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by Mahmut Sonmez

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A review and critique of supplier selection process and practices

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Abstract

With increasingly competitive global world markets, companies are under intense pressure to find ways to cut production and material costs to survive and sustain their competitive position in their respective markets. Since a qualified supplier is a key element and a good resource for a buyer in reducing such costs, evaluation and selection of the potential suppliers has become an important component of supply chain management. Hence, development of an effective and rational supplier selection model is naturally desirable. Several evaluation and selection models for supplier selection have been proposed and reported in the supply chain literature. This paper reveals the findings of a wide ranging literature review of supplier selection practices and models. Altogether 147 refereed academic journal articles are reviewed and classified into five categories. A list and summary of the papers falling into each category with brief annotations is provided. The areas that have received little attention or lack of research interest are discussed and some new research settings are also suggested.

Key words: Supplier selection; multiple criteria decision making; vendor selection; supplier management; international supplier selection; buyer-seller relationships; e-procurement

Article Type: Literature review

A review and critique of supplier selection process and practices

Purpose – Supplier selection is an important purchasing activity for many firms. Today’s consumers demand cheaper, high quality products, on-time delivery and excellent after-sale services. Hence, companies are under intense pressure to cut product and material costs while maintaining a high level of quality and after-sale services. Achieving this starts with supplier selection. Therefore, an efficient supplier selection process needs to be in place and of paramount importance for successful supply chain management. It begins with the realisation of the need for a new supplier; determination and formulation of decision criteria; pre-qualification (initial screening and drawing up a shortlist of potential suppliers from a large list); final supplier selection; and the monitoring of the suppliers selected (i.e. continuous evaluation and assessment). The main purpose of this paper is to provide an extensive literature review and critique of the studies related to various aspects of supplier selection process over the last two decades and find out the areas that are under-researched.

Design/methodology/approach – An extensive literature review was conducted using phrases “supplier selection” and “vendor selection” as key words on major databases. A total of 147 refereed journal articles appeared between 1985 and 2005 on supplier selection were reviewed. These articles were categorised using keywords under five main headings: 1) Papers emphasising the decision criteria that should be used; 2) Papers reporting the use of decision making / support techniques and tools; 3) Papers focusing on buyer-seller relationships; 4) Papers studying the international supplier selection practices and 5) Papers emphasising the issues in online supplier selection, i.e. e-procurement.

Findings – The review revealed some trends in supplier selection related studies. Specifically, the review revealed that greater emphasis was placed on i) decision criteria and associated weightings used for supplier selection and ii) decision making methods/tools used and/or proposed for supplier selection. It was observed that there was a more recent trend towards studying the effects of buyer-seller relationships, international supplier selection and e-commerce on the supplier selection process and practices. The review also exposed the areas that attracted little or no research attention. There has been a growing demand and need for a more detailed supplier selection process by considering all qualitative and quantitative criteria. More effort should be made towards combining both qualitative and quantitative factors affecting the supplier selection process in a rational and systematic way. In addition, there were very few studies on supply chain security given the current political climate and security concerns around the world.

Originality/value – This paper provides an overall picture of research on supplier selection process and practices. This piece of research would be of value to both academics and practitioners interested in supplier management.

Introduction

In increasingly competitive and globalised world markets, firms are constantly under pressure to find ways to cut material and production costs. Since a qualified and reliable supplier is a key element and a good source for a buyer in reducing production and material costs, evaluation and selection of the suppliers is an important component of supply chain management and an important task for the purchasing department of a firm in particular. Supplier selection and evaluation is the process of finding the suppliers being able to provide the buyer with the right quality products and/or services at the right price, at the right quantities and at the right time [92, 121]. Evaluation and selection of suppliers is a typical multiple criteria decision making (MCDM) problem involving multiple criteria that can be both qualitative and quantitative. Hence, supplier selection process requires a formal, systematic and rational selection model. There is an abundance of supplier evaluation and selection models proposed in the supply chain literature.

The main aim of this paper is to get an overall picture of research on the supplier selection process and practices. The paper looks into the sorts of decision making methods and tools reported in the literature and/or applied in practice. The paper also reveals some trends in supplier selection process by looking at the frequency of papers appeared in the refereed journals and categorising the papers theme-by-theme. It is aimed that the findings will lead to new research settings together with directions for future research.

The rest of the paper is structured in the following way. The next section will provide a brief background to supplier selection process. Then, the details of the literature review will be given. The findings of the extensive review will be provided before discussions and conclusions.

Background

In this paper, we review refereed journal articles pertaining to supplier management, supplier selection practices and decision tools or methods used and/or proposed for supplier selection process in particular. Supplier selection is generally considered as a five-phase process starting from the realisation of the need for a new supplier; determination and formulation of decision criteria; pre-qualification (initial screening and drawing up a shortlist of potential suppliers from a large list); final supplier selection; to the monitoring of the suppliers selected (i.e. continuous evaluation and assessment) [42]. Supplier selection involves two main tasks, which are also central to any decision making problem [23]: (i) the process of evaluation and assessment and (ii) aggregation of evaluation and assessment to make a choice.

< Take in Figure 1 >

As can be seen from Figure 1, the evaluation and assessment task, first, requires the identification of decision attributes (criteria) against which the potential suppliers are to be assessed. Then, evaluation scales/metrics are determined in order to measure the appropriateness of a supplier. Such metrics or scales are useful and necessary to determine the likely worst and best outcomes for each attribute. The next requirement is to assign weights to attributes to indicate the relative importance and contribution of each criterion to the supplier evaluation and assessment. Furthermore, an attribute (father attribute) may comprise of several sub attributes (child attribute). In this case, sub attributes are assigned weights in accordance with their importance and contribution to the associated father attribute. The final step in the supplier evaluation and assessment is to evaluate potential suppliers against the attributes identified at the beginning using the scales/metrics established. Once candidate suppliers are given scores or ratings against each attribute, it is then necessary to aggregate these scores and/or ratings, which may be both qualitative and quantitative, to make a rational and sound choice over which suppliers should be included in the firm's supplier base. There

are two main approaches for aggregating scores/ratings: (i) compensatory (linear) or (ii) non-compensatory (non-linear) approaches [38, 41, 103, 110]. In compensatory approaches a weak performance on one criterion is offset by a good performance on another criterion. If a decision maker does not accept the weakness in one criterion to be compensated by the strength of another criterion, then the use of non-compensatory approaches is more appropriate in this case.

There are several factors that affect the supplier selection process, which is depicted in Figure 2 and briefly explained here. The number of suppliers to be selected depends on the sourcing strategy that a firm follows. If the firm is in favour of single sourcing, a single supplier is to be selected. If, on the other hand, the firm follows a multiple sourcing strategy, then more than one supplier is selected. In relation to sourcing strategy, the minimum order quantity and a supplier's capability may affect the supplier selection process. If a single supplier is unlikely to deliver the required goods and/or services due to limited capacity and/or unable to meet the minimum order quantity, then it is necessary to select more than one supplier.

< Take in Figure 2 >

Wilson (1994) quoted the study, conducted by Lehmann and O'Shaighnessy in 1982, which suggested that type of products has a significant effect on how the purchasing decision is made in terms of the choice (decision) criteria used and the weights assigned to each criterion [142]. Lehman and O'Shaighnessy defined product types and the most important criteria for each product type were as follows:

- 1) **Routine order products:** are those having no problems associated with learning to use the product and no questions regarding the functional capability of the product (reliable delivery and price were the most important criteria).
- 2) **Procedural problem products:** are those for which there is no question about the capability of the product, but likely problems with learning to use the product (service and delivery were the most important criteria).

- 3) **Performance problem products:** are those for which there is some doubt as to whether the product will perform satisfactorily in the application for which it is being considered (in particular a problem associated with technical outcome of the product's use) - (delivery and service were the most important criteria).
- 4) **Political problem products:** are those that require large capital outlays, multiple decision makers are likely to be involved in buying decisions (price, reputation, and product reliability data were the most important criteria).

Another factor affecting the supplier selection process is the type of manufacturing strategy followed by the buyer. There are three manufacturing strategies that may impact on the supplier selection: make-to-order (MTO), make-from-stock (MFS), and make-to-stock (MTS) strategies. In MTO strategy, the customer order is received prior to final assembly. The end product is assembled in anticipation of customer orders in MTS strategy while in MFS strategy, a company's procurement activities are conducted in anticipation of customer orders, but the end product is only assembled after a customer order has been received [25].

A buyer's preferences towards location of suppliers can have some impact on the supplier selection process. Choosing local (domestic) suppliers can be less complicated than of those overseas (international) suppliers. The supplier selection process for both domestic and international suppliers may involve different sets of decision criteria and weights assigned to each criterion. Finally, the authority of making the decision can be either in the hands of a single person (department) or multiple person (multiple department), which may further complicate the decision process of supplier selection.

It is generally agreed in the literature that the following makes the supplier selection decision making process difficult and/or complicated [41, 75, 78, 79, 95, 100, 136, 140]:

- Multiple criteria – both qualitative and quantitative
- Conflicts amongst criteria – conflicting objectives of the criteria
- Involvement of many alternatives – due to fierce competition
- Internal and external constraints imposed on the buying process

The background information in the previous paragraphs demonstrates and explains the need for a formal approach to conceptualise and structure the various elements and components of supplier selection process. The literature review in the next section looks at the studies on supplier selection.

Literature Review

There are several keywords associated with the supplier selection. The terms “supplier selection” and “vendor selection” are frequently and interchangeably used in the literature. They both have the same meaning and are related to the selection of suppliers engaged in manufacturing and/or production of materials, product parts and components. The terms “bidder evaluation”, “tender evaluation” and “contractor selection” all refer to similar processes to supplier selection. While the first two terms are somewhat less frequently used, the term “contractor selection” is mostly associated with the purchasing of services offered by a firm in urban and civil engineering, and construction industry in particular. Since supplier management is a popular topic and attracts greater research interest, the literature review is based on two keywords: (i) supplier selection, and (ii) vendor selection.

An extensive literature review was carried out by focusing on the refereed journal articles only as supply chain management is a broad subject area having links to other subjects such as engineering, production, marketing and finance. The refereed journal articles are deemed appropriate as they can be accessed via major databases by scholars around the world. They can also provide a good picture of the supplier selection process worldwide. We do not claim that other publications such as books, conference proceedings and/or working papers are not worth reviewing but the task would be more complicated and may become unmanageable due to a large volume of publications in this subject area. The literature review was performed using the following databases most of which allowed access to full text articles: Science Direct, NESLI, Proquest (ABI/INFORM), Ingenta, Blackwell, Wiley Science, Emerald,

USTOR, Web of Science, Swetsnet, EBSCO and Inderscience. The search encompassed the articles that appeared between 1985 and 2005.

After an initial screening of the articles found, 147 articles were selected for the review. The distribution of the articles according to time period was as follows: four articles appeared between 1985 and 1989; 14 in 1990-1994; 47 in 1995-1999 and 82 in between 2000 and the first half of 2005. These articles were published in fifty-four different refereed academic journals some of which are listed here (number of articles published shown in brackets): The Journal of Operational Research Society (12), Industrial Marketing Management (10), International Journal of Production Economics (9), Journal of Supply Chain Management (8), International Journal of Purchasing & Materials Management (7), Supply Chain Management (7), European Journal of Operational Research (6), Expert Systems with Applications (6), Journal of International Business Studies (5), International Journal of Physical Distribution & Logistics Management (5), Journal of International Business Studies (5), Purchasing (5), International Journal of Operations and Production Management (4), Journal of Business Research (4), Journal of Information Technology (4), European Journal of Purchasing & Supply Management (3), Journal of Operations Management (3), and Journal of Purchasing and Supply Management (3).

The articles are initially categorised based on keywords under three broad groups: decision criteria used; decision making methods and tools, and buyer-seller relationships. The first broad category includes the papers on supplier selection (decision) criteria that examine several issues. The most common issue is how to assign weights to decision criteria. The second issue is the categorisation of decision criteria into three broad areas: critical, objective, and subjective criteria [70]. Another issue is that of incorporating environmental criteria into supplier selection process due to increasing consumer awareness and consumers' concerns

over environmental pollution [71, 72, 96, 104]. A few papers addressed the use or preferences towards different set of decision criteria by individual buyers' demographic differences. For example, the differences in gender of buyers influence the set of criteria used and weights assigned to the criteria [130]. Other factors such as age, the number of years spent in the job, educational background, experience and ethnic background also affect the choice of decision criteria and associated weights [1, 50, 68, 110]. Decision criteria used for supplier selection can be different depending on the size of a buyer organisation. Large companies use a different set of criteria and a formal approach when selecting suppliers compared to small and medium sized enterprises [113].

The second broad category includes the papers on decision methods and tools used for supplier selection. A formal decision making approach is required either at the prequalification stage or at the final selection stage. When there are more than one supplier selected (multiple sourcing), then there is another decision to be made as to how much purchase should be made from each supplier. Therefore, a buyer may opt to use more than one decision method to help him/her make a decision. Decision methods used for supplier selection can be divided into two groups: linear weighted or non-linear. A number of papers reported the use of mathematical programming methods such as goal programming, integer goal programming, total cost based approach and data envelopment analysis. There are also some papers on the use of artificial intelligence and expert systems which included the techniques such as case based reasoning and knowledge based systems supported by computer software. The Analytical Hierarchy Process (AHP), Multiple Attribute Utility Theory (MAUT), Outranking methods are well-known and typical multiple criteria decision making methods suggested for supplier selection. As Putton (1996) claimed there is still not much evidence which methods are actually used by individual buyers [110]. The use of multivariate statistical analysis such as structural equation modelling, principal component

analysis and factor analysis for supplier selection practice has also been reported in the literature.

The third broad category that the more recent papers fall into is based on the theme buyer-seller relationships. Some papers looked at the buyer-seller relationships in international supplier selection. While some papers emphasised the differences in buyer-seller relationships from the single or multiple sourcing points of view, some other papers examined the effects of trust on buyer-seller relationships. The idea that buyers and sellers are adversaries has now been replaced by considering buyers and sellers as collaborators. The buyer-seller relationship may become more important depending on the size of the buyer and seller organisations. The purchasing activity may be conducted by an individual in a small and medium sized enterprise while a group of individuals perform the purchasing activity in a large company.

Findings

This section presents the findings from the reviewed articles in a tabular format. Pearson and Ellram (1995) and Wilson (1994) observed that supplier selection studies in the literature could be categorised as (i) prescriptive (suggesting models that should be used), (ii) descriptive (emphasising models that are in use) and (iii) research that examines the supplier selection criteria [113, 142]. Such division of supplier selection literature appears to be valid for the review reported in this article, perhaps with the addition of two more categories. With the developments in the world economy (i.e. globalisation) and in communication, information technology and transportation, there is tendency towards exploring the issues and concerns over international supplier selection as well as tendency towards better understanding of buyer-seller relationships. Another tendency in supplier selection studies is to look at the effects of selecting and assessing suppliers online (i.e. e-commerce, e-procurement). The findings from the review of the supplier selection related articles will be summarised under the following headings: 1) Papers emphasising the decision criteria that

should be used; 2) Papers reporting the use of decision making / support techniques and tools (whether descriptive or prescriptive); 3) Papers focusing on buyer-seller relationships; 4) Papers studying the international supplier selection practices and 5) Papers emphasising the issues in online supplier selection, i.e. e-procurement.

Supplier Selection (Decision) Criteria

Twenty-three per cent of the papers reviewed (i.e. 34 out of 147) examined the decision criteria used for supplier selection. Most papers attempted to identify and determine the relative importance of criteria for supplier selection in various industries as shown in Table 1. The decision criteria used for supplier selection and the weightings assigned to them can be different due to a number of factors; the demographic characteristics of the purchasing managers [68, 76, 99, 110, 113, 130, 133, 135, 141, 142, 145], the size of the buyer organisation (i.e. small vs. large) [113], the preferred sourcing strategy (i.e. single vs. multiple) and the existence of a supply chain (purchasing) strategy [83, 88, 90, 129], and the type of products and/or services purchased [2, 4, 11, 12, 22, 35, 50, 63, 77, 81, 86, 122, 123, 128]. Some scholars emphasised the need for integrating environmental criteria into the supplier selection process as more and more end users (customers) become aware and concerned about the environmental issues [71, 72, 96, 104].

< Take in Table 1 >

Decision making methods and tools

More than half of the papers reviewed reported and/or introduced the use of different decision making methods and tools for supplier selection. The decision making methods reported for supplier selection can be clustered into several broad categories: traditional (conventional) multiple criteria decision making (MCDM) techniques, mathematical programming, artificial intelligence and expert systems, and multivariate statistical analysis. In addition, there are two more categories that are somewhat different from the categories mentioned earlier: group decision making and multiple methods. Due to strategic importance and involvement of

various uncertainties and risks associated with the supplier selection process, the purchasing activity is usually carried out by buying teams rather than individual purchasing managers. The supplier selection process also concerns several other departments other than purchasing such as production, finance, and marketing. Hence, the personnel from these departments may involve in the decision making process of selecting suppliers alongside the purchasing manager. Therefore, some scholars emphasised the need for a rational and systematic group decision making process for supplier selection (see Table 2).

Single or multiple suppliers are selected depending on the sourcing strategy followed by the buying organisation. If a firm follows a single sourcing strategy, the task is to select the 'best' supplier among all alternatives that satisfies the firm's requirements. In such a case, a single decision making method capable of ranking alternative suppliers, such as MAUT and AHP, can be used. Multiple methods may be needed for selecting multiple suppliers if a multiple sourcing strategy is followed. This is because there are two types of decisions when a multiple sourcing strategy pursued by the buyer: (i) how many and which suppliers to select and (ii) how much purchase should be made from each supplier selected [78, 79]. Hence, some papers reported the use of more than one decision making technique for supplier selection (see Table 2). A list and classification of decision making methods and tools for supplier selection is provided in Table 2.

< Take in Table 2 >

Buyer-seller relationships

Twenty-nine out of 147 articles reviewed examined the influence of buyer-seller relationship on the supplier selection process. There is now wider consensus among scholars that there has to be a strong collaboration between the buyers and the sellers as opposed to the idea that the buyers and sellers are adversaries [35, 142, 146]. One important observation about the papers related to customer-supplier relationships is that majority of these papers appeared from the

late 1990s up until the present time. This suggests and shows that more and more emphasis is placed on non-technical, non-qualitative aspects of the supplier selection process.

International Supplier Selection

Another area that has attracted research interest in the last five years is that of international supplier selection. Eighteen out of 147 articles reviewed focused on international supplier selection. Many companies have now realised the opportunities in terms of lower production and labour costs that other countries can offer. Then, it becomes necessary to understand and analyse these countries' political, legal, economic, socio-cultural and technological features as well as how to go about doing business in these countries. Selecting suppliers in foreign countries may then become complicated due to the uncertainties caused by lack of information and/or risks (such as safety and security related) associated with these countries' business environment. The selection of international suppliers may involve more criteria and require more time to gather information to evaluate potential suppliers. It was observed from the review that the papers reporting the various aspects of supplier selection process in a particular country is limited with mainly developed (technologically advanced) countries. USA is most widely studied country. Other countries include Canada [22], Germany [22, 24], The Netherlands [24], Switzerland [119], Sweden [107], China [27, 82, 99, 102, 117], Japan [54, 68, 73] and Korea [54, 108]. Although an effort was made to build a model for supplier selection in developing countries in [98], there is not much evidence how supplier selection process is carried out in developing countries.

E-procurement: Online Supplier Selection

The world has seen rapid developments in information technology and electronic data interchange in particular over the last two decades. The extensive use of the Internet has enabled buyers to locate large number of suppliers and has provided opportunities for suppliers to let buyers know of their existence. The Internet has become an e-marketplace

where buyers and sellers interact electronically. However, surprisingly, there were only nine papers focusing on e-procurement mainly from buyer-seller relationship point of view.

< Take in Table 3 >

Discussions, Conclusions & Future Research

The earlier sections have highlighted some trends in supplier selection practices. The identification and determination of decision criteria and the methods used for supplier selection appear to be the dominating topics in supplier management literature. However, from the late 1990s until the present time, there are more articles emphasising the importance of buyer-seller relationship, international supplier selection and online evaluation and selection of suppliers largely due to globalisation and rapid developments in information technology.

Although there are a large number of articles studying the (decision) criteria to be used for supplier selection process, these papers do fail to address the need to include the criteria related to safety and security issues, which have become extremely important given the present threats to security and current 'climate' around the world. The security issue becomes much more important in selecting suppliers for products and materials for defence industry. The papers reviewed mainly concentrated on manufacturing related industries ranging from electric, electronic, textile, furniture to automobile, information systems and technology. There are hardly any papers on supplier selection for services rather than products and materials [45]. The review also provided strong evidence that there is a clear division of studies on supplier selection and contractor selection even though both processes follow an identical procedure. Contractor selection is mainly associated with the construction industry while supplier selection is concerned with manufacturing related industries.

The reviewed articles studied the purchasing activities of the private sector organisations. Surprisingly, there was no evidence of any research on how public organisations evaluate and

select suppliers. This may be either because such research reported within contractor selection literature or the purchasing activity is carried out by the private consultants hired by the public organisation, who would only provide a brief report to the organisation concerned. It is already known fact that the evaluation and selection of suppliers and/or contractors by public organisations is more complicated than by the privately owned organisations due to strict regulations and the bureaucracy to be followed by the public organisations. While the final decision to select suppliers is made by the public companies based on the principle “the best value for money”, the private sector companies do not base their selection decisions solely on price but also other criteria such as quality, on-time delivery, after-sale services, buyer-seller relationships and so on.

The review also revealed that there are a large number of decision making methods and tools proposed for supplier selection. Due to the multi objective nature of the supplier selection process, there are more papers emphasising the use of mathematical programming based decision making methods and total cost based approaches in particular. However, these approaches fail to address the subjective (qualitative) criteria for supplier selection. A decision model that accommodates both subjective and objective criteria is desirable. The review showed little effort was made on this issue. One major observation about the review was that the supplier selection process requires more and more detailed evaluation and assessment of potential suppliers. This is because now many companies consider the suppliers as their best intangible assets [92] and potential suppliers whether selected or not would want to know how they fared in the selection process and/or the areas which they need to improve.

This paper aimed to explore the various issues affecting the supplier selection process. The wide ranging literature review suggests that much of the focus on supplier selection process has been given to the decision criteria and the decision making methods used for evaluating

and selecting suppliers. There is now some evidence that more efforts are being made in examining the effects of buyer-seller relationship, international supplier selection and e-commerce (evaluating and selecting suppliers online) on the supplier selection process. The shift towards the qualitative and non-numerical aspects of supplier selection process clearly supports the idea that buyers benefits from considering these qualitative and non-numerical factors. However, the problem of how to quantify and measure these qualitative factors still remains to be tackled. A model incorporating both qualitative and quantitative criteria in a rational and systematic way is needed. Further research efforts should be made towards building such a detailed model by considering all qualitative and quantitative criteria.

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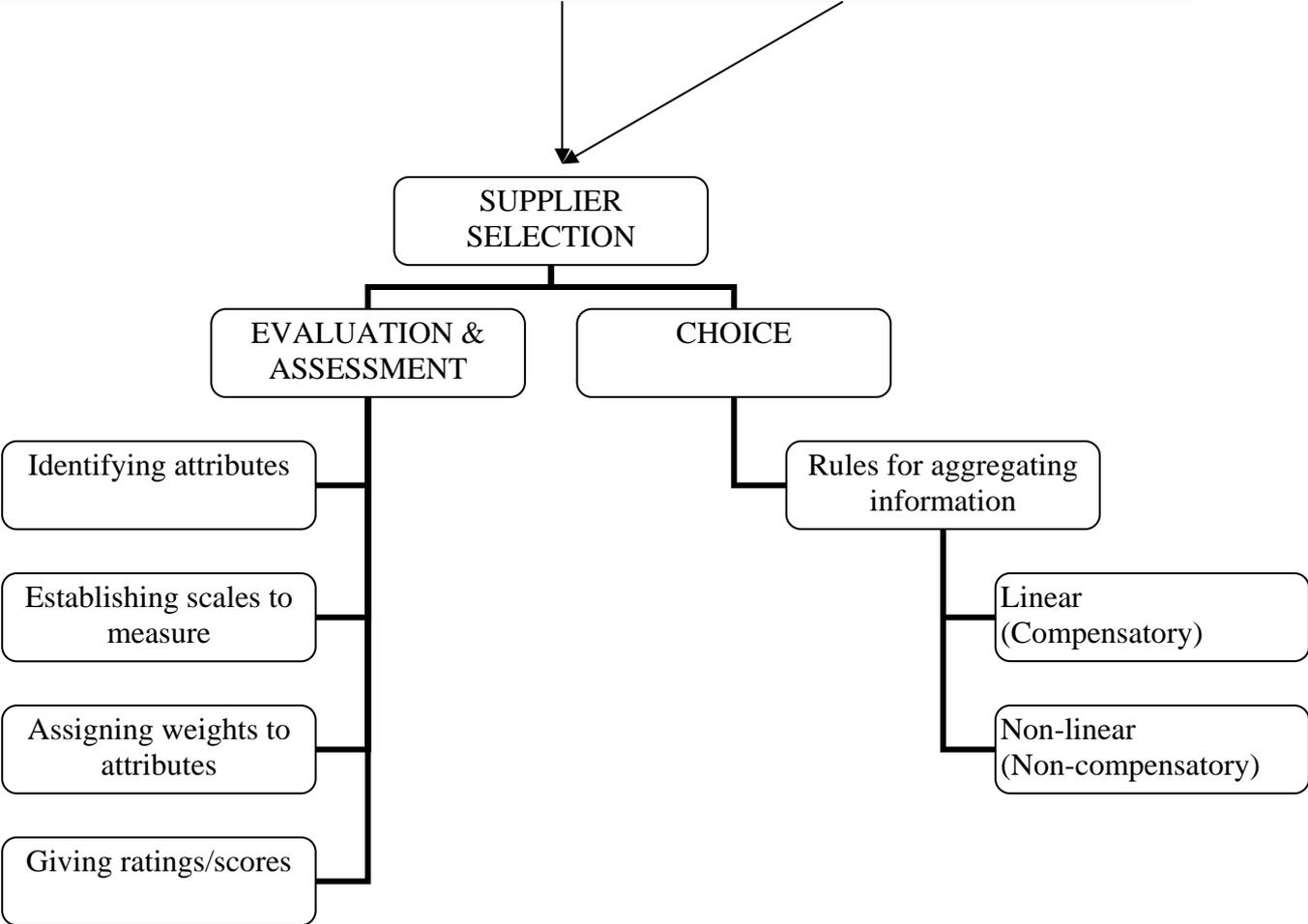
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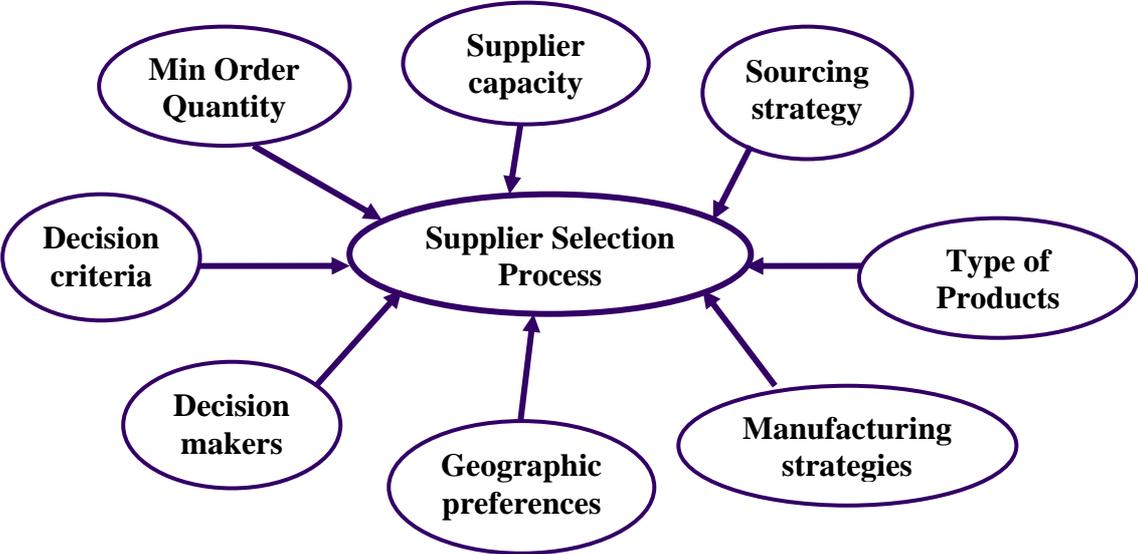
Figure 1: Phases of supplier selection process and tasks in supplier selection

Phase – 1	Phase – 2	Phase – 3	Phase – 4	Phase – 5
The need for a new supplier	Determination and formulation of decision criteria	Pre-qualification of suppliers	Final supplier selection	Monitoring of suppliers selected



Source: Created by the author based on the literature review.

Figure 2: Factors affecting supplier selection



Source: Created by the author based on the literature review.

Table 1: List and summary of papers related to decision criteria used for supplier selection

Paper ID	Brief description of content	Paper ID	Brief description of content
[2], Abratt (1986)	Analyses the buying process and identifies and determines the relative importance of the factors influencing supplier selection	[88], Lee, Ha & Kim (2001)	Proposes a methodology which identifies the managerial criteria using information derived from the supplier selection processes and makes use of them in the supplier management process.
[4], Akarte, Surendra, Ravi & Rangaraj (2001)	Identifies 18 criteria and groups them into four categories	[90], Lin, Chow, Madu, Kuei & Yu (2005)	Identifies the factors affecting the supply chain quality management
[11], Avery (1999)	Identifies the criteria used for IT purchases	[99], Mummaleneni, Dubas & Chao (1996)	Examines the Chinese managers' preferences of decision criteria when selecting suppliers
[12], Avery (1999)	Identifies factors affecting MRO supplier selection	[86], Lambert, Adams & Emmelhainz (1997)	Examines the decision criteria used by healthcare organisations and looks at the weights assigned to them
[13], Avery (2000)	Presents the experiences of three purchasing professionals and their preferred criteria when purchasing IT	[83], Krause, Pagell & Curkovic (2001)	Aims to develop a set of measures of purchasing's competitive priorities
[22], Bowman, Farleyn & Schmittlein (2000)	Examines the relative importance of factors that affect supplier selection and level of usage for global business services providers	[96], Min & Galle (1997)	Draws attention to include environmental criteria in the supplier selection process
[26], Choi & Hartley (1996)	Aims to identify supplier selection practices based on a firm's position on supply chain, and to provide recent supplier selection practices that incorporate contemporary supplier management issues	[104], Noci (1997)	Attempts to incorporate environmental criteria into supplier selection process
[35], Craig, Daugherty & Ellinger (1997)	Aims at exploring the criteria used during the selection of systems/software vendors for all or part of an integrated logistics information system	[71], Humphreys, McIvor & Chan (2003)	Attempts to integrate environmental factors into the supplier selection process
[50], Deng & Wortzel (1995)	Presents the results of an empirical study of the supplier selection criteria used by U.S. importers in three merchandise categories when selecting an Asian supplier	[72], Humphreys, Wong & Chan (2003)	Develops a decision support tool which should help companies to integrate environmental criteria into their supplier selection process
[63], Gonzalez, Quesada & Monge (2004)	Looks at the variables and their relative importance in supplier selection from quality, cost and productivity perspectives	[110], Patton (1996)	Attempts to find out what criteria and which methods purchasing professionals use in practice
[68], Hirakubo & Kublin (1998)	Examines the purchasing behaviour in the Japanese electronic and office equipment industries	[113], Pearson & Ellram (1995)	Examines and explores the differences in decision criteria used for supplier selection in small and large organisations

Table 1: List and summary of papers related to decision criteria used for supplier selection (continued)

Paper ID	Brief description of content	Paper ID	Brief description of content
[77], Kannan & Tan (2002)	Describes an empirical study of the importance of supplier selection and assessment criteria of American manufacturing companies for items to be used in products already in production	[130], C. O. Swift and K. H. Gruben, (2000)	examines the differences between the weightings applied to supplier selection criteria by male and female purchasing managers
[81], Katsikeas, Paparoidamis & Katsikea (2004)	Reports on a systematic examination of supplier performance in purchasing decision criteria of U.K. distributor firms of information technology (IT) products.	[133], Thorelli & Glowacka (1995)	Reports on factors thought to have an impact on decisions of purchasing professionals to source internationally
[122], Sharland, Eltantawy & Giunipero, (2003)	Examines the impact of cycle time on supplier selection	[135], Verma & Pullman (1998)	Examines the differences in weights assigned to decision criteria in actual choice of suppliers and perceived importance of decision criteria before selecting the suppliers
[123], Shipley, Egan & Edgett (1991)	Compares the performance of two channel designs in meeting customer sourcing criteria for industrial re-buy products	[141], Weber, Current & Benton (1991)	Looks at the criteria and analytical methods used in the vendor selection process
[128], Svensson (2004)	Investigates the models of supplier segmentation and supplier selection criteria.	[142], Wilson (1994)	Compares the relative importance of supplier selection criteria of late seventies and eighties with those of nineties
[129], Swift (1995)	Aims to determine whether there are differences in supplier selection criteria between purchasing managers who have a preference for single sourcing and those who prefer multiple sourcing	[145], Yan & Wei (2002)	Uses supplier selection criteria as an example to apply a proposed compromise weighting in a group decision making environment

Table 2: List and classification of decision making methods reported in the reviewed articles

Category	Method	Paper Reference number
Artificial Intelligence & Expert Systems	Neural networks	28, 32
	Case-based reasoning	27, 28, 29, 30, 31, 32, 33, 71
	Bayesian Belief Networks	84
Mathematical programming	Total cost based approaches	8, 14, 19, 21, 43, 44, 45, 46, 47, 48, 49, 114, 117, 120, 126, 146
	Non-linear programming	61
	Mixed integer programming	25, 49, 75
	Linear programming	60, 61, 145
	Integer programming	56, 65
	Heuristics	5, 18, 58, 132
	Goal programming	52, 78, 79, 137
	DEA	23, 91, 138, 139, 140
MCDM	AHP	4, 16, 21, 60, 100, 105, 121, 131, 137, 144
	Outranking methods	41, 53
	MAUT	57, 95
	Linear weighted point	101
	Judgemental modelling	38, 103
	Interpretive Structural Modelling	92
	Categorical method	70
Fuzzy sets	143	
Multivariate statistical analysis	Structural equation modelling	90, 134
	Principal component analysis	115
	Factor Analysis	83, 134
	Confidence interval approach	100
Other decision making tools	Group decision making	66, 92, 100, 101, 111, 112, 131, 145
	Multiple Methods	5, 21, 49, 60, 100, 137, 139, 140

Table 3: List and classification of papers on buyer-seller relationship, international supplier selection and e-procurement (online supplier selection)

Category	Brief content / article type	Paper Reference number
Buyer-Seller relationships	Socio demographic factors	1, 76, 107, 128
	Information and data sharing	3, 24
	Sourcing strategy and TQM	9, 10, 37, 55, 88, 94, 97, 102
	New product launch	15, 27, 33
	Conceptual & methodological	34, 93, 127, 139
	Review	51, 74
	Trust	54, 58, 59, 116, 122,
	E-commerce, e-procurement	124
International Supplier Selection	Decision criteria used	22, 50, 68, 80, 82, 98, 99, 109, 119, 133
	Methods proposed	39, 95, 117, 125
	Buyer-seller relationship	89, 102, 106, 107
E-procurement (online supplier selection)	Using the Internet, Electronic Data Interchange, evaluating & selecting suppliers online	4, 6, 17, 36, 39, 67, 73, 84, 124