Секция: Логистика.

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SUPPLIER SELECTION METHODS IN SUPPLY CHAINS

The completion between companies is taking a whole new level: “Companies don’t compete, supply chains compete”. And one of the most essential things about creating reliable supply chain is the process of selection suppliers.

The literature on supplier selection methods is full of various analytical approaches; I will observe some of the basic methods utilized for selecting the suppliers, which are: weighted point, cost ratio, categorical, analytic hierarchy process. The main goal is to find the most appropriate and universal method for supplier evaluation.

As selection criteria I will use the most common [1, 17], which is: price, quality, financials, and technical capability.

Weighted Point Method.

Weighted point methods is widely used to select suppliers, this method consider criteria that are weighted by decision maker. After criteria were weighted, decision maker should rate each supplier against all criteria and multiply the scores with their weights. The higher total score belongs to better supplier.

The example is shown in Table 1.

Table 1. Weighted Point Method

Criteria	Weight	Grade (1-10)	Total Score
Price	0,30	8	2,4
Quality	0,35	7	2,45
Financials	0,10	3	0,3
Technical capability	0,25	4	1
Total	1,0		6,15

Cost Ratio Method.

The cost-ratio provides a total cost approach. Costs should be identified by different categories for each supplier: "The higher the ratio of costs to shipment, the lower the rating applied to the supplier" [2, 204].

Categorical Method.

With this approach, suppliers are evaluated on a set of criteria as previous methods. But this method is qualitative, decision maker categories suppliers as "preferred", "satisfactory" or "neutral"[4, 354] for each criterion, and after overall rating (using three options again) suppliers will be sorted into three groups. The supplier with maximum score (preferred/satisfactory) should be selected.

Analytic Hierarchy Process Method.

Analytic Hierarchy Process is comprehensive method that required information "regarding the relative importance of one criterion versus another criterion and similarly regarding the relative preference for one supplier versus another on a criterion."[3, 82] Example of such comparison is shown in Table 3.

Table 2. Comparison: Criteria

Criteria	Price	Quality	Financials	Technical capability	Geometric Mean*	Normalized weight**(1)
Price	1,00	0,50	0,20	0,11	0,32	0,05
Quality	2,00	1,00	0,20	0,14	0,49	0,08
Financials	5,00	5,00	1,00	0,25	1,58	0,25
Technical capability	9,00	7,00	4,00	1,00	3,98	0,62
					6,38	100%

* $\sqrt[4]{1{,}00 \times 0{,}50 \times 0{,}20 \times 0{,}11} = 0{,}32;$

** $0{,}32 \div 6{,}38 = 0{,}05$

After comparison consistency should be checked. We need additional two columns to calculate *Consistency Index* (CI).

Table 3. Additional columns

Matrix×Vector (2)	(1) ÷(2)
0,21	4,09
0,32	4,14
1,04	4,20
2,61	4,18

$$CI = (\lambda\max - x) \div (x - 1),$$

$$where\ x\ is\ quantity\ of\ criteria$$

Consistency Index should be less than 0,1.

$$\lambda\max = (4{,}09 + 4{,}14 + 4{,}20 + 4{,}18) \div 4 \approx 4{,}15$$

$$CI = (4{,}15 - 4) \div (4 - 1) \approx 0{,}05$$

The similar table should be made for supplier versus another on a criterion. For example, we could compare suppliers on a criterion “Price”.

Table 4. Comparison: Suppliers

Supplier	S1	S2	S3	Geometric Mean	Normalized weight (NW)
S1	1,00	0,2	0,4	0,4	0,10
S2	6,00	1,0	1,0	1,8	0,50
S3	3,00	1,0	1,0	1,4	0,40
		Λmax=3,05	***CI=0,027***	3,6	100%

When normalized weights for each supplier on each criterion will be, total score could be calculate by multiplying criterion's NW on supplier's NW on relevant criterion. The total score will be the sum of all obtained values of each supplier.

Pros and Cons of Supplier Selection Methods.

Table 5. Pros and Cons of Methods

Method	Pros	Cons
Weighted Point Method	Criteria are given different weights; Easy to implement; Combines qualitative and quantitative criteria;	Could be subjective;
Cost Ratio Method	Provides a total-cost approach	Hard to identify all costs (internal and external); Focus only on cost criterion;
Categorical Method	Requires minimum efforts; Low-cost method;	The same weight of criteria; Subjective, so less reliable;
Analytic Hierarchy Process Method	The most comprehensive; Objective, most reliable; Combines qualitative and quantitative criteria; Criteria are given different weights;	Requires complex calculations and data; Time consuming;

In this work, I have briefly described some of supplier selection methods and investigated its advantages and disadvantages. In my opinion, AHP could give more useful and objective results although this method requires some complex calculation.

Reference

1. Chengjing, Jounio. Supplier Selection Based On AHP Method / Jounio Chengjing // 2013 – 63 p.
2. Gopalakrishnan. Purchasing and Material Management / Gopalakrishnan // 2006 – 443 p.
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4. Umit S. Bititci, Allan S. Carrie. Strategic Management of The Manufacturing Value Chain/ Bititci Umit, Carrie Allan// Proceedings of the International Conference of the Manufacturing Value-Chain. – 1998 - 661p.