



CUSTOMER SATISFACTION ASSESSMENT OF FOURTH PARTY LOGISTICS SERVICE PROVIDERS BY USING QUALITY FUNCTION DEPLOYMENT

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Abstract: *The purpose of this research is to enhance the customer satisfaction of fourth party logistics service provider and applies quality function deployment to identify the key technical measures of quality improvement. According to the national logistics report published by Japan Comprehensive Logistics Policy in 2012 proposes to efficiently integrate transportation mode and establish complete global logistics network to meet the increasing demand for advance logistics infrastructure and lowering the logistics cost. Nowadays, around 70% of the firms in Japan and about 40% in US already outsource their major logistics business to professional logistics service providers. The main advantages of logistics outsourcing could support the firms to relieve from complicated logistics task as well as concentrate on their core business. Furthermore, the globalization of economy creates various opportunities as well as challenges for fourth party logistics service providers to gain more business niches in this changing market. Generally speaking, logistics service is mainly characterized by offering efficient business solutions and specialized logistics activities. Their major customers are manufacturing clients. Customer satisfaction is considered as key managerial task since competition is extremely severe in this industry. The quality function deployment is one of the special methodologies to explore the requirements of customer and transform them into meaningful technical measures by cross correlation analysis between customer requirements and technical measures. The empirical study is performed to evaluate service quality of fourth party logistics service providers to give practical suggestion for decision makers.*

Key words: Fourth Party Logistics Service Providers, Customer satisfaction, Quality Management, Quality Function Deployment

1. INTRODUCTION

In 2012, Ministry of Land, Infrastructure and Tourism in Japan promotes several policies for streamlining the transportation and logistics activities such as facilitating freight companies to expand logistics business, application of IT in logistics for the efficient administrative procedures mandatory for import and export process. According to “Japan Comprehensive Logistics Policy Outline (2005-2009)”, they also promote the ideas of “Super-hub Port” and “Asia Gateway Project” to enhance marine transport network, reduce the CO₂ emissions of logistics service business, improve intermodal capability and realize the East Asia Seamless logistics area. In 2012, a group of logistics experts from EU countries joined the meeting in Brussels to provide ideas and advice of logistics performance for decision makers. In EU, logistics business provides over 11 million jobs and stands for around 4.9% of economy value added. The policy of logistics industry becomes the primary issue for economy growth in EU countries. In recent years, logistics service providers have diversified their service options rather than merely transport, warehousing, order processing, shipment handling and cargo tracking. They could provide very professional logistics service to support their client’s core business. Therefore, many companies in US and Japan chose to outsource their main logistics activities to external service providers. In recent year, this market is growing significantly and almost all the manufactures collaborate with at least one or two logistics service providers in East Asia.

In general, second party logistics (2PL) providers support shippers to handle fundamental logistics service such as international freight forwarders, carriers and warehousing companies. Around 1980, firms began to outsource their logistics activities to third party logistics providers (TPL) and concentrated on their core business for greater cost saving. After numerous firms entered the market such as Fedex, TNT, and DHL in 1990s, the annual growth rate of this industry was about 14 percent in USA; the total gross revenue is about 89 billion. The logistics activities may be outsourced or contracted to TPL with complete coordinated services and efficient logistics solutions. Among the services TPL generally provides transportation, warehousing, cross-docking, inventory management, packaging, freight forwarding and other service.

However, with globalization of economies, strict competition, demanding customer requirements, lead time reduction, supply chain integration, uncertainty of market and customization concept create many opportunities as well as challenges for logistics providers to set up appropriate strategy to meet with their new customer needs and supply chain solution. Nowadays, TPL service is merely a basic option for enterprises and no longer a competitive advantage. The concept of fourth party logistics (4PL) has been introduced by Accenture group as an innovative way to efficiently manage above mentioned logistics service providers. Therefore, Accenture consulting group defines 4PL as an integrator that collects the capacity, resources, and IT of its own business and other logistics business to build and operate complete supply chain solutions. Also, 4PL is featured by its powerful capabilities to integrate the whole supply chain. By the way, we can tell the difference between TPL and 4PL from several points. First, TPL focus on offering various services such as inbound freight, freight consolidation, warehouse management, delivery, order fulfilment, outbound freight and value added service with global coverage. 4PL provide the complete supply chain solution and all related logistics activities rather than simply cargo movement. Second, the feature of TPL is logistics outsourcing to manage the transport activities for customer; 4PL also attain resource from other party to give total supply chain solution for each customer. Third, 4PL market rise significantly with the application of advanced IT solution to provide professional services where other logistics operators execute the physical movement of cargo. They are usually non asset-basis and control over other logistics service

providers as a particular coordinator between customer and other logistics operators. Fourth, the core competency of 4PL is to incorporate and manage the various resources of client's supply chain process practically, efficiently and flexibly. As a result, the client can enjoy the high quality and low cost logistics service. The development of internet helps to optimize the supply chain, information sharing between partners and facilitate the formation of 4PL to provide more efficient service to client by detecting commercial risk, examining the KPIs and managing alliance network. The concept of 4PL is as Figure 1.

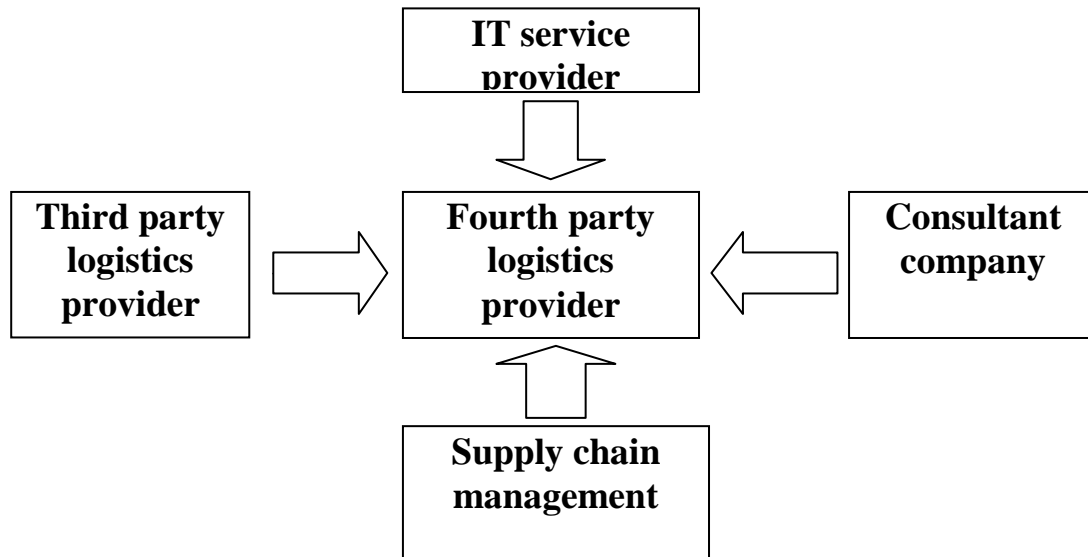


Figure 1. Fourth party logistics

2. LITERATURE REVIEW

With the increasing number of 4PL service providers, some papers reveal the importance of measuring performance of this innovative business but there are only limited researches studying about service quality issues. Customer satisfaction and customer value become strategic or even survival issues to gain the competitive advantage, so hearing the voice of customer and providing quality service would help providers gain customer's loyalty. To accurately express and quantify the service quality of 4PL service provider is difficult due to its characteristics such as intangibility, inseparability, ambiguity and heterogeneity. The perceived service quality is the interaction between service provider and customer, so the key attributes of the logistics service are practically assessed by customer with qualitative and quantitative questionnaires.

Through the literature, we could still find some previous researches and related studies to investigate the service quality or performance of 4PL. Panayides (2004) explored the impact of product-market and resourced-based competitive strategies to measure the performance of logistics service providers with four multivariate techniques. The result shows market segmentation, service differentiation and inter-functional coordination have positive effect of performance while cost advantage does not have significant effect of performance. Jharkharia (2007) use ANP method for the selection of a logistics service provider. The research gave many related service attributes for selection and found compatibility between service provider and customer the most important reason for decision making. Xu Haolu (2008) empirically

studied the Chinese 4PL companies. He emphasizes the competition condition not only happens among individual company but also between supply chains while collaboration of supplier has become a key factor to success. Win (2008) explores the value of using 4PL contributed to an organization within the beverage industry. The major benefits are reduced inventory investment of annual sales, improved inventory return and integration of value chain. Kravovics (2008) point out the outsourcing of TPL needs close monitoring of logistics system and service level. He empirically explores 4PL provider appointed by chemical company in Brazil to monitor the work of the 3PLs with important performance indicators. Vivaldini (2008) uses a case study to analyze the coordination of ten TPLs by a logistics leader (4PL). the author prove the use of 4PL would improve SCM system and service pattern. Buyukozkan (2009) uses MCDM and 2-additive Choquet integral model to assess 4PL operating models. Network structure is important to manage the operation with TPL. Hamilton (2010) stress the creation of 4PL would provide customer a competitive service by detecting related business risk, giving KPI and alliance network rather than traditional TPL. Kersten (2010) use SEM model to evaluate the relationship among logistics service quality, quality management and business success in Germany. The result shows the service quality has positive impact on business success in terms of service potential, process and outcome. Yao Jianming (2011) use ACO algorithm to solve the decision-making and optimization problem of supply chain resources integration in 4PL. Pettersson (2012) found important customised performance measurement indicator for fourth party logistics service providers. These KPIs will help to deal with uncertainty of supply chain and effectively evaluate the performance for each partner. Huang et al. (2013) applied fuzzy duration time to find out the route of minimum cost with constraints under uncertainty environment for 4PL. The proposed 4PLRP model is to investigate the performance of both time and cost as decision making tool. Cui et al. (2013) handled a multi-source single-destination 4PL routing problem with fuzzy duration and cost discount considering the comprehensive ability of 3PL suppliers and linking nodes. The performance of this method has significant contribution to solve the routing issues. Liu et al. (2014) proposed a multi-objective scheduling model aiming at minimizing the total operation costs, finishing time of logistics tasks in a 4PL. This scheduling model is presented to optimum the operational efficiency of 4PL. Based on above publication, we can gain 10 customer requirements and 11 technical measures.

3. QUALITY FUNCTION DEPLOYMENT AND HOUSE OF QUALITY

In 1966, Professor Yoji Akao developed quality function deployment (QFD) with an aim to analyse new product design based on customer inputs. House of Quality (HoQ) is considered the major tool of QFD and was first applied in the Kobe Shipyard of Mitsubishi Heavy Industry for improving a new shipbuilding project of an oil tanker. Yoji Akao suggested the use of QFD for the shipbuilding industry and shortly its popularity was applied among several industries. The HoQ is useful to allocate possible contribution of improvements into customer requirements, and the service provider can maximize customer satisfaction through execute the alternatives of improvement. This research investigates fourth party logistics service providers and their customer requirements are discussed under the QFD method.

The procedure for building the house of quality for completion of the QFD can be explained by the following steps:

A. Dimension of customer requirements (WHATs, CRs): We can investigate to gain the information about customer requirement. Typically, the weight of customer requirements is to quantify the level of importance and satisfaction of each item. The result of deployment

stands for the voice of customers in this model. Through the expert consultation, we can calculate the relative weight of each CR.

B. Dimension of technical measures (HOWs, TMs): Technical measures can be constructed according to firm's internal resources and coordination. We can calculate each TM to express the level of contribution to each CR. The key TM will be discussed for its business practice in the conclusion part.

C. Dimension of cross relationship matrix: Comparing each WHATs and HOWs, the relationship matrix demonstrates the contribution level and relation of each technical measure to each customer requirement. Typically, symbols represent three degree of strength (low relationship, moderate relationship, strong relationship, no relationship), such as 9-5-1 or 9-6-3.

D. Dimension of correlation matrix : Correlation matrix relationship is to measure the relationship of each technical measure and how much they influence each other. Correlations are represented with symbols that express the degree of relation between technical measures. Symbols are translated into a four-value rating scale (strong relationship, moderate relationship, low relationship, no relationship), such as 9-5-3-1 or 9-7-3-1.

E. Dimension of target values : It is necessary to construct the relationship between customer requirements and technical measures. The crisp numeric can show the value in precision-based QFD. In practically, the business operators often estimate them along with their practical experience, past knowledge and information. On the other hand, the estimation of the relation power between customer requirements and technical measures is usually demonstrated in linguistic values, e.g. 'high', 'medium' and 'low'. Through calculating weight of technical measures, we can find the target values of each TM. The classical structure of the HOQ is listed in Figure 2.

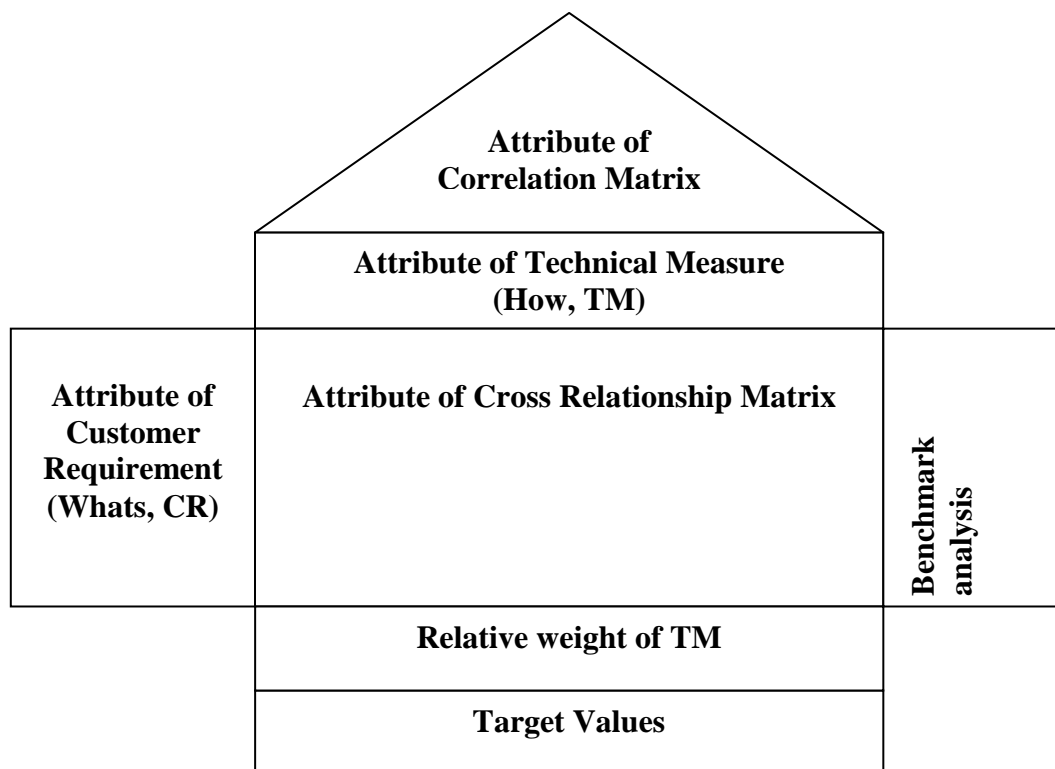


Figure 2. Dimension of house of quality

4. DISCUSSIONS

The research surveys are performed by expert consultation with business practitioners from freight forwarders, logistics providers as well as academic practitioners in East Asian countries, such as Japan, Taiwan, Korea and China. After the expert consultations, the relationship matrix between customer requirements and technical measures are obtained in QFD framework. The HoQ is presented as Table 1 to present these relationship and key service quality attributes of 4PL.

According to the research result shown in Table 1, the *Excellent IT ability* (8/11) and *Customized ability* (8/11) are found as most related factors by technical contents. These two factors are could be considered as important customer requirements and strongly relevant for improving customer satisfaction. First of all, regarding to excellent IT ability, since 4PL is considered as strong integrators of several logistics functions such as TPL, IT provider and consultant companies. The primary task is to satisfy the client's requirement of IT ability. The important of information sharing among the supply chain becomes key competency for 4PL providers. Facilitating the information flow and advance IT application are key considerations to respond customer needs. Second, customized ability is considered as important requirement since every customer's need is different. The ability of tailor-made service is a crucial ability for 4PL to attract new customers as well as satisfy old customers. Since it is easy to be replaced by other 4PL service providers, the operators should consider these two important customer requirement in order to survive in the competitive market situation.

To our surprise, the *competitive price* (5/11) is not considered as related factor of technical contents in this research. The possible reason may be related to the motivation of using the 4PL service. In general, the 4PL is featured by their professional service and expert consultation. This service attribute would not be replaced by other important factor such as price. The users could take advantage of this service rather than price factor. The priority of customer requirements in this research may reveal the important information of changing customer value in 4PL industry.

5. CONCLUSIONS

This research investigated key service quality of logistics service provider in East Asian and the QFD method is implemented to perform the assessment of the services and facilities for customer satisfaction. We explore the foremost customer requirement and transferring into technical measures on quality improvement. The expert participants are professors, business practitioners and experiential experts from East Asia and US. The consultation results were collected by telephone, email, facsimile and personal visits. We will discuss the key technical measure and its business practice through Lloyd's publication in conclusion part until now.

First, overall supply chain management is important is key issue for 4PL to improve service quality. In 2012, M&S logistics executive warns logistics providers of increasing challenge for deliveries due to the complexity and market uncertainty. The ability to give the supply chain solution becomes important since customer may easily change their supplier at any time, so providers should provide instant, efficient and cost effective solution.

Second, human resource management is also popular issue in recent year. The new Southampton project of UK in 2012 is a good example for university to cooperate project with industry. This kind of alliance will help university to train their students and develop a high quality human resource. Since many non-asset based logistics provider does not have much real estate such as warehouse, truck fleet or aircraft, entry barrier is lower and threat of new competitor may exist. Human resource will be the key weapon for the business success and increase the barrier for competition.

Third, quality procedure may help companies to define the details of operation and provide guideline for the corporate such as vision, mission and process management. Recently, CSR and green logistics policy become a popular issue. Editor of Lloyd's Fairplay, Paul, stressed the importance of Corporate Social Responsibility policy for firms. Logistics providers may need to spend money on this policy but the profitability and positive image of reputation is much more than its cost. It is essential for 4PL to have more quality certificates to demonstrate their services have international standard.

Since the 4PL service should provide more advance service than traditional logistics provider. The operational coordination may be considered as an important function since 4PL provider should monitor every party such as consultant, TPL, IT provider as a whole to serve their customer. The commitment between each party should be well coordinated. As the SBS CEO Steve stressed the logistics providers should have strong relationship and commitment with more than one suppliers or partners to make sure they can provide customer the sustainable service. 4PL providers should take this kind of concept in mind to provide customized service to their clients.

In East Asian countries, many logistics service providers are small-medium size firms. The research results could provide practitioners very important business implications. First of all, the service providers should provide customers useful information for better supply chain solutions. As its function as consultant, professional 4PL should efficiently integrated related service providers but also provide customers instant market information for better decision making process. Furthermore, as the human capital is key success factor in this industry, the better education of professional and experts are indispensable to attain this targets. As one Japanese executive stresses, he deeply thinks that 'Only well trained staff and experts could really provide customer quality service and make significant contribution to our organization. As a service industry, our company strictly trains and educates our staff to provide customer most professional service.' 4PL should realize the high quality human resources would have positive impact on their financial performance as well as overall business performance. On the other hand, many small medium size firms do not have the ISO certificate of quality procedure or other important certificate. As the larger scale of organization, the standard operational procedure would be more important because this standard could ensure process efficiency and effectiveness as well as have positive on business reputation.

For the suggestions of future study, the integration of global supply chain management become critical issue for enterprises as well as 4PL. As a service provider, 4PL should be able to follow this trend to deeply involve customer's supply chain and work more closely to understand customer needs. How to become customer's strategic partner and offer cost-effective solutions is very important concerns for service provider. Therefore, the mission of 4PL would not only support their customer relieving from complicated logistics burden but also positively act as a valued strategic partner to achieve business.

6 ACKNOWLEDGEMENT

Author is indebted to the comments of anonymous reviewers and the support of Department of Transportation Science, National Taiwan Ocean University (NTOU) as well as Ministry of Science and Technology, ROC, Taiwan.

Table 1. House of Quality Matrix for Customer's Requirements

HoQ of Customer Satisfaction		Maximize (▲), Minimize (▼) and Target (x)										
		Key Performance Indicator	Human Resource Management	Operational Coordination	Customer Relationship Management	IT Implementation	New Market Entry	Quality Procedure	Overall Supply Chain Management	Business Diagnosis and Consultancy	Profitability Analysis	Global Service Network
Relative weight												
0.1	Excellent IT ability	*●		■	●	■	●	●	●		●	
0.1	Customized ability	▲	■	▲	■			■	■	▲		●
0.1	Value added service	■	■	■	●	●	●	●	▲			
0.1	Supply chain solution		■	■				▲	■	●	●	
0.1	Good public image		▲	▲				■	■			■
0.1	Open information	▲		●				●	●	●		
0.1	Professional staff	■	■	■	●			■	▲		●	
0.1	Worldwide service		●	●		●		●	■			
0.1	Consultancy ability		■	▲	●			■	▲	■		■
0.1	Competitive price	▲				●		▲	●		■	
	Sum product	2.6	5.6	5.9	2.8	2.1	0.29	4.9	5.4	3.1	0.47	2.7
	Relative weight	0.07	0.15	0.16	0.08	0.06	0.01	0.14	0.15	0.1	0.01	0.08
	Rank	8	2	1	6	9	11	4	3	5	10	7

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