

KEY PERFORMANCE CRITERIA FOR VENDOR SELECTION – A LITERATURE REVIEW

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Abstract

The selection process of vendors is very essential nowadays for companies, as costs are reduced and sales increase along with the profit. For this reason, selecting the right vendor to collaborate leads to competitive advantage. The main purpose was to identify the most important criteria as constructed by the academicians/practitioners based models by focusing on the most crucial indicators that must be employed by the enterprises and increase the awareness especially to the southeastern enterprises to operate effectively and efficiently in this context.

Keywords: vendor selection, supplier evaluation, performance criteria and measurement, total cost of ownership, evaluation models.

1. INTRODUCTION

One of the biggest challenges of vendors' evaluation is considered to be criteria selection. This issue is considered to be significantly important because criteria used in the evaluation process depend from industry to industry, therefore this paper contains the opinion of different authors concerning the key indicators and factors in the process of vendor evaluation. Vendor selection and evaluation is typical multiple criteria decision making problem that involves both qualitative and quantitative criteria.

Nonetheless, the notion of this process is to seek for systematic, formal and select models that are rational (Obreoi and Khamba, 2005). According to, Weber et al. (1991) a trade-off between the buyer and supplier must be made in order to proceed in the selection process. After the indicators have been chosen by the firm, several other issues must be taken into account concerning which factors must be measured and which are more reliable so the firm will formulate and execute the right purchasing strategy. As Lysons and Farrington (2006) point out that apart from criteria and other factors that affect vendor selection, decision making is difficult and complicated by other factors as well that could be tangible or intangible criteria, however, there is no single vendor that can perform significantly in all criteria during the selection process. In addition, Lysons and Farrington (2006) imply that the traditional key performance indicators for the selection of supplier performance have been the following: Price,

quality and delivery. While these indicators are found to be very basic to vendor evaluation, developments such as JIT, lean manufacturing, integrated supply chains and e-procurement have made the fuller evaluation of suppliers relationships an important consideration.

2. REVIEW OF VENDORS SELECTION CRITERIA

The criteria that are critical for evaluating suppliers depend on the type of product or service that is to be purchased (Ellram and Zsidisin, 2002). However, it is claimed that different factors mean different indicators to authors that have specialized this issue. There are many evaluation/selection models but the most popular will be represented in this section.

2.1. Dickson's Analysis of Ssupplier Selection

According to the study that Dickson (1966) made in North America during the 1960's, there appeared 23 important criteria. The centrality of this study was to identify and rank accordingly the criterions. Therefore, Dickson surveyed 273 purchasing managers in different companies to state the importance of the criteria's in four groups.

TABLE 1 - DICKSON'S SUPPLIER SELECTION CRITERIA (DICKSON, 1966)

Rank	Factor	Mean Rating	Evolution
1.	Quality	3.508	Extreme importance
2.	Delivery	3.417	
3.	PERFORMANCE HISTORY	2.998	
4.	WARRANTIES AND CLAIM POLICIES	2.849	CONSIDERABLE IMPORTANCE
5.	PRODUCTIONS FACILITIES AND CAPACITY	2.775	
6.	PRICE	2.758	
7.	TECHNICAL CAPABILITY	2.545	
8.	FINANCIAL POSITION	2.514	
9.	PROCEDURAL COMPLIANCE	2.488	AVERAGE IMPORTANCE
10.	COMMUNICATION SYSTEM	2.426	
11.	REPUTATION AND POSITION IN INDUSTRY	2.412	
12.	DESIRE FOR BUSINESS	2.256	
13.	MANAGEMENT AND ORGANIZATION	2.216	
14.	OPERATING CONTROLS	2.211	
15.	REPAIR SERVICES	2.187	
16.	ATTITUDE	2.120	
17.	IMPRESSION	2.054	
18.	PACKAGING ABILITY	2.009	
19.	LABOR RELATIONS RECORD	2.003	SLIGHT IMPORTANCE
20.	GEOGRAPHICAL LOCATION	1.872	
21.	AMOUNT OF PAST BUSINESS	1.597	
22.	TRAINING AIDS	1.537	
23.	RECIPROCAL ARRANGEMENTS	0.610	

As shown above in the Dickson's study there are 23 KPI's which differ in the purchasing environment and situation. Hence, factors that are found to be extremely important in the study are quality, delivery,

and performance as well as warranties and claim policies, while the most slight important was reciprocal arrangements. To conclude, this is the first study that concentrated to identify the main criteria that affect vendors' selection process but yet, it must be clear that since that period of time new strategies are formulated and new studies have been published regarding this topic since the contemporary conditions have improved and better approaches are available.

2.2. Weber's vendors selection criteria and methods

The effort that was provided in the published article of Weber et al. (1991) is very complicated and incorporates effective multiple criteria in process of the selection process. However, Weber's study concerning vendors selection criteria and methods claimed that out of 74 articles that tended to stress in selection criteria, many of the articles considered Dickson's 23 criteria. The majority of the articles ranked more than one criterion and the top ten criteria ranked are shown below in the figure. The research claimed that net price, delivery and quality factors are the most important factors since these factors represented the highest percentage.

TABLE 2 - WEBER'S SELECTION CRITERIA (WEBER ET AL, 1991)

Rank	Rating	Criteria	Number of aticles	%
6	1	Net price	61	80
2	1	Delivery	44	58
1	1A	Quality	40	52
5	1	Production facilities and capabilities	23	30
20	2	Geographical location	16	21
7	1	Technical capabilities	15	20
13	2	Management and position in the industry	10	13
11	2	Reputation and position in the industry	8	11
8	1	Financial position	7	9
3	1	Performance history	7	9

Ratings: 1A = Extreme Importance 2 = Average Importance
 1 = Considerable Importance 3 = Slight Importance

2.3. Ellram's "Soft" factors in Vendor Selection

According to Ellram (1990) most of the researches in this area focused much on the quantifiable criteria such as quality, cost, delivery and other similar factors. Therefore, this study attempted to avoid the importance of the quantitative criteria and encompassed new issues and more qualitative criteria that

are supplementary to enhance the long-term relationship between the buying firm and the supplier. The “soft” factors are divided in four groups: financial issues, organizational culture and strategy, technology as well as miscellaneous issues as shown in the figure beneath (Ellram, 1990). In fact, these particular issues seek to facilitate the creation of partnership sourcing and integrate the relationship between the vendors and organizations. To sum up, the implementation of this model requires for buyers to formulate a strategy so they can assess and measure suppliers’ performance (Narasimhan et al., 2006).

TABLE 3 - ELLRAM’S “SOFT” FACTORS (ELLRAM, 1900)

FINANCIAL ISSUES

1. ECONOMIC PERFORMANCE
2. FINANCIAL STABILITY

ORGANIZATIONAL CULTURE AND STRATEGY ISSUES

1. FEELING OF TRUST
2. MANAGEMENT ATTITUDE/OUTLOOK FOR THE FUTURE
3. STRATEGIC FIT
4. TOP MANAGEMENT CAPABILITY
5. CAPABILITY ACROSS LEVELS AND FUNCTIONS OF BUYER AND SUPPLIER FIRMS
6. SUPPLIER’S ORGANIZATIONAL STRUCTURE AND PERSONNEL

TECHNOLOGY ISSUES

1. ASSESSMENT OF CURRENT MANUFACTURING FACILITIES/CAPABILITIES
2. ASSESSMENT OF FUTURE MANUFACTURING CAPABILITIES
3. SUPPLIER’S DESIGN CAPABILITIES
4. SUPPLIER’S SPEED IN DEVELOPMENT

OTHER FACTORS

1. SAFETY RECORD OF THE SUPPLIER
2. BUSINESS REFERENCES
3. SUPPLIER’S CUSTOMER BASE

2.4. Krause, Pagella and Curkovic’s suppliers’ evaluation criteria and measurements

The aim of this study is that authors through their research succeeded to construct a vendor’s selection tool that will help companies to formulate a base of competitive objectives concerning their purchasing activities. Performance objectives are the right measurement to state organization position in terms of operation. The finding that Krause et al. (2000) is that they added innovation as an equally factor in their research and assigned each of the objectives as shown below in the figure to different companies in order to search which of them is plays a vital role in the process of supplier evaluation. They came up with a conclusion stating that delivery factor that involves JIT, delivery speed, reliability or dependability and cost factor with the competitive pricing are less important than the rest of the categories with involved criteria.

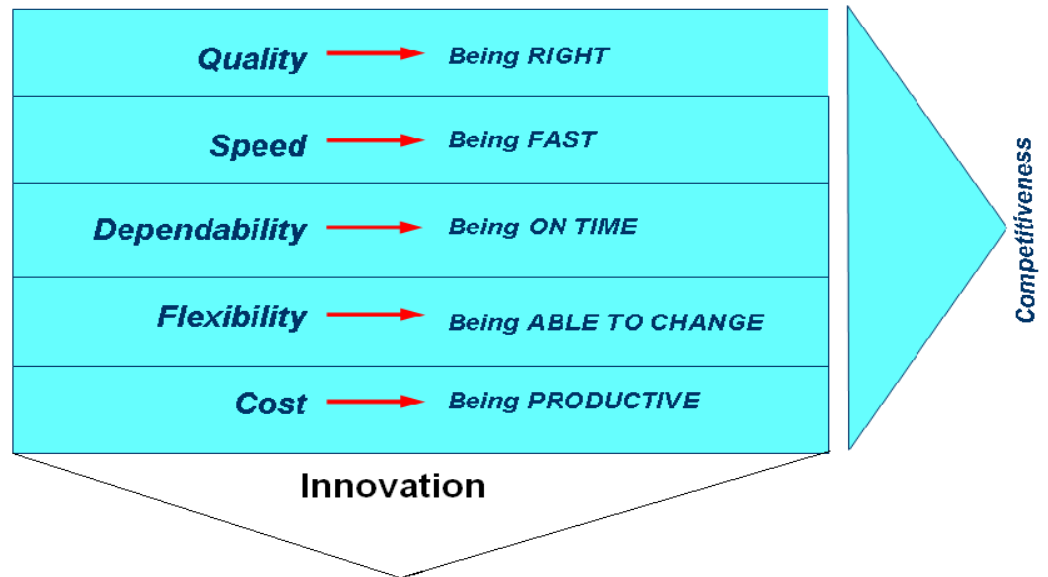


FIGURE 1 - KRAUSE ET AL. EVALUATION CRITERIA (KRAUSE ET AL., 2000)

2.5. Birch's evaluation criteria

According to Birch (2001) a relationship approach between buyers and suppliers must be firstly decided before aiming for identifications of the most important criteria. Therefore the purchasing managers primarily have to come to an agreement with their suppliers and conclude the terms for a negotiation. As Birch in 2001 conducted this research to the car industry and the conclusion was derived that criteria must belong to a tool that supports them in all aspects. The criteria as can be seen belong to five categories: Cost, logistics, quality, development and management the categories consist of questions that companies need to address to the market and evaluate the proper supplier.

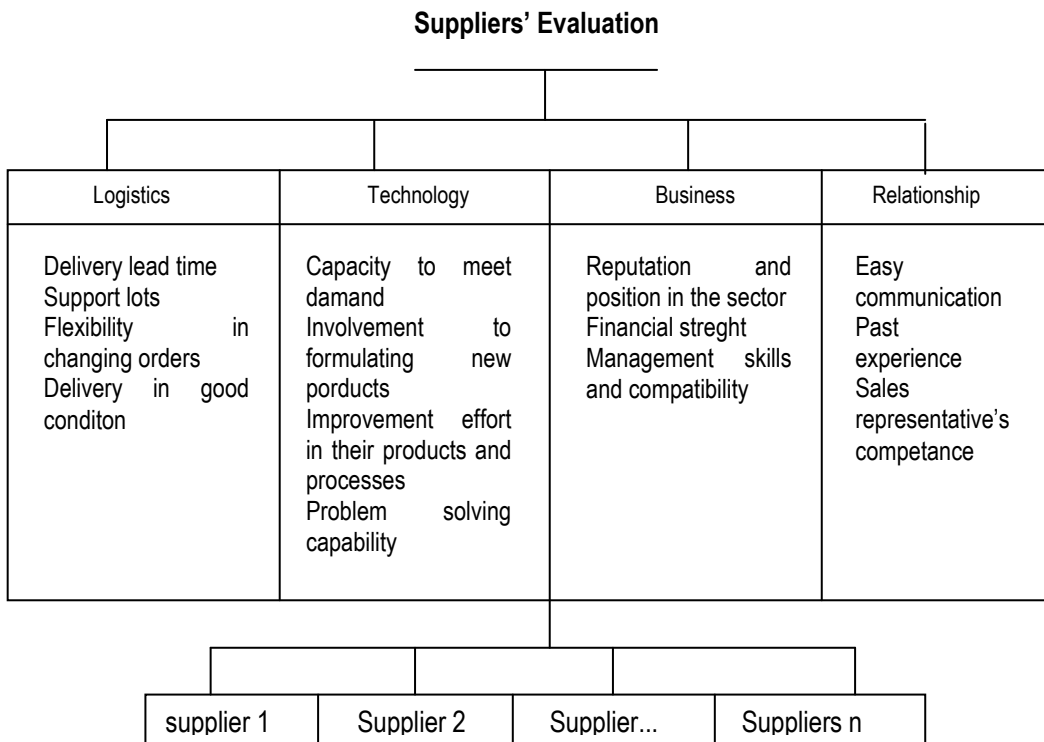
TABLE 4 - BRICH'S EVALUATIN CRITERIA (BRICH, 2001)

Criteria	Questions to be asked
Cost	Is the supplier prepared to work with an Open Book policy? Will the supplier agree to share cost reduction benefits? Will the supplier agree to work within agreed profit margins?
Logistics	What is the supplier's performance in delivering products or services: At the right time? To the right place? In the right quantities?
Quality	Does the supplier have ISO 9000? Has it received quality awards from any other customers? Is there a quality department? What quality improvements process does it have?
Development	What research and development capability do you need from a supplier? Does the supplier have the research and development facilities required? How much of its profits does the supplier put back into R&D?
Management	Is the management style of the supplier autocratic or democratic? Does the supplier have a good record of industrial relations? Does the supplier' management team understand what its core business competence is?

2.6. Cebi and Bayraktar's integrated evaluation process

The research that was conducted by Cebi and Bayraktar (2003) clarified similar criteria as Brich (2001) but this approach is more integrated for evaluating suppliers. They categorized the factors as: logistics, technology, business and relationship that involved criteria of both qualitative and quantitative factors. However, this is the only model that correctly distinguishes criteria in their form whether they are tangible or intangible and also considered the operational and strategic factors that might occur. The process grasps the main criteria from other studies so they could come up with an integrated approach. Therefore, they claimed that these categories are descent as they incorporate an analytical hierarchy approach for each of them to ascend the more crucial factors regarding the company situation and suppliers' availability.

TABLE 5 - CEBI'S AND BAYRAKTAR'S INTEGRATED EVALUATION CRITERIA (CEBI AND BAYRAKTAR,2003)



3. CONTEMPORARY ASSESSMENT OF KEY PERFORMANCE CRITERIA

The studies criteria that were identified by Dickson (1966), Ellram (1990) and Weber (1991) have provided helpful and appreciated studies; however all the mentioned authors have not categorized the

criteria in order to state to what extent are they applicable and in what set of functions they belong rather than just stressing their importance by the surveyed companies.

Nonetheless, companies tend to categorize these days the criteria in order to involve all function in the evaluation process because this is a team task. In the contemporary process practitioners and academics divide the categories if the key performance indicators in some stages. As the last three models by Krause et al. (2000), Birch (2001), Cebi and Bayraktar (2003) use categories so they can distinguish among criteria and most of the models developed include similar categories

The main categories developed by Krause et al. (2000) are quality, delivery, flexibility, cost and innovation that incorporate subcategories related to each of them, while Birch involved cost, logistics, quality, development and management so the one could claim a difference rather a replacement of names. In the other hand Cebi and Bayraktar (2003) included logistics, technology, business and relationship critical categories and these resemble to those mentioned in the previous one.

4. APPROACHES TO EVALUATE SUPPLIERS

Methodologies for evaluating suppliers are also known as quantitative approaches and used as a tool for the final choice phase. There are many approaches regarding the evaluation process, however the ones described in section are most popular and use by innovative companies .

4.1. *Linear Weighting Models*

This model weights each given criterion by indicating the highest and least importance. The ratings of the criteria than are multiplied according to their weights in order to reach a total score for each vendor by assessing their performance so they can select the suppliers with the highest overall rating

However, one of the most used methods in the linear weighting models is the Analytical Hierarchy process (AHP). This tool is a contemporary multi criteria method that aims to make decisions by providing a framework to deal with those criteria (Kemp, 2002). Now, this method firstly structures the problems in a form of hierarchy to classify the criteria, sub-criteria and alternatives.

Afterwards, all criteria are compared to in order to state their weights and derive the final outcomes from the procedures as a score for every involved alternative.

Thus, this method is very practical for suppliers' evaluation process because it can measure both qualitative and quantitative criterions and in the other hand it avoids the main constrains of the traditional linear scoring model (Dzever ,2001).

Yet, another popular method that linear weighting model employs is Interpretive Structural Modeling (ISM), the objective of this method is to correctly structure the problem so it can summarize and identify the relationship among each criterion. In addition, this method is mostly used to evaluate international suppliers' performance that strictly weights attribute (Kemp, 2002).

To wrap up, the linear weighting models has also some drawbacks that are worthy to mention. Although some methods such as AHP and ISM proved the chance to the model stay consistent still subjectivity matters because there are cases when is not clear, also when new criterions are inserted to the model it tend to modify the classification of the criteria.

Finally, the model is not considering cases for evaluation of multiple suppliers'.

4.2. Total cost of ownership Model

According to Ellram (1995) TCO is a very complicated approach because it requires for the buying company to decide which cost is more imperative in creating an acquisition and control. TCO is a method which includes more than just the price in purchasing situation; it includes many other elements such as, suppliers' qualification, transportation, receiving, and inspection and so on.

The model is based on all costs related to the chain and created by the suppliers (Bhutta and Huq, 2002). This approach can be applied for every kind of purchase depending on the factors with regards to the type of product or service.

However, TCO model can be used to help companies value and classify their suppliers, mainly companies that use this approach seek to measure and develop accurate purchasing process and use it as tool to evaluate the proper suppliers' (Mattson,2000).

In the other hand traditional models for selecting and evaluating suppliers focus on price only or are based mostly on price or buyers qualitatively measure and evaluate suppliers' performance by using different categorical or weighted approaches (Ellram, 2002).

Yet, supplier selection and evaluation that are closely related with TCO incorporate the cost of the life cycle, the zero base pricing or also known as all-in-costs, cost ratio method and cost based supplier performance evaluation.

As Enarsson (2006) states, the purchasing function is always aware that some suppliers provide better services than others but there is not a systematic method to measure all costs and decide for the right suppliers.

Therefore, purchasing managers that are interested in cost information face complexity to gather information, if only those costs are in the form of lump, than the main constrains can be avoided. Likewise, Ellram and Seiferd (1993) have developed a model so better information can be obtained concerning a detailed costs, as can be seen in the figure below.

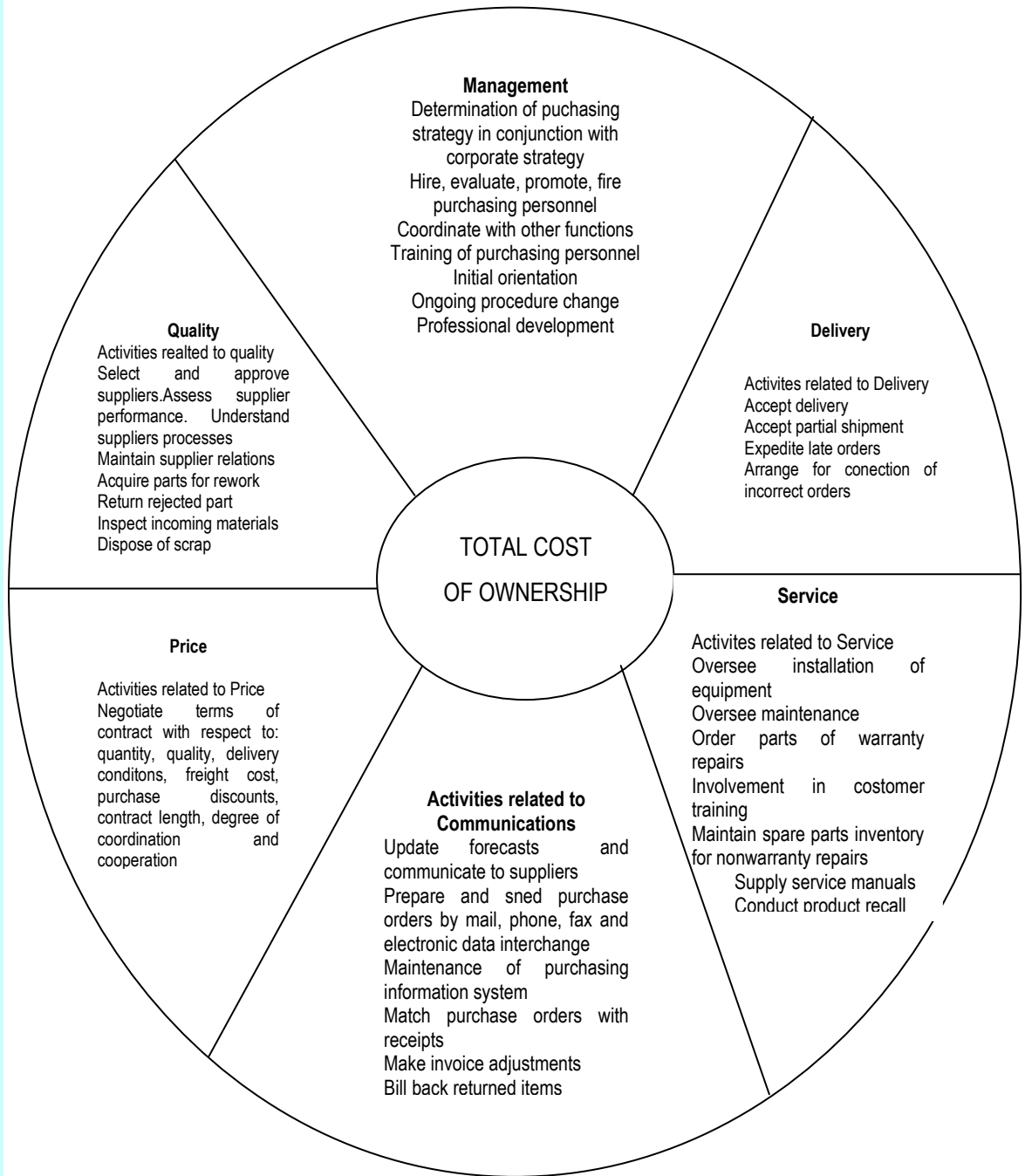


FIGURE 2 - TOTAL COST OF OWNERSHIP (ELLRAM, 1995)

The first activity as a contribution to total cost of ownership is Management: mainly it includes the costs related for creating purchasing activities according to the firm's mission and co-ordination of other functions as well as training of the personnel in the purchasing department. Delivery: this activity involves costs that have to do with the acceptance of the delivery and partial deliveries, expedition of the late orders and arranges correction and insurrection of the orders. Services: costs that are involved in this particular activity are the oversee installation of equipment and maintenance of equipments, parts that are to be ordered in the repair of the products. Actually in this part are involved the matters of the ordering spare parts that are not available in the customers guarantee, accepting returns if needed and searching for solutions to the customers problems regarding the product.

Communication: it involves costs that are related to update forecasts and communicate the suppliers so they can send orders by e-mail, fax, telephone and electronic data interchange, maintenance of the purchasing information system is another crucial cost, other costs are matching the order, make invoice adjustments and invoice changes, manage re-payment of the returned goods as well as maintenance of the inventory records. Activities related to Price costs include quality, delivery, quantity, freight costs, discount, contract length and of course the degree of co-ordination and co-operation. Finally, Quality consist of costs that are related with selection of suppliers, assessment of the suppliers' performance and understanding of the processes as well as marinating relations and collaborating with suppliers' Enarsson (2006).

According to, Haq and Kannan (2006) that a unique model is used when the purpose of using TCO is present to support suppliers evaluation. The model can be useful to companies that are highly interested in considering cost factors, therefore TCO analysis can be the implemented as a tool in their purchasing perspective.

4.3. Mathematical Programming Models

The purpose of mathematical programming is to select a variety of suppliers to increase the validity of the objective functions in more subjective mode so constrains of both suppliers and purchasers can be identified (Obreoi and Khamba, 2005).The objective functions can be either single criteria or multi criteria, however, this model is tending to analyze mostly multi criteria since it utilizes a mixed program integer that can reduce the number of items not received, delivery time and unit price. This model employs a program named Hyper LINDO, this integer linear program solves problems with cost reduction and searches to find suitable purchasing strategy for buyers (Narasimhan et al., 2006).

Data envelop analysis (DEA) is also a known mathematical programming method for suppliers' evaluation and it seeks to address issues related to comparative efficiencies regarding the decision making units but yet it is difficult to compare when multiple inputs and outputs are present. Thus, DEA is a non-parametric method that permits efficiency to be measure without identifying and stating the production function or weights for any kind of inputs and outputs.

The model attempts to find solution for modeling and constrains, it is suggested that it works better when there are present high number of constrains. Therefore the model can approach for solutions to current problems and be further use for vendor selection. The main pitfalls of the model are that it usage is limited to qualitative criteria and it is very complex to use it in practice (Linn et al., 2006).

4.4. Statistical Models

The statistical models is the least used model for suppliers' evaluation because it emphasizes on stochastic uncertainty and all models assess one criterion at a time and this makes it very time consuming. Moreover, it is necessary to mention that it employs confidence for the criteria analysis and assess properly the nature of the relationship between suppliers and buyers in order to dictate their performance (Chen and Chen, 2006).

4.5. Artificial Intelligence (AI) based models

Artificial intelligence models are based computer systems that provide information and historical data to purchasing experts. This model employs neural network methods that do not demand for formalization concerning the decision making process. Indeed, this method can cope also with difficult and uncertain situation because the method provide companies or purchasing managers with correct information in the decision making since the method will show up information similar to past cases and situations. Nonetheless, AI models are difficult to be use and not all purchasing managers can use it unless they have done some training (Boer et al., 2001).

5. CONCLUSIONS

This essential paper summarizes the overall effort and derives conclusions from the study. The role of vendors' selection process recently have raised a big issue in the business environment since it reduces costs in the core functions of the company and aims for savings in order to increase profits. However, there are many criteria that companies can chose and this makes it complex to decide which are the most valuable ones that so they could benefit from this process. The cornerstone of vendor

selection process is to incorporate the main indicators that are considered to be important for the market where companies are already operating in order to sustain a competitive advantage and satisfy customers' preferences.

The final goal of this research after identifying the important indicators by the SME's in the country a model must be developed in order to wrap up the objectives. As mentioned before there are three main methods to evaluate suppliers that were constructed by Weber et al. (1991) such as categorical method, weighted point, and cost ratio. The first method is straightforward for companies to implement but the findings might be unreliable but there are acceptable cases as it in ours since companies use any of the models so far.

In the other hand the weighted point method is a very flexible one to rank suppliers accordingly but still the criteria tend to vary so assumption must be made by the researcher and if they are not reliable the values are lost. Indeed the cost ration method is the most precise and incorporates a total cost of ownership that aims for ranking of all costs related to the process and is a strategic tool. The method is very difficult to be used and implemented because it requires for experts in this field as well as more financing.

The best method that can be implemented by the enterprises in Macedonia to select their suppliers is the weighted point model because it is simple to use and provides more precise results, in contrast categorical method is very simple and cost ratio method is very complicated not experienced companies. For this reason weighted point model is the most suitable for companies in this country.

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