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A Service Quality Index for Evaluating and Improving Container Depot Services

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The high movement of containers has led to massive spatial requirement at seaport yard. Several container depot services have emerged in the hinterland to provide temporary storage area for container. This had created congestion at the container depots that has resulted in service inefficiency as well as safety issue. Haulage driver's satisfaction as a daily depot user has eroded. To maintain the service quality, depot operator should consider factors such information, time and safety. The objective of this study is to determine the significant service quality factors by introducing a Depot Service Quality Index (DSQI). A survey from haulage drivers has been conducted at ICS Depot Services Sdn. Bhd. in order to evaluate existing depot services based on user perspective. An analytical point system comparing the attributes to the right order value is proposed in order to estimate this DSQI. This study is significant because it helps to identify existing problems as well as to propose solutions in improving the container depot services.

Keywords: container depot; satisfaction; depot service quantity index

I. INTRODUCTION

The user perception towards the service experiences are important elements towards success of service providers. The degree in which customer perceive every services attribute directly to how it affects customers attitude on overall judgment about the quality of service delivered (Brida, 2016) and represents a measure of company performance according to customer needs (Hill *et al.* 2003). The customers are the sole judges of service quality (Berry *et al.* 1990). The complex of logistics activities flow has led to the operations efficiency especially in movement of containers. Expansion and continuous development in corporate commercial operations across the world are the reason for the growth of container traffic between 2010 and 2017.

The seaport and maritime sector have become a significant contributor to a country accomplishing business with other countries. The growth of containerization has enhanced the maritime industry whereby more than 80% of world trade is moving by seaborne (UNCTAD, 2017). After the liberalization of containerization in 1997, the logistics activities in Malaysia has become progressive especially when involving much containership from containership owners and leasers, liners, logistics service providers, third party logistics companies and many more.

Empty container depots are currently situated at seaport hinterland areas which provide empty container storage

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and services such as maintenance and repair. The aim of having such depots is to remove congestion situation from the port activities and ease delays in port. Unfortunately, high container depot gate charges were imposed to the haulage companies during collection of empty containers.

The level of service (LOS) model was originally established to measure the quality of traffic service. There are various LOS models that have been adopted in different contexts such as pedestrian, transit, stairway and bicycle (Khisty, 1994; Landis *et al.* 2001; Lee and Lam, 2003; Petritsch *et al.* 2006). The studies have significantly shown a quantitative measure by a service provided which accommodates a given facility or system under certain conditions at a given level of service. The system has been designed based on a range of operating conditions on a particular type of facility and it usually ranges with six levels of quality from level A to level F.

Currently, there are no established approaches existing to measure container depot service. Thus, this paper aims to fill the research gap by proposing a DSQI model for evaluating the basic service quality needs by the container depot to ensure the depot efficiency. In addition, this DSQI model presents existing container depot problems and indicates which issues require improvements by obtaining a higher DSQI value. Different service quality indicator can be assessed using this practical DSQI model. Although this method can be used in different application contexts, the proposed DSQI in this study is only tested in ICS Depot Services Sdn. Bhd.

The main goal of this study is to improve the efficiency of depot operator to achieve optimal operations level. In order to materialize this objective, the researcher proposed this of depot service quality index (DSQI) evaluation method for the assessment of value that determines the percentage of efficiency for each service quality attribute based on current depot issues. Specifically, this research addresses three objectives. The first objective is to find the significant factors for service quality in container depot based on literature. The second objective is to develop a model to evaluate the service quality of container depot. Finally, the third objective is to examine the developed model in existing container depot to identify problems and proposes recommendation where improvements are required. The next section discusses about the materials and methods of this study. Section 3 presents the results and discussion. Section 4 concludes the study.

II. MATERIALS AND METHODS

This section presents the materials and methods used in this study.

A. Indicators

Quality is the total feature and characteristics of a product or service being delivered that meets the needs and customer satisfaction. Meanwhile, service quality is the management of customer perceptions toward the services provided. The nature of service is intangible whereas goods are tangible. In order to measure the quality of intangible services, generally the researcher will use the term perceived service quality. Perceived service quality is a result of the comparison of perceptions about service delivery process and actual outcome of service (Gronroos, 1984; Lovelock and Wirtz, 2011).

Furthermore, the measuring of service quality and the dimensions of service quality has become major critical area of services, scholars and practitioners. Table 1 shows the summary of various service quality models covering the aspects of conventional to web interaction. Eleven service quality models have been reported between 1984-2003 and each of these models represents a different point of view about service quality. This study considers the previous service quality dimensions by reviewing service quality factors that relates to container depot operation. Therefore, 6 indicators have been selected and there are availability-tangibles, accessibility, information-communications-reliability, time-responsiveness, Customer service-understand/knowing customer and safety-security.

Despite this, many studies have been extensively used service quality as a main indicator of customer satisfaction in various service sectors and operational, for example, healthcare (Mosadeghrad, 2014), supermarket shoppers (Orel & Kara, 2014), universities (Yousapronpaiboon, 2014) and airlines (Suki, 2014). However, there are relatively few studies addressed of container depot rather than some studies on container depots location (Palacio *et*

al. 2016) and empty container repositioning (Song and Dong, 2015). Therefore, this research is to prove the need of service quality studies on container depot operations globally and in Malaysia specifically.

Table 1. Summary of different dimensions of service quality models

Author (year)	Model	Dimension
Grönroos (1984)	Service Quality Model	Technical quality, functional quality, corporate image
Parasuraman *et al.* (1985)	GAP Model	Reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding/knowing the customer, tangibles
Haywood-Farmer (1988)	Service Quality Attributes	Physical facilities, processes and procedures, people behavior and conviviality, professional judgment
Parasuraman *et al.* (1988)	SERVQUAL	Tangibles, reliability, responsiveness, assurance, empathy
Cronin & Taylor (1992)	SERVPERF	Same as SERVQUAL but with performance only statements
Dabholkar *et al.* (1996)	Retail Service Quality Scale (RSQS)	Physical aspects, reliability, personal interaction, problem solving, policy
Philip &Hazlett (1997)	PCP Model	Pivotal, core, peripheral attributes
Frost & Kumar (2000)	INTSERV QUAL	Reliability, tangibles, assurance, responsiveness, empathy (SERVQUAL)
Brady & Cronin (2001)	Service Quality Model	Personal interaction quality, physical service environment quality, outcome quality
Zhu *et al.* (2002)	IT-Based Model	Linkages IT-based service quality, preferences towards traditional services, experiences in using IT-based services and perceived IT policies with SERVQUAL
Santos (2003)	E-Service Quality Model	Web site design, easy access to technology, web site attractions, good support, fast speed, attentive maintenance

B. Methods

Most LOS studies use questionnaires, direct observations and video techniques to collect data. Analytical point system is a practical tool in allowing the set of variables being weighted. This includes previous efforts that used analytical point systems (Dixon, 1996; Miller *et al.* 2000). This system can be enhanced by adding more indicators in avoiding biasness which is easy to follow.

A sample of n=82 respondents representing 450 daily haulage drivers using ICS Container Depot Sdn. Bhd. has been randomly selected for one-week survey. Specifically, the respondents are asked to evaluate the 19 items as shown in Table 2 on 5-point scale (1-5). Optional measure on the overall quality of the service is being evaluated by (1=strongly disagree, 2=disagree, 3=neither or nor, 4=agree, 5=strongly agree).

$$DSQI=\sum_{i=1}^{19} ciDsi \quad (1)$$

Where

DSQI = depot service quality index,

i= indicator number,

c= coefficient of depot indicator and

Ds= depot indicator score

The coefficient of depot indicator *(c)* presents the effectiveness of each service quality for the DSQI, so the importance and priority of each indicator is illustrated by c.

$$ci = \sum_{j=1}^{3} Nij \quad (2)$$

Where

c = coefficient of depot indicator,

i = indicator number,

j = depth of evaluation number,

$$DSQI\%=\frac{DSQI}{\sum_{i=1}^{19} ci}x100 \quad (3)$$

Where

DSQI% = percentage of quality service index,

DSQI = depot service quality index,

i = indicator number and

c = coefficient of depot indicator

In Table 2, the set of criteria is designed according to the six service quality indicators by several revisions set of questions following the feedback by the container depot users pertaining to the current issues faced.

Table 3 shows various classifications for DSQI% rating and their interpretations. The DSQI scores obtained for this study were stratified into five classes from common concept used in traffic transportation studies. DSQI A indicates the highest quality with very pleasant. DSQI B may be acceptable with some improvements required. DSQI C requires more attention and improvement while the rest of DSQI below this rating requires considerable improvement.

Table 2. Overview of service quality criteria

No	Criteria	M	SD
1	Crane availability for container stacking	3.3537	1.43477
2	Frequency of crane broke down	2.9878	1.32864
3	Equipment availability	3.9756	1.19645
4	Hours depot operation	4.7317	.54544
5	Depot service planned schedule	2.3659	1.16016
6	Depot operation layout	2.5244	1.28837
7	Frequency of depot operation update	2.5488	1.31612
8	Precisely of container stacking with system record	2.8293	1.22530
9	Information system handled by professional	3.5000	.91961
10	Time taken for crane lift-on and drop-off container	4.1463	1.01983
11	Time promises of container operation is meet	2.0366	1.02373
12	Waiting time caused queuing at gate	2.1829	1.24849
13	Depot operator addressed customer feedback	2.1098	1.18641
14	Inaccurate direction feedback to pick up container	4.2805	.77419
15	Feedback on information given	4.0732	1.00346
16	Clarity of customer feedback	2.3537	1.07004
17	Crane is properly managed during operation	3.5366	1.09087
18	Haulage drivers may safely monitor the container process	2.8537	1.24843
19	Container operation process supervise by depot	2.2927	1.15990

III. RESULTS AND DISCUSSIONS

This model can be utilized in different context since it has the potential to assess different container depot operation in different parts of the world. Based on Table 2, the following DSQI% and DSQI grade for ICS Depot Services Sdn. Bhd. were obtained:

DSQI=[(3.3537+2.9878+3.9756)/3]+[(4.7317+2.3659+2.5244)/3]+[(2.5488+2.8293+3.5000)/3]+[(4.1463+2.0366+2.1829)/3]+[(2.1098+4.2805+4.0732+2.3537)/4]+[(3.5366+2.8537+2.2927)/3] = 18.493

Therefore, DSQI% = (18.493/19) x 100 = 97. Thus, the DSQI grade for this container depot is A (refer Table 3).

Certain single attributes can still be compared although the overall score of this container depot is at a very pleasant condition. Based on the result acquired, information, time and safety fall at a moderate score which can indicates that a considerable improvement is required. Does, the following improvements are suggested:

- The depot operations need to be frequently updated to haulage driver.
- Container stacking works should be as in system record.
- IT operation system should be handled by professional or expert people.
- Time taken for crane to lift-on and drop-off should be reduced.
- Lift-on and drop-off the container must be according to time promised.
- The waiting time at depot gate should be reduced.
- The container crane should be properly managed for haulage driver safety.
- Waiting area should be provided for haulage driver during container lift-on and drop-off process.
- Lift-on and drop-off of container should be supervised by depot management.

The selected depot operator was evaluated in these studies where the improvements are discussed, and suggestions are based on the survey in Table 2. The proposed model of DSQI is a solution for the deport operator in managing and monitoring their services with simple applicable measurement tool. However, this research is a case study approach where only one depot operators been evaluated. It is recommended that more depot operator should being access and be repeated in order to obtain an accurate result.

Table 3. DSQI% Interpretation

Rating	DSQI model	Interpretation
A	80 - 100	Highest quality (very pleasant)
B	60 - 79	High quality (acceptable)
C	40 – 59	Moderate quality (rarely acceptable)
D	20 – 39	Low quality (uncomfortable)
E	0 - 19	Lowest quality (unpleasant)

IV. CONCLUSIONS

Container depot was evaluated at ICS Depot Services Sdn. Bhd. as a selected depot service provider where the issues of improvement are discussed, suggesting solutions by DSQI. Only one container depot provider has been selected in this research. Service quality is a prime essential in the container depot operation. Thus, an examination of haulage drivers perceived as a major initial concern for the container depot efficiency. Information, time and safety are identified as the most important factor. Furthermore, appropriate service quality highlighted in this paper should be a concern in order to assess a depot service level. Even though the various studies have considered various service index especially in public transportation, the proposed DSQI model can be a practical evaluation in industrial operation as well. This initial attempt was made to generalize the needs of all container depots which operate a similar operation. In addition, DSQI is universal and applicable in other contexts areas with suitable adjustments. In order for more convenient use, software application may be developed which is easiest to evaluate.

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