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Using the FITradeoff method to solve a shopping mall location problem in the northeastern countryside of Brazil*

by

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Abstract: This paper presents a practical case involving a shopping mall location problem in the northeast countryside of Brazil. In this problem, conflicting objectives have been expressed in terms of seven criteria. Then, ten cities of the northeastern countryside have been selected to compose the space of actions. The problem plays a special role since Brazil is a big country that requires investments in the countryside. Thus, the shopping mall aims to stimulate economic growth in the respective region. In the study, this multi-objective problem is solved using the FITradeoff method. In FITradeoff, the combination of the paradigms of holistic evaluation and elicitation by decomposition in preference modeling are well explored, bringing different perspectives for the decision-maker during the decision process.

Keywords: location problem, shopping mall, FITradeoff method, elicitation by decomposition, holistic evaluation, multi-criteria decision-making/aiding (MCDM/A)

1. Introduction

A multicriteria decision problem is characterized by the presence of multiple and conflicting objectives, through which more than two alternatives are evaluated

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(Keeney and Raiffa, 1976; Belton and Stewart, 2002; de Almeida et al., 2015). Thus, rational methods have been constructed to support the decision-maker (DM) when dealing with such types of problems. The FITradeoff method (de Almeida et al., 2016, de Almeida, Frej and Roselli, 2021) was developed to solve Multi-Criteria Decision Making/Aiding (MCDM/A) problems in the context of Multi-Attribute Value Theory (MAVT) (Keeney and Raiffa, 1976). Variants of this method were designed to support decision problems involved in different kinds of more specific decision situations, such as choice (de Almeida et al., 2016), ranking (Frej et al., 2019), sorting problematic (Kang, Frej and de Almeida, 2020), and portfolio problematic (Frej, Ekel and de Almeida, 2021).

The FITradeoff method has been made use of in a wide range of practical applications. Thus, it was used in medical applications (Dell'Ovo et al., 2020; Camilo et al. 2020), in energy applications (Fossile et al., 2020; de Macedo, de Miranda-Mota and Sola, 2018; Kang, Frej and de Almeida, 2018), in environmental applications (Monte and Morais, 2019; Carrillo et al., 2018), in a security application (Camara e Silva et al., 2019), and in industry applications (Frej, de Almeida and Costa, 2017; Santos et al., 2020; Pergher et al., 2020; Silva, Costa and de Almeida, 2019; Frej, de Almeida and Costa, 2019; Lima, Viegas and Costa, 2017; de Gusmão and Pereira Medeiros, 2016). In order to test the performance of the FITradeoff method, Mendes et al. (2020) performed simulation studies considering several scenarios, including different number of criteria and alternatives.

Hence, this study uses the FITradeoff method to solve a location problem. The facility location problem is rather common in the literature and it is known for its great relevance and long-term impact for the competitiveness and strategy of companies. The well-done decision as to a location can effectively support the organization in the achievement of its objectives.

This study investigated a MCDM/A problem that involves the choice of a location for a shopping mall. In this problem, five conflicting objectives have been identified. Also, to measure these objectives, seven criteria have been established. Finally, the organization intended to locate the shopping mall in a city in the northeast countryside of Brazil. Thus, ten alternatives have been selected to compose the space of actions in the problem. Throughout the analysis of this practical problem, new features of the FITradeoff method are illustrated (de Almeida, Frej and Roselli, 2021), highlighting the combination of two different perspectives of preference modeling: elicitation by decomposition and holistic evaluation. The integration of those two types of preference modeling is presented as a way to improve the decision process with the FITradeoff method, including the possibility of shortening the decision process.

The paper is divided as follows. Section 2 presents a brief background on the FITradeoff method. Section 3 describes the shopping mall location decision problem. In Section 4, the FITradeoff method is applied to solve the shopping mall location problem. Finally, in Section 5 the conclusions from this study are discussed.

2. The FITradeoff method

In the context of Multi-Attribute Value Theory (MAVT) (Keeney and Raiffa, 1976), the FITradeoff method (de Almeida et al., 2016; de Almeida, Frej and Roselli, 2021) is used to elicit scaling constants and to obtain the solution for MCDM/A problems. Within MAVT scope, the solution is obtained from an additive aggregation model illustrated in equation (1), in which $\mathrm{V}(a_j)$ is the global value for alternative a_j. Thus, the alternative, for which the highest global value is obtained, is considered to be the best one in the set of alternatives. In equation (1), k_i is the value of the scaling constant of criterion i, and $v_i(x_{ij})$ is the marginal value function of the alternative j in criterion i:

$$\mathrm{V}(a_j) = \sum_{\mathrm{i}=1}^{\mathrm{n}} \mathrm{k_i} v_i(x_{ij}). \tag{1}$$

The FITradeoff method is based on the classical tradeoff procedure (Keeney and Raiffa, 1976). However, this method uses the concepts of partial information, not requiring the DMs to express their preferences in a complete way. In the FITradeoff method, the DM is not asked to define indifference relations between consequences, as this happens in the classical tradeoff. On the other hand, the method considers, mainly, the strict preference statements, expressed by the DMs. Therefore, the FITradeoff method presents the same axiomatic structure of the tradeoff procedure, but does not require indifference relations to be necessarily defined. Indifference relations are difficult to provide, and a high cognitive effort is spent in such process, which leads to the rate of 67% of inconsistencies, when this procedure is applied, according to behavioral studies (Weber and Borcherding, 1993).

Also, FITradeoff offers flexibility for the DM during the decision process. In FITradeoff, the DM can combine two paradigms of preference modeling: the elicitation by decomposition and the holistic evaluation (de Almeida, Frej and Roselli, 2021). Hence, the DMs can alternate between these two perspectives, expressing their preferences in the way that seems more appropriate according to the DM's cognitive style.

Concerning the decision process, the first steps concern the intra-criteria evaluation and the inter-criteria evaluation. In the intra-criteria evaluation, the FITradeoff permits linear and nonlinear value functions to be defined. In the FITradeoff method, the interval scale is used to conduct the elicitation process (de Almeida et al., 2016; de Almeida, Frej and Roselli, 2021). Moreover, for linear value functions, a normalization procedure should be considered (Keeney and Raiffa, 1976; Belton and Stewart, 2002). Therefore, in the FITradeoff method, similarly as this is done in the classical tradeoff procedure, the normalization transformation makes the value of the consequence, which shows the worst performance on each criterion equal to zero, and the values of the consequence, which show the best performance on each criterion equal to one. The use of such procedure is necessary due to the way, in which the preferential information is incorporated into the mathematical model. For more details regarding the justification of the use of such normalization procedure, see Keeney and Raiffa (1976) and Belton and Stewart (2002).

In the intercriteria evaluation, the scaling constants are elicited. However, using the FITradeoff method, the exact values of the scaling constants are not obtained. Instead, a space of values is obtained, based on the preferences expressed by the DM during the decision process.

The intercriteria evaluation starts with the ranking of criteria scaling constants. Thus, the DM has to rank the scaling constants considering the ranges of consequences in each criterion. After the ranking of the scaling constants, inequalities in the format of equation (2) are obtained, in which n is the total number of criteria presented in the MCDM/A problem:

$$k_1 > \ldots > k_i > k_{i+1} > \ldots > k_n. \tag{2}$$

After that, continuing in the elicitation process, the DM is asked to compare pairs of consequences, by considering tradeoffs amongst criteria. The comparisons follow the order of scaling constants in equation (2). Therefore, in the elicitation process by decomposition, the DMs express their preferences for pairs of consequences. Moreover, after each preference has been expressed, an inequality is generated to represent such statement.

Based on equation (2), the comparisons are made based on pairs of adjacent criteria (Criterion i and Criterion $i+1$), which obtain different values of consequences; i.e., an intermediate consequence in Criterion i is compared to the best consequence of the Criterion $i+1$. Thus, the DM chooses if he/she prefers an intermediate consequence in the Criterion i more than the best consequence of the Criterion $i+1$ (case, in which equation (3) below is obtained), or if he/she prefers the best consequence of the Criterion $i+1$ more than an intermediary consequence of the Criterion i (case, in which equation (4) below is obtained). Or the DM can also declare to be indifferent between these two consequences (equation (5)). The elicitation by decomposition continues in this sense, presenting pairs of consequences for the DM to compare (de Almeida et al., 2016).

$$k_i v_i\left(x_{ij}\right) > k_{i+1} \tag{3}$$

$$k_i v_i\left(x_{ij}\right) < k_{i+1} \tag{4}$$

$$k_i v_i\left(x_{ij}\right) = k_{i+1} \tag{5}$$

In this context, combined with the elicitation process by decomposition, the holistic evaluation can be performed by the DM. In the holistic evaluation, instead of comparing consequences, the DM compares alternatives. The holistic evaluation is performed using graphical and tabular visualizations, which are presented in the FITradeoff Decision Support System (DSS), named: bar graph, spider graph, bubble graph, and tables (de Almeida, Frej and Rosetti, 2021).

By presenting a group of different visualizations, dominance relations can be defined between alternatives, generating the inequality in equation (6) below, which may speed up the decision process. When the DM declares that an alternative j dominates another alternative z, the inequality in (6) is obtained:

$$\sum_{\mathrm{i}=1}^{\mathrm{n}} \mathrm{k_i} v_i\left(x_{ij}\right) > \sum_{\mathrm{i}=1}^{\mathrm{n}} \mathrm{k_i} v_i\left(x_{iz}\right). \tag{6}$$

Inequalities of this type are then included into a Linear Programming Problem (LPP), which is computed to find a recommendation regarding the decision alternatives (de Almeida et al., 2016; Frej, de Almeida and Costa, 2019). Hence, at each interactive cycle of the decision process, the LPP model is run, and based on the results obtained, the set of potentially optimal alternatives is reduced, for the choice kind of problems (de Almeida et al., 2016), or a ranking of the alternatives is obtained, for the ranking kind of problems (Frej, de Almeida and Costa, 2019), depending on the nature of the decision problem being treated.

Therefore, during the FITradeoff process, the DM can alternate between these two paradigms, expressing preferences using the perspective, which seems more appropriate. The holistic evaluation plays a special role in evaluating the partial results obtained with the elicitation process (de Almeida, Frej and Roselli, 2021). Moreover, it is worth mentioning that behavioral studies have been conducted to investigate the DM behavior during the elicitation process by decomposition and the holistic evaluation (Silva, Costa and de Almeida, 2021; de Almeida and Roselli, 2020; Roselli and de Almeida, 2020a,b; Roselli, de Almeida and Frej, 2019; Roselli, Frej and de Almeida, 2018; de Almeida and Roselli, 2017). The FITradeoff DSS is available by request at www.fitradeoff.org.

In this study, the FITradeoff method is applied to solve a shopping mall location problem. The next section presents the problem description, and in Section 4 the FITradeoff decision process is described with presentation of the elicitation questions and visualizations used in the holistic evaluation.

3. The location problem

In order to locate a facility, the organizations, involved in decision making, have to evaluate different aspects. The choice for a location should support the company in the achievement of its goals, such as being closer to the clients or to raw materials, for example. In each case, there will be a range of objectives to be satisfied.

When it comes to a shopping mall, the decision concerning a location is also very important. The dimension and economy of a city, the presence of competitors as well as cultural aspects can directly affect the organization's purposes, so the identification and evaluation of the decision objectives becomes critical for a well-done decision-making process. In the particular problem that is considered here, five objectives could be identified as follows:

Serving as many customers as possible. A shopping mall exists to be lucrative by providing different services for the population, so it is reasonable to assume that the more customers frequent the installation, the higher chances for the success of the enterprise. The variable assumed to evaluate the degree of achievement of this objective is the number of inhabitants in each of the cities.

Locating the mall in a city which has a low number of competitors. The beginning of an enterprise is usually very demanding and often involves some level of uncertainty. The absence of competitors or the low number of them provides more security on investment return through the expectation of people's acceptance of the enterprise. The variable considered to reflect this goal is the number of similar establishments in each city, evaluated on a 4-level scale (1: no establishment, 2: one establishment, 3: two or three establishments, 4: more than three similar establishments).

Spending less resources on the installation and operation of the shopping mall. Different locations involve different costs of constructing and maintaining the establishment in operation. In this context, two variables were evaluated in order to reflect the degree of achievement of this objective, which are: the electricity price (R$ per KWh) and the average land price in each city (R$ per m^2).

Locating the mall in a city in which people have facilitated access to the installations. The achievement of this objective is evaluated through the number of vehicles in each city.

Choosing a growing-economy city to locate the mall. When a city has a stable economic situation, its population enjoys a better life standard, there are more job opportunities, and, as a consequence, people can spend more on consumption of goods and services. This objective is evaluated through the city GDP (R$) in addition to the Gini Index, which measures the distribution of wealth to the population (0: equality; 1: entire city income owned by a single person).

As discussed above, seven criteria were established for evaluating the decision objectives. Table 1 summarizes the criteria.

After establishing the criteria of the problem, it is necessary to identify the feasible alternatives for the decision problem. In this case, the organization aimed to locate the shopping mall in a city in the northeast countryside, looking forward to stimulating economic growth as well as obtaining the benefits of installing the mall in a region with high development potential. Another point of attention to the organization was the identification of medium-sized cities as

Table 1: Criteria description

Criteria	**Objective**	**Measure**
Car fleet	Maximize	Number of vehicles in the city
Competitors	Minimize	4-levels scale
Electricity price	Minimize	R$/KWh
GDP	Maximize	Billions of Brazilian reals (R$)
Gini index	Minimize	Continuous variable varying from 0 to 1
Land price	Minimize	R$/m^2
Population	Maximize	Number of inhabitants

potential locations of the mall. Taking these specifications into account, it was possible to define a group of ten possible locations, as shown in Table 2.

Table 2: Actions space

City	**State of Brazil**
Arapiraca	Alagoas
Caruaru	Pernambuco
Imperatriz	Maranhão
Juazeiro	Bahia
Juazeiro do Norte	Ceará
Mossoró	Rio Grande do Norte
Nossa Senhora do Socorro	Sergipe
Parnaíba	Piauí
Santa Rita	Paraíba
Vitória da Conquista	Bahia

The ranking type of problem was considered throughout the modeling and analysis process. Even though the problem involves the choice of a unique city to locate the mall, the setting of ranking was considered the most suitable, as it allows for observing the dominance relationships between the alternatives, which can be very useful when it comes to decision implementation.

The first alternative in the ranking is the most recommended one; however, there are different aspects that were not considered in the model, such as agreements on electricity fare, governmental incentives and so on, that can make another alternative also desirable. In this case, the result in the form of a ranking enables avoiding the necessity of repeating the problem modeling and resolution.

The performance of each alternative with respect to each criterion was evaluated in order to build the problem consequences matrix, as illustrated in Table

3. For the maximized criteria (car fleet, GDP, population), the best outcome is the highest value, and the worst outcome is the lowest value. For instance, in Table 3, for the criterion 'car fleet', the highest performance is for the alternative Caruaru, with performance equal to 150,462; and the worst performance is for the alternative Santa Rita (34,962). On the other hand, for minimization criteria (competitors, electricity price, Gini index and land price), the best outcome is the lowest value, and the worst outcome is the highest value. For instance, for the criterion 'competitors', the highest performance is for the alternative Santa Rita (since it presents only one competitor), and the worst outcome is for alternatives Caruaru, Juazeiro do Norte, Nossa Senhora Do Socorro and Vitória da Conquista (with three competitors in each of those locations).

Table 3: The consequences matrix

Criteria / Cities	Car fleet	Competitors	Electricity price	GDP	Gini index	Land price	Population
Arapiraca	95,312	2	1.124	4,100,974.72	0.5589	223.49	214,006
Caruaru	150,462	3	1.158	6,877,208.88	0.5422	405.73	314,912
Imperatriz	134,918	2	1.4	6,599,566.71	0.5612	387.02	247,505
Juazeiro	89,887	2	1.207	3,700,881.80	0.5723	286	197,965
Juazeiro do Norte	112,091	3	1.114	4,427,525.37	0.5488	226.07	249,939
Mossoró	137,019	2	1.082	6,166,118.90	0.5340	300.12	259,815
Nossa Senhora do Socorro	62,793	3	1.114	2,597,290	0.4980	212.48	160,827
Parnaíba	83,475	2	1.198	2,037,540.02	0.5772	216.51	145,705
Santa Rita	34,962	1	1.052	2,222,358.73	0.4760	199.84	120,310
Vitória da Conquista	122,605	3	1.207	6,482,662.68	0.5588	238.36	306,866

4. Use of the FITradeoff method

The problem of locating the shopping mall was solved by using the FITradeoff method, which allows the DM to perform both the intra-criteria and the inter-criteria evaluation. The method is operated by means of an interactive Decision Support System (DSS).

Throughout the intra-criteria evaluation, a linear value function was assumed for all the problem criteria, so the DSS performed the consequence normalization, in which, considering the objective of each criterion, the consequences have their scale transformed and so then it is possible to aggregate that information into a unique synthetic criterion.

When it comes to the inter-criteria evaluation, the DSS allows the DM to decide between ordering the criteria scaling constants and following directly to the preferences elicitation.
In this case the order obtained was as illustrated in formula (7).

$$k_{GDP} > k_{Population} > k_{Comp} > k_{Gini} > k_{Fleet} > k_{Eletricity} > k_{Land}. \quad (7)$$

After performing the scaling constants ordering, it is possible to continue with the flexible elicitation. In this phase, the DM's preferences are elicited through a series of structured questions formulated in order to build inequalities that represent the weight space boundaries. With that information it is possible to establish the relationships between the alternatives evaluated.

As previously discussed, FITradeoff runs an LPP model in order to establish the relationships within the group of feasible alternatives. The first time this model is solved, the weight space is bounded exclusively regarding the criteria scaling constants order information, besides the normalization constraints. Even though, it is already possible to find the dominance relationships which provide the DM with an initial insight concerning the actions space, as illustrated by the Hasse Diagram in Fig. 1.

Along the flexible elicitation, the DM answers the questions, in which two consequences are compared, by informing of the strict preferences. That information allows the DSS to formulate the LPP model constraints. The questions are asked by showing two bar graphics to the DM, making the issue better understandable.

The very first question asked of the DM compares the criterion, which has the highest value of weight with the one that has the lowest value. The answer given to this question is going to define the distribution type of the weights, which can be either markedly different or approximately equal (de Almeida et al., 2016). In this case, the weights distribution was such that the weights were markedly different.

This information should be considered when performing a holistic assessment, once it changes the impact of the differences between the alternatives in the comparison of their global values (Roselli, de Almeida and Frej, 2019; Roselli, Frej and de Almeida, 2018). Figure 2 illustrates the comparison of an intermediate consequence of the criterion GDP (Consequence A) with the best consequence of the criterion of population (Consequence B).

In this elicitation question, the GDP criterion, with an average outcome, was compared to the population criterion with its best possible outcome. The DM informed that Consequence A was preferable to Consequence B, therefore

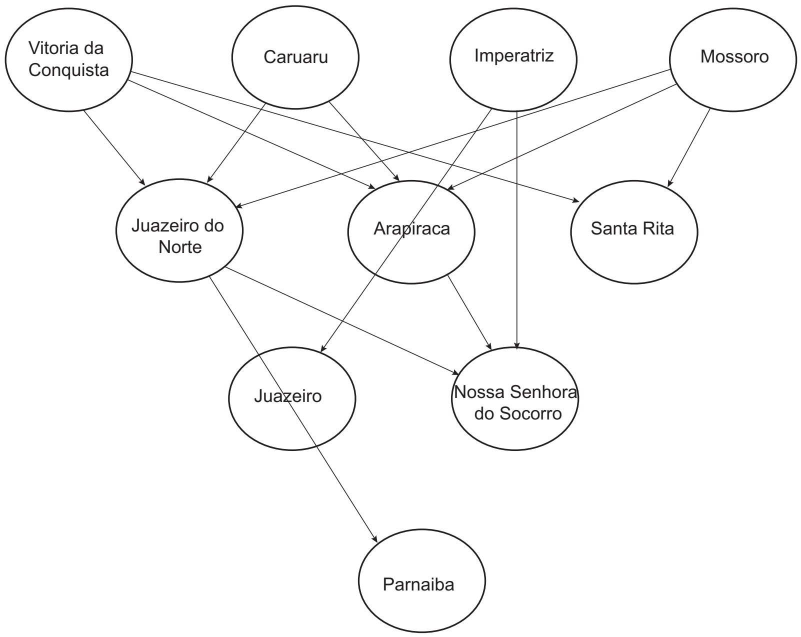

Figure 1: Hasse Diagram obtained after the ranking of criteria weights

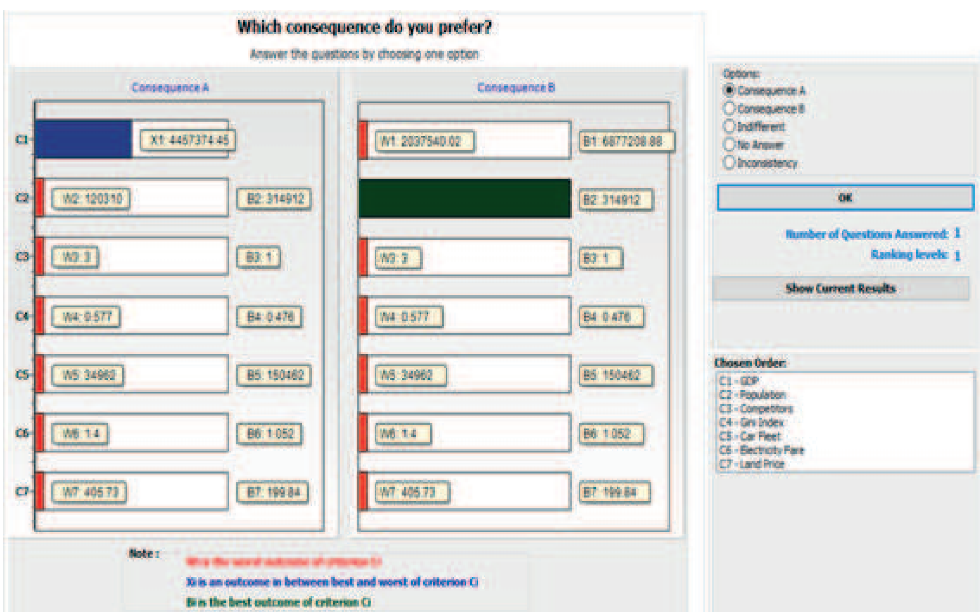

Figure 2: Flexible elicitation

providing the LPP model with the following inequality:

$$0.5 * k_{GDP} > k_{Population} . \tag{8}$$

There were four levels in the ranking after answering the sixth question. At this point, Caruaru had already dominated most of the cities considered, except for the city of Mossoró, that still was incomparable with it. After answering ten questions, two more positions in the ranking were established, as illustrated by the Hasse Diagram of Fig. 3.

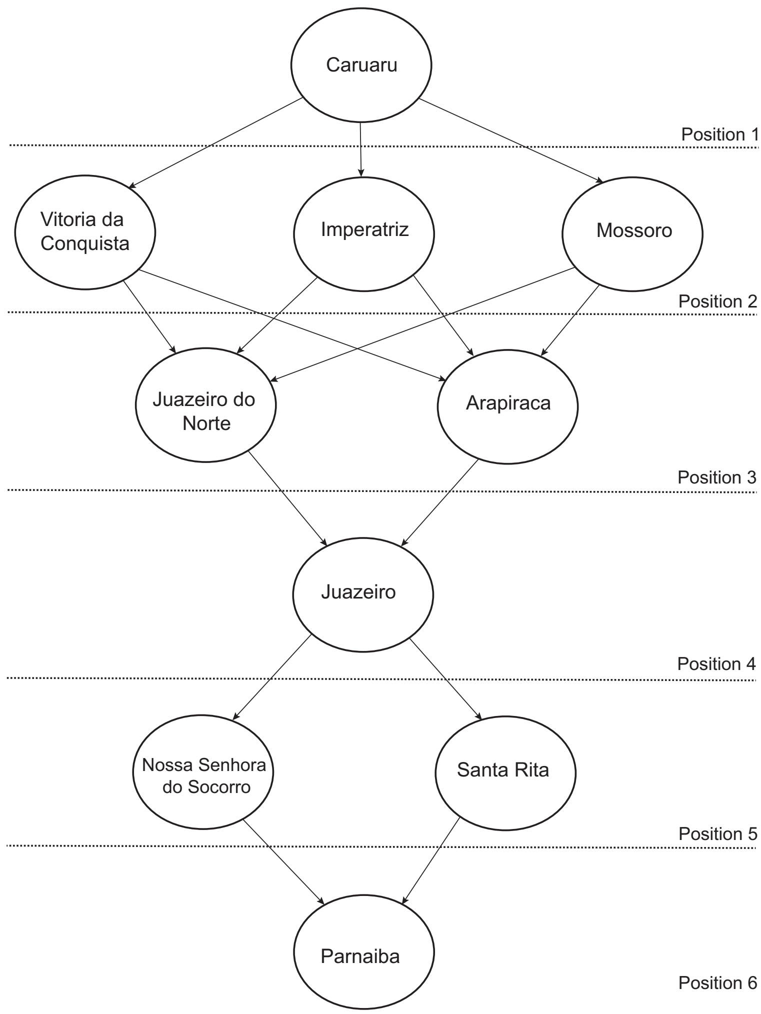

Figure 3: Ranking after the tenth question

It is possible to observe in Fig. 3 some incomparability relations between the alternatives, in positions 2, 3 and 5. The incomparability between the cities of Mossoró, Imperatriz, and Vitoria da Conquista is observed in position 2. Therefore, at this point of the decision process, the holistic evaluation can be performed by the DM in order to assess these alternatives, because they are all in the second position of the ranking, and this position has definitely a significance regarding the ultimate use of the results from the procedure.

In this decision process, the DM selected the bar graph to perform the holistic evaluation. The FITradeoff DSS also disposes of bubble and radar graph, but it is the bar graph that has been chosen by the DM to evaluate those incomparable alternatives.

It should be pointed out that bar graphs enjoy positive recommendations for use according to behavioral studies (Roselli de Almeida and Frej, 2019; Roselli, Frej and de Almeida, 2018; de Almeida and Roselli, 2017). In bar graphs, the heights of the bars represent the performance of the alternatives for each criterion, normalized to the ratio 0-1 scale. Thus, the bar graphs, provided here in Figs. 4, 5, and 6 were used to compare these alternatives.

In Fig. 4 it is possible to observe that Mossoró has a better or equal performance on all criteria, except for the GDP. However, the criterion of GDP presents the highest value of weight (criteria are ordered from left to right in the graph). By analyzing this graphic, the DM declared preference for Imperatriz, since the differences of performance in the other criteria are very small (lower than 0.2 on the scale between 0 to 1). That is, the DM established that Mossoró is dominated by Imperatriz in this problem.

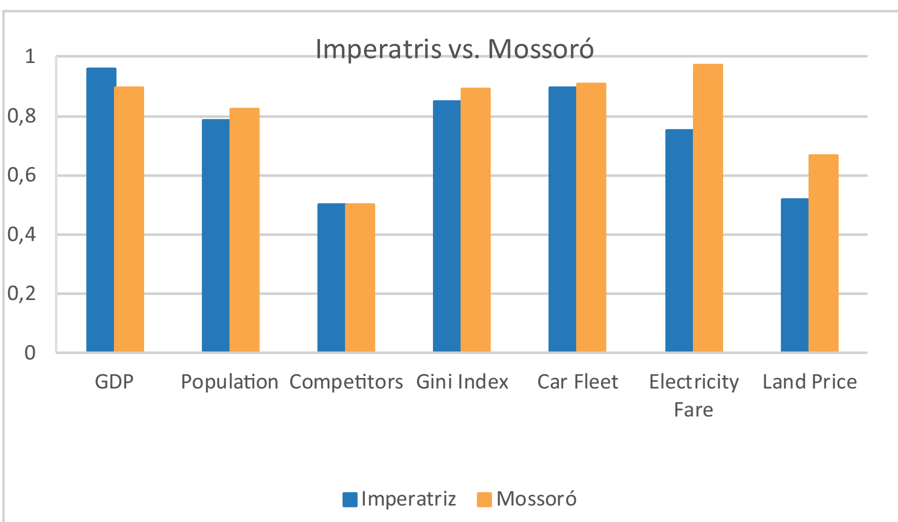

Figure 4: Imperatriz vs. Mossoró

The city of Imperatriz was also incomparable with Vitória da Conquista. Thus, Fig. 5 illustrates the comparison of these alternatives. Vitória da Conquista has a lower performance on the criterion for the GDP vis á vis Imperatriz, but the difference of performance between them is very small (lower than 0.1 on the scale between 0 to 1). Moreover, regarding the criterion of Gini index, the alternatives represent the same performance. On the other hand, concerning the criteria of population, electricity price and land price, the performance of the alternative Vitória da Conquista is better than the respective performance of Imperatriz, and regarding the criteria of competitors and car fleet, the performance of the alternative Vitória is worse than that of the alternative Imperatriz. Hence, for these alternatives, the DM did not feel comfortable enough to define a preference relation between them at this point.

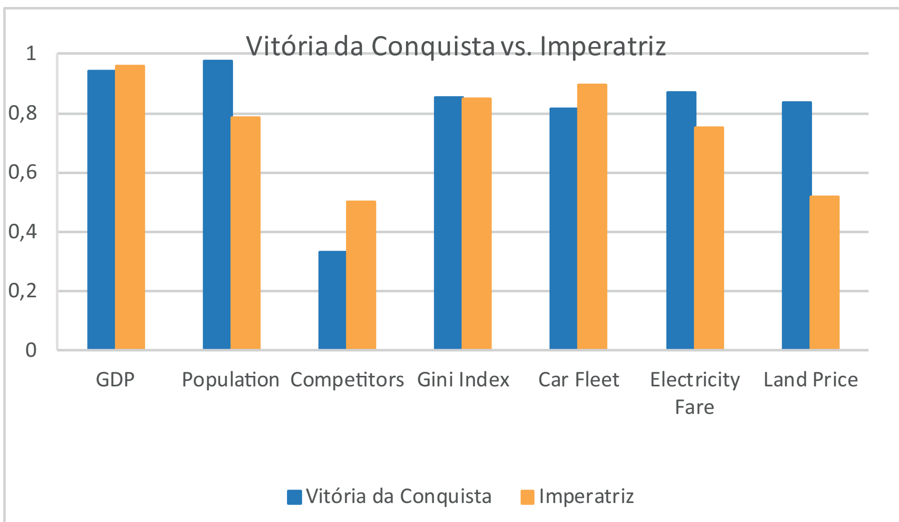

Figure 5: Imperatriz vs. Vitória da Conquista

Lastly, Vitória da Conquista is incomparable with Mossoró, as well (see Fig. 6). Although on the criteria of competitors, Gini index, car fleet, and electricity price the alternative Mossoró has better performance than Vitória da Conquista, this latter alternative shows better performance on the criterion of GDP as well as a considerable difference concerning the criterion of population. Therefore, since those criteria correspond to the first and second highest weight values, respectively, the DM considers Vitória da Conquista as preferable, establishing a dominance relation between them.

In order to obtain more information on the relation between the alternatives of Imperatriz and Vitória da Conquista (position 2), the DM decides to return to the elicitation process by decomposition so as to continue the comparisons of consequences.

So, yet more elicitation questions have been answered by the DM, until a complete ranking of alternatives was obtained. In this context it is important to point out that the FITradeoff method does not force the DM to continue answering the questions until a complete order of alternatives is obtained – the DM can finish the process as soon as the partial results become sufficient for his/her purposes.

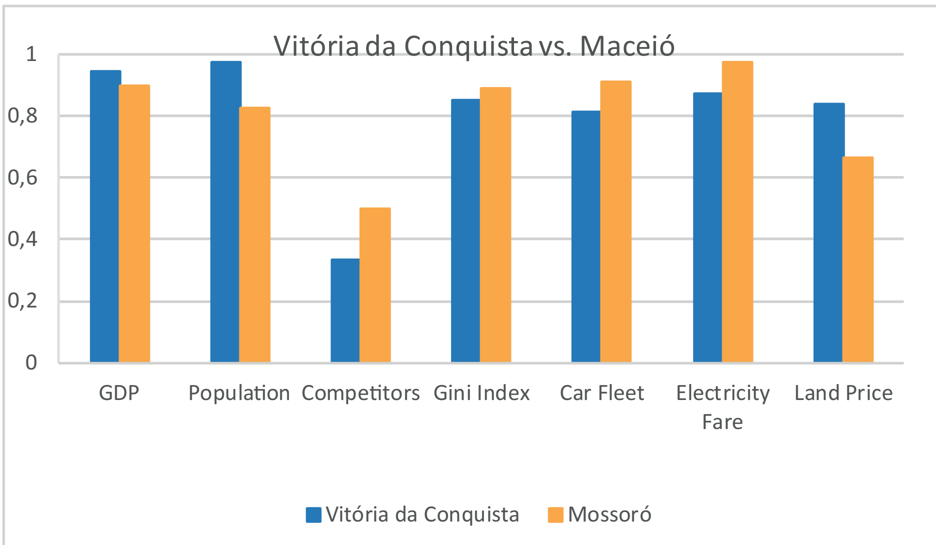

Figure 6: Vitŕia da Conquista vs. Mossoró

At the time the DM answered the eleventh question, the city of Caruaru had already dominated all the problem alternatives. If the DM were interested only to obtain the best alternative, according to his/her preferences, the problem could be finished at this point. However, for this problem, it is relevant in obtaining either a complete order or a complete pre-order, that is why the DM decided to continue the elicitation process by decomposition. The complete ultimate ranking is presented in Table 4.

As mentioned before, Caruaru was indicated as the most desirable city to locate the shopping mall. The city has the best consequences evaluated against three out of the seven criteria considered, which are GDP, population and car fleet, and the worst consequence evaluated against the criterion of land price.

The cities of Vitória da Conquista and Imperatriz were pointed out as a pair of indifferent alternatives and occupied the second position of the ranking.

The last position in the ranking was occupied by the city of Parnaíba, representing the worst consequences evaluated against the criteria of GDP and the Gini index, which means that the city has the lowest income and the highest level of wealth concentration in the group of the cities, considered as potential locations.

Table 4: Ranking outcome

Positions	Alternative
1	Caruaru
2	Vitória da Conquista |Imperatriz
3	Mossoró
4	Juazeiro do Norte
5	Arapiraca
6	Juazeiro
7	Santa Rita
8	Nossa Senhora do Socorro
9	Parnaíba

5. Conclusion

This study presents the use of the FITradeoff method in solving a location problem, involving the construction of a shopping mall in a city in the northeastern countryside of Brazil. This problem plays insofar a special role as Brazil is a big country that requires investments to be made in cities of the countryside.

The concrete problem considered is composed of ten alternatives that are evaluated with respect to seven criteria. A complete ranking of the alternatives was obtained using the FITradeoff method. In this study, the FITradeoff decision process is described focusing on the combination of the two perspectives of preference modeling: the elicitation by decomposition and the holistic evaluation.

As result, the first alternative in the ranking is the city of Caruaru, which is the most recommended one for constructing the shopping mall. A complete ranking is obtained, presenting the alternatives of locations in Vitória da Conquista and Imperatriz as tied in the second position of the ranking, and the city Parnaíba in the last position of the ranking.

For future studies, different aspects that were not considered in the problem, such as agreements on electricity prices, governmental incentives and so on, can be considered in order to evaluate other alternatives of cities in the countryside. Moreover, behavioral studies can be conducted, supported by neuroscience tools, to evaluate how the DM combines the two perspectives in the use of the FITradeoff method.

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