

METHODOLOGY OF LOGISTIC EVALUATION WHEN SELECTING TRANSPORTATION SERVICE PROVIDERS UNDER EXCEPTIONAL CONDITIONS

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Abstract

The present article deals with the selection of an appropriate supplier and service provider in the field of transportation and with the determination of key assessment indicators for the selection of transportation service providers. At present, the theories of logistic evaluation of material flows in the transportation segment are paid much attention due to occurrence of plenty of negative phenomena. This topic is presented in the article through a model situation in a particular company.

Keywords: Logistic evaluation, model situation, transporting service, weight

1. INTRODUCTION

In the Slovakia, there are efforts to apply the knowledge obtained in other countries and search for the best solutions for the transportation segment with the aim to offer a methodology regarding the selection of transportation service providers while accepting several indicators, often even contradictory ones, in all stakeholders, i.e. carriers, consignors, forwarders, manufacturers, as well as traders. And also to find, while considering such mass of requirements, the best solution for those who are looking for a provider of transportation services.

A service is define as an activity or series of activities of more or less intangible nature that take place in interactions between the customer and service employees [1]. Quality is the key decision-making factor for customers, when choosing from several services and means the compliance with the requirements and assurance thereof is a controlled process involving people, service systems, as well as supporting tools and methods [2]. Authors Grönroos [3] and Parasuraman [4] maintain that the perception of the quality of service is the result of a comparison of consumer expectations with actual service performance perception. The indicators of quality are importance attributes for customers [5] or also importance are the performance metrics for determining the compliance with performance-based quality contracts [6], [7], [8]. Quality of service is a significant factor of transport demand [9], [10]. The transport service quality is the ability to meet the needs of a particular customer [11], [12], [13]. The literature [14], [15], [16], [17], [18], uses various terms and applications of methods that might be used for such analysis. The assessment of the quality of a transport service provided by a particular company may be carried out while applying the method of determining the relative weights of quality criteria [19]. There are several approaches to the determination of relative weights of quality criteria importance. The determination of relative weights using the pairwise comparison is based on the determination of superiority or inferiority of a single criterion [20].

As an example, we can state the methods of key assessment indicators, the methods of logistics performance evaluation, etc. For the selected methodology of the assessment of the provision of logistics services in the field of transportation, we can use the concept of functional performance evaluation in the transportation process. This shall mean the selection of an appropriate supplier and transportation services provider so that the transportation fulfils the intended purpose [21], [22].

2. APPROPRIATE METHODOLOGY PROPOSAL

The given methodology is formulated so that it is capable of evaluation of the quality of a service provided by a provider. To select an appropriate methodology when selecting a transportation service provider, the following procedure was chosen:

- Provider selection, depending on the scope of provided services, based on the experience gained for the marketing survey: forwarding agency, carrier, logistics company.
- Selection of a transportation technology: wagon consignment, piece consignment.
- Determination of general assessment indicators in the selection of a provider in the field of transportation.
- Selection of an appropriate provider.
- Provider is selected.
- Negotiations and subsequent execution of a contract with the selected provider.

3. DETERMINATION OF GENERAL ASSESSMENT CRITERIA AND INDICATORS

To determine the assessment indicators within the provider selection, general indicators were selected in the first place (**Table 1**). The group of indicators is open and it can be supplemented anytime with new indicators “U”. The order of indicators in **Table 1** is random, i.e. the order of importance of individual indicators is not determined yet.

Table 1 General assessment indicators for the selection of a transportation service provider

Order (random)	General assessment indicators
1.	Reliability in adherence to delivery times when delivering the transported goods
2.	Total transportation time until the goods are delivered to a customer
3.	The price of transportation from a goods sender to a goods recipient
4.	Provision of regular monitoring on the current location of the transported material
5.	Insurance for the transported material
6.	Warranty for the protection of goods against loss, damage, or disturbance
7.	Simplicity and quality of negotiations on competitive prices offered by individual carriers
8.	Provider's willingness to negotiate on service alterations
9.	Provider's willingness to negotiate on price adjustments
10.	Securing the transported goods against theft
11.	A possibility to ensure pallets for the goods relocation
12.	Financial stability of a provider
13.	A possibility to agree on a payment method and conditions with regard to the provided transportation service
14.	ISO quality certificate holder
15.	Additional criteria required for a provider selection
16.	Membership in the Association of Logistics and Freight Forwarding of the Slovakia

4. CASE STUDY - A MODEL EXAMPLE OF THE SELECTION OF KEY ASSESSMENT INDICATORS (KAIS) WITH THE DETERMINATION OF THEIR WEIGHTS BY APPLYING MATHEMATICAL METHODS

Out of the general assessment indicators listed in **Table 1**, the following key assessment indicators (KAIs) were selected and listed in **Table 2**:

Table 2 Specific assessment indicators for the process of selection of a transportation service provider carried out in a company

Order (random)	Key assessment indicators
1.	Reliability in adherence to delivery times when delivering the transported goods
3.	The total price of transportation from a goods sender to a goods recipient
6.	Warranty for the protection of goods against loss, damage, or disturbance
9.	Provider's willingness to negotiate on price adjustments
14.	ISO quality certificate holder

The above specified selection of KAIs will be carried out on the basis of a defined order of importance weights. The sum of all KAI weights for a particular model example must equal to one:

$$\sum_{i=1}^u w_i = 1, w_i \geq 0 \quad (1)$$

where:

w_i - the weigh for the i^{th} indicator,

u - the number of indicators.

Let us define the order of KAI importance weights as follows: 1,3 = 6,9,14. It means that the "I"1 indicator will be the most important, followed by "I"3 and "I"6 indicators, both of equal importance, then followed by "I"9 indicator, and finally by "I"14 indicator, which is the least important.

4.1 Determination of sensitivity for the evaluation of individual indicators

By determining the indicator sensitivity, we define a point where a given indicator crosses a borderline between two evaluation results. The more closely this sensitivity is determined (i.e. the wider the range of options), the higher the explanatory power of the result.

Indicator sensitivity determination:

- a) a provider is capable of fulfilling a selected indicator exactly as required without the need to apply the agreed tolerance, a provider is capable of proposing a new qualitative or cost-effective solution,
- b) a provider is capable of fulfilling a selected indicator as required within the pre-agreed tolerance without the customer's intervention,
- c) a completely new provider with good references,
- d) a provider is capable of fulfilling a selected indicator but the limits of the agreed tolerance are exceeded, resulting in the customer's intervention,
- e) provider is capable of fulfilling a selected indicator but the limits of the agreed tolerance are exceeded and the provider waits for the customer's intervention and only then proceeds further, the provider must be constantly supervised to ensure that the contractual obligations are fulfilled,
- f) a new provider without any references,
- g) a provider is not able to fulfil a selected indicator.

4.2 Evaluation of selected key indicators an assigning sensitivity values

To evaluate KAIs, we will use the 1-5 scale, whereas the higher the value, the more the provider is able to meet the requirements of individual KAIs and the higher position the provider will hold in the final order of applicants - providers.

Evaluation:

- 5 - a provider meets our requirements without any other comments,
- 4 - a provider still meets our requirements but with minor reservations,
- 3 - a provider still meets our requirements but with substantial reservations,
- 2 - even though a provider meets our requirements to the minimum extent, we do not have any other choice,
- 1 - a provider does not meet our requirements at all and is unacceptable.

Now it is appropriate to assign a sensitivity value to the evaluation result:

- 5 - a
- 4 - b, c
- 3 - d
- 2 - e, f
- 1 - g.

The example was considering six applicants - providers. In each provider, we were separately evaluating the selected KAIs. Then we used the weights determined by applying the Saaty's matrix for the selected key indicators and by calculating their product we obtained the overall evaluation E of a particular key indicator "I" for a particular provider p .

$$E_{i,p} = v_i \cdot E_{i,p} \quad (2)$$

where :

$i = 1$ to u

$E_{i,p}$ - the overall evaluation of the i^{th} key indicator "I" of the p^{th} provider, where:

$p = 1, 2, \dots$ - the number of providers,

u - the number of indicators,

w_i - the weight of the i^{th} KAI,

$\sum Q_{i,p}$ - the sum of overall evaluations of KAIs - the resulting evaluation of the p^{th} provider.

The list of required evaluations of individual providers is shown in **Table 3**, where the providers are arranged in the order. A provider with the highest sum of KAI evaluations will hold the highest position in the order of providers and will be on the 1st place in the **Table 3**.

By comparing the resulting evaluations of providers we will obtain the order of providers. The higher the value of the sum of the resulting evaluations $\sum Q_{i,p}$, the more successful the applicant. To provide a better result review, **Table 3** was supplemented with the order of providers according to the evaluation results.

Table 3 Evaluation of individual providers

	INDICATORS					ORDER OF PROVIDERS
	"I"1	"I"3	"I"6	"I"9	"I"14	$\Sigma Q_{i,p}$
Weight w_i	0.38	0.22	0.22	0.12	0.06	
E_i evaluation of the 1 st provider	5	4	4	2	5	1.
$O_{i,p}$ overall evaluation of "I"	1.90	0.88	0.88	0.24	0.33	4.20
E_i evaluation of 2 nd provider	4	5	1	2	5	5.
$O_{i,p}$ overall evaluation of "I"	1.52	1.10	0.22	0.24	0.30	3.38
E_i evaluation of 3 rd provider	4	3	5	4	1	2.
$O_{i,p}$ overall evaluation of "I"	1.52	0.66	1.10	0.48	0.06	3.82
E_i evaluation of 4 th provider	3	4	4	5	5	3.
$O_{i,p}$ overall evaluation of "I"	1.14	0.88	0.88	0.60	0.30	3.80
E_i evaluation of 5 th provider	2	4	4	3	5	6.
$O_{i,p}$ overall evaluation of "I"	0.76	0.88	0.88	0.36	0.30	3.18
E_i evaluation of 6 th provider	5	2	3	5	1	4.
$O_{i,p}$ overall evaluation of "I"	1.90	0.44	0.66	0.60	0.06	3.66

4. CONCLUSION

In the context of the methodology of logistics evaluation of the transportation service providers was implemented the method of evaluating key assessment indicators. The Saaty's matrix was used for the determination of the weights of the selected key indicators because it is the most appropriate of the multicriteria approach. The selection of key assessment indicators and determination of their weights by mathematical methods was chosen as described herein because this method offers the widest range of point evaluation of matrix components, being thus the closest to real evaluation of weights of key assessment indicators.

At present, there are many competitors in the transportation segment and every undertaker should carefully decide which method to apply to the selection of an appropriate carrier or a consignor providing the transportation services. The present article describes one of the methods of point evaluation of potential service providers applied in a particular company; the company name is not presented herein. We all are aware of the fact that quality is the only key to successful business and thus to adequate profit. To conclude, we would like to point out that there are other options how to evaluate the quality of provided services, including the EFQM Excellence Model, emphasizing various systemic measurements.

ACKNOWLEDGEMENTS

This article is a part result of the project VEGA 1/0577/17 Transfer of knowledge from laboratory experiments and mathematical models in the creation of a knowledge based system for assessing the quality environmentally friendly conveyor belts.

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