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The Total Landed Cost Concept. Begging for Answers

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Andreas Pumpe and Franz Vallée

The Total Landed Cost Concept Begging for Answers



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The Total Landed Cost (TLC) often comprise a large share of the total international sourcing cost and thereby determine the cost-saving potential. Therefore, the TLC must become an integral part when making international supplier selection decisions to be able to make deliberate choices on a case-by-base base. The literature proposes a number of frameworks to evaluate the TLC, but the ordinary way has not been examined satisfactorily.

In this research, an online survey was conducted and the importance-performance analysis (IPA) was applied. IPA is an effective tool that simultaneously analyses quality attributes of the two dimensions performance and importance to identify areas needing improvement as well as areas of effective performance. The sample included 264 valid and usable respondents.

As a result, reasons for an overall performance in need of improvement are the accessibility of required information and the duration of the TLC evaluation process. Based on a comprehensive literature review, this is probably why TLC frameworks with sufficient detail to prompt effective decision-making are not present in research. The authors discuss the resulting, derived research needs to enable an appropriate TLC evaluation in international supplier selection decisions.

Keywords: Total Landed Cost, International Sourcing, Supplier Selection, Importance-performance Analysis

1 Introduction

Several researchers have mentioned that international sourcing is typically driven by cost considerations. Lower factor costs, fewer regulatory control and several other factors could lead to considerable savings (Trent and Roberts, 2010). However, the Total Landed Cost (TLC) often comprise a large share of the total international sourcing cost and complicate the profit picture (Zeng and Rossetti, 2003). In this study, TLC is seen as the “sum of all costs associated with obtaining a product, including acquisition planning, unit price, inbound cost of freight, duty and taxes, inspection and material handling for storage and retrieval” (Trent and Roberts, 2010, p.67). It also includes hidden costs; for example, uncertainty in supply is often accompanied by additional inventory (Young, et al., 2009). Therefore, TLC must become an integral part of every international sourcing analysis (Hausmann, et al., 2010; Kamann and van Nieulande, 2010; Trent and Roberts, 2010) to be able to make deliberate choices on a case-by-case base. Different studies clearly show that companies often underestimate the true costs of international sourcing, with the consequence of yielding less than expected savings or in fact uneconomical results (Holweg, Reichhart and Hong, 2011; Schiele, Horn and Vos, 2011; Bygballe, Bø and Grønland, 2012). Accordingly, the TLC evaluation is particular important but unfortunately not costless. The evaluation requires employment of skilled and costly labor, information system support, etc. For this reason, an efficient procedure with a favorable ratio between effort and benefit is needed. The more complex and important the decision, the more effort has to be invested (Eisenführ, et al., 2010; Trent and Roberts, 2010).

Up to now, the TLC evaluation for international supplier selection decisions is unexplored and hence the focus of this research. The main research questions are the following:

How do companies do the evaluation of the Total Landed Cost to support international supplier selection decisions?

How is the perceived performance of the Total Landed Cost evaluation procedures?

This paper is organized in the following manner. The next section contains a review of existing literature relating to TLC in international sourcing. In section 3, a brief description of the importance-performance analysis method (IPA) is given, followed by a detailed description of the survey results in section 4. This paper concludes in chapter 5 by discussing the contribution of this study and questions that could be addressed in future research.

2 Literature Review

The following comprehensive literature review of TLC in international sourcing is structured according to the main phases in the supplier selection process: from the formulation of criteria, over the pre-selection, to the final choice among the preselected suppliers. The framework of Levy and Ellis (2006) and vom Brocke, et al. (2009) was applied.

A number of studies about the considered cost criteria as well as their proportion of the total international sourcing costs have been identified. For example, Young, et al. (2009) analyzed if the landed cost models are adequate in that they take into consideration all relevant costs. Ferrin and

Plank (2002) developed a comprehensive categorization of cost drivers, as a checklist to consider all possible cost factors when sourcing internationally. In contrast to this, Platts and Song (2010) focused on the amount of the costs. They found out that storage costs are on average 8.9%, transport is 5.7%, and inspection of the goods is 5.4% for sourcing from China. Further research has been carried out in this field but most of these studies are based on survey data from purchasing managers which may measure their expectations rather than actual costs (Platts and Song, 2010; Horn, Schiele and Werner, 2013). The TLC evaluation procedure is unknown, and a validation of these self-reported costs data did not take place. The number of cases is mostly too high, and/or getting access to carry out detailed costing within companies is not possible.

Besides the formulation of the relevant cost criteria, a procedure for an appropriate assessing of the TLC is required to support the pre-selection and final supplier selection phase. Frameworks could meet this challenge; they describe a procedure in an abstracted, model-like way. They can be understood as normative references to manage the complexity and to be applicable in a wide range of individual cases (Stahlknecht and Hasenkamp, 2005; Wasson, 2006; Adaev, 2015). However, frameworks are not a stand-alone solution, because available methods are included (Balzert, 2005; Pernice, 2010; Ebel, 2012). Frameworks represent a structure intended to serve as a guide for solving a special problem, whereas methods are in general transferable, like the famous ABC analysis (Beller, 2009). Against the background of the research problem, the existing frameworks are divided into two groups: On the one hand, those frameworks that support the development of an individual TLC model with recommended methods, and, on the

other hand, those frameworks which provide a selection of the most appropriate methods.

Frameworks of the first group use, adapt and combine existing methods to develop a specific TLC model in a structured way. For example Rennemann (2007) developed a model for the automotive industry which used mathematical algorithms for a quantitative part and a scoring model for difficult-quantifiable elements. Further frameworks were developed by Zeng (2003), Weber, et al. (2010), Cagliano, et al. (2012), Johnson, Sawaya and Natarajathinam (2013), which differ in the use case, level of detail, generalizability, underlying assumptions, and, of course, the applied methods. Nevertheless, the frameworks of the second group will show that not all methods are equally useful in every possible supplier selection situation. The specific industry in which a method has been empirically tested does not determine the usefulness of certain procedures. More generic, situational characteristics like the importance of the purchase are determinatives for the suitability of a certain method. However, these frameworks do not sufficiently address this contextual issue.

Frameworks of the second group are not developing a TLC model, but rather focus on the selection of the right method based on situative context factors. For example, the meta-model of Masi, Micheli and Cagno (2013) allows the choice of the most appropriate method in relation to a specific purchasing situation. A scoring model is the optimum method if the impact of the purchase on the project is low and the degree of difficulty in managing the purchase is high. Further approaches can be found by Boer, Labro and Morlacchi (2001), Weber and Wallenburg (2010), Arnolds, et al. (2013), Schuh (2014). These frameworks confirm the necessity to apply certain

methods depending on the decision type. Nevertheless, these are just meta-models, without application guideline, method combination, recommended criteria, etc. Focus on TLC is also lacking. Besides this, the pre-selection phase has received far less attention from all researchers, whereby the quality of the supplier selection largely depends on the quality of the previous step.

Nevertheless, the literature also proposes different transferable methods, which could be part of a TLC framework. They range from verbal and graphical methods, rating/ linear weighting methods (e.g. Janker, 2008), over standard cost allocations (e.g. Kumar, Andersson and Rehme, 2010) and classification approaches (e.g. Zeng and Rossetti, 2003), to mathematical algorithms (e.g. Rennemann, 2007), special accounting systems (Clemens, 1995), and different process costing methods (e.g. Meinke, 2007). These methods have different degrees of accuracy and complexity, since a higher level of accuracy generally implies greater complexity of the method.

In conclusion, several cost criteria, frameworks and methods have been proposed and tested, but the ordinary way and especially the perceived performance has not been examined satisfactorily. The TLC literature in international sourcing is prescriptive rather than descriptive. The next step is to conduct a survey where companies are asked concerning the TLC evaluation utilized when making international supplier selection decisions. In this research, the importance-performance analysis technique (IPA) is applied.

3 Methods

The IPA was introduced by Martilla and James (1977), originally developed for marketing purposes, and has now been applied in diverse research settings (Azzopardi and Nash, 2013), including e-business (Levenburg and Magal, 2005), supplier`s performance evaluation (Ho, et al., 2012), and risk assessment (López and Salmeron, 2012). IPA is an effective tool that simultaneously analyses quality attributes of the two dimensions performance and importance to identify areas needing improvement as well as areas of effective performance (Skok, Kophamel and Richardson, 2001). After obtaining the scores for each attribute, the attributes are plotted on the IPA grid (figure 1). The quadrant method splits the plots into four areas, which are identified as 'Possible overkill' (Q1), 'Keep up good work' (Q2), 'Low Priority' (Q3) and 'Concentrate here' (Q4).

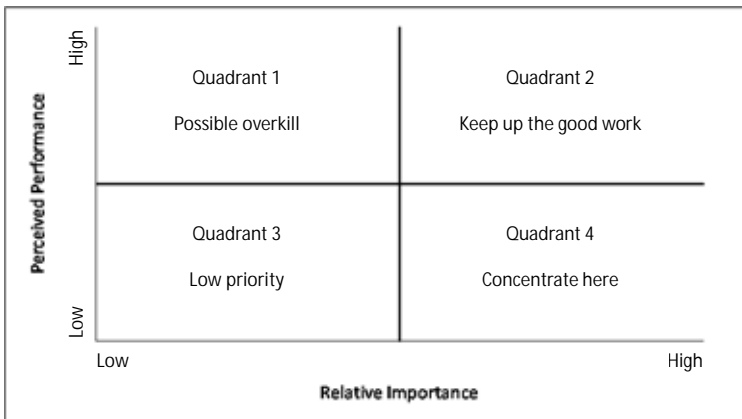


Figure 1 Importance-performance analysis grid

Quadrant 1 contains attributes that are insignificant strengths of the TLC evaluation procedure and suggests areas where resources could be withdrawn and better used elsewhere: 'possible overkill'. Quadrant 2 contains attributes that are strengths of the procedure and calls for 'keep up good work'. Attributes positioned in Quadrant 3 are not performing exceptionally well, but are considered to be relatively unimportant. They do not represent a threat to the TLC evaluation: 'low priority'. Attributes located in Quadrant 4 represent key challenges that require immediate corrective action and should be given highest priority: 'Concentrate here' (Bacon, 2003; Matzler, Sauerwein and Heischmidt, 2003). This research was based on the framework of Lai, Ivan Ka Wai and Hitchcock (2015) to ensure a reliable and valid way of research.

3.1 Questionnaire Design

This paper is applying the updated DeLone and McLean model for evaluating information systems' (IS) success as a framework to guide the identification of the critical attributes to be evaluated. It was selected because it is well validated and its six interrelated dimensions (figure 2) ensure a multi-dimensional identification of attributes. This model has been successfully applied in diverse research settings, including beyond the IS domain (Wang, 2008; Baraka, Baraka and EL-Gamily, 2013; Bossen, Jensen and Udsen, 2013).

The success of IS ('Net benefits') depend on the intervening variables ('Use' and 'User satisfaction'), which in turn depend on the quality of 'Information', 'System' and 'Service' (Eom, et al., 2012). The initially broad eval-

uation model was subsequently developed to focus on the relationship between the three quality dimensions and 'use' on the one side, and 'user satisfaction' on the other side (highlighted arrows in figure 2). In this work, the relevant dimensions of the DeLone and McLean IS success model can be applied to the TLC evaluation environment as follows: 'Information quality' is concerned with whether the data are relevant, complete, accurate, etc. 'System quality' addresses the performance in terms of functionality, flexibility, ease of use etc. 'Service quality' addresses the support of users (e.g. user training). 'User satisfaction' measures the level of acceptance by the users (DeLone and McLean, 2003, 2004).

Within this conceptual framework, specific attributes were identified from a comprehensive literature review concerning TLC in international sourcing. 830 identified articles have been reviewed to identify a comprehensive set of attributes, which have been clustered and afterwards mapped to the relevant dimension. Service quality attributes were not discussed.

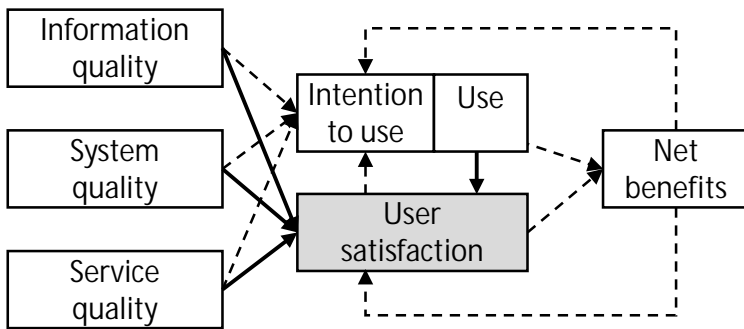


Figure 2 Updated IS Success Model (based on DeLone and McLean, 2003)

Due to survey length restrictions, a high level of abstraction rather than specific attributes is recommended (Oh, 2001; DeLone and McLean, 2003, 2004). The number of attributes was reduced to nine through expert interviews with purchasing and supply chain managers as well as logistics consultants. All interviewees had more than five years of work experience. Table 1 presents the complete list of relevant attributes.

Table 1 Questionnaire Attributes

Attribute		Brief description
Information quality		
1	Development of TLC	Cost development because internal (e.g. purchasing volume) and/ or external factors (e.g. oil price) change
2	Accessibility of cost information	Effort for data collection and data preparation
3	Up-to-dateness of cost information	Appropriate updating of evaluation base, surcharge rates etc.
4	Plausibility of TLC	Amount and composition of the costs can be understood
5	Documentation of TLC	Appropriate documentation of the results

Attribute		Brief description
System quality		
6	Flexibility of TLC evaluation	Easy adaptable evaluation e.g. change of Incoterm, transport mode
7	Transparency of TLC evaluation	Cost methods, assumptions etc. are sufficiently well-known
8	Quick TLC evaluation	Sufficient responsive decision support
9	Controlling of TLC	Comparison of actual and estimated results
Use		How frequently is the TLC evaluation for international supplier selection decisions used? for nearly every decision; for a few important decisions; for some selected decisions
User satisfaction		Overall perceived performance

The next step was to conduct an online survey. To avoid a parallel set of repetitive questions to measure performance and importance within the same questionnaire, a statistically inferred method based on correlation estimation was applied (indirect importance measurement). It reflects the causal relationships between the importance of the attributes and the overall performance (Gustafsson and Johnson, 2004; Matzler, et al., 2004). The questionnaire's length could be significantly curtailed to benefit from less fatigue and higher respondent involvement. Based on discussions by

Preston and Colman (2000) as well as Lai, Ivan Ka Wai and Hitchcock, (2015), a seven-point Likert scale, ranging from performance 'very bad' (1) to performance 'very good' (7), has been adopted.

Because of a cross-border Dutch/ German research project, a specialist with economics background and fluent language skills translated the German questionnaire into Dutch. The questionnaire was pre-tested in both countries and has been adapted to minimize the possibility of misunderstanding and misinterpretation.

3.2 Participants

Of the 264 valid and usable respondents, 201 (76.1%) were German and 63 (23.9%) were Dutch companies. The sampling frame used for the German part was a list of randomly selected enterprise representatives from purchasing and logistics/ supply chain management (Hoppenstedt database). 201 of 1,883 mailed surveys were completed, representing a response rate of 10.7%. In the Netherlands, 255 mailed surveys, one stand at the Business Meets Twente Exhibition, and the usage of two association newsletters (World Trade Center Twente, VNO NCW Midden) led to 63 completed surveys. The largest company size group was the large-enterprises (41.7%), as defined by EU law, while the smallest group was that of micro-enterprises (5.3%). Small-enterprises were represented by 51 (19.3%) and medium-enterprises by 89 surveys (33.7%). The mean international sourcing share by company size was between 21% and 27%. Approximately 70% of the respondents were manufacturing companies (155), whereby trading companies (69) had a substantially higher inter-national sourcing share, with

33.6% (SD = 34.6) in comparison to 19.5% (SD = 21.8). 188 respondents are involved in international sourcing and form the basis of this analysis.

3.3 Statistical Analysis

The data derived from the survey was systematically coded and analyzed using SPSS (Statistical Package for the Social Sciences) software. The perceived performance of the different attributes was obtained through the average ratings of the respondents, while correlation coefficients were used to implicitly measure the related relative importance. According to Matzler, Sauerwein and Heischmidt (2003) and Homburg and Klarmann (2012), the relative percentage importance (w_j) is determined as the ratio of the squared correlation coefficients of the attribute (r_{j2}) to the sum of the squared correlation coefficients of all attributes (j). This 'powerful' method has three main advantages: (1) relative simple and comprehensible; (2) high popularity; (3) no negative correlations and other implausible results (Homburg and Klarmann, 2012; Azzopardi and Nash, 2013; Sever, 2015).

Preliminary reviews of the data suggested that the distribution of it might not be normal (Kolmogorov-Smirnov method), and thus non-parametric correlation coefficients were used (Kendalls Tau). To verify construct validity of the questionnaire, an exploratory factor analysis with varimax rotation, eigenvalue exceeding 1, and factor loadings exceeding 0.5 was conducted. The test value of the Kaiser-Meyer-Olkin test was 0.904, and the p-value of the Bartlett's test was zero (Lai, Ivan Ka Wai and Hitchcock, 2015). The questionnaire has also acceptable reliability with a value of

Cronbach`s alpha for each attribute greater than 0.60, except for ‘Development of TLC’ (1).

4 Results

4.1 Total Landed Cost Evaluation

Related to the first research question, a descriptive analysis concerning the TLC evaluation was conducted. 176 respondents answered the question when they evaluate the TLC for international supplier selection decisions: 50% for nearly every decision, 32% for a few important and 18% just for some selected decisions. Especially for geographically distant regions like China, more respondents evaluate the TLC for nearly every decision. In contrast, the frequency of use is independent of the Incoterm. It thus makes no difference if the delivery term is ex works, free on board, or any other. Furthermore, the scale of the TLC evaluation differs significantly. The respondents have been asked per TLC cost category if and how they evaluate them. The options have been exact evaluation, differentiated and lump sum surcharges, included in purchasing price and no evaluation. Surprisingly, several TLC elements are not considered by the respondents at all. As example, 29% do not consider costs for inspection and material handling for storage and retrieval, 36% storage costs, 29% capital commitment cost and even 41% administration costs. On the contrary, especially customs are mainly accurately calculated (41%). More than half of the respondents are not using any information system for TLC evaluation, which include integrated systems as well as application software. All in all this study has found out that the TLC evaluation is rarely used and the scope is often insufficient for

international supplier selection decisions. In the following, the overall perceived performance of the respondents is analyzed.

4.2 Overall Performance

Based on the survey data, the mean and standard deviation of overall perceived performance was 4.5828 and 1.34. This value was obtained through the average rating of the respondents. Consequently, the respondents ranked the overall TLC evaluation between 'mediocre' and 'rather well', which indicates that room for improvement exists. It should be noted that a higher frequency of use led to a statistically significant ($p=0.0005$) higher overall performance. Experiences, standardized processes, and increased number of software system users could explain the better performance. In order to find out the reasons for an amendable overall performance of 4.5828, the performance and importance of the individual attributes are analyzed.

4.3 Importance-Performance Analysis Grid

The average performance ratings for the nine attributes ranged from a high of 5.1 to a low of 4.5. All attributes had standard deviations below 1.7 and a positive impact on the overall performance, with a significant level of correlation. The implicitly derived relative importance of the attributes ranges between 3% and 15%, which is described in the following section. The result of a factor analysis was that all attributes are performance factors (Matzler, et al., 2004; Homburg and Klarmann, 2012).

After obtaining the scores of importance and performance for each attribute, the nine attributes were plotted on the IPA grid (figure 3). The quadrant

method splits the plots into four areas by using the often applied 'data-centered quadrants approach', where the empirical mean values obtained from the data determine the cross-hair point of the IP matrix (Martilla and James, 1977; Sever, 2015). As already explained, the four quadrants are identified as 'Possible overkill' (Q1), 'Keep up good work' (Q2), 'Low Priority' (Q3) and 'Concentrate here' (Q4).

The matrix in figure 3 shows that four attributes were identified in the 'keep up good work' quadrant (Q2), indicating that these attributes were perceived to be very important, and at the same time were rated as having a high level of performance. These attributes are 'Up-to-dateness of cost information' (3), 'Plausibility of TLC' (4), 'Flexibility of TLC evaluation' (6) and 'Transparency of TLC evaluation' (7). Even though all of these attributes appear in the 'keep up good work' quadrant, it was shown that performance scores were not rated very highly (i.e., all are less than 6). Some of these attributes were also at a close distance to the performance axe, especially 'Transparency of TLC evaluation' (7). According to Bacon (2003) as well as Eskildsen and Kristensen (2006), borderline attributes are not to be interpreted in the same way as attributes that fall clearly within a quadrant. "Discontinuity in the inferred priority" has to be considered (Bacon, 2003, p.58). As a consequence, more efforts could be necessary to improve these attributes. The attributes 'Development of TLC' (1) as well as 'Controlling of TLC' (9) fall within the 'low priority' quadrant (Q3). These attributes are not performing exceptionally well, but are considered to be relatively unimportant. The attribute in the upper left-hand quadrant (Q1) should command the lowest priority for improvement: 'Documentation of TLC' (5). Re-

sources could be withdrawn and better used elsewhere. Especially the attributes in quadrant 4 are considered problematic, because the TLC evaluation fails to satisfy the users' perceived level of performance in relative important areas. The attributes in this quadrant are 'Accessibility of cost information' (2) and 'Quick TLC evaluation' (8). These attributes require immediate action with highest priority.

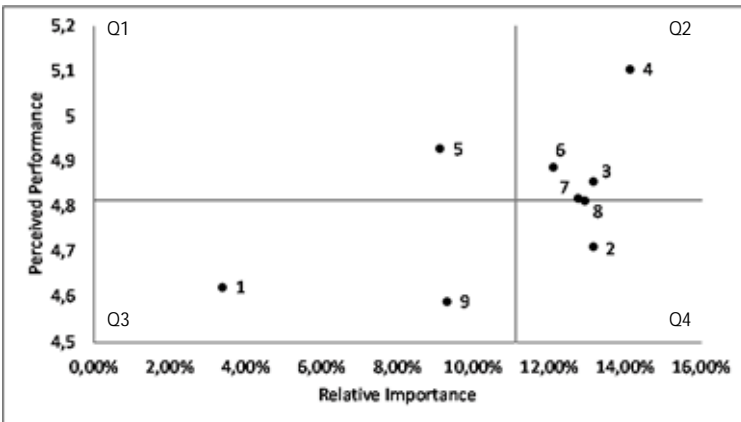


Figure 3 Importance-performance analysis grid

5 Conclusion

As international sourcing is an important business strategy, evaluating the TLC has to be seen as increasingly critical and important. The first contribution of this research was the result that just 50% of the respondents evaluate the TLC for nearly every international supplier selection decision. The fact that several TLC elements are not considered by the respondents

makes matters worse. An IPA with a unique set of attributes has been developed to shed light on the reasons of an amendable overall performance. The IPA grid provided detailed insight into the importance and performance of the selected attributes, as areas of weakness were easily identified. To summarize, reasons for an amendable overall performance are especially the attributes 'Accessibility of cost information' and 'Quick TLC evaluation'.

The sample included 264 valid and usable respondents, of which 188 respondents are involved in international sourcing. This research involved German and Dutch enterprises representing multiple industries; however, it was geographically limited, which limits the generalizability of the research findings from the current study.

A comprehensive literature review identified several cost criteria, frameworks and methods, which have been proposed and tested. However, the review suggests that the TLC evaluation is not presented with sufficient detail to prompt effective decision-making. An appropriate framework has to differentiate between consecutive supplier selection phases, select and perhaps combine the situationally best fitting methods, and additionally guide the application of them. Therefore, the amendable TLC evaluation in practice is also due to insufficient frameworks in research.

For this reason, the TLC concept is begging for answers and it is hoped that this research will stimulate the development of an appropriate framework that overcomes the limitations. An important need for action has been identified to enable companies to choose the right supplier in an international context.

However, the applied IPA grid clearly sacrifice depth for breadth and convenience; it is unlikely to provide the detailed insights (Skok, Kophamel and Richardson, 2001). The IPA grid also rely on the respondent's perception of satisfaction and not on objective values. The inability to account for such metrics should be a recognized weakness. The indirect measures are also limited by the assumptions underlying the statistical procedure. Indeed, the IPA grid is used as a preliminary research to identify attributes requiring more detailed analysis to improve the TLC evaluation in international sourcing decisions.

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