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Hirata, Enna

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Service characteristics and customer satisfaction in the container liner shipping industry

Enna HIRATA[a]

[a] *Visiting Researcher, Graduate School of Business Administration, Kobe University, E-mail:enna.hirata@gmail.com*

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ABSTRACT

This research is mainly devoted to investigating key service characteristics in the container liner shipping (CLS) industry and its impact on customer satisfaction. It maps service quality dimensions to a new set of service characteristics based on the latest priorities of container liner shipping companies. The data collected through online survey is regressed in a non-linear model. The results indicate that the top three service characteristics influencing customer satisfaction are (1) quality of customer service representative, (2) quality of digitalisation and (3) quality of sales representative in that order. The research also suggests that the ability to offer long term rates is not effective in enhancing customer satisfaction as it is usually perceived; digitalisation tops the liner shipping managers' agenda.

1. Introduction

Containerisation has transformed ocean shipping in a relatively standardised process. Product differentiation exists nonetheless because of route densities, cargo and customer types, schedule, punctuality, and degree of digitisation among other factors. Notteboom (2004) suggests that liner shipping services are differentiated through characteristics such as transit time, reliability and frequency of service.

Besides those traditional service characteristics, digitalisation – the ability to offer digital solutions is becoming one of the most important service characteristics that influence a shipper's choice. Digitalisation is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business [1]. Digitalisation has changed the business world already a long time ago for other industries, and in shipping industry in the past few years. Some companies in shipping industry have started digitising the processes that used to be carried out manually, for example, booking, documentation, tracking and payment through EDI [2] or

[1] https://www.gartner.com/it-glossary/digitalization/

[2] EDI: Electronic Data Interchange

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API [3] connection, online portal or mobile apps. These kinds of digital solutions are being offered during the end-to-end process of a shipment journey, which enables new experience to shippers and improved efficiency in business processes.

Studies that incorporate traditional service characteristics and new priorities in liner shipping such as firms' digitalisation initiatives has been lacking. Furthermore, little is known with regards to how these characteristics influence customer satisfaction level. Therefore, this study aims to estimate the response of service characteristics to customer satisfaction in the CLS industry and to identify the most influential service characteristics.

The remaining parts of this paper are organised as follows. Section 2 reviews literature on service characteristics in shipping industry as well as the causal relationship between service characteristics and customer satisfaction. Section 3 presents research methodology. Section 4 discusses analysis methods and results. Section 5 discusses findings and limitations, and conclusion is presented in the last section.

2. Literature Review and Theoretical Framework

2.1. *Service Characteristics (SC)*

This research discusses the characteristics of service provided by a shipping line. The shipping industry is classified as a service sector (Branch and Stopford, 2013). The product provided by shipping companies is an overall service package. Characteristics of the service package could be either tangible or intangible. Tangible characteristics include point to point schedule, on-time load and delivery, availability of containers, freight and digital solutions. Intangible characteristics include attitude and knowledge of sales representatives, customer service representatives, timeliness of communication and response to service failures (Hirata, 2017a).

SC has been primarily discussed in form of service quality and its impacts on customer satisfaction.

2.2. *Service quality (SQ)*

The existing literature has developed frameworks to identify the dimensions of SQ. Gronroos and Shostack (1983) suggested that quality of a service can be experienced during a service (functional quality) and on completion of a service (technical quality). The authors also suggested that customers' experience of both functional and technical quality should be contrasted with their expectations. Subsequently, this has resulted in the development of the GAP model where SQ is measured by the difference between expected and perceived performance (Parasuraman et al., 1988). The authors developed SERVQUAL scale which consists of five SQ dimensions – tangibles, reliability, responsiveness, assurance and empathy. The SERVQUAL scale has been widely applied in assessing SQ across different industries.

Chen et al. (2009) applied SERVQUAL instrument to measure SQ in shipping industry. The authors suggested the SERVQUAL instrument was developed from the perspective of end consumers. This does not fit in shipping, which is a predominantly business-to-business industry. As a result, managing SQ is more complex, attributing to a larger group of customer representatives who interact with a service provider on a personal or functional level (Gounaris, 2005).

2.3. *Customer Satisfaction (SAT)*

Despite extensive research on customer satisfaction, researchers cannot agree on a common definition for the concept. This research adopts the definition given by Chang et al. (2009) that customer satisfaction is the psychological reaction of the customer with respect to his or her prior experience with the comparison between expected and perceived performance. Satisfaction has been measured through either a single transaction, or a series of interactions with a product over time.

A few literatures discuss SQ and SAT in liner shipping industry. Kang and Kim (2009) discussed service quality of Korean shipping companies in three dimensions. Yuen and Thai (2015) examined the effects of four SQ dimensions on SAT in the CLS industry.

This research adopts the four SQ dimensions developed by Yuen and Thai (2015), and further maps the dimensions to key service characteristics basis on observations to the most recent CLS market developments. The purpose of the mapping is to design the questionnaire to be relevant to respondents' daily business operation, hence easier for respondents to answer; meanwhile to make the implications more practical for shipping managers to refer to. It differs from previous literature in following perspectives.

(1) It separately evaluates service quality of ocean transport and inland transport. In modern shipping with large ships being deployed in main east-west and south-north shipping routes, cost structure of ocean transport and inland transport are usually different. Most of shipping lines operate in port to port service, while inland transport is outsourced to subcontractors. Therefore, shippers may perceive different level of performance for ocean and inland transport.

(2) It divides rate into long term ocean rate, spot ocean rate and inland rate. The purpose is to identify if different rate offering patterns and rate components impact SAT in different way.

(3) It introduces indicators to measure digitalisation as discussed in section 1.

A comparison of SQ dimension in previous literature and this research is outlined in Figure 1. Detailed comparison of indictors for each dimension are listed in Appendix.

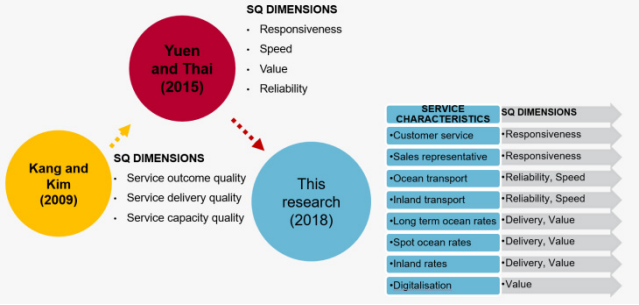

Fig. 1. Comparison of SQ dimension

Source: Author compiled

3. Methodology

3.1. *Design of research instruments*

This research collects feedback from real-world shippers reporting actual CLS service through online survey. Comparing to experimental design method, it ensures the external validity. This is because the

[3] API: Application Programming Interface

respondents are part of the service setting - they do worry about product characteristics, financial loss, and so on.

As described in 2.3, the four SQ dimensions (Yuen and Thai, 2015) are mapped to service characteristics provided by shipping lines to capture answers as accurate as possible.

In the questionnaire, respondents were asked to provide feedback to liner shipping service they received in the past 12 months. They were asked to rate the perceived satisfaction level to service characteristics of the carrier on 0-10 scale, where 0 refers to "not at all likely" or "extremely dissatisfied" and 10 refers to "extremely likely" or "extremely satisfied".

3.2. *Method of data collection*

The sampling frame for this research is constructed from CLS shipper located worldwide. The questionnaire was distributed to 3,000 randomly selected shippers through online survey during January to March 2017.

The contents of questionnaire are guided and reviewed by business persons working in shipping industry. This is to make sure the survey questions are relevant to business to increase response rate. Two measurements are implemented to minimise non-response bias. First, the respondents are informed that information given is for research analysis and completely confidential; second, reminders are sent on weekly basis.

By the cut-off date, 982 answered questionnaires were returned by shippers from 72 countries, of which 208 were completed answered without using "Don't Know" (DK) response in any questions. The response rate is 33%.

DK response is offered in the questionnaire to allow respondents who don't have experience to some of the service characteristics to complete the questionnaire. Three reasons are suggested on why an opinionated respondent opts for the DK, rather than expressing his/her true opinion. First, respondents will opt for the DK if they are not fully certain of the meaning of a question (Feick, 1989). Second, to avoid thinking and/or committing themselves (Oppenheim, 1992). Third, when the survey exceeds their motivation or their ability (Krosnick, 1991). One of the advantages of a DK response option is that it helps reduce noise caused by people who offer a response to a closed ended response option. That is, people who haven't thought much about a topic or don't have the experience or attitude relevant to the question are indistinguishable from people who do. DK response is treated as missing data in regressions. Table 1 outlines descriptive statistics of variables.

Table 1

Descriptive statistics

Variable	Observation	Mean	SD	Description
SAL	504	6.14	3.14	Quality of sales representatives
CUS	682	6.23	3.09	Quality of customer service representatives
OCE	697	6.85	2.53	Quality of ocean transport
INL	511	6.59	2.64	Quality of inland transport
LR	504	6.22	2.78	Long term ocean rates
SR	526	5.97	2.70	Spot ocean rates
IR	437	6.26	2.59	Inland rates
DIG	610	7.15	2.37	Satisfaction with digital solutions
SAT	635	6.47	2.67	Overall satisfaction (taking everything into account)

(SD is standard deviation)

4. Empirical analysis and results

4.1. *Internal consistency reliability analysis*

Since survey data are used for analysis, it is necessary to report internal consistency reliability. Internal consistency reliability is a way to gauge how well a survey is measuring what it is intended to measure. For this purpose, this paper calculates and reports Cronbach's alpha coefficient (α). Cronbach's alpha (Cronbach, 1951) is a function of the number of items in a test, the average covariance between pairs of items, and the variance of the total score. Many statisticians recommend a minimum α coefficient between 0.65 and 0.8 (or higher in some cases), while α coefficient less than 0.5 is usually unacceptable. Alpha value for all variables are higher than 0.80 in this research, which indicates that the survey instrument is reliable (Table 2).

Shapiro – Wilk W test (Shapiro and Wilk, 1965) is conducted to test variable normality. The null hypothesis that variable is normally distributed can be rejected at 1% significance level for all variables (Table 2).

Table 2

Internal consistency and normality test results

Variable	Observation	Cronbach's alpha value (α)	Shapiro – Wilk W test (W)
SAL	504	0.942	0.963***
CUS	682	0.938	0.961***
OCE	697	0.937	0.951***
INL	511	0.937	0.968***
LR	504	0.941	0.965***
SR	526	0.940	0.976***
IR	437	0.939	0.977***
DIG	610	0.940	0.965***
SAT	635	0.931	0.964***

(*** indicates 1% significant level)

4.2. *Regression*

In the context of survey responses, it does not take much for customers to move from "Very dissatisfied" to "Dissatisfied", but it takes a lot for customers to jump from "Satisfied" to "Very satisfied". Therefore, it is far better to treat the data as ordinal rather than cardinal. With ordinal data, each higher category represents a higher degree of satisfaction, but respondents do not necessarily treat the intervals between adjacent categories as equal. One of common methods for determining relationships among ordinal variables is to apply order models, for example ordered logit (OLOGIT) model.

Following the work of McCullagh (1980) and Greene (1993), the ordered logit model is set up in the following way. Consider a latent variable model of the following form, where y^* is the unobserved dependent variable, x^T is a vector of explanatory variables, β is the vector of regression coefficients, and ε is the error term:

$$y^* = \beta x^T + \varepsilon \qquad (1)$$

Since $y^*$is unobserved, instead of y^*, the following is observed:

$y = 0$ if $y^* < 0$

$y = 1$ if $0 < y^* < \mu_1$

$y = 2$ if $\mu_1 < y^* < \mu_2$

.

.

$y = j$ if $\mu_{j-1} \leq y^*$

where y is the frequency of attendance and μ_j the vector of unknown threshold parameters that is estimated with the β vector. ε is assumed to have a standard logistic distribution. Consequently:

$\Pr[y_i = j] = Pr[\, y^*$ is in the jth range$]$

Hence, the probability of observing an outcome is written:

$$\Pr[y_i = j] = F[\mu_j - \beta' x_i] - F[\mu_{j-1} - \beta' x_i] \quad (2)$$

Where $F(.) = \exp(.)/[1 + \exp(.)]$.

This implies,

$$\Pr[y_i = j] = 1/[1 + \exp(-u_j + \beta' x_i)] - 1/[1 + \exp(-u_{j-1} + \beta' x_i)] \quad (3)$$

which can be used to derive a likelihood function and, subsequently, maximum likelihood estimates of μ and β. Eq. 3 defines the OLOGIT model[4].

$$\log(SAT) = a\log(SAL) + b\log(CUS) + c\log(INL) + d\log(OCE) + e\log(DIG) + f\log(LR) + g\log(SR) + h\log(IR) + \nu \quad (4)$$

where ν is the error term.

Table 3 sets out the estimation results. Logistic regression does not have an equivalent to the R-squared that is found in linear regression. Instead, the pseudo R-squared is computed to evaluate goodness of fit for logistic regressions. It represents McFadden's (1974) pseudo R-squared. It is defined as (1 - L1/L0), where L0 and L1 are the constant-only and full model log-likelihoods, respectively. A higher Pseudo R-squared value indicates better model fit.

Table 3

Estimation results (dependant variable = overall satisfaction)

Variables	Coefficient	SE
SAL	0.28***	0.06
CUS	0.42***	0.09
OCE	0.21*	0.11
INL	0.25**	0.11
LR	0.06	0.10
SR	0.28**	0.11
IR	0.09	0.10
DIG	0.33***	0.09
P-value	0.00	
Pseudo R^2	0.42	
Observation	208	

(SE is the standard error, *** indicates 1% significant level.)

The results indicate the model is statistically significant. Five out of eight variables are statistically significant at 5% level. In terms of the magnitude of coefficient, the top three characteristics are (1) customer service representative, (2) digitalisation and (3) sales representative.

[4] For comparison, a simple linear model (Ordinary Least Squared: OLS) was also estimated and the results indicate the OLOGIT model is more efficient.

5. Findings and implications

5.1. *Findings*

This research suggests that the top three characteristics having greatest impact on customer satisfaction in the CLS industry are (1) quality of customer service representative, (2) quality of digitalisation and (3) quality of sales representative. Especially, digitalisation has emerged to be one of top three impacting characteristics. The ability of a shipping line to provide digital solutions is closely related to customer satisfaction level.

Interestingly, long term ocean rate is found to be statistically insignificant and its coefficient has the least magnitude. Ability to offer favourable long-term rate to shippers does not seem to contribute efficiently to customer satisfaction as it may have been expected.

5.2. *Managerial implications and recommendations*

From a managerial perspective, the implications are threefold. First, out of all characteristics measured, quality of customer service representative has the most significant impact on customer satisfaction in the CLS industry. It indicates that shipping managers may put more focus on improving customer service quality to enhance customer satisfaction. Existing customer service models may need to be re-assessed to ensure they support seamless customer experience and loyalty right across the customer journey.

Second, ability to provide long term rate is not contributing to customer satisfaction improvement as it is usually perceived. Shipping lines may need a more dynamic pricing model to meet shipper's needs.

Last, digitalisation plays more important role than ever before. While digitalisation has long since changed many industries, it has been slower to reach the shipping industry, which is still quite traditional due to its complex nature. Since over 90% of the world's trade is currently carried by sea, the old-fashioned ways of handling shipping processes can cost money, time, efficiency and customer loyalty.

6. Conclusions and discussions

This paper contributes to the existing literature by examining new set of service characteristics and investigating its impact on customer satisfaction in the CLS industry. A total eight of service characteristics are regressed using a non-linear model. The results suggest quality of customer service representative, quality of digitalisation and quality of sales representative are the most significant service characteristics influencing customer satisfaction.

The research finding that digitalisation emerging to be one of top three service characteristics supports the reality observed. In today's market place, facing rapid technology adoption, customer's behaviours are changing. Regardless of business-to-business nature in the CLS industry, processes are handled by individuals as end customers in today's digital world. Customers expect every organisation to deliver products and services conveniently with a seamless user experience. They demand digitised business process with intuitive interfaces, around-the-clock availability, personalised treatment, global consistency, and zero errors.

To keep up with the market's complexity, pace and growing competition, the CLS industry needs to constantly improve the way of conducting business. In a competitive market context (Hirata, 2017b) in the CLS industry, ability to offer long term rate is not effective in enhancing customer satisfactory. Digitalisation is clearly seen to top the liner shipping managers' agenda.

This study differs from previous empirical research in the field of service characteristics and satisfaction in CLS industry with regards to three aspects. First, this paper draws on data from actual shippers and therefore benefits from increased external validity. Secondly, this paper maps service quality dimensions to service characteristics to be of practical reference for shipping managers. Thirdly, the service characteristics are composed to reflect rapid developments of digitalisation in the latest CLS market, which positions this research one of pioneer studies in the field.

This research has a limitation that it focused on global carriers only. Study on regional carriers[5] in each continent may give different findings. Future study may endeavor to identify most important characteristics of intracontinental services.

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Appendix

Comparison of survey instruments in Kang and Kim (2009), Yuen and Thai (2015) and this research

Kang and Kim (2009)	
Dimension	**Indicator**
Service outcome quality	Delivery reliability;
	Product quality;
	Cost savings
	Lead time
Service delivery quality	Claims handling
	Product visibility
	Communication
	Order convenience;
Service capacity quality	Cargo handling
	IT system
	Professional
	Stability

Yuen and Thai (2015)	
Dimension	**Indicator**
Responsiveness	Speed and ease of claims
	Promptness of customer service
	Effectiveness of sales team
	Corporate social responsibility and concerns for human safety
	Green shipping practices
	Variety of service offerings
Speed	Transit-time of transportation services
	Frequency of transportation services
	Accuracy of cargo tracking systems
	Ideal time of shipments
	Availability of empty containers
Value	Pricing of shipping services
	Total logistics cost
	Freight changes
	Consistency of customer service
	Conditions of ships and equipment
Reliability	Safety and security of shipment;
	Consistency of customer service
	Error-free documentation
	On-time pick-up and delivery of cargo

[5] Regional carrier: shipping lines that mainly provided service within same continent. e.g. Intra-Asian, Intra-European, Intra-American carriers.

This research (2018)	
Dimension	**Indicator**
Quality of interaction with sales representatives (SAL)	Responsiveness of sales representatives
	Ease of making contact with sales representatives
	Sales representatives' understanding of business needs
	Translation of business needs into specific offers
	Your relationship with sales representatives
Quality of interaction with customer service representatives (CUS)	Responsiveness of customer service staff
	Ease of making contact with customer service
	Customer service representatives general attitude towards me as a customer
	Customer service representatives' knowledge of my business
	Quality of issue resolution
	Keeping customers informed when changes happen to transport plan
Quality of ocean shipment (OCE)	Schedules
	On time loading of vessel
	On time arrival at destination
	Availability of equipment
	Transit time
Quality of inland shipment (INL)	Inland and intermodal offerings suit your needs
	On time arrival
Satisfaction with long term ocean rates (LR)	Long term ocean rates
Satisfaction with short term ocean rates (SR)	Spot ocean rates
Satisfaction with inland rates (IR)	Inland rates
Satisfaction with digital solutions (DIG)	Finding schedules and routes
	Looking up relevant rates
	Getting quotes in time
	Ease of booking
	Additional booking requirements (e.g. reefer container temperature specification, etc.)
	Documentation (e.g. B/L, Shipping Instruction, etc.)
	Accessing shipment information while in transit, e.g. container status, tracking
	Payments
Overall satisfaction (SAT)	Overall satisfaction (taking everything into account)