ANALYSIS ON CUSTOMER SATISFACTION USING QUALITY FUNCTION DEPLOYMENT APPROACH: A EMPIRICAL STUDY OF FOURTH PARTY LOGISTICS SERVICE PROVIDERS

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Abstract
The national logistics guidelines 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 chose to outsource their major logistics business to other logistics service providers. The globalization creates various opportunities as well as challenges for logistics service providers to gain more business niches in this changing market. The purpose of this paper aims to improve service quality of fourth party logistics service provider and applies quality function deployment to explore the key measure of quality improvement. Logistics service is mainly characterized by offering efficient transport solution and specialized logistics activities. The major customers of the logistics services are the manufacturing clients. The customer satisfaction is key managerial task since competition is extremely severe in this industry. The quality function deployment is one of the unique procedures to find the requirements of customer and transform them into executive measures by cross correlation analysis between customer requirements and technical measures. The empirical study is performed to explore service quality of fourth party logistics service providers to give practical suggestion for decision makers.

Keywords: Fourth Party Logistics Service Providers, Quality Management, Quality Function Deployment

1. INTRODUCTION
After Eastern Japan’s earthquake, Ministry of Land, Infrastructure and Tourism promotes several measures 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 idea of “Super-hub Port” and “Asia Gateway Project” to enhance marine transport network, reduce the CO2 emission 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.

In recent years, logistics service providers have diversified their service options rather than merely transport, warehousing, order processing, shipment handling and cargo tracking. In general, second party logistics (2PL) providers help 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 (3PL) and concentrated on their core business for great 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 requirement, 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.

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.

![Fig. 1. Fourth party logistics](image)

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 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.

Based on above publication, we can gain 10 customer requirements and 11 technical measures as shown in Table 1.
### Tab. 1. House of Quality Matrix for Customer’s Requirements

<table>
<thead>
<tr>
<th>HoQ of Customer Satisfaction</th>
<th>Maximize (▲), Minimize (▼) and Target (x)</th>
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<tbody>
<tr>
<td>Relative weight</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excellent IT ability</td>
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<td></td>
<td>*</td>
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<tr>
<td></td>
<td>Customized ability</td>
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<tr>
<td></td>
<td>Value added service</td>
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<td></td>
<td>Supply chain solution</td>
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<td></td>
<td>Good public image</td>
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<td>Open information</td>
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<td></td>
<td>Professional staff</td>
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<td></td>
<td>Worldwide service</td>
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<td></td>
<td>Consultancy ability</td>
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<td></td>
<td>Competitive price</td>
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<td>Sum product</td>
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<td></td>
<td>Relative weight</td>
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<td></td>
<td>Rank</td>
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*“■”, Strong relationship (9), “▲” Moderate relationship (5), “●” Low relationship (1) and “Ø” No relationship*

3. QUALITY FUNCTION DEPLOYMENT AND HOUSE OF QUALITY

In 1966, Yoji Akao developed quality function deployment (QFD) with an aim to evaluate new product design based on customer inputs. House of Quality (HoQ) is the most important tool of QFD and was first applied in the Kobe Shipyard of Mitsubishi Heavy Industry for improving a new building project of an oil tanker ship. Yoji Akao suggested the use of QFD for the shipbuilding industry and shortly its popularity was improved among several industries. The house of quality would be 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 the international logistics companies and the 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. 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. 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. 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. 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 9-5-3-0 or 9-7-3-0.

E. 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.

4. CONCLUSION

This research investigated key service quality of 4PL 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 CSR 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.

Finally, 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.

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LITERATURE


[16] http://www.drewry.co.uk/