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Development of strategic planning of a financial education company in Brazil: an approach based on the new Multicriteria Decision Analysis Method S.W.O.T-D.M.S

Daniel Augusto de Moura Pereira[a], Bruno Pereira Diniz[a], Guilherme Nascimento Araújo[a], Alexandre Chaves Araújo[a], Mateus José de Siqueira Silva[a], João Cavalcanti Neto[a], Jordan Matheus Barbosa Araújo[a], Pedro Paulo Mendes Tomaz[a], Marcos dos Santos[b]*

[a]*Federal University of Campina Grande, Campina Grande, PB 58428-830, Brazil*
[b]*Military Institute of Engineering, Urca, RJ 22290-270, Brazil*

Abstract

Structured decision-making plays a pivotal role in an organization's Strategic Planning process, offering essential elements to enhance the precision and effectiveness of the planning at hand. Accordingly, this article aims to demonstrate the implementation and advancement of the S.W.O.T-D.M.S Multicriteria Decision Method, utilized in conjunction with the SWOT Matrix to rank alternative options within the Strengths, Weaknesses, Opportunities, and Threats segments. To reduce the cognitive effort on decision-makers, a VBA framework was developed. Additionally, an application of the S.W.O.T-D.M.S Method was carried out in a Brazilian company focused on promoting financial education, effectively illustrating its operational functionality.

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Keywords: "Strategic Plan; Multicriteria Decision Marking; Method S.W.O.T-D.M.S"

* Corresponding author. Tel.: + 55 (83) 99912-7417.
E-mail address: danielmoura@ufcg.edu.br

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1. Introduction

According to [1], corporate strategy is the general plan of a structured company, which contains two levels of strategy: competitive strategy and corporate strategy. In this sense, one of the traditional ways used to diagnose companies is to perform qualitative analyses, such as CANVAS and SWOT Matrix, to carry out their Strategic Planning.

These types of diagnoses mentioned above bring with them preferential decision-making on the part of the Decision Maker (DM), in the sense that he indicates what is most important or which point should be prioritized in the Strategic Planning process. This concept applies exactly to the SWOT Matrix, in which strengths, weaknesses, opportunities, and threats are listed, but it is not quantified which of the characteristics is the most important, or the one that should be prioritized, by ordering, at the time of execution of the Strategic Planning.

Therefore, to make the Strategic Planning process more assertive for companies and decision-makers, it is possible to use Multicriteria Decision Methods. It is worth noting that the integration of Operations Research and the SWOT Matrix can provide valuable information for Strategic Planning and decision-making in an organization [2].

In this context, the objective of this work is to show how the S.W.O.T-D.M.S Method was developed to assist in the Strategic Planning of organizations.

2. Theorical Framework

2.1. Multicriteria Decision Concept

The Multicriteria Decision Markup (MDCM) approach plays an important role in selecting non-dominant alternatives from among several viable alternatives evaluated against various criteria in real-life decision-making involving uncertainty issues ([3];[4];[5]).

The following aspects should be involved in decision making (DM) ([4];[6];[7]):

- A perception of the DM regarding the necessity and appropriateness of the decision, considering marketing, operational, technological, strategic, financial variables, etc;
- The adoption of a methodology or combination of methodologies, enabling the identification of the variables and a rational analysis of the information;
- The assessment of the necessity and feasibility of sharing the decision-making process to ensure the required engagement in the deployment of the chosen alternative.

According to Pereira et. al. [8], "Despite the diversity of MCDM approaches, methods and techniques, the essential ingredients of MCDM are a finite or infinite set of actions (alternatives, solutions, courses of action, etc.), at least two criteria, and at least one DM".

For Drumond et. al. [9], "It is essential to use a Multi-Criteria Decision Support (AMD) method to support the classification process".

The decision-making process must meet the important objective according to which, whatever option is chosen, the best opportunity must be seized, without harming the strategic position of the decision-maker ([10];[11];[12]).

3. Methodology

The methodological flow for the development of the S.W.O.T-D.M.S Method can be seen in Figure 1.

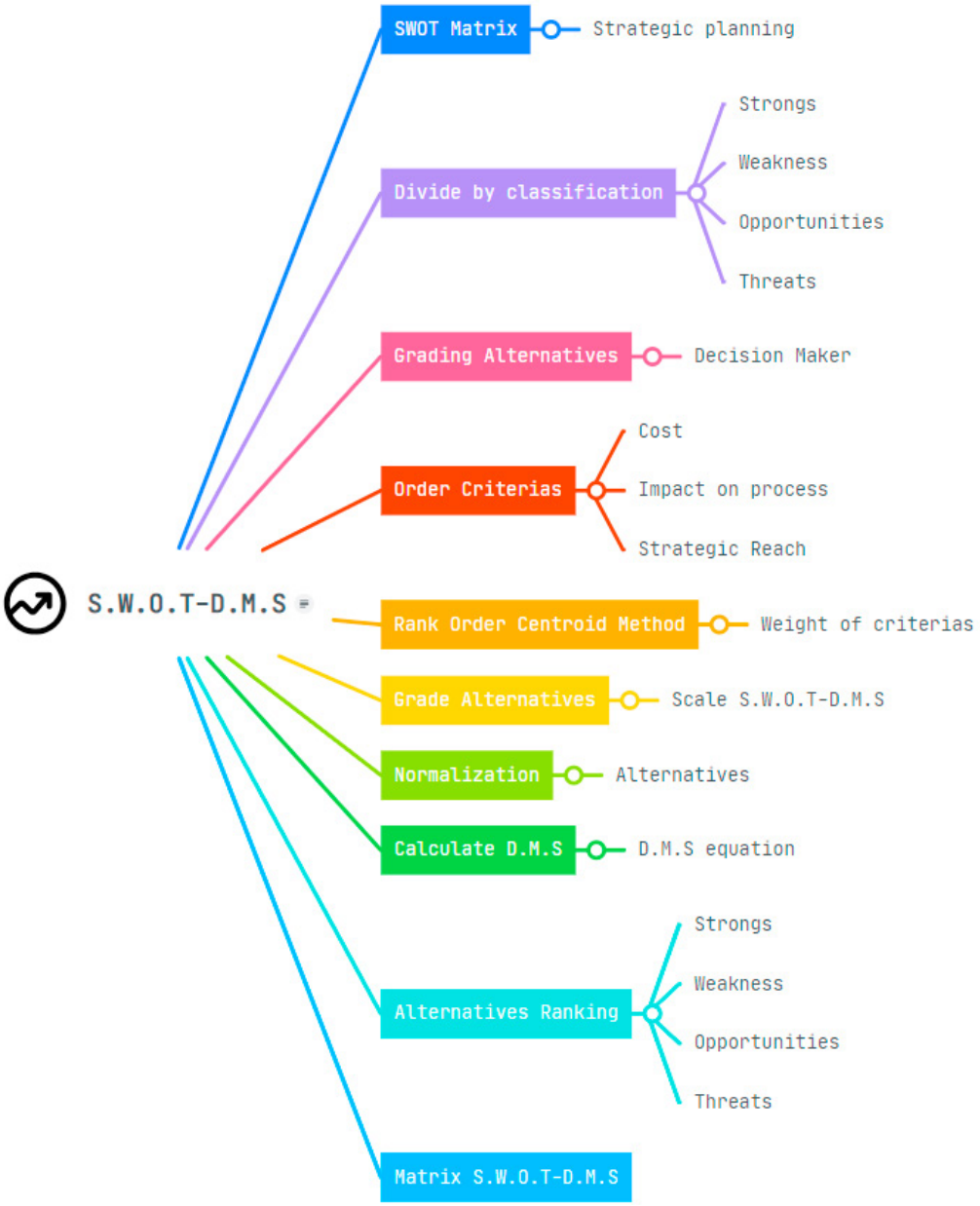


Fig. 1. Methodological procedure used

This method was developed by researchers from the Data Analysis Laboratory (LADA), Laboratory of Practice in Production Engineering (LAPEP), both from the Federal University of Campina Grande (UFCG), Brazil, in partnership with a researcher from the Military Institute of Engineering (IME) in Brazil. LADA Researchers created the mathematical method and approach. The LAPEP researchers tested the method in Visual Basic Applications (VBA) as a data input-output model, in Microsoft Excel, [13], and the IME researcher contributed to the creation of the S.W.O.T-D.M.S scale.

The development of the S.W.O.T-D.M.S Method took into account the already consolidated SWOT Matrix for the composition of the Strategic Planning. Each of the classifications is divided by segment so that it is possible to perform each one separately.

Then, after the segregation of the SWOT Matrix, three criteria were created to evaluate the strengths, weaknesses,

opportunities, and threats, namely: Costs, Impact on the process, and Strategic Scope. To reduce the cognitive effort of DM, the weights of the D.M.S criteria were generated from the Rank Order Centroid Method (ROC), [14]. The ROC is a method of partial information, which usually requires the ordering of criteria according to their relative importance. This method reduces the maximum error of each criterion weight by identifying the centroid of all possible weights. The weights (W) are determined for each criterion, such that: $w_1 \geq w_2 \geq w_3 \ldots w_3$., where $n\ j\ j = 1\ w = a_1, j = 1, 2, \ldots, n$. From Equation (1) the weights of the ordered criteria are calculated, where n is the number of criteria and $j = 1, 2, \ldots, n$ is the position of the ordered criterion.

$$W_{j(Roc)} = \frac{1}{n}\sum_{j=1}^{n}\frac{1}{j} \quad , j = 1, 2, \ldots, n \tag{1}$$

The grades that the decision maker assigns to the alternatives of the problem must be given according to the S.W.O.T-D.M.S., based on [16], which says that, on average, people can process only about seven (with a variation of more or less two) portions of information at a time.

Table 1. S.W.O.T-D.M.S scale

Reference	Meaning
1	Irrelevant
2	Very Weak
3	Weak
4	Moderate
5	Considerable
6	Strong
7	Very strong

After assigning grades to the alternatives, they were normalized using Equation 2. This normalization technique aims to resize the variables to a common range between 0 and 1 in order to retain values independent of the width of the measuring scale [15].

$$\frac{a_{ij}}{\sum_i a_{ij}} \tag{2}$$

After normalization, a new decision matrix is generated, considering the weight (P_1, $P_{2,\ldots}$ P_n) of the criteria and the values of the already normalized alternatives (A_x, A_y, … A_n). To calculate the D.M.S. the Equation 4 is used:

$$D.M.S = \left[(A_x \times P_1) + \left(A_y \times P_2\right) + (A_n \times P_n)\right] \tag{3}$$

At the end of the process of calculating the D.M.S by alternative, and segment, a ranking of the alternatives is performed, where the highest score is the priority alternative for execution, the second highest score comes next, and so on.

4. Results and Discussions

4.1. Application of S.W.O.T-D.M.S

To assist in the process of using the S.W.O.T-D.M.S Method was developed a framework in VBA-Microsoft Excel. This framework was made an application in a company that operates in the promotion of financial education in Brazil. The first step of the S.W.O.T-D.M.S method is generate the SWOT Matrix, as can be viewed in Figure 2..

FORCES	WEAKNESSES
Product Mix	Lack of Physical Environment
Qualification of Consultants	Inadequate Machinery and Equipment
Market Expertise	Investment Capacity
OPPORTUNITIES	**THREATS**
Rising Market	Competitive Market
Customer Growth	Disinformation
Increase in Revenue	Fiscal policy

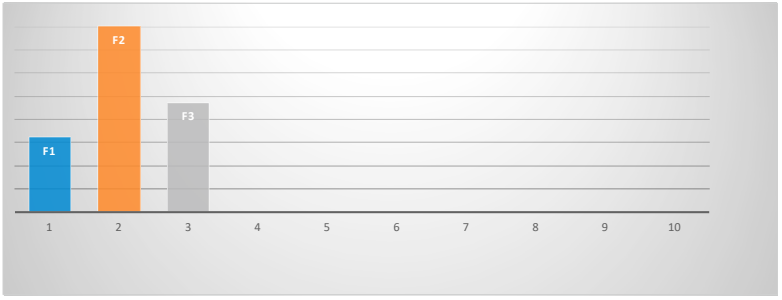
Fig. 2. SWOT Matrix

The analysis was carried out with the strategic sector for the Internal Environment (Strengths and Weaknesses), starting with the company's Strengths, which brought three alternatives, namely: Product Mix, Qualification of consultants, and Expertise in the Market (Figure 3). The criteria were ordered as Impact on the company being the most important, then the Reach throughout the process, and, finally, Cost. After assigning the scores in the decision matrix, the normalized matrix was generated, and finally the D.M.S values for each alternative. As a result, the force to be prioritized in the company's Strategic Planning process is the Qualification of Consultants, then Market Expertise, followed by Product Mix.

DECISION MATRIX					∑ Weighted Weight	NORMALIZED MATRIX			FINAL SCORE	
CODE	FORCES	COST	IMPACT ON THE PROCESS	STRATEGIC REACH		COST	IMPACT ON THE PROCESS	STRATEGIC REACH	D.M.S	RANKING
	Ordination	3	1	2						
	Weighted Weight	0,11	0,61	0,28	1					
F1	Product Mix	3	6	7		0,2	0,32	0,35	0,31	3
F2	Qualification of Consultants	7	7	6		0,47	0,37	0,3	0,36	1
F3	Market Expertise	5	6	7		0,33	0,32	0,35	0,33	2

Fig. 3. D.M.S Calculation of Forces

In addition, Figure 4 displays the Column Chart, which indicates the ordering of the alternatives, enabling a better visualization of the difference in scores between F2 (0,36), F3 (0,33), and F1 (0,31), in addition to a Radar Chart, which shows that the Impact on the process is the most important criterion, followed by Strategic Reach and Cost.



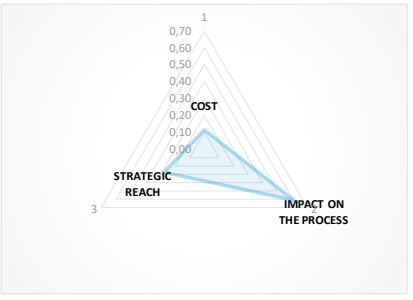


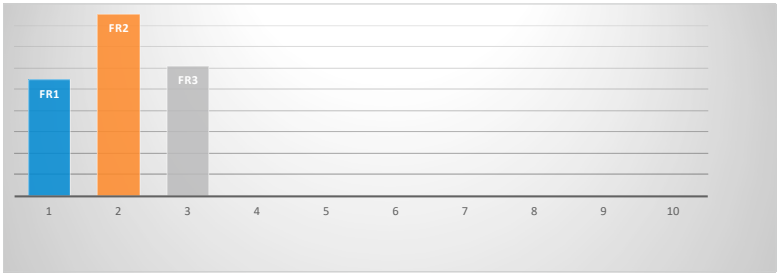
Fig. 4. Graphic Analysis of the Forces D.M.S

The analysis along with the Weaknesses of the company brought the following alternatives: Lack of physical environment, Inadequate Machinery and Equipment, and Investment Capacity. The ordering of the criteria was an Impact on the process, Cost, and Scope throughout the process. After assigning the grades in the decision matrix, the normalized matrix and the D.M.S values for each alternative were generated. As a result (Figure 5), the Weakness to be prioritized in the company's Strategic Planning process is Inadequate Machinery and Equipment, Investment Capacity, and Lack of Physical Environment.

DECISION MATRIX					∑ Weighted Weight	NORMALIZED MATRIX			FINAL SCORE	
CODE	WEAKNESSES	COST	IMPACT ON THE PROCESS	STRATEGIC REACH		COST	IMPACT ON THE PROCESS	STRATEGIC REACH	D.M.S	RANKING
	Ordination	2	1	3						
	Weighted Weight	0,28	0,61	0,11	1					
FR1	Lack of Physical Environment	5	4	6		0,29	0,25	0,33	0,27	3
FR2	Inadequate Machinery and Equipment	7	7	7		0,41	0,44	0,39	0,42	1
FR3	Investment Capacity	5	5	5		0,29	0,31	0,28	0,30	2

Fig. 5. D.M.S Calculation of Weaknesses

Figure 6 displays the Column Chart which indicates the FR2, FR3, and FR1 (D.M.S. ranking 0,42, 0,3 and 0,27 respectively) as the best alternatives, in that order. The Radar Chart, shows that the Impact on the process is the most important criterion, followed by Cost and Strategic Reach.



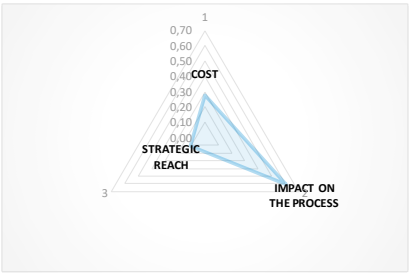


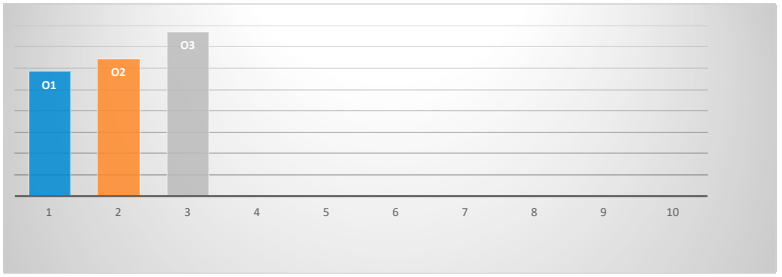
Fig. 6. Graphic Analysis of the Weaknesses D.M.S

Regarding the External Environment (Opportunities and Threats), the alternatives of the Opportunities were: Rising Market, an Increase in Customers, and an Increase in Revenue. The order of the criteria was Scope throughout the process, Impact on the process, and Costs. The D.M.S order indicated Revenue Increase as the main opportunity for Strategic Planning, followed by Customer Increase and Rising Market (Figure 7).

DECISION MATRIX					∑ Weighted Weight	NORMALIZED MATRIX			FINAL SCORE	
CODE	OPPORTUNITIES	COST	IMPACT ON THE PROCESS	STRATEGIC REACH		COST	IMPACT ON THE PROCESS	STRATEGIC REACH	D.M.S	RANKING
	Ordination	3	2	1						
	Weighted Weight	0,11	0,28	0,61	1					
O1	Rising Market	1	7	6		0,14	0,33	0,30	0,29	3
O2	Customer Growth	1	7	7		0,14	0,33	0,35	0,32	2
O3	Increase in Revenue	5	7	7		0,71	0,33	0,35	0,39	1

Fig. 7. D.M.S Calculation of Opportunities

Figure 8 displays the Column Chart which indicates the O3, O2, and O1 (D.M.S. ranking 0,39 0,32, and 0,29 respectively) as the best alternatives, in that order. Also, the Radar Chart shows that Strategic Reach is the most important criterion, followed by Impact on process and Cost.



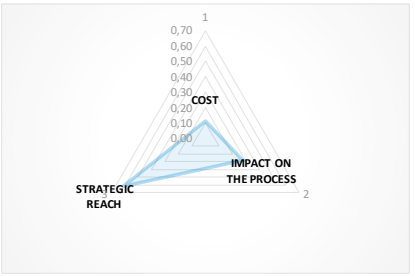


Fig. 8. Graphic Analysis of the Opportunities D.M.S

In Threats, the alternatives pointed out were: Competitive Market, Disinformation, and Fiscal Policy (Figure 9). The order of the criteria was to Impact the process, Costs, and Scope of the process. The D.M.S order indicated competitive market is a priority in Strategic Planning, Disinformation, and Fiscal Policy.

DECISION MATRIX					∑ Weighted Weight	NORMALIZED MATRIX			FINAL SCORE	
CODE	THREATS	COST	IMPACT ON THE PROCESS	STRATEGIC REACH		COST	IMPACT ON THE PROCESS	STRATEGIC REACH	D.M.S	RANKING
	Ordination	2	1	3						
	Weighted Weight	0,28	0,61	0,11	1					
A1	Competitive Market	7	7	5		0,33	0,39	0,28	0,36	1
A2	Disinformation	7	6	7		0,33	0,33	0,39	0,34	2
A3	Fiscal policy	7	5	6		0,33	0,28	0,33	0,30	3

Fig. 9. D.M.S Calculation of Threats

Figure 10 displays the Column Chart which indicates the A1, A2, and A3 (D.M.S. ranking 0,36 0,34, and 0,3 respectively) as the best alternatives, in that order. Also, the Radar Chart shows that Impact on the process is the most important criterion, followed by Cost and Strategic Reach. It is worth mentioning that the results of the D.M.S indicated exactly the same order of Threats indicated by the managers, which indicates that they are well aware of the Threats within their Strategic Planning.

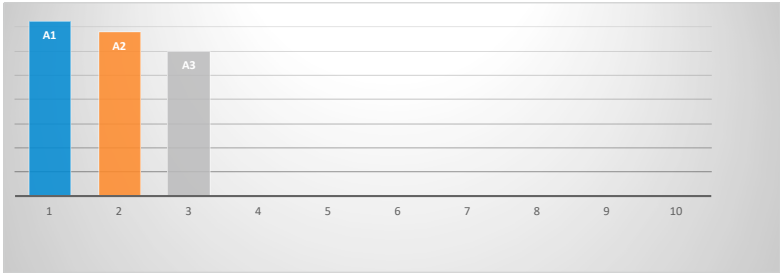


Fig. 10. Graphic Analysis of the Threats D.M.S

After the ordination of all alternatives, along with their classifications, the S.W.O.T-D.M.S Matrix is generated, as shown in Figure 11, which shows the prioritization of alternatives for the Strategic Planning of the company under study.

S.W.O.T-D.M.S	
FORCES	WEAKNESSES
Qualification of Consultants	Inadequate Machinery and Equipment
Market Expertise	Investment Capacity
Product Mix	Lack of Physical Environment
OPPORTUNITIES	THREATS
Increase in Revenue	Competitive Market
Customer Growth	Disinformation
Rising Market	Fiscal policy

Fig. 11. S.W.O.T -D.M.S Matrix

5. Final Considerations

This article aimed to show the development of the new Multicriteria Decision Method S.W.O.T -D.M.S, focused on the Strategic Planning of organizations, in a financial education company in Brazil. This method uses the SWOT Matrix as the basis for generating the alternatives. Then, the entry into the decision matrix is performed, where each segment is analyzed individually, by the Decision Maker, to prioritize the best alternative, according to the ranking from the D.M.S. As the final product of the modeling, the S.W.O.T-D.M.S Matrix is generated.

The results presented were consistent, especially when comparing the SWOT Matrix, generated from the interviews with the managers of the company under study, with the S.W.O.T-D.M.S Matrix, generated after the mathematical modeling, in which it is possible to verify the difference in the ordering of the priorities of the alternatives for the Strategic Planning of the company. The results found in this work were forwarded to the company and put into practice by it, being the guide of its business strategy the Qualification of Consultants (Strength), Investment Capacity (Weakness), Increase in revenue (Opportunity), and competitive market (Threat).

To improve the user experience, and expand the use of the S.W.O.T -D.M.S Method, the next step will be the creation of Decision Support System (DDS), to analyze larger volumes of data, have a database with previous decisions, which serve as a guide for business management and support the levels of management, operations, and planning of the organization under study, making decision-making more assertive.

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