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ASSESSING THE STATUS OF PURCHASE IN THE VALUE CHAIN

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Abstract

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The present paper is concerned with the following questions: what are the advantages and disadvantages of the method of complex evaluation (MCE) scoring model as compared with that designed by Tomek. Both scoring models are compared (MCE and Tomek) presenting the results using a simple illustrative case study. The criteria for evaluating the scoring model variants include: the amount of information necessary, level of difficulty, details of the results, the object comparison.
A single illustrative case study is used. This paper is concerned with presenting the scoring model for evaluating the existing suppliers in the first instance for production enterprises. Other existing scoring-models aren't present and compare.
This paper aims to compare the scoring model by Tomek and that of the method of complex evaluation (MCE) by Chytilova. Other scientific aim of this paper consists in the description of business conditions which MCE is suitable.
The result of this paper is the description of differences in evaluation processes between two scoring-models (by Tomek and MCE) presenting the advantages and disadvantages of MCE. The comparison of the scoring model variants focuses on formulating the conditions of business under which MCE is more suitable than the scoring-model by Tomek.
This paper is concentrates on middle-sized production enterprises. It is oriented towards the evaluation of suppliers in the first instance. It only compares the supplier evaluation processes used by the enterprises. For illustration purposes data from enterprise managements are used. Only the existing suppliers are evaluated in this paper.

Keywords: existing suppliers' evaluation, value chain, scoring-model, supply chain management, production enterprise, supplier in the first instance

INTRODUCTION

At present, building a strong and flexible supply chain is considered fundamental for a successful business. There are several methods of supplier evaluation. A scoring model is seen as the basic method. There are several views on the choice of evaluation criteria.

Therefore, currently SCM is playing an important role. The objective of SCM is to achieve efficient use of all resources entering into the process, timely delivery of all goods and services, speeding the process, minimizing downtime and zero losses. (Christopher, M., 2005).

According Jiří Koleňák, František Milichovský (2010) situation, often called the global financial and economic crisis, creates a new dimension of competition because the above mentioned hyper-competition on the markets, which is due to developed logistics and informatic technologies causing lower barriers for entry into these fields, is now still more intensive as the total volume of businesses is smaller. This situation, often called the global financial and economic crisis, creates a new dimension of competition because the above mentioned hyper-competition on the markets, which is due to developed logistics and information

technologies causing lower barriers for entry into these fields, is now still more intensive as the total volume of businesses is smaller. (Koleňák, J., Milichovský, F., 2010)

According to Milan Zelený (2006), the current business conditions can be characterized by the following:

- Large companies become networks of outsourced resources. Small companies are grouped into alliances, partnerships and cooperation networks. Traditional company transforms into a flexible business network. For building a strong business network, a certain amount of information on suppliers (first instance) and subcontractors (higher degrees) is required.
- Cooperation supplements or replaces competition. While the enterprises in the network or alliance cooperate, it is the networks that compete with each other. Because of this, choosing suppliers in the first instance is one of the basic steps in building a supply chain.
- Global customers require more and more products and services "tailored". Mass customization and individualization are replaced by mass production. Selling first and then custom-produce is a new paradigm of global competitiveness.
- Increasing outsourcing creates long-term, stable relationships. The success of companies increasingly depends on partnerships with suppliers and customers.
- Co-location. The customer does not buy just parts and components, but also functional parts and components.
- Small and medium enterprises build cooperation networks. They are actually the necessary environment for effective outsourcing and offshoring. (Zelený, M., 2006).

1 LITERATURE REVIEW

1.1 The Mistakes of Supply Chain in Small and Medium-sized Enterprises

The present paper is concerned with small and medium industrial enterprises. A small and medium enterprise is newly defined by the Commission Regulation (EC) No. 364/2004, of 25 February 2004 which provides an additional subdivision:

- Micro enterprise – up to 10 employees, annual turnover or balance sheet total of up to 2 million EUR.
- Small-enterprise – up to 50 employees, annual turnover or balance sheet total of up to EUR 10 million.
- Medium Enterprise – up to 250 employees, annual turnover of 50 million or balance sheet total of up to EUR 43 million. (European Commission, 2004).

According to Sixta Joseph, Mačát Václav (2005), the most serious mistakes of the supply chain can be divided into the following types:

- lack of inventory control,
- lack of flexibility,
- inadequate network configuration,
- poor layout of the plant,
- insufficient information on costing,
- Poorly defined measurements and poor allocation of responsibilities,
- not rational base of suppliers. (Sixta, J., Mačát, V., 2005).

1.2 Selection Criteria of Evaluation

- According to Jafar Razmi, Hamed Rafiei, Mahdi Hashemi (2009), evaluation criteria can be divided into:
- price, C1;
- quality, C2;
- time of production, C3;
- position the enterprise, C4;
- history of the enterprise, C5,
- the economic status of the enterprise, C6.

In the next step, the criteria are grouped together into two groups: the status of the company (including C1, C2, C3) and business performance (including C4, C5, C6) (Razmi, J., Rafiei, H., Hashemi, M., 2009).

- Amy H. I. Lee, He-Yau Kang b, Chang-Fu Hsu, Hsiao-Hung Chu (2008) describes the current environmentally oriented criteria: use of technologies friendly to the environment (C1), use of materials, environmentally friendly (C2), the share of "green" market (C3), partnerships with green organizations (C4), the management focused on the practice green (C5), compliance with environmental policy (C6), participation in green projects (C7), staff training (C8), lean planning processes (C9) and others (Lee, A. H. I., Kang, H.-Y., Hsu, C.-F., Hung, H.-C., 2009).
- M.-H. Shu, Wu H.-C. describe a quality-oriented method of supplier choice, (Shu, M.-H., Wu, H.-C., 2009).
- Ceyhun Araz, Irem Ozkarahan referring to De Toni and Nassimbeni (2001) present a structure for assessment of joint planning with the contractor. It is, for example, the level of simplicity support, the selection of components to support the design of production/assembly operations, etc. The use of these techniques leads to a substantial quality improvement, cost reduction, and timely delivery performance (Araz, C., 2006).
- The most popular criterion is quality, followed by delivery terms, price/cost, capacity, service management, technology, research and development, finance, flexibility, risk and safety, environmental management. 68 articles (87.18%) describe the quality as a basic criterion in evaluating suppliers. Specialised papers mention various quality attributes such as "adherence to quality", "continuous improvement", "Six Sigma programs", "service

quality", "experience with the quality of services" and other.

The second most popular criterion is delivery conditions (64 articles or 82.05%). Its attributes are presented as "fitness delivery date", "due respect", "degree of closeness", "delivery, and location", "delivery time", "reliability of supply", "geography" and more.

The third most popular criterion is the price/cost (63 articles or 80.77%). Attributes are presented as "cost competitiveness", "ability to reduce costs", "total cost of supplies" and others (Ho, W., Xu, X., Dey, P. K., 2009).

1.3 Scoring Model for Supplier Evaluation

Scoring models are among the basic evaluation methods.

A scoring model is based on score calculation of suppliers. The highest score determines the most suitable supplier. The total score of a supplier is the sum of the values all the evaluation criteria.

In this paper, attention will be paid to comparing the scoring-model as presented by Tomek (1999) and that based on the Method of Complex Evaluation (MCE) by Chytilova, Jurova (2010). Those two scoring models have different calculation bases.

1.3.1 Scoring Model by Tomek

This method consists in scoring the main indicators of supplier performance. The resulting score for each supplier is calculated as follows:

$$A_j = \sum_{i=1}^{n} a_i b_{ij} , \quad (1)$$

where

A_j... the total number of supplier's points j,

a_i.... the weight of criteria i,

b_{ij}... the performance evaluation of supplier j according to criterion i,

n.... the number of evaluation criteria.

A weight can be assigned to each criterion. The total point value of each supplier is obtained as the sum of the products of scores and weights for each criterion.

The resulting total score can be compared with the valuations of other suppliers. The higher the total number of points of a supplier, the better the supplier meets the needs and specifics of the business.

However, the overall high rating of a supplier should not cover defects that could adversely affect the future ability of suppliers to meet customers' requirements (Nenadál, J., 2006).

An example of applying the scoring model by Tomek is presented in Tab. I.

1.3.2 The MCE Scoring Model

Evaluation of existing suppliers and contractors selected by the customer includes the following evaluation groups:

Delivery Time

In this group the terms of delivery of time-related conditions and prices are evaluated. This group of evaluation criteria will have a relatively high weight for companies that focus on shorter delivery time such as major distributors at companies that implement their production only in one operation, mostly the final assembly.

The Expertise of Suppliers

This group of evaluation criteria focuses on the expertise of suppliers in the first instance. At the same time, it takes into account the supplier's product certification, certification of production processes, time to market and their own experience with the accuracy of product and delivery time. This group of evaluation criteria will have the greatest weight for companies that manufacture products with high precision the product parameters, for companies that place emphasis on the quality of the finished product. This group of evaluation criteria will be a priority for enterprises with manufacturing innovative and high-technology products.

I: *Example of applying the scoring model by Tomek*

Evaluation criterion	Index	Supplier		
		X	Y	Z
A. Quality (weight 45)	Number of error-free supply of the 30	22.0	25.0	18.0
	Share in%	73.3	83.3	60.0
Points	Share X weight	33.0	37.5	27.0
B. Price (weight 30)	Average price over the past thirty supplies in CZK	160.0	180.0	100.0
	Reciprocal index	62.5	55.5	100.0
Points	Index X weight	18.8	16.7	30.0
C. Reliability (weight 25)	The total delay in delivery for the last 30 days	190.0	105.0	160.0
	Reciprocal index	55.3	100.0	65.6
Points	Index X weight	13.8	25.0	16.4
Total evaluation		65.6	79.2	73.4

Source: Tomek, 1999

Costs

The evaluation group focuses on the sum of all the costs of a particular supplier. It is the only assessment group in which a smaller value brings a higher evaluation in the overall rating for selection. For enterprises trying to achieve a smaller price for the end user this evaluation group will have the greatest weight. This group of evaluation criteria will assign the greatest weight to enterprises whose product does not require unique semi-products that do not require high precision parameter in semi-products finished products while the competition is strong in a given region.

Transportation

This evaluation group includes arrangements for the delivery of a product in the region. The scarcer the supply of a product, the less firm focuses on the distance to the supplier. In the case of a relatively affordable product, the manufacturing company rather focuses on the distance to the supplier. This group also includes evaluation criteria and conditions of the possibility of shortening delivery times. The transportation evaluation criteria group will assign the greatest weight to businesses that choose the product of delivery from a highly competitive market.

Flexibility of Supplier

The flexibility of supplier evaluation group includes the evaluation of the existing methods of implementing broader and deeper cooperation with the suppliers in the first-instance. This group of evaluation criteria emphasizes the flexibility of the relationship with the first-instance supplier. Mobility means the possibility of a potential transfer of activities (operations) with flexible payment terms. This group of evaluation criteria will assign the greatest weight to companies manufacturing products precisely specified in the contract and/or products that are a prerequisite for continuous innovative development.

The Results of the Audit of the Existing Suppliers (Process Organization Level)

This group of evaluation criteria focuses on the quality of processes occurring in the company. The quality is assessed on the basis of the results of the enterprise's own audit of the supplier. No self-evaluation takes place. This group of evaluation criteria will assign the greatest weight to businesses that require the most common suppliers of activities (operations).

2 METHODOLOGY

2.1 Selected Research Method

Case study research is an inductive research method. It is usually accompanied by an analysis of qualitative data. (Collis and Hussey, 2003). A case study is considered the emerging prototype – explorative research (Líška, V., 2009), characteristic of qualitative research. Yin, Collis and Hussey distinguish five types of case studies:

- Research (exploratory) – used in areas where there are few theories and there is a lack of knowledge.
- Descriptive (descriptive) – the aim of these case studies is to describe the limitations of current practice.
- Illustrative – the purpose of the illustrations (sample) of new innovative processes, applied in specific companies.
- Experimental – This approach examines the difficulties in implementing new procedures and techniques in organizations and also evaluates benefits.
- Explanatory – existing theory is used to explain what is happening.

In terms of the design, case studies can be divided into single type case studies and multiple case studies (comparative) (Yin, 2003).

To present the results of this paper, the format of a single illustrative case study was chosen.

Single illustrative case study using changed data from a real middle-sized enterprise will help to compare two scoring-models of suppler evaluation.

2.2 Research Questions

The research question of this paper is: what are the advantages and disadvantages of MCE as compared with the scoring-model by Tomek? The paper compares the above two scoring models.

The criteria for comparing the two scoring model variants are:

- amount of the information necessary,
- level of difficulty,
- how detailed the results are,
- object of comparison.

3 RESULTS

3.1 Description of Information on the Company

1) The Business Conditions

NPO SpecTehMash has existed for several years. Currently, 80 percent of the production company is producing for the needs of the oil industry; in particular, the company consists of production shafts for electric submersible pumps.

The main type of activity – mechanical machining shafts for electrical submersible pumps of certain physical characteristics (size, water resistance, hardness, smoothness).

In the region a total of about 20 companies exist offering the same products and services of the same scope.

The company clients are medium-sized enterprises that fulfil orders for larger companies. The customer then assembles the rods to manufacture the final product.

Characteristics of the product-range requirements: as in most enterprises engaged in manufacture, SPECTEHMASH is trying to satisfy each customer. On the other hand, it has a limited production capacity. At present, it expanded its production capacity with new production facilities through which products can be produced of different sizes.

The product range means the range of dimensions, hardness, shafts, shaft diameter, related services, new product development, transport, inspection, machining services of individual preparations. The customer requirements differ in their diversity.

2) Preferred Evaluation Criteria when Selecting Suppliers

The priorities of the evaluation criteria vary depending on the changing customer requirements. These may price or quality.

For MCE evaluation, weights of the evaluation criteria groups were determined by the purchase priorities.

In quality is the focus, additional weights of evaluation criteria groups were determined (Tab. II).

3.2 Evaluation with the Scoring-model by Tomek

The result of the evaluation using a scoring-model by Tomek is presented in Tab. III.

The weights of evaluation criteria in Tab. III are determined in compliance with those used in Tab. II. At the demand of the company management, the values presented are not real.

3.3 Evaluation Using an MCE Scoring-model

The weights of evaluation criteria in Tab. III are determined in compliance with those used in Tab. II. The result of both methods is the same; the most suitable supplier in current conditions is the S1. MCE scoring model is oriented to compare with average values. Average value in the total evaluation result is 1. If supplier will have value less than 1 it means that this supplier is subnormal. If supplier will have total value result more than 1 it menas that that supplier is above-average. More of the total evaluation result exceeds 1 means more appropriate of supplier. The total evaluation result cannot be negative.

The values in the group The results of the audit existing suppliers (level of organization of the production process) are subjective and based on enterprise determined scale.

The evaluation using an MCE scoring-model is presented in Tab. IV.

II: *Weights of evaluation criteria groups. Spectehmash*

Evaluation criteria group	Weight
Delivery time	0.1
Expertise of suppliers	0.25
Costs	0.2
Transportation	0.1
Results of the audit of the existing suppliers (level of process organization)	0.2
Flexibility of supplier	0.15
Total	1

Source: our own processing

III: *The result of evaluation using a scoring-model by Tomek*

Evaluation criterion	Index	Supplier	
		S1	S2
A. Quality (weight 25)	Number of error-free supply of the 100	92	91
	Share in%	92	90.91
Points	Share X weight	23	22.73
B. Price (weight 50)	Average price over the past thirty supplies in CZK	160	180
	Reciprocal index	100	88.89
Points	Index X weight	50	44.44
C. Reliability (weight 25)	The total delay in delivery for the last 30 days	130	100
	Reciprocal index	76.92	100
Points	Index X weight	11.54	15
Total evaluation	84.54	82.17	

Source: our own processing

IV: *The result of evaluation using an MCE scoring-model*

Weight	Group	Evaluation criterion	Evaluation index	Coefficient	S1	S2
	Delivery time	Compliance the period of application of material element in the operating conditions and the average delivery time	The period of application of material element in the operating conditions		5	7
			Average delivery time		5	7
			Calculation	0.05	0.035	0.068
		Possibility transport vehicle to the supplier + time transportation	Possibility		0	0
			Time of transportation		0	0
			Calculation	0.05	0	0
		Possibility shorting lead times and associated conditions	Possibility shorting lead times		0	1
			Shorting lead times		0	3
			Associated increasing price		0	1
			Calculation	0.05	0	0.1
0.15		**Calculation**			**0.035**	**0.168**
	The expertise of supplier	Certification	Existence compulsory quality certificates		1	1
			Existence voluntary quality certificates	0.0375	0	2
			Calculation		0.019	0.056
		Supplier position on markets	Time on market	0.019	6	4
			Calculation		0.023	0.015
		The reliability of supplier	Actual number of supplied pieces		115	100
			Planned number of supplied pieces	0.075	125	110
			Calculation		0.069	0.068
0.15		**Calculation**			**0.11**	**0.139**
	Costs	Index the full cost of purchase	Purchasing value		25	15
			Transport costs		1	5
			The cost of packaging		2	2
			The cost of storage		1.5	3.1
			Costs tariff	0.3	0	7
0.3		**Calculation**			**0.209**	**0.192**
	Transportation	Distance to supplier	Distance to supplier, km	0.2	14	1
0.2		**Calculation**			**0.56**	**0.04**
	The results of the audit existing suppliers (level of organization of the production process)	The level of management	Management's responsibility		3	5
			Training and staff		2	4
			Financial considerations in quality management		2	4
			Process safety	0.033	5	5
			Calculation		0.053	0.08
		The level of organization of production process	Spatial resolution		2,5	4
			Information security		2	5
			Course material flow	0.067	3	4
			Calculation		0.073	0.127
0.1		**Calculation**			**0.127**	**0.207**
	Flexibility of supplier	Possibilities	Possibility of online orders		0	1
			The possibility of modification of the product under the company claim		0	1
			The communication options in creating custom-made product		1	1
			The possibility of transfer activity		0	1
			The possibility of deferred payment	0.05	0	1
			Calculation		0.042	0.208
		Associated costs	Associated costs	0.05	4	3
			Calculation		0.086	0.064
0.1		**Calculation**			**0.127**	**0.273**
		The evaluation result			**1.168**	**1.019**

Source: own processing

4 DISCUSSION

The following are the disadvantages of MCE:

- A large amount of information (intensive collection) is necessary.
- It helps choose the supplier type rather than a vendor.

The following are the advantages of MCE:

- When using MCE to select suppliers, what is used for evaluation is the average relationship.
- MCE makes it possible to compare the overall competitiveness of individual suppliers in the first instance as seen by the enterprise (first-instance customer).

As compared with the scoring model by Tomek, MCE has several distinct features:

- MCE uses comprehensive evaluation criteria to assesses suppliers.
- MCE compares the values of individual suppliers with the average.
- MCE focuses on the diversity of the requirements of the potential customers.
- MCE takes into account the compliance of the time of use in operating conditions with delivery time.

Under conditions similar to those at the company presented in this paper, MCE can be seen as a better scoring model than that by Tomek.

SUMMARY

The article is built on in order to find an answer on the status of the purchase in the value chain of supply levels. For evaluation method was used Scoring model.
This paper aims to compare the scoring model by Tomek and that of the method of complex evaluation (MCE). Other scientific aim of this paper consists in the description of business conditions which MCE is suitable.
The evaluation was carried out on the example of one purchase situation.
Results are indicative and primarily involve of an evaluation the intensity.
The results of the comparison of the scoring-models presented are:

1) Amount of the information necessary

Collecting data for MCE is more difficult compared with the scoring model by Tomek.

2) Level of difficulty

With MCE, carrying out the evaluation is slightly more difficult compared with the scoring model by Tomek.

3) Details of the results

MCE provides more comprehensive results in comparison with the scoring-model by Tomek.
The results can then be used to carry out a comprehensive analysis of suppliers and to choose the most suitable option.

4) Object of comparison

Scoring using the model by Tomek is based on the absolute values of suppliers in individual groups.
Scoring using the MCE model is based on a reciprocal comparison of average values in the selection.
The MCE-scoring model helps choose the existing suppliers in the first instance.
It can be used for repeated purchasing of materials and semi-products.

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