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Impact of Logistics Information Service on Customer Satisfaction: An Empirical Study with Assurance as the Moderator

Liu Chang[1], Jia YongFei[2] and Kong Bei[3]

[1]Department of Economics and Management, Taishan University, Tai'an, CO 271000, CHINA
[2]Shandong Institute for Development Strategy of Science & Technology, Shandong Academy of Science of Ji'nan, CO 250014, CHINA
[3]Department of Economics and Management, Taishan University, Tai'an, CO 271000, CHINA

Abstract

Background/Objectives: Internetization at the communication and channel levels impels many companies to make efforts in building themselves as a trading platform, where a huge bulk of buyers and sellers can carry on transactions. **Methods/Statistical analysis:** In this paper, by summarizing the critical factors of logistics information system (LIS) quality, a theoretical model was established to resolve the factors that influence customer satisfaction. In this process, customer satisfaction theory (CS) is applied to be a moderator. And then based on the PLS structural equation model, an empirical study was conducted. **Findings:** The results presented that making full use of Internet of things technology to accelerate the process of reengineering and standardization while guaranteeing the information quality to make contribution to the improvement of customer satisfaction. At the meantime, the establishment of service quality evaluation system in the context of Internet of things can help logistics enterprises to improve the service quality, promote the enterprises' competitiveness, and realize the collaboration management of enterprises' services. **Improvements/Applications:** At the meantime, the establishment of service quality evaluation system in the context of Internet of things can help logistics enterprises to improve the service quality, promote the enterprises' competitiveness, and realize the collaboration management of enterprises' services.

Index Terms

Logistics information system, Personnel contact quality, Information quality, Information system quality, Customer satisfaction

Corresponding author : Jia YongFei
jiayongfei1983@126.com

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I. INTRODUCTION

Internetization at the communication and channel levels impels many companies to make efforts in building themselves as a trading platform, where a huge bulk of buyers and sellers can carry on transactions. As a result, with the internetization established at the supply chain level, enterprises have successively developed their global distribution network and continuously optimize their logistics nodes.

As the main organizational form of supply chain management, the third party logistics plays an important role in improving the competitiveness of both individual companies and overall industry by executing and completing the traditional transportation and warehousing operations of manufacturing companies. In the field of logistics and supply chain management, especially in the field of modern logistics, many scholars have conducted a large number of effective explorations and applications in terms of the management models, theories, and technologies. Although the logistics industry has achieved a considerable maturity in networking and informatization, few studies have investigated the logistics information system (LIS) quality and customer satisfaction in the context of big data. In this paper, with assurance as the moderator, customer satisfaction was evaluated via three aspects, i.e., personnel contact quality, information quality and information system quality. Our conclusion has an important reference value in improving customer satisfaction, optimizing logistics nodes, as well as maintaining the core competitive advantage of enterprises.

II. LITERATURE REVIEW

A. Logistics Information System

LIS serves as the pillar of modern logistics operations. Compared with the traditional logistics, the management and operation of modern logistics are featured by intelligence, systematization, automation and other aspects. LIS is a human-computer interaction system composed of employees, computer hardware and software, network communication apparatus and other office equipment. Its mission is to provide logistics administrative personnel and other administrators with strategic, tactic and operation decision support through logistics information collection, storage, transportation, processing, maintenance and output, thereby giving a full play of the strategic advantages of the organization and enhancing efficiency and profits of enterprises in logistics operation[1,2]. Information plays a vital role in modern logistics, whose central nervous system is constructed by the information system. By tracking the information dynamics in the logistics system in a rapid, accurate and real-time manner, enterprises may quickly respond to the market and achieve a virtuous cycle among business flow, information flow, and capital flow.

B. Overview of Customer Satisfaction-related Theories

In 1965, American scholar Cardozo first introduced the concept of customer satisfaction (CS) into the marketing field and proved its significant influence on repurchase. Nowadays, scholars mainly define customer satisfaction theory from two perspectives. According to the first definition, customer satisfaction refers to customer's evaluation on the process of purchasing product or acquiring a service in a particular transaction (an expectation to purchase a product or acquire a service); this understanding explains from the perspective of transaction and emphasizes the service process. Subject to the expectation-perception theory, customer satisfaction is also defined as customer's overall evaluation after comparing their perception obtained during purchasing a product or acquiring a service with their expectation upon the target product or service before the transaction based on their multiple previous consumption experiences (service experiences).

C. Measurement of Logistics Service Quality

Crosby (1979) defined quality as a conformity to certain specifications set forth by consumers and users[3]. Under the guidance of this concept, the early measurement and evaluation of logistics service quality mainly considered the suppliers while ignored the opinions of customers. Based on other studies, Mentzer et al. (2001)established the LSQ model constituted nine indexes, including personnel contact quality (PCQ), order release quantities (ORQ), information quality (IQ), ordering procedures (OP), order accuracy (OC), order condition, order quality (OQ), order discrepancy handling, and timeliness[4]. Despite of placing high emphasis on the dimensions of logistics service quality, the scholars have not provided a set of universal standards. Kersten and Koch (2010) divided LSQ indexes into three dimensions: potential, process and result service model[5]. They emphasized the importance of quality in logistics services and advocated logistics practitioners to attach higher significance to service quality improvement for the sake of business success.

DeLone and McLean (1992)first proposed the information success model (IS)[6]. They believed that the success of an information system could be

measured from six dimensions: use, user satisfaction, system quality, information quality, organizational impact and individual impact, and then they put forward the information system success model. By modifying the information system success model and incorporating service quality, a new external influencing variable, DeLone and McLean (2003) considered that the service provided by the information system was also an important factor affecting consumer satisfaction; they merged the original organizational impact and individual impact into net benefits and foregrounded satisfaction as a key index to examine the success of an information system[7]. Based on LSQ and IS models and by referring to the customer satisfaction theory, our study was carried out through identifying the three dimensions for LIS quality, that is, personnel contact quality, information quality and information system quality.

III. RESEARCH HYPOTHESES AND MODEL ESTABLISHMENT

A. Research Hypotheses

Personnel contact quality is an index measuring whether or not the service personnel of the logistics enterprise can provide personalized service via a sound contact with their customers. This dimension includes such considerations as whether the service personnel is equipped with professional knowledge, whether they can understand the customer's situation and whether they can help to solve the customer's problems. Hartline and Ferrell (1996) held that all of the forementioned factors would affect the customer's evaluation on logistics service quality[8]. Surprenant and Solomon (1987) thought that the perception of service quality had a closer relationship with the service process[9]. Since consumers acquire services mainly through contacting with the service personnel, their evaluation on service quality should be formed in the service process. To this end, strengthening the contacts between service personnel and customers turns to be of great significance in improving logistics service quality (Hartline et al., 2000)[10]. The interactions between related personnel from logistics companies and customers are an important quality measurement (Ramayah et al., 2017)[11]. Fonia and Srivastava (2017) stated that one index to assess service quality should be assigned to the contact with customers[12]. Contact means to learn about and understand the needs of customers, which signifies that the company must adjust itself to satisfy different consumers so as to achieve the objective of improving service quality. In this regard, we hypothesize that:

H1: Personnel contact quality has a positive effect on customer satisfaction.

Information quality refers to customers' perceptions of the information provided by the supplier regarding products from which customers may choose (Mentzer et al.,1997[13]; Mentzer et al.,1999[14]). Information quality can be reflected from such several aspects as availability, reliability, adaptability and response time (Hariguna et al., 2017)[15]. Modern logistics involves all sides of the social and economic life and covers the whole process of market circulation from raw material wholesalers, suppliers, retailers, manufacturers to final consumers. By providing accurate, reliable and timely operation command for customer's order processing, logistics information not only guarantees the accuracy of logistics operations but also offers an evidence for establishing a customer-oriented service strategy (Kampf et al., 2017)[16]. In this paper, the term of information quality consists of both the catalog and specifications of various logistics products provided by logistics companies and the information on logistics activities. Based on the above discussion, we hypothesize that:

H2: Information quality has a positive effect on customer satisfaction.

Information system quality refers to the evaluation on the information system itself. In the context of Internet application, DeLone and McLean (2003) supposed that the assessment of E-commerce system quality should include such indexes as usability, response time, user satisfaction, availability, reliability and adaptability[7]. At the same time, they held that system quality was a measure of the processing capability of the information system itself, especially a measure of the system engineering-oriented performance, which revealed that system quality was a more technical dimension. System quality should be personalized, complete, related, understandable and safe (Hariguna et al., 2017)[15]. In this paper, information system quality consists of three aspects, i.e., the convenience in operating logistics information system, usability of the interface and functions provided by the system, as well as the efficiency and success rate during establishing and processing customers' orders (Hult 1998)[17]. We hereby hypothesize that:

H3: Information system quality has a positive effect on customer satisfaction.

Ruyter et al. (l997) [18]proposed that customer loyalty was subject to the complex effects generated by the interactions between many different factors, where the complexity of such interactions might be even unthinkable; one of the nonlinear factors that influenced customer loyalty was customer satisfaction (Rajic et al., 2016)[19]. The term of assurance in SERVQUAL refers to the professional knowledge mastered by the employees as well as their ability to express confidence and credibility. In this paper, assurance is defined as the ability to fulfill

service commitments in a reliable and accurate manner. Specifically, it includes accuracy of the logistics information about letters and packages, order condition during delivery, and the commitment of logistics-related companies and personnel that they will not disclose any information about the logistics activities. According to the discussion above, we hypothesize that:

H4a: Assurance plays a moderating effect between personnel contact quality and customer satisfaction.

H4b: Assurance plays a moderating effect between information quality and customer satisfaction.

H4c: Assurance plays a moderating effect between information system quality and customer satisfaction.

In summary, the research model proposed in our study has been shown in Figure 1:

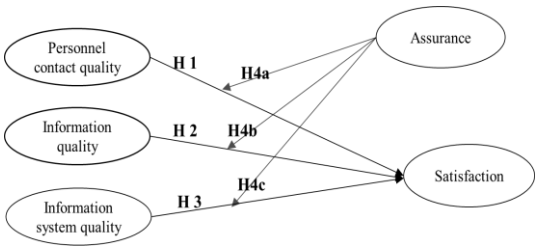

Fig. 1. Research Model

B. Research Methods

The research questionnaire is constituted by two parts, where the first part is for collecting the basic personal data of research objects, and the second one is an investigation on LIS service quality and customer satisfaction. On the basis of LSQ model, the measurement dimensions were adjusted in this paper. With three involved dimensions including personnel contact quality (PCQ), information quality (IQ) and information system quality (ISQ), our LSQ additionally takes assurance as the moderator; each dimension is ultimately embodied in 4-5 questions, which forms the secondary evaluation indexes. The questionnaire was scored via Likert five-point scale (1 for strongly agree, 3 for neutral, and 5 for strongly disagree).

We conducted a survey by distributing questionnaires to college students online from May 8, 2018 to May 12, 2018. A total of 301 questionnaires were distributed and 323 were returned, of which 288 were valid with an effective rate of 89.2%.

IV. DATA ANALYSIS AND MODEL VALIDATION

A. Descriptive statistics of samples

To handle small sample data, PLS2.0 is used to conduct descriptive statistical analysis and verify the reliability and validity of model indexes. The results show that there are 118 males among the people surveyed accounting for 41.0.%, less than females, 170, accounting for 59.0%. 243 people are above 25, accounting for 84.4% of the total; 22 are between 26 and 35, 7.6% of the total, 23 people are above 36 years old, 8% of the total. In terms of the educational level, 8 people are high school graduates or with a lower educational background, accounting for 2.8% of the total people surveyed, 13 people are junior college graduates, 4.5% of the total, 245 people are undergraduates (85.1%), and 22 people have a master's degree or above(7.6%). In terms of jobs, 232 people were students, accounting for 80.6%, with the rest being 56, accounting for 19.4%.

B. Reliability and validity of samples

According to SmartPLS2.0 results, the Cronbach's α values of customer satisfaction, assurance, PCQ, IQ and ISQ were 0.902, 0.897, 0.847, 0.872 and 0.881, respectively; the composite reliability far exceeded the critical value of 0.7 and achieved over 0.8 (see Table 1), indicating that the questionnaire exhibited a good consistency. In conclusion, all variables were of high confidence.

Table 1. TEST RESULTS OF VARIABLE RELIABILITY

Construct	No. Items	Cronbach's alpha	CR	AVE*	R Square
PCQ	5	0.847	0.898	0.689	
IQ	4	0.872	0.913	0.723	
ISQ	4	0.881	0.918	0.738	
Assurance	4	0.897	0.928	0.764	
CS	3	0.902	0.939	0.836	0.466

* p<.05. Note: *Average variance extracted.

The validity can be generally measured from two aspects: convergent validity and discriminant validity. The convergent validity of latent variables can be reflected by AVE value. If the AVE value is greater than 0.5, it means that 50% of the variance of the observed variable can be explained and suggests a good convergent validity of the given latent variable. The convergent validity of observational variables can be tested via factor loading. It is generally recognized that a factor loading coefficient of more than 0.7 implies a good convergent validity of the observational variable. The results obtained from PLS calculation have been shown in the table above. The AVE value of all latent variables was greater than 0.5, indicating that each of them exhibited a good convergent validity. The factor loading coefficient of all observational variables was more than 0.7, suggesting that each of them exhibited a good convergent validity.

Table 2. TEST RESULTS OF DISCRIMINANT VALIDITY

Construct	PCQ	IQ	ISQ	Assurance	CS
PCQ	0.830				
IQ	0.778	0.850			
ISQ	0.716	0.734	0.859		
Assurance	0.389	0.457	0.434	0.874	
CS	0.593	0.642	0.619	0.352	0.914

Note: Diagonal data is the square root of AVE; ** indicates P<0.01. Other items are the correlation coefficients between variables.

Table 2 shows that the square root of AVE of all latent variable is greater than their corresponding correlation coefficient, suggesting that each of latent variables exhibited a good discriminant validity. In summary, the validity of our questionnaire proves to be high.

C. Model Evaluation

1. R2 test

R2 is an important index employed to evaluate the effect to explain internal relations in the PLS path model. Known as the deterministic coefficient of inear regression equation, R2 ranges between 0 and 1, where the closer to 1 it is, the stronger the explaination capacity of the independent variables has for corresponding dependent variables. Higher R2 value means higher fitting and stronger predictive ability of the structural model. In this paper, PLS was used to test path assumptions in the research model. The results showed that the sample data support all hypotheses proposed in our study. All path coefficients are significant at the p<0.01 level, which states that all hypotheses H1, H2, H3, and H4 are supported(Table 3). The variance of customer satisfaction explained by the model was 46.6%.

Table 3. PATH COEFFICIENT AND TEST RESULTS

Hypothesis	Coefficient	Standard Deviation (STDEV)	T Statistics
H1: PCQ -> CS	0.534	0.014	37.125
H2: IQ -> CS	0.598	0.014	41.329
H3: ISQ -> CS	0.568	0.015	38.113
H4a: PCQ *Assurance -> CS	0.040	0.013	3.074
H4b: IQ * Assurance-> CS	0.055	0.012	4.434
H4c: ISQ * Assurance-> CS	0.080	0.016	4.997

Table 4. TEST RESULTS OF HYPOTHESES

Hypothesis	Prediction	Support
H1	PCQ -> CS	Supported
H2	IQ -> CS	Supported
H3	ISQ -> CS	Supported
H4a	PCQ *Assurance -> CS	Supported
H4b	IQ * Assurance-> CS	Supported
H4c	IQ * Assurance-> CS	Supported

V. CONCLUSION

By virtue of empirical analysis and through dimensional adjustments of the logistics service quality evaluation model (LSQ) and information system success model (IS), our study obtained an evaluation tool for logistics service quality. Meanwhile, a scientific verification was also conducted regarding the dimensions, reliability and validity of the new model. Our new model provides a specific theoretical framework for logistics enterprises and administrators to improve their logistics service quality by identifying three dimensions (PCQ, IQ and ISQ) when excluding the influence of multicollinearity. Secondly, according to the results of model evaluation (Table 3and Table 4), IQ has the greatest influence on customer satisfaction, followed by ISQ and PCQ. For the sake of customer satisfaction, the highest priority should be assigned to establishing a sound logistics management information system from the perspective of IQ. Providing customers with accurate and timely logistics information is an important factor affecting customer satisfaction. Realization of management collaboration and information collaboration based on the Internet-sourced big data appears not only the core competitiveness of the long-term development of logistics service companies but also a critical prerequisite for guaranteeing customer satisfaction.

This paper is not the first study that applies LSQ and IS models to the field of logistics activities and is restricted by some limitations although we have modified and assessed the measurement model to certain extent. Firstly, our selection scope of index weights appears to be narrow. Excluding some multicollinearity-related indexes leads to a narrow selection scope of index weights as well as the disadvantage and deficiency in covering extensive variables. Secondly, the demonstration on the important indexes of logistics information system quality is insufficient. For logistics that serves as a part of the supply chain, the performance evaluation on the system should not be an assessment on a separate link but an extensive process over the entire system, which allows to establish a set of, rather than a single, more practical and scientific evaluation

indexes.

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