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Prioritization of Criteria for Product Selection in the Import of Goods by Using Multi-Criterion Decision-Making Method (Case Study: Car Imports)

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ABSTRACT

Undoubtedly, a right decision is not taken by chance, but is the result of a correct analysis and wise selection among many options. Difficulty of selecting the right product is an issue that final consumers, importers, and vendors all are faced with. Due the diverse market of car, awareness of decision-makers about the selection criteria can help them to provide the community of consumers with a product that meet their needs and demands. Given the failure of some importers in this sector, it seems that decision-makers in these institutes and companies were not aware of criteria of choosing a product based on the market demand. Hence, the author aims to propose a model for selection of right goods by using multi-criterion decision-making methods. Statistical population in this study included 40 experts, middle managers, and senior managers in car companies. After collecting data through questionnaires and group meetings, group hierarchical analysis method was used for investigating the findings. Expert choice and Matlab software were also used for data analysis. Then, three selected cars based on the study findings were prioritized by paired comparison of criteria and sub-criteria of decision-making hierarchy. The findings of this study can be very helpful for managers and decision-makers in the field of car imports.
KEYWORDS: Decision-Making; Multi-Criterion Decision-Making; Analytic Hierarchical Process; Car Imports

1- INTRODUCTION

Car market is highly diverse because car is a product with several parameters. Parameters for selection of a car is not only restricted to exterior options, ease of travel, type of fuel and fuel consumption rate, and price. In this regard, various items such as engine features and power transmission system, safety system and safety value, break system, and pollution measures are of criteria that should be taken into account by decision-makers for car imports. Besides all these factors, rules and regulations in the country will have a great impact on car imports. Therefore, difficulty of selecting the right product is an issue that final consumers, importers, and vendors all are faced with. Awareness of decision-makers about the selection criteria can help them to provide the community of consumers with a product that meet their needs and demands.

In recent years, car imports, something that experts believe that can increase competition and improve the quality of domestic products, has caused the domestic car manufacturers, which possess the lion's share of car market in the country, to start car imports. According to the Ministry of Industry, Mine and Trade, during the six months ending September of 2014, manufacturing of car has increased by 74.3% compared to the same period last year, while car imports shows an increase of 115% in the same period [1]. However, the important point is that whether all car importers are familiar with the science and knowledge of decision-making about a product like car with multiple parameters and criteria or not and whether this knowledge has been helpful for decision-making in this sector in selection, prioritization, and imports of products that suit Iran's market, meet the demands and requirements of Iranian customer, and be compatible to the social, economic, and environmental conditions of Iran or not.

Multi-criterion decision-making is one of the most powerful tools which has been widely used in operation research for making managerial decisions in recent decades. Multi-criterion decision-making is a supporting system for decisions which helps managers when they should make decisions about issues with one or multiple criteria and makes it possible for managers to consider all qualitative and quantitative parameters for selection of the best option among a group of options [2]. Hence, the present study aims to prioritize the criteria for selection of appropriate products in in car imports using Multi Criteria Decision Making methods.

2- Overview and research background:

Multi Criteria Decision Making: All of us consciously may make different decisions or choose one strategy among several strategies in our personal and organizational life. Accordingly, it can be stated that life is full of different decision-

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makings. Decision-making is also of major components in management, as Herbert Simon 1) believes that management is equal to decision-making. In fact, performing the tasks such as planning, organization, and control is nothing but making right decisions. Newman 2) also states that the quality of management is a function of decision-making quality. Therefore, from the perspective of these scholars, management of organizations is equal to decision-making [3]. The space of any decision is either continuous or discrete and single-criterion or multi-criterion. In addition, these criteria could be quantitative, qualitative or combinative. In a discrete space and single-criterion mode, decision-making is easy, but in the case when multiple criteria are raised, both the choice and conversion of quantitative and qualitative criteria should be considered. Hence, multi-criterion decision-making process has the following two main problems:

1- Lack of standards for measuring the qualitative criteria

2- Lack of a unit for conversion of criteria

In resolution of such issues with the help of operation research, the following two main mechanisms can be considered [4]:

A) Classical models of operation research: Classical models were associated with the rise of management systems movement and it is highly of interests to mathematicians. The main focus of these models is on the existence of one criterion or one target function. These models can be linear, nonlinear or mixed and the common point between them is that all of them own an optimality criterion, that is, optimization of the target function. In addition, classical models of operation research only support the quantitative variables.

B) Modern models of operation research: In the wake of some of the weaknesses and shortcomings of the classical models of operations research for making decisions in the real world, efforts were made by scientists for addressing these shortcomings. Following these efforts and in recent decades, various methods and techniques have been developed for proposing applied methods of decision-making that are known as "Multi Criterion decision Making". In modern models, there are multiple optimality criteria instead of only one, so that they are capable of proposing practical solutions to the issues with more than one optimality criterion and qualitative variables and criteria. It should also be considered that criteria may be in contrast to each other in multi-criterion decision-making. Conflicting criteria are those that their full addressing leads to incomplete addressing of other ones.

In a general classification, multi-criterion decision-making techniques can be divided into two categories of Multi Objective Decision Making (MODM) and Multi Attribute Decision Making (MADM) [5].

Multi Objective Decision Making (MODM) models are a branch of multi-criterion decision-making and have been developed due to the contrast between multiple targets. Achieving and approaching some targets causes keeping away from some other ones. Hence, it is more difficult to find a set of variables which can simultaneously pursue all objectives.

Multi Attribute Decision Making (MADM) models have various forms, the most important of which include Electra, SAW, TOPSIS, and Hierarchical Analysis. In such techniques, that are used for selecting an option among several options, decision-making is dealt with selection, prioritization, and rating among a limited number of choices. Thus, MADM models are used in order to select the best and most appropriate choice among *m* number of choices. For developing and formulating such models, agreement tables are used instead of mathematical models. That's why these models are also called soft models.

The steps of modeling MADM techniques are as follows:

1- Defining and determining the options (solutions): Suppose that $A_1, A_2, \ldots, A_m$ are the defined solutions to an issue.

2- Setting the criteria and attributes for evaluation of options: Suppose that $X_1, X_2, \ldots, X_m$ are the attributes for evaluation of options.

3- Defining the decision matrix which is an $M \times N$ matrix and MADM issues are formulated by this matrix. In such a matrix, A_i, X_j, and R_{ij}, respectively, denote the ε^{th} option, the j^{th} measure, and the value of the i^{th} measure for the j^{th} option.

4- Matrix preparation: In this step, quantification of qualitative attributes, normalization, and determining the coefficients of importance for attributes should be done.

In most multi-criterion issues and especially in MADM issues, it is necessary to know the relative importance of the existing attributes. Methods such as Delphi, Shannon entropy, Lynmp, special vector, etc. can be helpful in this regard.

Prioritization models

There are various models for ranking and integration of the ranks of alternatives and choices. Some these models are as follows:

1- SAW: This technique is based on estimation of optimality for each option in order to select the best option with the highest optimality. This technique assumes that the effect of attributes have a preference autonomy and are separated from each other. In this technique, preference of options can be easily achieved by calculating the weight of importance for each attribute.

2- TOPSIS: This method is based on the fact that the best option is the one which has the closest distance to the ideal positive choice and the farthest distance from the negative ideal choice.

3- Electra: In this technique, instead of ranking the options, a new concept known as non-ranking is used. For example, an option may mathematically have no preference over other one but the analyzer or decision-maker finds it better. In this model, all options are evaluated by non-ranking comparison and ineffective option are eliminated. Since all steps of this technique are based on a coordinated set and an uncoordinated set, this technique is also known as coordinated analysis.

4- Analytic Hierarchical Process (AHP): In this method, decision-makers can determine the mutual and simultaneous effects of many complex and uncertain situations and also set the priorities based on objectives, knowledge, and experience. For solving the issues by this method, the issue should be comprehensively and accurately explained and its details should be outlined in a hierarchical structure.
5- Revised and group AHP: The difference between groups AHP with simple AHP is that only one decision-maker is not involved in the formation of decision-making matrix for evaluation of attributes and options. The revised AHP also is used when there is inconsistency in ranking the options in simple AHP method.
In the present study, group AHP method was used in order to prioritize the options in a better way through aggregation of the opinions and comments of car industry scholars and experts.
Analytical Hierarchical Process (AHP) changes the complex and tough issues into a simpler form and resolve them. AHP has many applications in economic and social fields [6]. In this method, organizations address their problems in group meetings and then come to a conclusion. A Group Decision Support System (GDSS) along with AHP can increase the interaction and participation of individuals in decision-making. In the use of hierarchical analysis in order to decide on company issues, instead of using the judgments of only one manager in the formation of paired comparison matrix (which is the basis of decision-making), opinions and views of several experts are taken into account and geometric mean is used to reach a consensus. Finally, the completed tables are evaluated in terms of incompatibility rate and those that their incompatibility rate is less than 0.1 are accepted [7]. In fact, sharing of opinions and ideas often leads to a fuller expression and understanding of issues, rather than the cases where there is only one decision-maker. When AHP is used in a group meeting, members organize the issues, provide different views and opinions, negotiate and discuss these views and opinions, and then come to an agreement on the discussed issues [8].
Many studies have been conducted on the application of multi-criterion decision-making methods in various industries, especially in car industry and many researchers have studied the selection of suppliers by multi-criteria decision-making methods such as TOPSIS and AHP.
Salimi [2] proposed a tool for multi-criterion decision-making in industrial projects by introducing AHP software and a decision support system. Chang *et al*., [9] conducted a study on selection of the best cutting machine among three options (DFD600, dfd670, and AWD300) and prioritization of them based on the criteria for selection of cutting machines such as measurement, part management, automaticity of processes, reduction of steps, and other defined sub-criteria. Hayati & Ataei [10] used two methods of SAW and TOPSIS for ranking the imported machinery in opencast mine drilling and tried to select the best device based on some criteria such as rate of drill penetration in rock, drilling capabilities, production rate per hour, service life of device, etc.

3- METHODOLOGY:

Statistical population:

The present study was conducted during fall and autumn of 2014 and 2015. Statistical population included professionals and experts in the field of car imports. Thus, managers and experts in engineering and product development were selected and a population of 40 experts in car imports. Due to the limited number population members, the whole population was considered as the sample.

Data collection methods:

To gather information about the theoretical foundations and research literature, library resources, articles, books, the Internet were used. In addition, questionnaire and review of documents of chosen products were used in order to collect data on paired comparisons. The questionnaire consisted of AHP and matrices for paired comparison of the criteria and sub-criteria identified for selection of products and was used for scoring the criteria and sub-criteria by experts and professionals. Each of the respondents expressed their idea about the extent of superiority of option over each other in different sub-criteria and the importance of criteria and sub-criteria to each other. Therefore, the junction of each row and column in paired comparisons indicate that the extent of importance of each criteria or sub-criteria.

The questionnaire included three sets of paired comparisons for measuring the superiority of options over each other in each sub-criteria, the importance of sub-criteria compared to each other, and the importance of each criteria or sub-criteria.

DATA ANALYSIS METHOD

AHP was used for analysis of data and information obtained from questionnaires. In this method, all criteria and sub-criteria for product selection are weighted and then the products are prioritized based on earning higher scores. The objective of this, which is on top of hierarchical structure (target level), was selection of appropriate products in car imports. In the second step, technical criteria for choosing a high-chassis car were identified and determined through eliciting the views and opinions familiar with the products. In determining the criteria in this study, the emphasis was on technical features and characteristics of cars and beauty that is nothing to do with technical specifications was not considered. Instead, interior and exterior equipment that have a great impact on the aesthetic point of view were taken into account. In the thirds step, sub-criteria were also determined by using the comments and views of experts and professionals. Three high-chassis cars which had been exhibited in a fair of foreign cars were selected as the options and the agenda was to select one car among these three options based on the determined criteria and sub-criteria.

The first step in AHP is to prepare a schematic presentation of the issue in which the objective, criteria, and options are shown. Figure 1 shows the schematic presentation of the issue of the present study.

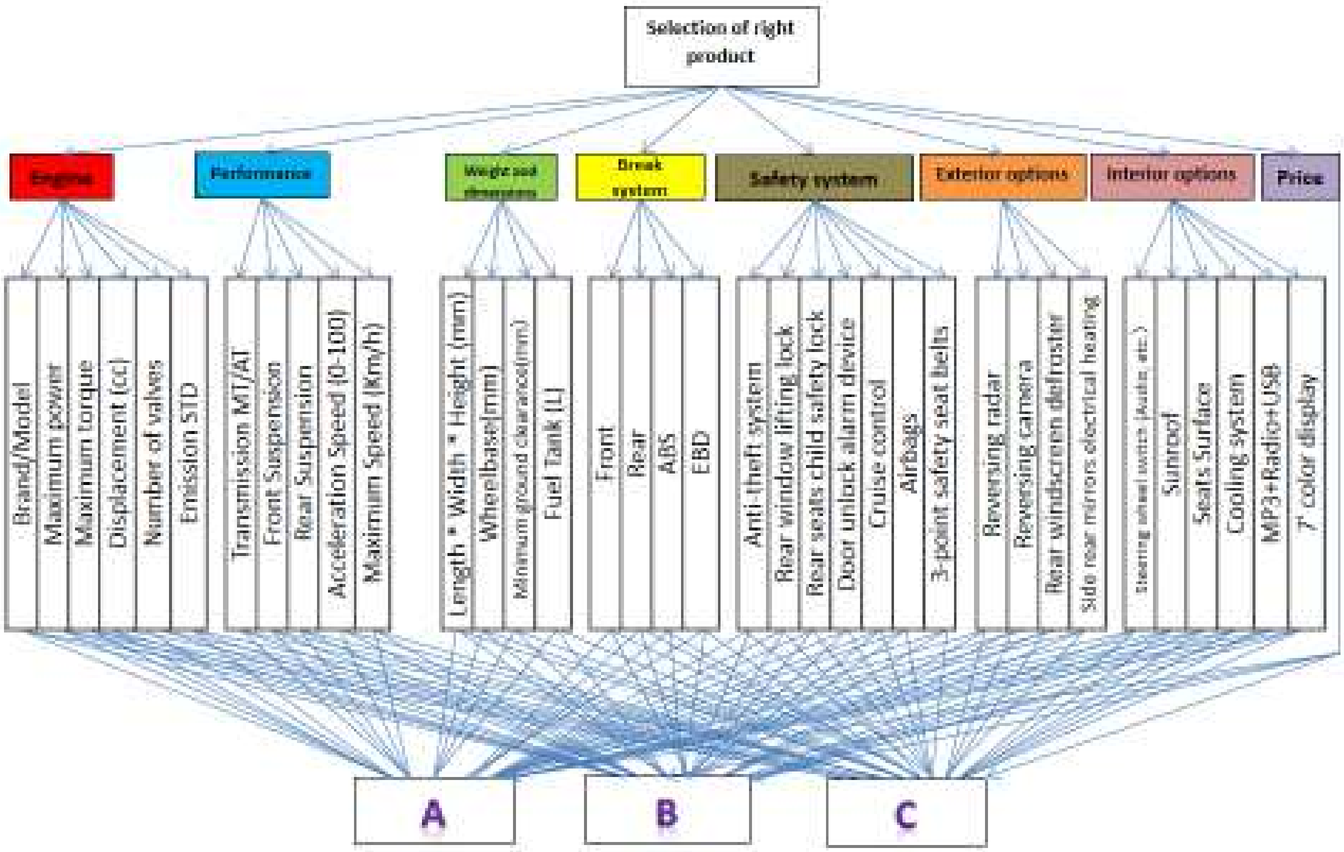

Figure 1. Hierarchical structure of the present study

In AHP, the elements are firstly formed in pairs and then the matrix of relative weight of elements is calculated. In paired comparison matrix, a_{ij} is the preference of the ε^{th} element over the j^{th} element. The, the weight of elements can be determined.

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix}$$

$$A = [a_{ij}] \qquad i, j = 1, 2, \ldots, n$$

Paired comparison matrix is either compatible or incompatible. If it is compatible, the weight of elements can be easily calculated by normalizing the elements of each column. But if the matrix is incompatible, calculation of the weight of elements is not easy and the following four methods should be used for this purpose [6]:

- Least Squares
- Logarithmic least squares
- Eigenvector
- Approximation

To calculate the incompatibility rate of each hierarchy, incompatibility index of each matrix (*I. I.*) is multiplied by weight of the relevant element (the element that the matrix has been formed in comparison to) and their sum is obtained. This sum is named $\overline{I.I.}$. The result of ….. is the hierarchical incompatibility rate.

Eigenvector method is used for relative weighting of criteria for product selection. In this method, the relative superiority of option to each other is determined in paired comparison matrices. All elements of the diagonal of this matrix are 1 and each value under the diagonal is the opposite of diagonal. For instance, if in paired comparison matrix, maximum power of engine in Option SUV-A is greatly superior to Option SUV-B, a 23 place in the matrix is filled with 9 and a 32 place is filled with 1.9. Other options are completed the same way. It is noteworthy to say that a scale from 1 to 9 is used for filling the matrix of paired comparisons in order to determine the relative importance of each element to another one for a given feature (Table 1).

Table 1. Weighting the criteria [6]

Degree of importance	Description
1	Two elements have the same importance
3	An element is relatively superior over another one
5	An element is highly superior over another one
7	An element is much more superior over another one
9	An element is extremely superior over another one
It is noteworthy to say that numbers 2, 4, 6, and 8 are intermediate values in making judgments	

4- RESULTS

The results of the paired comparison matrices:

Three sets of paired comparisons were done that are as follows:

1- Paired comparisons of options in sub-criteria according to decision hierarchy.
2- Paired comparison of sub-criteria in main criteria.
3- Paired comparison of main criteria

Knowing the weight, importance, and priority of each of the sub-criteria, the decision-maker can select products with better features and specifications. The following figures show the results of paired comparisons of sub-criteria of car engine and their normalized matrix and also the relative weight of criteria related to that matric. It should be noted that these comparisons were done the same for all sub-criteria. In the next step and after calculation of the final weight of options, the options were prioritized.

Brand/Model	SUV-A	SUV-B	SUV-C
SUV-A	1	5	5
SUV-B	0.2	1	1
SUV-C	0.2	1	1

Brand/Model/N	SUV-A	SUV-B	SUV-C	AVERAGE
SUV-A	0.714	0.714	0.714	0.714
SUV-B	0.143	0.143	0.143	0.143
SUV-C	0.143	0.143	0.143	0.143

Figure 2. Paired comparisons of sub-criterion of brand/model based on the judgment of experts and professionals and the normalized matrix [In ranking of three options based on brand/model criteria, Option A ranked first and options B and C both ranked second].

Max power	SUV-A	SUV-B	SUV-C
SUV-A	1	0.695	2.028
SUV-B	1.438	1	2.928
SUV-C	0.493	0.341	1

Max power/N	SUV-A	SUV-B	SUV-C	AVERAGE
SUV-A	0.341	0.341	0.340	0.341
SUV-B	0.491	0.491	0.492	0.491
SUV-C	0.168	0.167	0.168	0.168

Figure 3. Paired comparisons of sub-criterion of engine power based on the judgment of experts and professionals and the normalized matrix [In ranking of three options based on engine power, options B, A, and C, respectively, ranked first to third].

Max Torque	SUV-A	SUV-B	SUV-C
SUV-A	1	3.43	5
SUV-B	0.291	1	3.285
SUV-C	0.2	0.304	1

Max Torque/N	SUV-A	SUV-B	SUV-C	AVERAGE
SUV-A	0.671	0.724	0.539	0.645
SUV-B	0.195	0.211	0.354	0.253
SUV-C	0.134	0.064	0.108	0.102

Figure 4. Paired comparisons of sub-criterion of

maximum engine torque based on the judgment of experts and professionals and the normalized matrix [In ranking of three options based on maximum engine torque, options A, B, and C, respectively, ranked first to third].

Displacement	SUV-A	SUV-B	SUV-C
SUV-A	1	3.761	4.905
SUV-B	0.265	1	4
SUV-C	0.203	0.25	1

Displacement /N	SUV-A	SUV-B	SUV-C	AVERAGE
SUV-A	0.681	0.751	0.495	0.642
SUV-B	0.181	0.200	0.404	0.261
SUV-C	0.138	0.050	0.101	0.096

Figure 5. Paired comparisons of sub-criterion of displacement (cc) based on the judgment of experts and professionals and the normalized matrix [In ranking of three options based on displacement (cc), options A, B, and C, respectively, ranked first to third].

Valves	SUV-A	SUV-B	SUV-C
SUV-A	1	1.428	1.714
SUV-B	0.7	1	1.285
SUV-C	0.583	0.777	1

Valves /N	SUV-A	SUV-B	SUV-C	AVERAGE
SUV-A	0.438	0.446	0.429	0.437
SUV-B	0.307	0.312	0.321	0.313
SUV-C	0.255	0.242	0.250	0.249

Figure 6. Paired comparisons of sub-criterion of number of valves based on the judgment of experts and professionals and the normalized matrix [In ranking of three options based on number of valves, options A, B, and C, respectively, ranked first to third].

Emission STD	SUV-A	SUV-B	SUV-C
SUV-A	1	2.286	2.286
SUV-B	0.437	1	1
SUV-C	0.437	1	1

Emission STD /N	SUV-A	SUV-B	SUV-C	AVERAGE
SUV-A	0.533	0.533	0.533	0.533
SUV-B	0.233	0.233	0.233	0.233
SUV-C	0.233	0.233	0.233	0.233

Figure 7. Paired comparisons of sub-criterion of emission STD based on the judgment of experts and professionals and the normalized matrix [In ranking of three options based on emission STD, options A, B, and C, respectively, ranked first to third].

The following figures present the results of paired comparisons of the main criteria of car engine.

Engine	**Brand/Model**	**Max power**	**Max Torque**	**Displacement**	**Valves**	**Emission STD**
Brand/Model	1.000	2.200	2.219	1.354	1.714	2.016
Max power	1.743	1.000	0.455	1.925	3.143	2.635
Max Torque	0.451	2.200	1.000	1.906	2.619	2.492
Displacement	0.739	0.519	0.525	1.000	3.571	2.540
Valves	0.583	0.318	0.382	0.280	1.000	1.540
Emission STD	0.496	0.003	0.003	0.394	0.649	1.000

Figure 8. Paired comparisons of the main criteria of car engine

Engine/N	Brand/Model	Max power	Max Torque	Displacement	Valves	Emission STD	Average
Brand/Model	0.200	0.353	0.484	0.197	0.135	0.165	0.256
Max power	0.348	0.160	0.099	0.281	0.248	0.216	0.225
Max Torque	0.090	0.353	0.218	0.278	0.206	0.204	0.225
Displacement	0.147	0.083	0.114	0.146	0.281	0.208	0.142
Valves	0.116	0.051	0.083	0.041	0.079	0.126	0.075
Emission STD	0.099	0.001	0.001	0.057	0.051	0.082	0.048

Figure 9. Normalized paired comparisons of the main criteria of car engine

In the criteria of car engine, the sub-criteria of model/brand, maximum power and maximum torque of engine, displacement, number of valves, and emission STD, respectively, gained the highest ranking in the selection of engine.

The results show that although our country is facing the problem of air pollution, especially in large cities, experts and professionals believe that emission STD is an option that is less taken into by customers in selection of a car. Hence, only the decision-maker should make decision at the time of production selection based on the knowledge of 51 different mandatory standards of car that are specified in the requirements of imported products. Naturally, the model or brand of engine is the first priority in selection of a car due to the limited number of engine manufacturers in the world (because of special technology of engine manufacturing). Decision-makers should also avoid choosing cars that their engines are made by unknown or less known brands; otherwise they should thoroughly promote the products to customers by taking appropriate strategies and advertisements. The ranking 3 of displacement after maximum power and maximum torque of engine, especially in our country, is not only for technical reasons, but some issues such as allocation of fuel card and custom tariff reduction to cars with low displacement are also involved in the prioritization of this sub-criteria.

In the criteria of performance, according to the chosen cars that all of them are high-chassis and SUV, the sub-criteria front suspension, transmission MT/AT, rear suspension, acceleration speed, and maximum speed have the highest priority, respectively. As the center of gravity is high and the weigh is higher in the chosen cars, sub-criterion of front suspension has gained a higher priority than the sub-criterion of transmission MT/AT. This story will change in the time choosing pickup trucks and what that determines the performance of pickup trucks is rear suspension. As it can be observed in the ranking of sub-criteria, maximum speed has the last rank. Limited allowable speed in streets, highways, and roads of our country and technical specifications would be effective in this ranking.

In terms of car weight and dimensions, main dimensions, wheelbase, minimum ground clearance, and fuel tank are the highest priorities, respectively. The issues about fuel consumption and limited spaces, urban architecture, and increased comfort of passengers in the vehicle can justify the first and second rank of main dimensions and wheelbase sub-criteria. Weight is an important factor in fuel consumption of a car and its proportionality to the engine specifications determines the quality of a car. This factor has gained the third rank from the perspective of experts and professionals. Fuel tank capacity indicates the distance that a car can cover with a completely full fuel tank and decreased fuel tank capacity in SUV cars, due to their higher fuel consumption, increases the frequency of refilling. According to the results, this factor has gained the last rank.

In the main criterion of break system, ABS, EBD, front break, and rear break, respectively, have the first to fourth ranks. This ranking can be justified by considering the importance and role of different breaks in a safe driving on slippery roads and the importance of frons breaks in a car.

About the safety system of cars, airbags, anti-theft system, 3-point safety belts, cruise control, rear windows lifting lock, rear seats child safety lock, and door unlock alarm device gained the first to seventh ranks, respectively. Given the high rate of accidents and deaths caused by them, the rank 1 for airbags is completely natural and justifiable. Three-point safety belts should also be taken into account by decision-makers in terms of both their role in the safety of passengers and observance of mandatory standards for imported cars (Now, 3-point safety belts is mandatory for all rear passengers).

In terms of exterior option, reversing camera, rear windscreen defroster, reversing radar, and side rear mirrors electrical heating gave the highest priority, respectively. The more the number of these options in the chosen cars for imports, the more successful the decision-makers in the field of car selection.

Among the sub-criteria of interior options, seats quality, cooling system, sunroof, 7' color display, MP3+Radio+USB, and steering wheel switch (Audio, mp3, etc.) gained the highest priorities. The most important sub-criterion in this par is the quality of seat, as it is directly associated with the passengers anatomy and comfort. Cooling system, because of its special function in cars and reducing part of the engine power and also because of the climatic condition in some parts of Iran, has gained the second rank. The more the number of these options in the chosen cars for imports, the more successful the decision-makers in the field of car selection. Compatibility rate for all hierarchical matrices was obtained equal to 0.88.

Calculation of the final weight of options:

After calculating the relative weights, the final weight of each option to the main criterion was obtained based on the weight given to each option, sub-criterion, and main criterion. The final weights of each of the options (A, B, and, C) based on the relative weight of sub-criteria are as follows:

Engine:

After multiplying the matrix of relative weights of engine sub-criteria to products by the matrix of relative weights of engine sub-criteria to each other, the weight of each of the products in this criterion was specified. As it can be observed, option A and C ranked the first and the third, respectively.

$$\begin{bmatrix} A & = & 0.554 \\ B & = & 0.276 \\ C & = & 0.141 \end{bmatrix}$$

Performance:

After multiplying the matrix of relative weights of performance sub-criteria to products by the matrix of relative weights of performance sub-criteria to each other, the weight of each of the products in this criterion was specified. As it can be observed, option A and C ranked the first and the third, respectively.

$$\begin{bmatrix} A & = & 0.439 \\ B & = & 0.305 \\ C & = & 0.262 \end{bmatrix}$$

Weight and dimensions:

After multiplying the matrix of relative weights of weight and dimensions sub-criteria to products by the matrix of relative weights of weight and dimensions sub-criteria to each other, the weight of each of the products in this criterion was specified. As it can be observed, option A and B ranked the first and the third, respectively.

$$\begin{bmatrix} A & = & 0.545 \\ B & = & 0.229 \\ C & = & 0.246 \end{bmatrix}$$

Break system:

After multiplying the matrix of relative weights of break system sub-criteria to products by the matrix of relative weights of break system sub-criteria to each other, the weight of each of the products in this criterion was specified. As it can be observed, all options have the same priority and rank.

$$\begin{bmatrix} A & = & 0.326 \\ B & = & 0.326 \\ C & = & 0.326 \end{bmatrix}$$

Safety system:

After multiplying the matrix of relative weights of safety system sub-criteria to products by the matrix of relative weights of safety system sub-criteria to each other, the weight of each of the products in this criterion was specified. As it can be observed, option A and C ranked the first and the third, respectively.

$$\begin{bmatrix} A & = & 0.376 \\ B & = & 0.314 \\ C & = & 0.308 \end{bmatrix}$$

Exterior options:

After multiplying the matrix of relative weights of exterior options sub-criteria to products by the matrix of relative weights of exterior options sub-criteria to each other, the weight of each of the products in this criterion was specified. As it can be observed, option A and B ranked the first and the third, respectively.

$$\begin{bmatrix} A & = & 0.471 \\ B & = & 0.242 \\ C & = & 0.286 \end{bmatrix}$$

Interior options:

After multiplying the matrix of relative weights of interior options sub-criteria to products by the matrix of relative weights of interior options sub-criteria to each other, the weight of each of the products in this criterion was specified. As it can be observed, option B and C ranked the first and the third, respectively.

$$\begin{bmatrix} A & = & 0.358 \\ B & = & 0.390 \\ C & = & 0.252 \end{bmatrix}$$

Price:

After multiplying the matrix of relative weights of price sub-criteria to products by the matrix of relative weights of price sub-criteria to each other, the weight of each of the products in this criterion was specified. As it can be observed, option A and B ranked the first and the third, respectively.

$$\begin{bmatrix} A & = & 0.261 \\ B & = & 0.272 \\ C & = & 0.466 \end{bmatrix}$$

Final weight of products and prioritization:

After determining the final weight of each of the options on the main criteria, the final weight of products and their order of priority were determined. Values in the following matrix show the final weight of these three products. As it can be seen, A, C, and B, respectively, gained the first, second, and third rank.

5- Conclusion and Recommendations

According the findings of the present study, the main criteria for selection of imported cars from the perspective of experts and professionals of car field include engine, performance, break system, safety system, price, interior option, exterior options, and weight and dimensions, in order of priority. Prioritization of the main criteria and determination of the weight of each of them can increase the awareness and knowledge of decision-makers for selection of the best products for imports. Due to the constraints of prioritization based on AHP method, it is recommended that other multi-criterion decision-making methods such as TOPSIS and SAW to be used for evaluation of cars with more criteria and sub-criteria, because the use of AHP method is very time-consuming and difficult when the number of criteria and sub-criteria increases. In addition, when the population is large, the volume of computations increases and decision-making gets difficult by this method. Hence, it is recommended that data collection to be done through group meetings and aggregation of opinions of comments rather than by questionnaire technique.

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