ISSN: 2755-0214

Journal of Economics & Management Research

SCIENTIFIC Research and Community

Review Article

Open Access

Comparative Analysis of Goods Supplier Selection and Logistics Service Provider Selection

Aicha Aguezzoul

CERIFIGE, IAE Metz, 57073 Metz Cedex 3, France

ABSTRACT

The selection of goods suppliers and logistics service providers is a strategic decision that significantly impacts a company's overall performance. This process is inherently complex and involves multiple criteria, requiring the consideration of both quantitative and qualitative factors. This article explores the selection of goods suppliers in comparison to logistics service providers, focusing on the criteria used and the decision support tools employed.

***Corresponding author**

Aicha Aguezzoul, CERIFIGE, IAE Metz, 57073 Metz Cedex 3, France.

Received: March 15, 2025; **Accepted:** March 18, 2025; **Published:** March 29, 2025

Keywords: Supplier Selection, Logistics Outsourcing, Criteria, Decision-Making.

Introduction

In today's uncertain and complex environment, a company must work closely with its partners to remain competitive. Goods suppliers and logistics service providers (LSP) are among the key actors of a supply chain (SC). Indeed, goods suppliers' selection is a critical purchasing activity, which can generate up to 80% of total product cost [1]. As for logistics services such as transport and warehousing, they represent a significant part of total logistics cost.

Although services and goods are both intangible, there are some differences between them. The production and consumption of goods are separated, while those of services generally take place simultaneously. Additionally, goods are stored, while services are provided when they are needed.

Nevertheless, working with goods suppliers or LSP requires selecting the most efficient, those with whom buyers will establish partnership relationships. This selection is a multi-criteria problem that uses various criteria such as cost, quality, delivery and services. Some are developed according to the specific needs of buyers while others are common to all circumstances.

The aim of this paper is to present a study on goods suppliers' selection versus LSP selection. For this purpose, our analysis refers to in the case of goods supplier's selection, and to in the case of LSP selection [2-5].

This Paper is Structured as Follows: The following section illustrates the services offered by LSP. Sections 3 and 4 present the main criteria and methods for selecting goods suppliers and LSP. A conclusion and future research are presented at the end.

Characteristics of LSP

Logistics outsourcing consists of entrusting logistics activities previously carried out internally by the shipper to a LSP. The LSP can perform the logistics functions of their shippers either in whole or in part, and have their own warehouses and transportation fleets deployed in the worldwide.

To remain competitive, LSP are increasingly offering innovative and value-added services. Table 1 provides an overview of LSP logistics services.

Table 1: Activities Associated with LSP

Logistics Processes	Services
Transportation distribution	Mode of transport, intermodal transport, distribution (urban, express, specialized, omnichannel), delivery (last km, drone, route planning, tracking), payment and audit of freight invoices, temperature-controlled transport,
Warehousing storage	Storage, inventory management, shopping, supply planning, (un)consolidation, temperature-controlled storage, automation.
Order management	Cross-docking, co-manufacturing, pick by (voice,vision, light), delayed differentiation, merchandising, postponement.
Packaging	Design, labelling, (co)packing, (re)conditioning, kitting, palletizing.
ICT	ERP, WMS, TMS, e-commerce, control tower, front office solutions, RFID, bar code, digital solutions, geolocation, tracking & tracing.
Reverse logistics	Pallet flow management, returns and waste treatment, eco-responsible packaging, electric vehicles, mega-truck.
Customer services	Call centers, logistics advice, after sales service, billing for account, direct marketing, logistics in situ, customs clearance, and promotional logistics.

Selection Criteria

- **Criteria For Supplier Selection**

The first writings on supplier selection are those of Dickson [6]. The latter conducted a survey of 274 Canadian and US companies' members of NAPM (National Association of Purchasing Managers), and identified 23 criteria used by buyers in the 1960s.

In a famous and widely cited literature review, analyzed 74 articles published between 1966 and 1991 and showed that criteria mentioned by Dickson are still widely used, even if the relative importance of these criteria has changed [7].

Table 2 Gives A Comparison of The Importance Degree of Each Criterion According to Dickson and Weber.

Table 2: Criteria Rank of Supplier Selection in 1966 and 1991

Criteria	Dickson (1966)	Weber el al.
Quality	1	3
Delivery	2	2
Performance history	3	10
Warranties & claim policies	4	15
Production Facilities & Capacity	5	4
Price	6	1
Technical Capability	7	5
Financial Position	8	9
Proceducal Compliance	9	14
Communication System	10	13
Reputation & Position in Industry	11	8
Desire for Business	12	14
Management & Organization	13	7
Operating Controls	14	11
Repair Service	15	10
Attitude	16	8
Impression	17	12
Packaging Ability	18	11
Labor Relations Record	19	13
Geographical Location	20	6
Amount of Past Business	21	15
Training Aids	22	13
Reciprocal Arrangements	23	13

As shown in this table, the relative importance of each criterion has changed following the evolution of the industrial context with the Just-in-Time concept. Indeed, according to Weber, geographical location is important (6th place), while this criterion has occupied the 20th place in 1966. Similarly, reciprocal arrangements between buyer and suppliers are important for proper cooperation between them. This criterion moves from 23th to 13th place. Some criteria are at the same level of importance such as communication system, labor relations record, training aids, and reciprocal arrangements, which occupy the 13th place. Finally, the cost-delivery-quality triptych was the most used from 1966 to 1991. Price became more significant in 1991, whereas it was in 6th place in 1966.

Analyzed 78 articles published during 2000-2008 period and identified 14 criteria for supplier selection (Figure 1), including new ones such as research & development, flexibility, risk, and safety & environment. Suppliers participate effectively in the final product development, and must maintain a long-term relationship with the buyer to jointly gain competitive advantages. We note risk, and security & environment are at the same rank (12th) as the relational criterion. As for the geographical location, it no longer matters. Buyers source from suppliers in developing countries for their low costs.

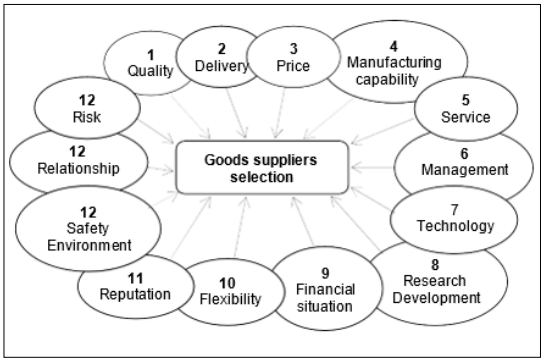

Figure 1: Criteria for Goods Suppliers' Selection

In summary and as stated in Table 2 and Figure 1, quality, cost and delivery remain the most commonly used criteria. Criteria such as financial situation and manufacturing capability are at the same importance level in 1991 than in 2010, while for service, its level has evolved more quickly from 15th in 1966 to 10th in 1991, and then to 5th place in 2010.

- **Criteria for LSP Selection**

For LSP selection, we refer to two studies: the first presents a literature review of 47 articles published during 1994-2013 period, and the second focuses on articles published from 2014 to 2017. Table 3 gives a comparison of the relative importance of each criterion according to these studies, while Figure 2 summarizes the overall rank of criteria over 1994-2017 period.

The Table 3 shows that during 2014-2017 period, the relative importance of the criteria underwent significant changes. Thus, the importance of ICT has increased enormously following major changes in shipper/LSP relationships. Indeed, ICT induces a rapid exchange of information between co-contractors, even if they are increasingly geographically distant, and (sustainable) supply chains are expanding to include other partners on a global scale.

Table 3: Criteria Rank of LSP Selection in 2014 and 2019

Criteria	Aguezzoul (2014)	Aguezzoul (2019)
Relationship	2	1
ICT	8	1
Quality	4	2
Price	1	3
Physical Assets	11	4
Services	3	5
Financial Situation	9	5
Delivery	6	6
Professionalism	7	6
Flexibility	5	7
Reputation	12	8
Location	10	9
Sustainable logistics	13	9

The relationships criterion is also gaining importance thanks to the emergence of new ICT. The extent and quality of the information exchanged makes it possible to strengthen the shipper/LSP partnership. The cost is relatively lower than in the past. In fact, the shipper/LSP relationships allow reducing logistics costs thanks to the implementation, for example, of shared supply management or pooling. This approach also makes it possible to reduce CO_2 emissions, improve the service rate and the information exchange. Criteria related to sustainable logistics, including returns and waste management, are of increasing importance in the context of development of sustainable supply chains. As for proximity to geographic markets, this does not seem to be a determining criterion.

Figure 2: Below Shows the Level of Relative Importance of Each of LSP Selection Criteria According to the Latest Study.

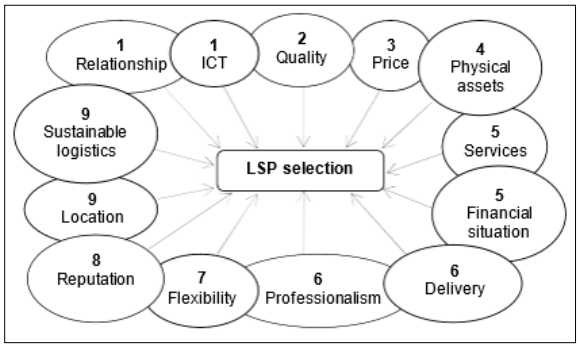

Figure 2: Criteria for LSP Selection

As shown in figures 1 and 2 above, several criteria are used in both goods suppliers' selection than LSP selection. However, the relative importance of these criteria in is not the same for the two cases. Thus, in the case of goods supplier's selection, quality is the most important criterion, followed by delivery and price. In the case of LSP selection, relationship and ICT occupy the first position, followed by quality and then by price, while delivery comes to 6th position. The relationship between shipper and LSP is very important in the current economic context for effective cooperation between them. This criterion is favored by the use of ICT such as digital solutions (ERP, WMS, TMS, RFID, robotics, etc.).

The different criteria involved in the selection process are interdependent. Indeed, the relationships between a buyer and its suppliers or LSP, based on trust and commitment, allow reducing costs, improving quality and mitigating risks throughout the supply chain.

Selection Methods

The main methods for selecting partners (goods suppliers, LSP) are classified into five main categories, namely: multi-criteria decision making (MCDM), statistical approaches, mathematical optimization, artificial intelligence, and methods based on costs. Most methods are hybrid.

- **MCDM Methods**

These methods aim to help decision-makers formalize a problem and explain the decision context, before proceeding with the evaluation and comparison of solutions. The most used are the following:

- **AHP (Analytic Hierarchy Process):** It is a process, which consists of hierarchically structuring multiple-choice criteria, evaluating the relative importance of these criteria, comparing the partners for each criterion, and determine the ranking of these partners.

- **ANP (Analytic Network Process):** This is a more general form of AHP that represents the connections between higher-level elements of the hierarchy, lower-level elements, and those on their own level. These elements correspond to criteria and partners to be selected.

- **TOPSIS (Technique for Order Preference by Similarity to Ideal Solution):** In this method, the partners to choose must have on the one hand, the shortest distance from the positive ideal solution, and on the other hand, the furthest distance from the negative ideal solution.

- **SMART (Simple Multi-Attribute Rating Technique):** It uses the simple additive weight method to obtain total values for individual partners, helping to rank them according to order of preference.

- **DEMATEL (Decision Making Trial and Evaluation Laboratory):** It works in the same way as AHP method, but seeks to determine the influences between the criteria by calculating two factors – the intensity of the influence and the direction of the influence-and whether the influence is a cause or effect.
  The method assumes that all criteria are interdependent and influence other criteria.

- **ELECTRE (Elimination Et Choix Tradescant la Reality):** It consists of the comparison of partners in pairs by means of an outranking relation, using the principles of concordance and discordance. Other ranking methods are used like PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluations), and MABAC (Multi-Attributive Border Approximation Area Comparison).

- **BWM (Best Worst Method):** It performs comparisons of all criteria with the predefined best and worst criteria. Unlike AHP, BWM method allows to reduce both the number of pairwise comparisons of criteria and the risks of inconsistencies.

- **QFD (Quality Function Deployment):** It aims to develop thinking about a new product or service, starting from the buyer's needs and determining the characteristics to give them as well as the relative importance of each. A grid in the form of a quality house represents it.

- **VIKOR (VIseKriterijumska Optimizacija I Kompromisno Resenje):** it is a method developed to solve multicriteria decision problems with contradictory and non-proportionate criteria.

Statistical Approaches

Correlation methods are the most used in this category to refer to data collected from empirical studies. The other methods are described below:

- **Binary Logit Model or Logistic Regression Model:** It is used when the dependent variable is not continuous but

instead has only two possible outcomes, "1" or "0". For example, the dependent variable is the transaction dummy. If a transaction between a buyer and a partner occurs, the value of this variable will be "1"; otherwise, it will be "0".

- Factor analysis allows to analyses the interrelationships between a large number of criteria, and to explain these variables according to their common underlying dimensions (factors).

- **Cluster Analysis:** It allows to group elements (partners) into clusters. The differences between elements of the same cluster must be minimal and those between different cluster elements must be significant.

Mathematical Optimization

Mathematical optimization consists of optimizing a set of objective functions under a set of constraints faced by the decision-maker. The most cited are:

- **Linear/Non-Linear Programming:** This model allows optimizing a single criterion, mainly costing.

- **MOP (Multi-Objective Programming):** It allows to simultaneously optimizing several criteria. Weber and Current first developed it in the case of goods supplier's selection [8].

- **DEA (Data Envelopment Analysis):** It is a non-parametric deterministic approach, which defines a linear envelope linking the criteria against which it is possible to calculate the effectiveness of partners.

Artificial Intelligence

Artificial Intelligence Aims to Consider Human Expertise in the Selection Process. The Most Used are:

- **Expert System**: It represents knowledge and expertise, which professionals hold on the partners, as well as the information collected from the literature on the various stages of their selection such as the formulation of criteria.

- **CBR (Case-Based Reasoning):** It uses knowledge deduced from experiences or similar cases on partners, in order to make decisions on their prequalification. This method is frequently combined with RBR (Rule-Based Reasoning), which allows representing the knowledge and expertise that buyer has about the partners.

- **ANN (Artificial Neural Networks):** It allows simulating the human brain functions. It can deal with the complexity and conflicts existing in partner selection through its two characteristics, namely: learning and recall. Learning allows the adjustment of a network model to produce the desired output, while recall provides an output for a given input according to the trained model.

- **SOM (Self-Organizing Map):** It is a type of ANN trained using unsupervised machine learning to produce a low-dimensional (typically two-dimensional) representation of a higher-dimensional data set while preserving the topological structure of the data.

Methods Based on Costs

These methods are quite complex and require the estimation of all costs generated by the activities implied in a purchasing transaction such as quality control, transportation, and administrative costs. They are mainly applied in goods suppliers' selection and rarely in LSP selection. The most cited are:

- **ABC (Activity Based Costing):** It is a costing model that identifies activities in an organization and assigns the cost of each activity resource to all products and services according to the actual consumption by each. It is used to select suppliers that minimize the total additional costs associated with the purchase decision.

- **TCO (Total Cost of Ownership):** It is a method of calculating the direct and hidden costs of a purchase. It includes the purchase price and all underlying operational costs such as quality, inspection, delivery, etc.

Note that the majority of methods are hybrid, and used at different stages of the partner selection process; such as when calculating the criteria weights (case of AHP), and the final selection of the best partners (case of ANN).

MCDM methods are widely cited, notably AHP, for their simplicity and great flexibility. They are integrated with methods in this same category, or with those from other categories. Statistical approaches are widely applied due to the empirical type of studies in this area. As for AI, it is still little applied.

The choice of such a method depends on buyer's activity sector, logistics activities to outsource, criteria to consider, and number of suppliers or LSP put in competition.

Conclusion

This study on goods suppliers' selection versus LSP selection allowed drawing the following conclusions:

First, this selection decision is complex and requires the use of different criteria. Some are more specific to services than products and vice versa. Moreover, the relative importance of criteria like ICT, quality, relationships, and delivery, has changed over time.

Secondly, the selection methods are classified into five categories namely: MCDM, statistical approaches, mathematical optimization, AI and cost-based methods.

This study offers provides future research opportunities. Thus, in the current sustainable development context, additional work considering sustainability and social responsibility criteria is requiring. Likewise, with logistics digitalization, AI has become crucial in any decision-making process within a SC. Finally, a SC is vulnerable and subject to various risks: contractual (buyer-supplier relationships), operational (delayed delivery), crises (economic, geopolitical, energy, health, etc.). Partners in such a SC must demonstrate flexibility and resilience to continue collaborating. Risk-related criteria have now become essential in supplier selection.

References

1. Aguezzoul A, Ladet P (2007) A nonlinear Mult objective approach for the supplier selection, integrating transportation policies. Journal of Modelling in Management 2: 157-169.
2. Aissaoui N, Haouari M, Hassini E (2007) Supplier selection and order lot sizing modelling: A review. Computers & Operations Research 34: 3516-3540.

3. Ho W, Xu X, Dey PK (2010) Multi-criteria decision-making approaches for supplier evaluation and selection: A literature review. European Journal of Operational Research 202: 16-24.
4. Aguezzoul A (2014) Third-party logistics selection problem: a literature review on criteria and methods. Omega: The International Journal of Management Science 49: 69-78.
5. Aguezzoul A (2019) Prestataires de services logistiques: évolution de l'importance relative des critères de sélection. Logistique & Management 27: 163-169.
6. Dickson GW (1966) An analysis of vendor selection systems and decisions. Journal of Purchasing 2: 28-40.
7. Weber CA, Current J, Benton WC (1991) Vendor selection criteria and methods. European Journal of Operational Research 50: 2-18.
8. Weber C, Current J (1993) A Mult objective approach to vendor selection. European Journal of Operational Research 68: 173-18.