

# The Model of Supplier Quality Management in a Transport Company

## Model menadžmenta kakvoće opskrbe u transportnoj kompaniji

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### Summary

The submitted article deals with the supplier quality management in a selected transport company in the Slovak Republic (SR). It describes evaluation of suppliers based on explicitly defined indicators in relation to the overall economic management in the given company. The evaluation model described in the final part of the article, based on the weighed amount method, is open, i.e. it can be supplemented with additional specifics characteristics depending on the needs of a specific company, and applied at the same time to other production as well as non-production companies.

### KEY WORDS

supplier quality management  
supply portfolio  
weighed amount method

### Sažetak

Ovaj članak bavi se menadžmentom kvalitete opskrbe u odabranoj transportnoj kompaniji u Slovačkoj Republici. Opisuje evaluaciju opskrbljivača temeljenu na eksplicitno definiranim indikatorima u odnosu prema cjelokupnom ekonomskom menadžmentu u danoj kompaniji. Evaluacijski model, opisan u završnom dijelu članka, temeljen na metodi izmjerene težine, otvoren je, t.j. može se nadopuniti dodatnim specifičnim karakteristikama koje ovise o potrebama specifične kompanije i primijenjuju se istovremeno na druge proizvode, kao i na neproizvodne kompanije.

### KLJUČNE RIJEČI

menadžment kakvoće opskrbe  
portofolio opskrbe  
metoda iznosa težine

### INTRODUCTION / Uvod

The key element of the success of a production company is represented by the company's relations to its suppliers. Efficient management of these relations creates strategic priorities of the company's activities, as they determine the overall economic result, the costs structure, and, of course, the overall value of the given company. Moreover, the level of execution of relations with suppliers is also affected by the company's competitiveness, productivity and production quality. The supply portfolio structure, composition and amount of individual orders depend on the demand development and customer preferences. For this particular reason it is very important to carry out regular monitoring and evaluation of the suppliers segment aimed at optimizing their portfolio on the basis of predefined indicators which can be clearly quantified. In order to achieve a relevant result we selected a transport company, which fulfils the conditions explicitly given entry parameters.

### GENERAL CHARACTERISTICS OF A SUPPLIER ANALYSIS AND SELECTION / Općenite karakteristike analize dobavljača i odabir

Analysis of the supplier segment in relation to the transport company represents identification and evaluation of conditions that serve as the basis for selecting the strategy for the purchase of the required production inputs (materials, semi-products, products), upon which the partial purchase decisions will be made and measures will be taken. In fact, it is the process of

mapping the circumstances to which the purchase activities must be adjusted so that potential opportunities are used, and, on the contrary, the risk of possible threats is minimized. Applying such method, the purchase process is able to face the unplanned confrontations (demand decrease, or supplier quality deterioration, achieving flexibility to the supply surplus on the market, exclusion of problems with suppliers, etc.) evoked either by the external or the internal environment of the transport company (Tomek, Vávrová, 2007).

Optimal selection of suppliers is even more complicated when the selection range is wider, in terms of options among the customers from foreign markets or for the purpose of foreign distribution. With a systematic process of selecting a specific supplier the transport company must make two crucial decisions (Tomek, Hofman, 1999):

**Decision 1** – decision regarding the fact whether the customer company will purchase the given product from one or more suppliers,

**Decision 2** – selection between local and global suppliers.

Increasing segment concentration determined by the sharpening international competition and the global pressure on minimizing the costs give rise to the need of constant search for foreign suppliers. Moreover, for the transport companies performing part of their production abroad the possibility to purchase materials, goods, or services directly from suppliers based in a particular foreign country represents a partial reduction of exchange rate risk (Jesný, 2010).

Each supplier (domestic or foreign) should prove their ability to provide the supplies that meet all the specifics and requirements defined in customer orders. Supplier selection only fulfils its purpose, if it is (Kubátová, 2008, Pavolová, 2010):

- **systematic**, i.e. the selection will be carried out according to the defined criteria as the basic and integral part of the purchase management,
- **comprehensive**, i.e. the selection of suppliers will include the complete set of relevant information on suppliers, as for the main parameters regarding the purchase object, location, and conditions,
- **efficient**, i.e. the selection of suppliers will be differentiated and rational means will be used for the collection and processing of the relevant information.

### THE MODEL OF SUPPLIER EVALUATION IN THE TRANSPORT COMPANY BASED ON THE SUPPLIER QUALITY / Model evaluacije dobavljača u transportnoj kompaniji temeljen na kakvoći dobavljača

The comprehensive evaluation of suppliers represents a key precondition for a customer's decision making – i. e. a transport company, regarding continuation of mutual cooperation, modification, or complete cancellation of relations with suppliers. Evaluation of suppliers represents for a transport company the identification of specific criteria based on the main indicators. Only after particular specification of these indicators of individual criteria, the evaluation process as such can be carried out. The basic criteria perceived as the set of supplier services include the following (Pražská, 2002):

- **delivery time** – expresses the time period between the two consecutive supplies. A transport company prefers the shortest possible delivery time, which facilitates creation of the smallest possible amounts of reserves on stock and the related storage costs,
- **delivery reliability** – in fact, it is the probability of adherence to the delivery time agreed in advance, or expresses the delay leading to higher costs of the delay elimination. In this respect, the most important is the reliability of operating procedures and the supplier's availability to deliver the goods,
- **delivery flexibility** – expresses the flexibility of the supplier's dispatching system response to the changing requirements and wishes of the transport company, including especially the changes in the purchased quantities, method of sale, and delivery mobilities (package type, transport alternatives, etc.)
- **quality lead** – expresses the accuracy of the delivery method and the overall status, including the package limiting the goods resistance to external effects and the damage and belongs to the most important indicators of supplier evaluation,
- **delivery price** is expressed by the price offer, or the possibility to apply quantity discounts or any other discounts by customers,
- **maturity of the invoice**.

The model management and evaluation of the supplier quality in the transport company was carried out using the weighed amount method with acceptance of the generally

applicable condition:

$$U_m(x) = \sum_{i=1}^n \alpha_i u_i(x_i)$$

where:  $\alpha_i$  – weigh of the i-criterion  $\sum_{i=1}^n \alpha_i = 1$ ,

$u_i(x_i)$  – efficiency of the i-criterion for the evaluation,

$x_i$  – result value according to the i-criterion,

$U_m(x)$  – total efficiency of the evaluated solution, stability index,  $m = 1, 2, 3, \dots$

Each selected criterion is assigned certain weigh  $\alpha_i$ , whereas  $\sum \alpha_i = 1$ . The relations between weighs express the ratio of the supplier quality evaluation criteria importance. The higher value assigned to the criterion, the higher importance of the criterion when selecting the optimal supplier. This condition applies, as we were solving the given problem on the basis of the maximization principle.

Consequently, in case of existing suppliers, individual criteria were also assigned certain points  $u_i$  within the range of the so called cardinal rate from the interval  $KM \in \langle 0, 10 \rangle$ . The more points were assigned to the evaluated criterion, the higher probability that the criterion is met by the supplier. The points were multiplied with the weighs and the points and weighs product sum determines the optimal supplier.

The above defined criteria for the supplier quality were assigned the weighs that express their importance in relation to the transport company's preferences. The weigh with the value 1 evaluates the given criterion compared to the evaluated criterion as significantly more important; whereas, on the contrary, the weigh 0 assesses the given criterion as less important, in comparison to the evaluated criterion. In case of weighs of 0.5 the value of the compared criteria corresponds to the equal importance in relation to the transport company's preferences (Tab. 1).

Table 1 Supplier Quality Criteria Importance Weighs Quantification Matrix

Tablica. 1 Matrica važnosti količine po težini prema kriterijima kakvoće opskrbljivača

criteria / interaction	delivery time	delivery reliability	quality lead	delivery price	delivery flexibility	maturity of the invoice	amount	weigh [%]
delivery time	X	0.5	0	0.5	1	0.5	2.5	16.13
delivery reliability	0.5	X	0.5	1	1	0.5	3.5	22.48
quality lead	0	0.5	X	0	1	0.5	2.5	16.13
delivery price	0.5	1	1	X	1	1	4.5	29.03
delivery flexibility	0	0.5	0	0	X	0.5	1.0	6.45
maturity of the invoice	0	0.5	0.5	0	0.5	X	1.5	9.68

Source: Authors

The result of the above criteria importance analysis in the supplier quality evaluation facilitated elaboration of the descending sequence of partial criteria for the evaluation of overall quality of suppliers of the transport company as follows:

1. delivery price,
2. delivery reliability,
3. delivery price, quality lead
4. maturity of the invoice,

5. delivery flexibility.

On the basis of the identified criteria we were assessing the selected suppliers of the transport company applying the multi-criteria weighed amount method, result of which is shown in the table below (Tab. 2). As the criterion for the supplier evaluation selection we chose the size of the supplier portfolio. Upon this criterion we chose the largest suppliers of cable assemblies and electronics for the selected transport company and we subsequently assessed their supplier quality (Tab. 2). Results of the supplier quality evaluation pointed out the most advantageous supplier of cable assemblies and electronics which is the supplier A, as they achieved the highest numbers of points (7.797). On the contrary, the supplier with the lowest number of points which had the lowest rate of meeting the partial criteria for the supplier quality evaluation is the supplier D (5.316).

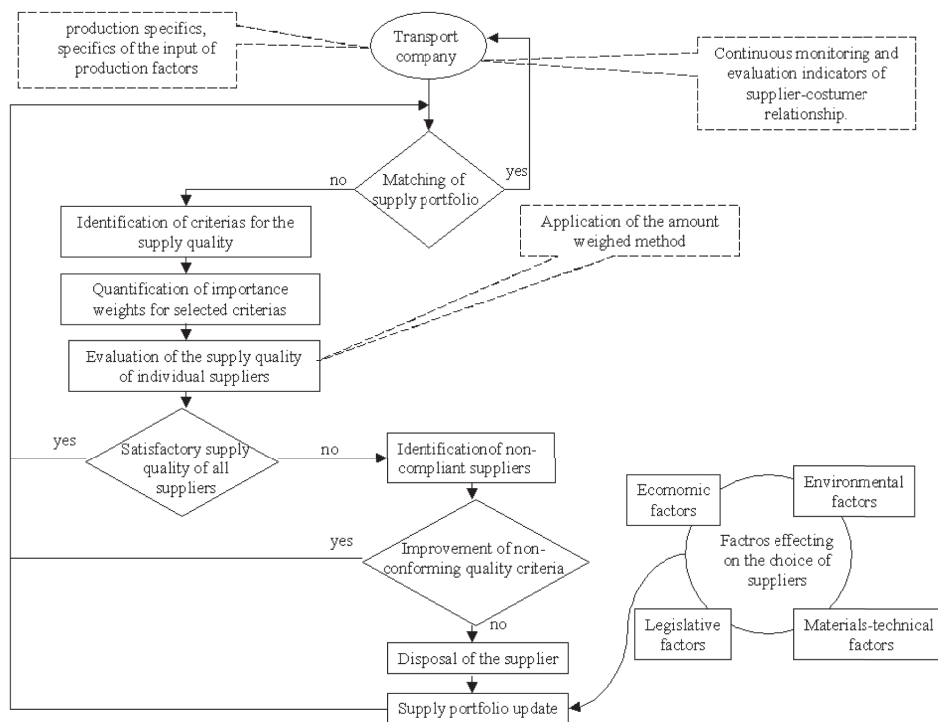
On the basis of the performed analysis we suggested the supplier quality management model, the integral part of which is also the matrix of multi-criteria evaluation of individual supply criteria (Fig. 1). This matrix can be complemented by additional criteria under which decisions can be done (an integral part of the management of relations with suppliers) on the optimal

choice of supplier in the analyzed transport company. The matrix expressing supplier quality evaluation enables the transport company to rank suppliers based on pre-defined criteria explicitly that determines the potential alternatives of necessary optimum supplies. The matrix is generally adaptable to other companies of manufacturing and non-manufacturing nature that is given to raising the quality of the supply. Based on the results of the analysis of the matrix structure and delivery of quality assessment it can be concluded that the proposed model considers not only the transport company's internal requirements, ktoré vyplývajú z vykonanej analýzy, but also the aspects of external environment affecting the relations with suppliers. At the same time, it is designed as an open model which can be supplemented with more requirements regarding the evaluation of the supplier quality criteria by the transport company as well as the constantly changing conditions of the external environment (Fig. 1) that the company itself can not directly influence. According to our proposed model of the management of the supply quality it is an essential criterion for this process of constant monitoring of the supplier portfolio prior to changing and adapting to the changing requirements of the manufacturing company itself.

Table 2 Supplier Quality Evaluation in Selected Suppliers  
*Tablica 2. Evaluacija kakvoće kod odabranih dobavljača*

Criterion	Weights	Supplier A		Supplier B		Supplier C		Supplier D		Supplier E	
	$\alpha_i$	$u_i$	$\alpha_i u_i$	$u_i$	$\alpha_i u_i$	$u_i$	$\alpha_i u_i$	$u_i$	$\alpha_i u_i$	$u_i$	$\alpha_i u_i$
delivery time	0.1613	10	1.613	10	1.613	10	1.613	10	1.613	10	1.613
delivery reliability	0.2248	9	2.0232	8	1.7984	8	1.7984	7	1.5736	8	1.7984
quality lead	0.1613	6	0.9678	5	0.8065	6	0.9678	5	0.8065	8	1.2904
delivery price	0.2903	8	2.3224	5	1.4515	5	1.4515	2	0.5806	4	1.1612
delivery flexibility	0.0645	6	0.387	4	0.258	4	0.258	4	0.258	4	0.258
maturity of the invoice	0.0968	5	0.484	7	0.6776	4	0.3872	5	0.484	5	0.484
Sum	$\Sigma 1$		$\Sigma 7.797$		$\Sigma 6.605$		$\Sigma 6.476$		$\Sigma 5.316$		$\Sigma 6.605$

Source: Authors



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Figure 1 Supplier Quality Management Model in a Selected Transport Company  
*Slika 1. Model menadžmenta kakvoće opskrbe u odabranoj transportnoj kompaniji*

## CONCLUSION / *Zaključak*

The fundamental precondition for the successful business in each transport company is the efficient management of the supplier quality that has a direct impact not only on the company's competitiveness, but also its image. Efficient management based on constant monitoring and regular evaluation of explicitly predefined partial criteria for the supplier quality of individual suppliers will enable each company to respond in a flexible manner to the changes in the preferences in the internal as well as external environment. It will also facilitate optimization of the company's cost structure (while accepting the economic criterion of the company management) which will be reflected also in the economic efficiency of the entire performed business activity.

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