also have more options for easily accessible services, thus making it easier, and therefore more likely, for them to switch. The evolution of service quality dimensions illustrates the usefulness and adaptability of the concept of service quality.

The later researchers on service quality, Prakash and Mohanty (2012), suggested a service quality blueprint in order to expand on the dimensions, particularly in the manufacturing environment. However, Prakash and Mohanty (2012), through the service blueprinting approach, focused on the specific elements of planning, design and implementation from a customer-centric approach. This approach was based on a manufacturing and engineering framework, where blueprinting forms a component (Prakash 2011). The approach does not cover the tangible aspects of bulk commodities, nor does it consider the value chain of sourcing of these bulk commodities. For example, the unique tangible aspects of coal, limestone, heavy fuel oils, water, diesel and petroleum lend themselves to the issues related to transportation. Time and space dimensions that speak to cost efficiencies are not covered in the marketing, technology, tourism and healthcare settings.

2.2. Service Quality Concepts in Supply Chain

Seth *et al*. (2006) reviewed the service quality dimensions and identified dimensions that have relevance in various aspects of the supply chain. Models relating to service quality and supply chain have predominance in logistics. As a result, the dimensions aim to solve the measurement issues with logistics only (Mentzer *et al*. 2003; Neo *et al*. 2004; Chen *et al*. 2004; Ho *et al*. 2012; Bienstock *et al*. 1997; Grant 2003; Ritchey *et al*. 2007; Kambe *et al*. 2012). The freight and forwarding industry have become increasingly competitive as globalisation makes the world smaller, and the ability to provide logistics solutions competitively becomes imperative. Thus, the freight and forwarding industry is forced to move into becoming a logistics solutions provider in order to become an industry leader. This has resulted in the development of tools to measure logistics service quality (Juga 2010; Ritchey *et al*. 2007; Ho *et al*. 2012; Kambe *et al*. 2012). Customer expectations and needs are constantly being assessed, and there are efforts to improve the quality of service for the logistics customer. The cost of the service is no longer the only dimension that measures customer satisfaction (Kilibarda, Nikilocic & Andrejic 2016). Consequently, dimensions are required to measure customer expectations and satisfaction, and thus to improve the quality of service.

SERVQUAL has been utilised by various authors as a basis for measuring different aspects of logistics. Service quality in the 3PL industry was researched by Neo *et al*. (2004) while Chen *et al*. (2009) used SERVQUAL to measure sea transportation. Logistics service quality dimensions (LSQ) were developed, namely personal contact quality, order release quantities, information quality, ordering procedures, order accuracy, order condition, order quality, order discrepancy handling and timelines.

The LSQ scale has become the base for various service quality dimensions in the logistics solutions arena. Authors have assessed the dimensions in different spheres, including assessing the dimensions as they relate to technology factors (Grant 2003; Ritchey *et al*. 2007) and other geographical areas (Kambe *et al*. 2012). Ho *et al.* (2012) adapted SERVQUAL with the dimensions of LSQ for the courier industry, where timeliness, accuracy of

the order, quality of information and availability of personnel were all considered to be important dimensions to measure customer satisfaction in the courier industry. Further logistics industry-specific service quality dimensions were developed by Mentzer *et al*. (2003), which considered availability, timeliness and quality. Bienstock *et al*. (1997) developed the SERVQUAL model and created the physical distribution service quality dimensions that included availability, timeliness and condition.

A scale to measure service quality in supply chains proposes linkages between loyalty, satisfaction, competitive advantage and organisational performance (Prakash 2011). Strong linkages lead to supplier loyalty and satisfaction and, in turn, have positive results for the organisation through the supply chain (Prakash 2011). The dimensions identified by Prakash assume that supplier loyalty and satisfaction represent the end result that should be attained. Therefore, loyalty, satisfaction, competitive advantage and organisational performance become the dimensions used. However, in an assessment of bulk commodity sourcing, loyalty and satisfaction of the supplier are not the critical elements that will achieve an efficient sourcing of the commodity. Accordingly, the elements identified by Prakash (2011) are limited.

E-sourcing brings a further layer to the service quality dimensions available in the sourcing context. Srivastava *et al*. (2012) provided mechanisms for managing quality in outsourcing through a combination of e-sourcing principles with service quality. E-sourcing is the utilisation of IT-enabled services that are provided globally through information and communication (Hyder *et al*. 2004). In this context, internet-based SERVQUAL models are assessed within the ambit of e-sourcing. As a result, service quality is affected by the service providers' ability to understand customer needs in specific domains and to execute these efficiently within the context of electronic interfaces. Srivastava *et al*. (2012) acknowledged that current literature in the context of sourcing and service quality for bulk commodities is limited, as the evolution of proposed service quality dimensions from the perspective of bulk commodities should consider various service quality dimensions as they relate to the aspects of the supply chain.

3. Research Methodology

A web-based census survey questionnaire was used to collect data on bulk commodities, namely coal, limestone, heavy fuel oils and water, which contribute approximately 30% of the input costs involved in the generation of electricity at Eskom. A 5-point Likert scale with 1 = Strongly Agree, 2 = Agree, 3 = Not Sure, 4 = Disagree and 5 = Strongly Disagree was used to measure the variables. Table 1 illustrates the dimensions and items (or variables) included in the questionnaire. An additional question, "What other service quality dimensions are important in the sourcing of bulk commodities in the power utility sector? (Please list and rate them) (1 being the most important and 5 being the least important)", was included in the questionnaire. The purpose of this was to be able to discover other, new dimensions that might be relevant in the sourcing of bulk commodities. The respondents included the buyers and suppliers of the bulk commodities.

Exploratory factor analysis was used to extract the dimensions from the data. Factor analysis begins with the construction of a new set of variables based on the relationships in the correlation matrix (Cooper & Schindler 2006; Warner 2008). These linear combinations of variables, called factors, account for the variance in the data. The analyst may run a series of different factor analyses, varying the sets of variables that are included and the choices of method of extraction and rotation until a meaningful result is obtained. Factor analysis is a data reduction technique used to reduce many variables to a smaller set of underlying factors that summarise the essential information contained in the variables. More frequently, factor analysis is used as an exploratory technique when the researcher wants to summarise the structure of a set of variables. SPSS 23 was used to analyse the data.

4. Results

The Kaiser-Meyer-Olkin (KMO) value of 0.672 and Bartlett's sphericity chi-square value of 112.578 with p = 0.000, meant that factor analysis was adequate. Table 1 shows the correlation matrix of the measured variables.

Table 1. The correlation matrix of the measured variables

	Logistics	Costs	Quality	Professionalism	Flexibility
Logistics	1.000	.299*** (.005)	.273** (.010)	.420*** (.000)	.386*** (.000)
Costs		1.000	.419*** (.000)	.333*** (.002)	.373*** (.001)
Quality			1.000	.363*** (.001)	.268** (.011)
Professionalism				1.000	.437*** (.000)
Flexibility					1.000

The results in the table indicate that logistics are closely correlated to costs, quality, professionalism and flexibility at the 5% level. Costs are closely correlated with quality, professionalism and flexibility at the 1% level. Quality correlates with professionalism and flexibility at the 5% level. Professionalism and flexibility are also highly correlated at the 1% level. Table 2 shows the extracted common factors (i.e. dimensions).

Table 2. The extracted common factors (i.e. dimensions)

Variable	Factor 1	Factor 2	Factor 3
Logistics	.041	**.830**	.104
Costs	-.172	.265	**.719**
Quality	-.053	.210	**.747**
Professionalism	-.029	**.584**	.467
Flexibility	-.059	**.709**	.265
Other Dimension 1	**.775**	.005	-.214
Other Dimension 2	**.844**	.120	-.178
Other Dimension 3	**.708**	-.332	.385

The results indicate that, apart from the already existing dimensions, three additional dimensions were extracted from the data (resulting from the additional question that was posed to the respondent), whose details are shown in Table 3.

Table 3. Additional dimensions were extracted from the data

	Dimension 1		Dimension 2		Dimension 3	
Item	Frequency	%	Frequency	%	Frequency	%
Accessibility of supplier to customers **(Accessibility)**	13	18.1	22	30.6	72	50.0
Being technically competent	1	1.4	2	2.8	2	1.4
Being responsive to customer demands on time	3	4.2	8	11.1	4	2.8
Capacity to handle bulk purchases **(Capacity)**	11	15.3	3	4.2	4	2.8
Having competitive prices	4	5.6	2	2.8	8	5.6
Being consistent and reliable **(Reliability)**	16	22.2	7	9.7	10	6.9
Always provide goods/services on time	2	2.8	1	1.4	8	5.6
Corporate citizenship	3	4.2	1	1.4	4	2.8
Meeting and exceeding customer expectations	1	1.4	3	4.2	2	1.4
Delivering quality products	3	4.2	4	5.6	2	1.4
Having good turnaround time	1	1.4	5	6.9	2	1.4
Meeting environmental standards	1	1.4	2	2.8	6	4.2
Access to funding	3	4.2	2	2.8	6	4.2
Streamlined processes	1	1.4	2	2.8	4	2.8
Being innovative	1	1.4	1	1.4	2	1.4
Quick decision-making	4	5.6	1	1.4	2	1.4
Complying with safety standards	4	5.6	1	1.4	6	4.2

For the new dimension 1, “Being consistent and reliable (Reliability)” at 22.2%, “Accessibility of supplier to customers (Accessibility)” at 18.1% and “Capacity to handle bulk purchases (Capacity)” at 15.3%, had the highest percentages. This implied that this dimension was made up of: reliability, accessibility and capacity. In the case of the new dimension 2, the item with the highest percentage, is “Accessibility of supplier to customers (Accessibility)” at 30.6%. For new dimension 3, the item with the highest percentage was “Accessibility of supplier to customers (Accessibility)” at 50.0%. The three new dimensions were therefore labelled reliability, accessibility and capacity. The dimensions were further clustered into three factors (i.e. themes) as shown in Table 4.

Table 4. Dimensions and Descriptive Naming Convention

Dimension	Descriptive Naming Convention
Logistics Professionalism Flexibility	Capability
Cost Quality	Product
Reliability Accessibility Capacity	Delivery

5. Discussion of findings

The newly identified dimensions provide new insights into what should be measured when sourcing bulk commodities. Reliability in the supply of bulk commodities is an important factor related to the provision of electricity, as bulk commodities contribute approximately 30% of the input product in electricity generation. Therefore, it is important that these bulk commodities are reliably delivered to the power utility. Otherwise there is a potential for inconsistent power generation, should the delivery of the product become inconsistent. The availability of bulk commodities and the need to produce the bulk commodities in order to generate electricity render accessibility an important attribute to measure. In the power utility sector, bulk commodities such as coal, limestone and fuel oils are resources that are traditionally inaccessible directly due to policy determination that discourages vertical integration of the public utility. The dependence on the outsourcing model for bulk commodities renders the capacity of the suppliers a critical attribute to measure. Capacity is the third dimension. The importance of the capacity dimension also relates to the type of commodities procured for the power utility as these commodities are sourced by third parties through mining (coal, limestone) or imports (fuel oils). Insufficient capacity to meet the demand for electricity generation results in inconsistent electricity generation.

6. Conclusion

The service quality dimensions for the sourcing of bulk commodities have been found to be logistics, professionalism, flexibility, cost, quality, reliability, accessibility and capacity. These dimensions were clustered into three themes, namely capability, product and delivery. Through some specific weighting of the themes, practitioners within the industry can prioritise and focus their efforts on more efficiently sourcing and managing bulk commodities for the power utility sector. Further research should investigate the clustering of these themes and relate them to a more practical application to industry.

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