

STUDY OF THE LOGISTICS SERVICE PROVIDERS PERFORMANCE IN MOROCCAN AGRICULTURAL SECTOR

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Abstract The main objective of this paper is to study the situation of LSP operating in the agricultural sector which is a key sector for the Moroccan economy. This study will help contractors to make a correct decision concerning the choice of a performing LSP in the agricultural sector, while providing a multi-criteria decision method (MCDM): fuzzy AHP. Nowadays the expansion in terms of service has become crucial for any implementation of a successful outsourcing strategy and to attract and convince contractors through well adapted services, furthermore, the diversity in terms of the offer made by the LSP and the competitiveness between them made the task of the contractors complicated. This paper intended to provide an exploratory study grouping, on the one hand, the various Moroccan LSP and the level of their service offered in logistics services in the agriculture field, and on the other hand, the different criteria that influence the choice of those LSP. As a result, a proposal of an MCDM is established. The objective is to provide the contractors with a decision-making tool for selecting suitable LSP to collaborate with and evaluating the outsourcing performance.

Keywords:

LSP,
agricultural
sector,
contractors,
MCDM,
Fuzzy
AHP,
outsourcing
strategy,
logistics
service
offer

1 Introduction

Any company seeking to be competitive must necessarily and primarily outsource some of its activities, particularly those of a logistical nature, it would thus be focused on its core business (Hdidou et al., 2018). In fact, by entrusting its logistics to a specialist will enable it to reduce the risks and the cost of these ancillary activities (Alami et al., 2016). As such, it is obvious that a company must focus on its development and its marketing strategy. But often, logistical problems take over and leave less time to develop the core business. Besides «the national Moroccan strategy for the development of logistics competitiveness», has as its main objective the improvement of the performance of the logistics sector as a whole, which is currently at a stage requiring additional support and effort on the one hand¹, and on the other hand, the state had adopted a proactive strategy for the development of the agricultural sector embodied by the Green Morocco Plan (GMP). The GMP aims to promote the agricultural sector suffering from several obstacles and which is a real driver of growth and socioeconomic development of the country.

Through this paper, we first propose to carry out a study on LSP operating in the agricultural sector in Morocco to assist decision-makers in their choices while implementing one of the most commonly used multi-criteria methods in the agriculture, and subsequently encourage them by the outsourcing strategy.

This study will be reviewed from multiple points: first of all, we present the state of the logistics outsourcing in the agriculture sector in Morocco, through secondary data collected on the Logistics Service Providers (LSP) operating in the Moroccan territory in this field. Quantitatively, the study concerns a set of 57 LSP the most present LSP in Morocco and which offer services in their field.

It is necessary to note that this manuscript is based on the results obtained from the study published in a conference proceeding (Azzouz et al., 2020), these results clearly show that in spite of the importance of the agriculture sector in economic, social and environmental terms on our country, it's still remains, strongly handicapped by a poorly performing logistics. This sector relies only on traditional services such as transport, and it remains resistant to high value-added services. This can be

¹ Ministère de l'équipement et des transports, Stratégie nationale de développement de la compétitivité logistique, Synthèse de la stratégie et du Contrat-Programme 2010 – 2015, 2011

explained by the nature and characteristics of their supply chains, which involve several stakeholders throughout the production chain, for example at the traditional distribution level, the immature stakeholders don't attach importance to the good logistic practices and don't have the logistic organizations (Mir et al., 2018).

This study will allow us to highlight the most performing LSP in terms of the criteria determined by the contractor contributing to the resolution of the decision problem with LSP in agriculture field, which are dealing with a variety of offer, so the decision-making tool for selecting suitable LSP to collaborate with contractor, in the agricultural sector is the study's purpose.

2 The multiple criteria decision making for the choice of a logistics service provider: agriculture sector case

2.1 State of the art on the agricultural sector in Morocco

Morocco has adopted several strategies for the profound transformation of its economy which is aimed to upgrade and improve the competitiveness of strategic sectors for the national economy². Through sectoral strategies aimed at modernizing its productive system and strengthening its performance and its resistance for the Moroccan economy to be registered on a path of strong and sustained growth².

The Government has also initiated strategic policies that contribute to the awakening of key sectors, among this plans which are implemented through sectoral program contracts, we find Agriculture Green Morocco

Since its independence, Morocco has placed the agricultural sector at the core of its development choices because of the important issues, raised by this sector on economic, social and territorial plan (Nejar et al., 2018).

² Rapport de la CFCIM, (2018). Le Maroc en bref . 13 Juillet

According to the Green Morocco Plan (GMP), Moroccan agricultural sector has doubled its turnover in 10 years. Local authorities have boosted the sector and increased its productivity by pursuing a policy of crop diversification and mechanizing plots. GMP, has given new impetus to the agricultural sector through a high mobilization of investment, both public and private.

So the modernization of the agriculture sector has become a necessity, by the establishment of a of regulatory and structural measures to generate an environment favourable to the professionalization and competitiveness of Moroccan products. This modernization aims to improve the agricultural techniques, better management of resources and intensification of production(Harbouze et al., 2019).

Given a study achieved on the LSP's offer suitability with contractor's demand in Morocco in terms of logistics services [4], according to the three sectors which constituting the Moroccan economic community, it seemed essential to take special care to a sector which is the core of the Moroccan economy and which suffers from weaknesses in both at the infrastructure and regulation level.

In order to deal with these constraints, the State has promoted this sector, while implementing in 2008 a plan named: Green Morocco Plan (GMP) which aims to make the agricultural sector a real driver of growth and socioeconomic development of the country (Harbouze et al., 2019).

Among the main objectives of this plan are:

- Modernization of the sector and integration into the global market while creating wealth across the entire value chain.
- Better promotion and sustainable management of natural resources.

In order to achieve these objectives, the state has established a logistics platform for distribution for the agricultural sector, while taking into consideration the proximity of economic operators and also consumers for a good convergence and concentration of the flows required for the development of a competitive offer of logistics services. (Azzouz et al., 2020)

These platforms will provide infrastructure (storage, large cold storage warehouses capacities, etc.) and many services (handling, quality control and traceability of products, administrative, banking, etc.) and will contribute to the discount and homogenization of marketing costs, the continuity of the cold chain, traceability, and better compliance with hygiene conditions³.

The considerable range of needs, sometimes highly specialized, emerges needs mainly in terms of storage space, cold chain infrastructure and adequate transport (especially during peak periods: marketing of agri-food products, fruit, vegetables and cereals and agro-industry outsourcing)³.

To go with the agricultural export's growth, the action plan predicts the following actions³:

- Improving logistics related to the exports of agricultural products and to the GMP initiatives through:
 - The development of an offer of logistics services within or near the agropoles envisaged in the GMP.
 - The development of logistics related to the cold chain at level of the entire chain between the production, warehousing until delivery by using road and sea transport and port transit.
 - Support for assembling exports around freight forwarders and transport organizers.
- Encourage investment in cold chain infrastructure and equipment (cold storage warehouses, refrigerated transport, maintenance and monitoring of cooling systems, etc.)
- Encourage the outsourcing of logistics associated with the export of agricultural products.

To sum up, the state's efforts in this sector are significant, however, they remain unfulfilled without the promotion of the logistics service sector. Indeed, the level of

³ Synthèse de la stratégie et du Contrat-Programme 2010-2015. Stratégie Nationale de Développement de la compétitivité Logistique, Ministère de l'Équipement et des Transports.

outsourcing of the logistics of the Moroccan companies is very low today, only 10 % proceed by outsourcing compared with 75 % for some countries such as Japan [9]. Moreover, the demand for logistics services is increasing, particularly in the distribution and export sectors. This request has a key role in the upgrading of the offer (Bennouri et al.,2020).

Due to their requirements and professionalism, many key structured stakeholders have made the evolution of the offer possible. The recourse to the aggregation of actors, for a better organization of incoming and outgoing flows by adopting the outsourcing strategy based on the shared management of logistics of the entire value chain from the procurement to the distribution of finished products is proven by the emergence of the LSP which offers value- added and targeted services³.

Therefore, these incentives have engendered a multitude of specialized LSP for specific sectors, it evokes a decision problem that the contractor must take into consideration because he is confronted by a diversified offer from the LSP, especially with the state direction towards the implementation of a rating and labelling system as a tool to enable the access to bank financing, and to the public markets through calls for tenders associated with multi-flow logistics zones and also the classification and qualification of integrated logistics actors (labelling system)⁴, this in order to attract investors in the logistics sector and to promote the emergence of integrated national and international operators, and to motivate economic operators to resort to the organized service providers for their logistic needs and outsource their logistics activities and to unite private sector for membership in the various labeling systems of the sector launched by the government³.

2.2 Choice of method

In the literature, many authors have trailed the issues of selection and evaluation of LSP, they focused on the evaluation criteria of LSP as well as on the multidimensional aspect of the problem (Hasannia et al.,2017).

⁴ AMDL, Système de labélisation. Logistics Performance Label.
<https://www.amdl.gov.ma/amdl/excellence-logistique/>

Therefore, the contractor must select a certain number of service providers presumed to be suitable partners. This choice can be achieved in different aspects, whether it's strategic, technical or geographical (Kierzkowski et al., 2005). This service provider selection problem is classified as a decision problem (Patila et al., 2020). Indeed, the choice of provider is a most critical step, since the effectiveness and efficiency of the outsourcing and even its sustainability will depend heavily on the suitability and performance of the provider (Arif , 2016). Especially with the encouragement of the state and the implementation of strategies that favors the occurrence of specialized actors in the logistics professions.

The multi-criteria analysis methods or, more exactly, the multi-criteria decision-making methods are fairly recent techniques and in full development (Ben Mena, 2000), by their attitudes of integrating any type of criteria (Amini et al., 2017), these procedures seem better to make it possible to converge towards an appropriate compromise rather than an often unsuitable optimum.

Ultimately, to solve this complicated issue, many techniques are suggested in the literature (Wetzstein et al., 2016).

Typically, when we pose a multi-criteria problem, it is a question of finding the “most appropriate solution” in light of a number of criteria (Ben Mena, 2000).

Aguezoul (2014) ranked the main models for selectin LSP according to five categories:

- Multi-Criteria decision support tools: (or MCDM: multi-criteria decision-making).
- Statistical models.
- Artificial intelligence.
- Mathematical programming.
- Hybrid models.

The choice of one or the other model depends on the character of the criteria (qualitative, quantitative), the outsourced activity and the set of LSP put in competition.

In our study, we will focus on multi-criteria decision-making tools (or MCDM, there are several methods that are part of this category, we cite for example AHP, ANP ... (Sohrabia et al., 2016).

The choice of the AHP method is justified by its practical and systematic nature for this type of problem, whereas the fuzzy logic is justified by its ability to represent uncertain information (Zouggari, 2011).

Regarding supplier selection, the AHP method is in particular used to treat the multi-criteria decision issue for supplier classification (Zouggari, 2011).

Accordingly, opting for this method is proved by a literature study on fuzzy AHP carried out using SCOPUS which gives 8,284 published papers (all fields).

According to a study conducted (Kahraman et al., 2015), we have extracted a comparison between the 4 most commonly used methods in agriculture:

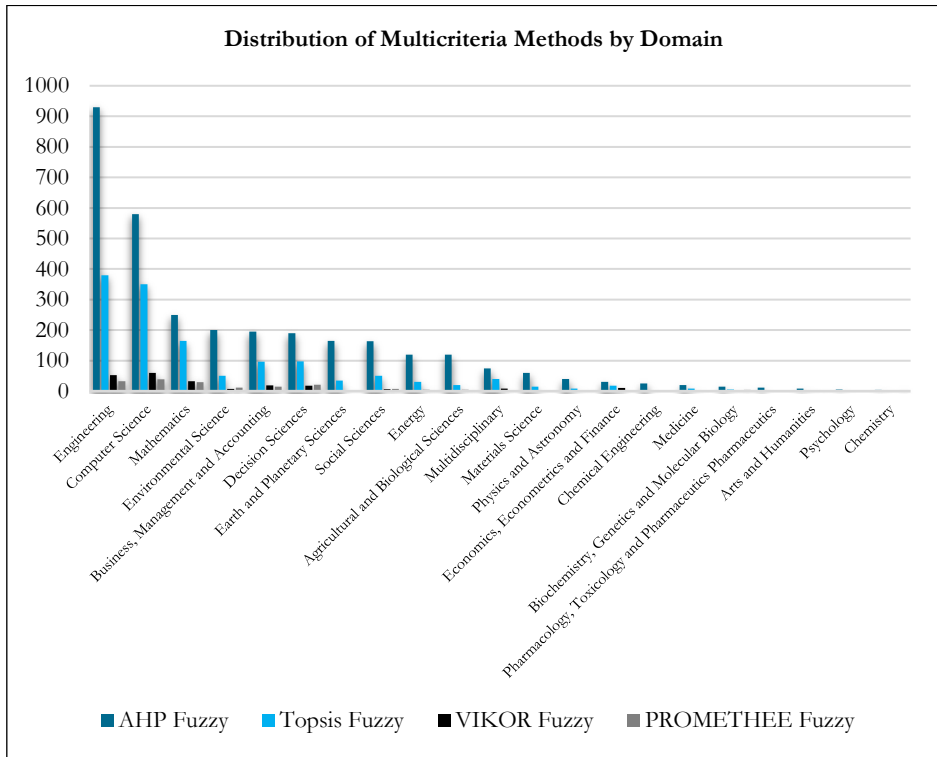


Figure 1: Distribution of multicriteria methods by domain
(Source: own.)

The review literature for the fuzzy VIKOR method using SCOPUS for extracting 964 papers published in various fields. For TOPSIS fuzzy, the review literature enables to extract 4010 papers published in several fields, However the fuzzy AHP method was the method that refers to the most published papers among these 4 methods by employing SCOPUS with 8284 papers in all fields (Kahraman et al., 2015).

If we specify the most explored areas, we find that the fuzzy AHP method greatly exceeded the other methods in terms of published paper in the field of agriculture with almost 100 articles against almost 10 papers for the other methods.

And according to (Kahraman et al., 2015), at the agricultural level, fuzzy AHP almost remains the only method used.

This finding, the choice was made to adopt the fuzzy AHP as a multi-criteria decision method to remedy the issue of the choice of LSP as part of a strategy of outsourcing among a panoply of offers available in the Moroccan market.

2.2.1 The AHP method

After choosing the fuzzy AHP method for the resolution of the LSP selection problem in the agriculture field, this choice based on the literature review referred to above, we will present a general overview of the chosen method.

The Analytical Hierarchy Process (AHP) is a structured approach used for decision-making in complex problems, proposed by Saaty (1980).

The AHP method provides a hierarchical organisation of decision-making criteria and a quantification of relative priorities for a given set of alternatives taking in consideration the pairwise judgements of decision-makers, Thus, it possible to treat problems with quantitative and qualitative criteria (Feki, 2013), using the following three principles: decomposition, comparative judgements and the synthesis of priorities (Saaty, 1983).

The AHP consists in breaking down a complex, multi-criteria problem into a hierarchy where each level is formed by a few manageable elements that are then broken down into another set of elements (Wind, 1980). The second step concern the use of measurement methodology to prioritize among the elements at each level of the hierarchy. The third step is to synthesize the priorities of the elements to establish the global priorities for the different alternative factors.

3 Case study: Selecting LSP in the Agricultural Sector

We have proposed a multi-criteria decision-making method for the selection of LSP operating in the agricultural sector, as part of an outsourcing strategy. The multi-criteria or multidimensional nature of the LSP selection issue makes the problem more complex.

This present research examines a multidimensional classification of LSP that provides a service which fit into the agricultural filed. Our approach will be focused on the evaluation of LSP based on a multi-criteria classification approach using an example of the prioritization of 57 LSP taking into consideration evaluation criteria.

A multitude works relating to the issue of LSP selection have suggested a certain number of criteria, and various approaches have been used to assess these criteria (Chai et al., 2013; Hasannia et al., 2017; Ho et al., 2010).

For that purpose, we will conduct an exploratory study of a representative sample of LSP operating in Morocco and services included in the agricultural sector. These LSP can be made up of foreign LSP with subsidiaries in Morocco or National LSP.

This exploratory, quantitative and qualitative study, was achieved on 57 LSP. This sample is statistically representative of LSP considered TOP LSP, whether in terms of technological innovation, the range of services offered, the level of traceability used, or their involvement in the agricultural sector. These characteristics will lead us to the identification of the criteria represent sources of customer added value (Mevel et al., 2010). Thus, the contractor can differentiate each LSP from its competitors regarding their expertise (Aguetzoul, 2019).

This study will be based on the following elements:

- Secondary data of LSP operating in Morocco, collected from their website portal, or on the websites of professional corporations.
- Summary table synthesizing all collected data.

Based on this information, a classification of LSP considered to be recognized as the best LSP will be established using the fuzzy AHP method, while adopting statistical tools linking all the LSP and the selection criteria set by contractors as examples:

- Tables
- Graphics and Scoreboard

The results of the exploratory study will highlight the most performant PSL in the agricultural sector giving the best choices among all the alternatives available by the inclusion of the various criteria.

3.1 Decision making: modeling and tools

Our research problem concerns the LSP selection using several criteria that we have previously set at 4 criteria but can be specified by the contractor as well.

In this section, we present the methodology adopted as well as the set of Moroccan LSP chosen as a sample in the outsourcing of logistics activities process. The objective is to determine the LSP which best meet the requirements of contractor in the agricultural sector, among a wide range of existing LSP in the market.

The problem of selecting LSP is one of the strategic decisions that have a considerable impact on the company's performance. For the decision-maker, the issue of LSP selection involves determining the number and the portfolio of LSP to be retained (Zouggar, 2011).

Therefore, the first step is to collect the necessary data based on the sample of 57 Moroccan LSP. Secondly, summary table synthesizing all collected data will be established.

The statistical study presented in table 3 allows us to get a clearest vision on the physiognomy of the Moroccan market in terms of the services offered by the LSP in the agricultural sector and then detect the most efficient LSP while taking into account the criteria that will be determined by the decision-makers.

In order to quantify and evaluate the data collected, we have used a rating associated with each criterion in regard to its level.

Table 1: Table of verbal judgment and the scores associated with each judgment

Criteria notes	Traceability	Specialization of the sector	Technology	Services offered	Transport
1	Website+contact	Does not work in this field	Website	Transport	Basic: road, railway
2	Tracking(icon)	A simple national actor	SI/EDI	Warehousing, storage, handling	Maritime
3	Tracking (customer space, blog,)	National and international actors	TMS, WMS,	Cold warehousing, Controlled temperature Storage	Airline
4	Advanced tracking	Specialization with specific fleets	Computer software, platform,	Transit	Messaging, Express, urgent transportation
5	RFID/GPS....	Restricted only to this field	IA, RFID,	Contract logistics, advanced, SCM	Cold transport, Temperature controlled

The transition from one level to another is cumulative, the maximum score that can be reached is 5 if all the underlying levels of a criterion are fulfilled.

For the types of variables, we notice that they are not of a numerical type, then in order to make them manipulable we need to convert the so-called linguistic variables to numeric variables by assigning quantifications to each linguistic variable according to a scale.

This brings us to introduce the fuzzy concept and linguistic variables to cope with the limitations of the methods and their uncertainties. In fact, the fuzzy sets introduced by (Zadeh, 1965), provides us with a new mathematical tool to deal with the uncertainty of the information. Due to the real decision-making situations and the vagueness of human mind, it is impossible to exactly express preferences and personal judgments confidently.

These judgments are often resulting from insufficient information and/or difficult to quantify, the fuzzy set theory can be used successfully (Zadeh, 1965).

Therefore, a fuzzy approximate value can be used to generate a more accurate modelisation of human judgment. We take as an example the evaluation of a LSP, terms like bad, medium, good and excellent can be the alternatives of ordinary numerical values (Igoulalene, 2014).

Among the different forms of fuzzy number, the triangular fuzzy number is the most popular.

The working principle of fuzzy AHP consists of a cross-over of the alternatives that are the subject of the study via a square matrix which contains the alternatives in row and in column.

Indeed, in his article, (Chang, 1996) proposed for the first time a method of calculating priorities for triangular fuzzy comparison matrices by introducing triangular fuzzy numbers for binary comparison between criteria.

So, we will have for each criterion 3 matrices: the first one represents the matrix M, it corresponds to the middle values of triplet which is composed of (L, M, U) elements, the other matrices are L and U which correspond to the other elements of the triangular fuzzy number.

We use a saaty scale for fuzzy AHP appropriate for our situation

Actually, the differences between two scores related to two alternatives vary between 0 and 4 respectively, the score 0 if it is the crossing of the same alternative or two alternatives have the same score, and the score 4 in the case where one of the alternatives had a maximum score and the other a minimum.

In this case we applied a mathematical formula revealed after observing the behavior of the scores associated with the saaty scale.

Table 2 represents a suitable saaty scale.

Table 2: Table of Saaty scale

(Bellaaj, 2011)

The difference between score	The assigned score	Judgment verbal numerical evaluation		
1	3	Extremely most important	8	9
2	5	Very strongly most important 7	6	7
3	7	strongly most important 5	4	5
4	8	Moderately most important 3	2	3
5	9	Equal importance 1	1	1

3.1.1 Treatment and result

After applying the fuzzy AHP method, we reached the following results:

We have end up with a dashboard linking all the spreadsheets for the fuzzy AHP method on the one hand, and on the other hand the selected sector that we have fixed for agriculture. Graphical tools and tables judging the performance of the method will also be used relating to the evaluation of the separability and homogeneity of the obtained ranking.

The choice of this sector is bound to its vitality as well as to its specialization, whether in terms of services or transport modalities, while bearing in mind the indisputable role of technology and traceability in ensuring the performance in this sector.

Later, decision-makers will be able to adapt these criteria, to their needs by giving a score between 1 and 5 to each of them. Any changes to this dashboard will involve changes in the other spreadsheets.

The table 3 represents the scores that constitute weights for the agricultural sector, recommended by a decision-maker or a group of decision-makers seeking a compromise between them. This to evaluate the weight of each criterion while taking into consideration the nature of the professional activities and services to be outsourced.

Table 3: Score of criteria

Criteria	Agriculture
Specialisation	5
Traceability	4
Technology	3
Services	2
Transport	4

Table 4: Extract from dashboard for the fuzzy AHP method

DASHBOARD for FUZZY AHP																																					
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The table 4 concerns the classification of the LSP achieved by the fuzzy AHP method. In addition, we have specified the occurrences of each ranking, for example in our case, the first ranking is devoted to a single LSP which is «Bolloré logistics», for the second ranking there was a single LSP which is "XPO logistics", and "Logicold" for the third ranking. From the 4th classification, we notice that the fuzzy AHP behaves differently, where it ranked 4 LSP for the 4th position.

The table 4 also corresponds respectively to the LSP data, we can make variations to find out the rating of each LSP by bringing in on ly the name of LSP concerned, and it displays the sector and the rating of the different criteria.

3.1.2 Synthesis

The fuzzy AHP method allowed us to achieve a classification of the LSP operating in the field of agriculture in order to help the decision-maker to make a good decision and then make an efficient choice of LSP adequate according to their priority in terms of selection criteria.

As a perspective, on the one hand, we envisage putting in place some indicators for the evaluation of the quality of classification obtained for the different alternatives, on the other hand, we are planning to insert witness LSP to ensure the compliance of the results obtained previously and also we will study the homogeneity of our method.

4 Conclusion

The study carried out on one of the key sectors forming the fabric of the Moroccan economy revealed several aspects that allowed us to become aware of a certain failure concerning the insufficiency and the poorly performing logistics, which is explained by the nature and characteristics of their supply chains. Indeed, for Morocco the development of this performing logistics is major challenges of economic growth and competitiveness both on the national and international market.

Thus, the reforms implemented in the context of the national strategy for the development of logistics and also in the other national plans through sector-program contracts for the development of various sectors in Morocco for example the agriculture sector, has favored the creation of a dynamic around LSP with the installation of many foreign LSP and the diversification of the offer of Moroccan LSP. This offer ranging from the simple service of transport to the total assumption of the logistics function and the supply chain of the customer while evolving similar to LSP abroad.

The study achieved has focused on the study of the state of the LSP operating in Morocco in the field of agriculture while taking into account some criteria.

This study was based on one of the decision-making methods, but this decision-making, for several structures is a complex and inevitable task in improving their processes. This decision affects various sectors and multi-criteria decision support tools have been the subject of diverse applications in several areas.

Through this paper, it appeared that the problem of the choice of LSP in the field of agriculture is one of the strategic decisions which has a considerable impact on the performance of the contractor. This choice was based on the priority of well-defined criteria by decision-makers which vary according to the priority expressed by the contractor.

The study made it possible to highlight and implement one of the existing MCDM methods for decision-making and to apply it to a sample of LSP operating in Morocco, which is the fuzzy AHP method.

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