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Article

SAPEVO-BSC Multicriteria Method

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Abstract: Strategic management is a fundamental process for global companies that wish to remain competitive in an increasingly dynamic and complex market. However, relying solely on the Balanced Scorecard may not be enough to guarantee your success. Companies must prioritize strategic projects, aligned with the business vision, that contribute to achieving established goals and objectives. In this context, this new proposal, SAPEVO-BSC, for the ranking problem, combined SAPEVO-M in its algorithm to indicate the degree of relevance between the different perspectives of the BSC, the strategic objectives linked to the perspectives will have greater weight in the classification of projects structural. Additionally, it is proposed to apply the Impact and Probability Matrix concept to ensure that these projects are evaluated according to their relevance and impact on the business, within a period compatible with the stipulated context.

Keywords: Multicriteria Methods; MCDA Process; Prioritization Problematic.

1. Introduction

Considering the contemporary business scenario, making efficient decisions is critical for success. However, the modern corporate environment is becoming increasingly complex and dynamic, with interconnected variables, real-time information, and constant competitive pressures at play.

[1] In this context, response time becomes a critical factor that can determine the success or failure of an organization. [2] Therefore, the ability to make agile and precise decisions is a strategic competence for companies seeking to excel in highly challenging environments. We will explore how the growing complexity of corporate environments demands a more structured and prioritized approach to decision-making. By establishing a theoretical

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foundation with real corporate daily life elements, this article highlights how incorporating concrete and organized elements in decision-making can become a crucial differentiating factor for organizations seeking to thrive in increasingly volatile business environments.

[3] The following sections show the main reasons why decision-making in complex environments requires a more structured and priority-oriented approach. Furthermore, we will explore tools, available techniques, and a proposal to integrate multi-criteria decision analysis with prioritization elements to provide a methodology for prioritizing strategic actions and projects.

This methodological proposal aims to support organizations to offer optimization and allocation of elements of people, time, and resources in prioritizing strategic projects. [4] Making informed, rapid, and strategically prioritized decisions is essential in a business world characterized by uncertainty and the acceleration of change.

This paper is subdivided into two elementary axes: the first, aspects of the business vision and strategic objectives, and the second stage, the insertion of axiomatic and mathematical models, where the strategic structure is converted into a vector. Thus directing priority actions and strategic projects in a corporation.

2. Business Vision & Strategic Alignment

Strategic alignment and the business vision play crucial roles in decision-making in the corporate environment. Strategic alignment refers to harmonizing an organization's actions and resources with its long-term strategic objectives. It involves integrating all company parts to work together towards common goals, like an integrated organism.

[5] This alignment is essential for decision-making, as it guides the organization's choices toward achieving its vision for the future. [6] Defining priorities is elementary to achieve this alignment because when an organization defines its strategy, it must allocate resources, such as capital, personnel, and time, to initiatives aligned with that strategy. The organization's strategic objectives strongly influence where to allocate resources.

It is crucial to establish clear objectives and goals for the entire organization. This provides a framework for evaluating decisions, ensuring they align with strategic objectives. A company can assess opportunities and threats more effectively by aligning with its strategy. [7] Decisions are made based on their potential contribution to achieving strategic objectives.

Three aspects are vital to corporate strategy and complete strategic alignment:

The business vision is the projection of the future that the organization seeks to achieve, along with the definition of the company's long-term purpose and Direction [8]. Therefore, this is a fundamental element that guides decision-making. Such decisions are made considering how they will contribute to realizing this vision over time (Figure 1).

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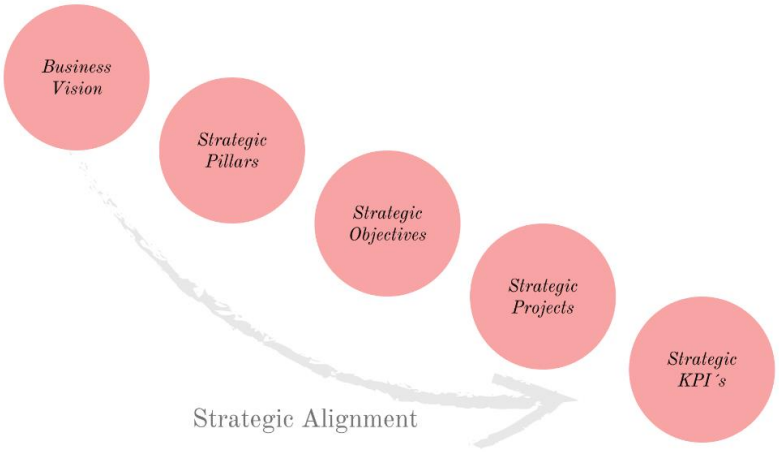

Figure 1. Representation of strategic alignment

2.1. Corporate Strategy

[9] Corporate strategy plays a fundamental role in the success of an organization, serving as the cornerstone for strategic decision-making that shapes its destiny.

This paper explores the fundamentals of decision-making in corporate strategy, emphasizing the importance of environmental analysis, the definition of clear objectives, and the effective allocation of resources. Furthermore, we will examine how continuous adaptation and strategic flexibility are essential in a dynamic and ever-evolving business world.

[10] Through an in-depth analysis of these elements, this work seeks to contribute to a better understanding of the complexities involved in the formulation and execution of successful corporate strategies. It is necessary to understand that a business's strategy is related to its essence, purpose, beliefs, values, and what it proposes (Figure 2).

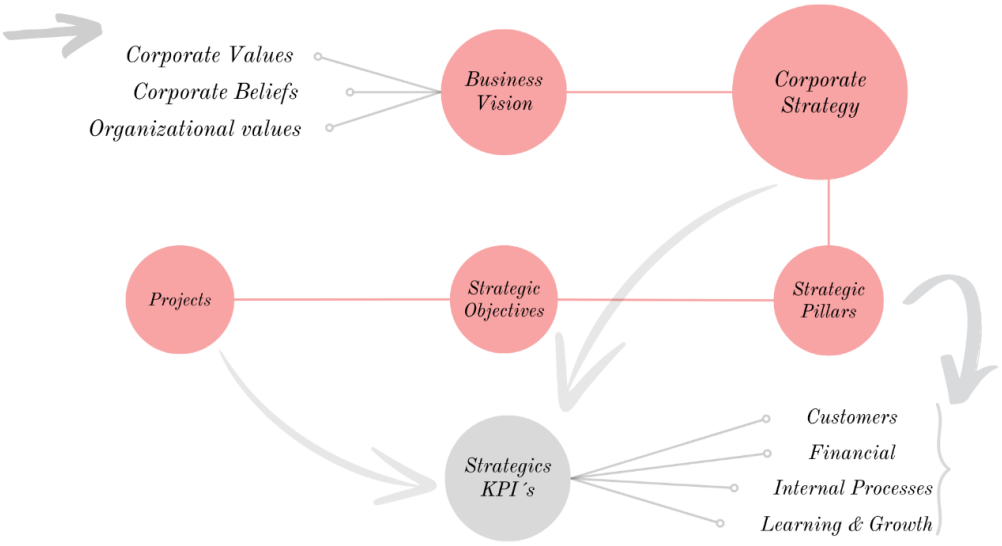

Figure 2. Business vision deployment into KPIs

2.2. Impact & Probability Matrix as a strategic prioritization element

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This consists of guidance and support for decision-making classified by two axes: probability and impact. It is possible to calculate the risk through these dimensions, which consists of evaluating the impact versus the probability. Applying an appropriate methodology to understand and mitigate operational risks is fundamental in the global business environment. [11] KPIs should be safeguarded and responsive to timely decision-making.

Considering that strategic decision-making is essential for the organization's success, the classification of actions and projects must follow a priority scale. This is a risk management tool that visually identifies the risks that should be understood as a priority by DM. [12] It is within this understanding that the I&PM approach emerges as a valuable tool for prioritizing actions, risks, or opportunities, enabling decision-makers to be effective in their positions. This is fundamental for allocating resources and efforts, highlighting its practical application in various organizational scenarios.

2.3 Integration proposal between BSC, I&PM and SAPEVO-M multicriteria method

The Balanced Scorecard (BSC) is one of the most used management artifacts in large organizations. Its main objectives are to communicate and operationalize long-term actions, promoting alignment between strategy and operations through a balanced composition of measures. It is observed, however, that many organizations, despite this, have difficulties in its implementation and use [13].

The decision-making process generally involves a choice between several alternatives. Efficiency in decision-making consists of choosing the alternative that, as far as possible, offers the best results. The feasible alternatives for meeting the objective, selected for evaluation, are compared according to criterion and under the influence of attributes [14].

The proposal for the creation and integration of this methodology aims to weigh relevant actions in strategic planning, being grounded by the SAPEVO-M multicriteria method, and then, among the relevant actions, insert the level of criticality of the respective action or project, which will be an approach based on the I&PM. The fundamental proposition of the BSC demonstrates the depth of integration of an adaptable methodology within the complex corporate world. In this way, decisions can consider not only the degree of importance but also their impact, acting as tactics within the strategy.

[15] The various decision analysis tools are developed in the decision-making process, each with its strengths and weaknesses. Based on the modeling of the respective problem, the fit decision-maker identifies post and counter aspects and requirements of these tools and their suitability for the process of decision-making.

Four elements characterize MCDM methods: a Set of "alternatives" from which the decision is chosen; a set of "criteria" or factors related to making a good decision; the "preferences" of the decision maker, being transparent, then the problem becomes more understandable; and the "result" of each choice, measured in terms of criterion according to the decision maker's preferences [16]. Given this perspective, it is necessary to highlight complex environments, such as corporate structures, where multiple decision-makers (executives) tend to create competing forces between indicators and metrics. There are competing metrics between people and areas of the organization.

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[17] Thus, decisions should be aligned with the organization's strategic objectives, considering multiple criteria and preferences. This synergy between different methods results in a more robust and efficient decision-making process, capable of leading to more aligned choices with the organization's vision and strategy.

2.4 SAPEVO-M multicriteria method

This approach is seen as an indirect method [18], where possible criteria are segregated into components and given weights based on previous similar problems, the decision maker's judgment based on experience.

Problems involving multiple criteria and variables are complex and conflicting, as they involve multiple actors with interests and perspectives that are not necessarily aligned in thought and with different concerns among DMs [4].

[2] Developed the Simple Aggregation of Preferences Expressed by Ordinal Vectors-Multi Decision Makers (SAPEVO-M) method, which approaches issues involving the classification of alternative rankings. Therefore, this is classified as a multicriteria, multi-decision-maker, and ordinal method. [5] emphasize that this approach converts ordinal inputs and establishes an order of magnitude based on the knowledge of DM, criterion, and alternatives, thus obtaining a column vector following the methodological steps:

i. Transform ordinal preferences among criterion into a vector of criterion weights;
ii. Transform ordinal preferences among alternatives for each criterion into partials of the alternatives;
iii. Determine the overall weight of the alternatives.

The criterion:

$$\boldsymbol{Ci\ e\ Cj = criteria\ of\ a\ set\ or\ degree\ of\ preference}$$

$$\boldsymbol{C = \{C1, C2, C3, \dots, Ci, \dots, Cj\}}$$

$$\boldsymbol{\delta CiCj = 1 \leftrightarrow Ci \cong Cj}$$

$$\boldsymbol{\delta CiCj > 1 \leftrightarrow Ci > Cj}$$

$$\boldsymbol{\delta CiCj < 1 \leftrightarrow Ci < Cj}$$

$\cong$ as important as; > more important than, < less important than

The DM:

Obtain a matrix based on the preference order of each decision-maker.

$$D = \{DM1, DM2, DM3, \dots, DMk\}$$

$$MDMk = [\delta CiCj]$$

By applying a relation with the 7-point scale, a column vector [vi] will be generated. After this step, it is necessary to normalize this vector to equalize the different units of measurement contained in the problem (Table 1).

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Table 1. Matching scale

Escale	
Absolutely Worse	-3
Much worse	-2
Worse	-1
Equivalent	0
Better	1
Much better	2
Absolutely Best	3

Thus, the equivalence analysis of the matrix and its normalization process is carried out (Figure 3).

	Decision Maker 1 - Criterio 1	Decision Maker 2 - Criterio 2	Decision Maker 2 - Criterio 3	Weight
Internal Process	1	1	0,875	2,875
Customer	0,002	0,625	0,00625	0,63325
Learning & Growth	0,8	0,875	1	2,675
Financial	0,2	0,00625	0,625	0,83125

Figure 3. Criterion relevance – (cross-criteria analysis)

For normalization, the respective notation is followed (Equation 1):

$$v = \frac{aij - min\ aij}{máx\ aij - min\ aij} \quad (1)$$

This sequence of steps should be applied considering the number of DMs involved in the evaluation. [6] Once this step is completed, global scoring among criteria will be carried out. To obtain the column matrix, one must sum the product of each criterion with its respective normalized vector and continue this operation for each alternative. In this way, in an ordinal manner, the most significant factor of importance of the alternatives considered in the respective problem will be obtained [7].

Methodology

The methodology consists of a multi-methodological approach where elements from the BSC, I&PM, and the SAPEVO-M Multicriteria Method are integrated (Figure 4).

The process is divided into sequential steps:

i. Identify all actions and projects that need to be executed;

ii. evaluate each action or project according to its importance and alignment with the business vision and corporate strategy;

iii. designate a priority, from the perspective of each decision-maker (DM), for each action or project, depending on the business vision;

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iv. considering the structure of the BSC, the four pillars will be considered as criteria to be weighted by the SAPEVO-M multicriteria method;

v. as alternatives, in this decision matrix, the strategic indicators designated by the company will be considered;

vi. considering that this is a multi-decision method, each DM will indicate, from their perspective, the relevance of each classification, as well as the alternatives;

vii. when executing the SAPEVO-M method, weights will be obtained for each classification. These weights, together with the assessment of the impact and probability of this event affecting the strategy, will obtain a relevance vector for each project or strategic action;

viii. the product between this matrix index and their respective weights will result in an ordering vector of the project or action;

ix. after that, order the actions and projects according to their priority, in descending order, to execute the projects with the highest priority.

This way, you will obtain a sorted list of the prioritized projects. Considering that the priority vector will be the product between the matrix index (I&P) and the weight obtained by executing the SAPEVO-M multicriteria method.

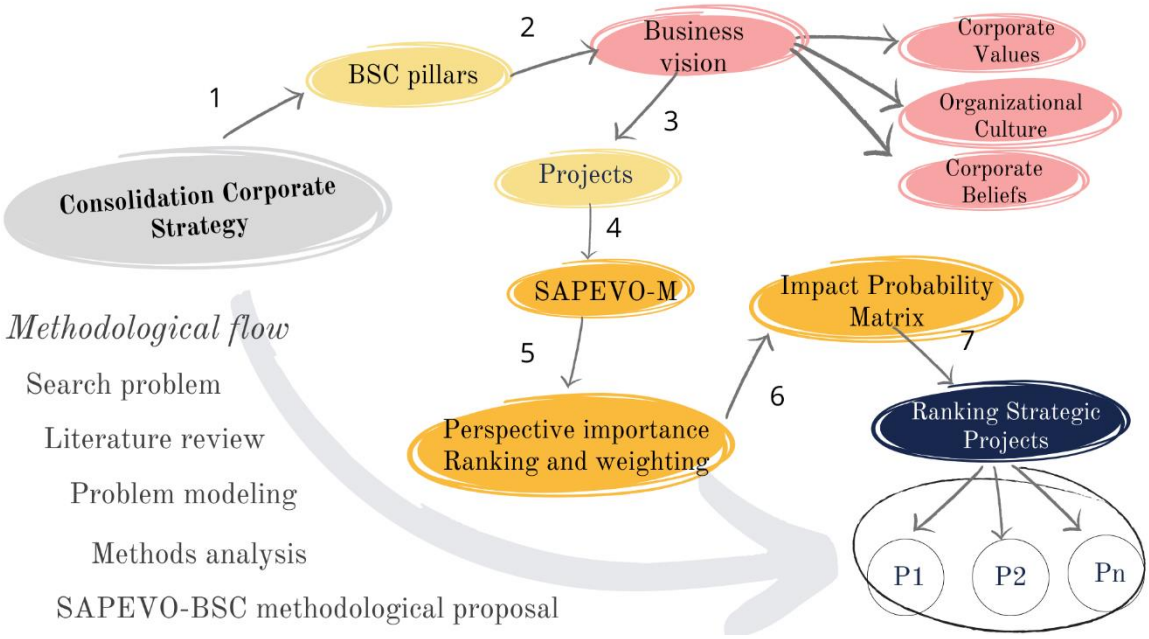

Figure 4. Methodological Flow

3. Results

Proposal for a framework addressing the multimethodological relationship between BSC, I&PM, and SAPEVO-M Multicriteria Method.

The structural premises are:

i. Understanding the business vision: Before weighing the perspectives, it is essential to clearly understand the organization's strategy

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and objectives that are aligned with the business vision. This will allow for determining which perspectives are most relevant to achieving these objectives.

ii. Discussions and involvement of stakeholders: Conducting discussions with the executive team, including the middle management team. This will help obtain different perspectives on what is most important for the business.

iii. Definition of relative weights: A common approach to weighing perspectives is to assign relative weights to each strategic objective. Applying the structure of the SAPEVO-M multicriteria method, having inputs (strategic perspectives of the BSC (financial, customer, learning, and internal processes) and strategic indicators (EBITDA, ROI, satisfaction index, market share).

iv. Impact evaluation: Consider how performance in each perspective impacts the others. For example, if you improve customer satisfaction (customer perspective), this will likely also have a positive impact on financial results (financial perspective).

SAPEVO-M Analytical Input

The assigned criteria are related to the strategic perspectives, and the alternatives are related to the strategic KPI designated in the business structure. This structuring proposes to find a common importance vector for business executives and decision makers (DM) (Figure 5).

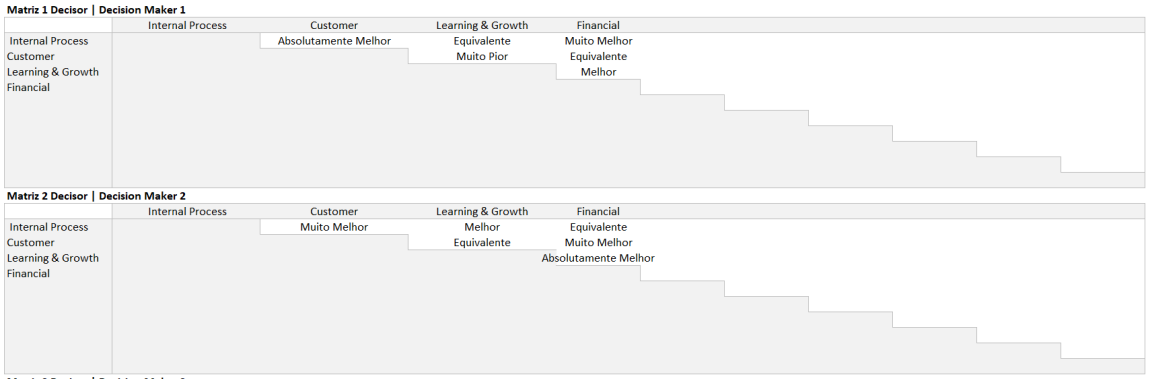

Figure 5. Decision matrix

At this stage, each DM will make a parity evaluation of relevance between each criterion (perspective). Next, the same process will occur with each KPI within each criterion.

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Therefore, each indicator will be relevant from different perspectives (Figure 6).

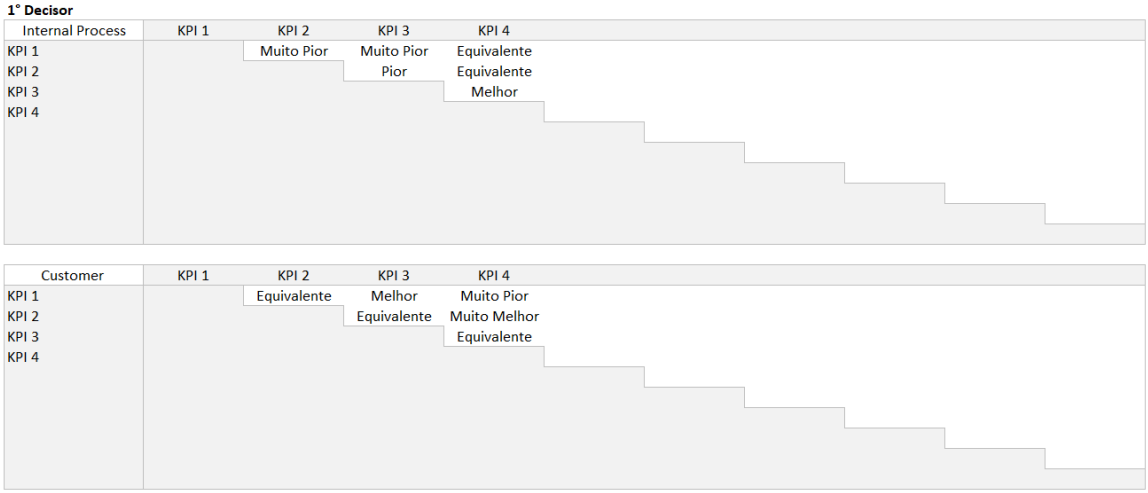

Figure 6. Equal analysis of alternatives for each criterion

The objective is to find the weights for each strategic objective (Figure 7).

Alternatives	Internal Process	Customer	Learning & Growth	Financial
KPI 1	0,363636364	0,16666667	0,142857143	2,1
KPI 2	2,086538462	2	2,75	1
KPI 3	2,090909091	1,83333333	1,125	2,15
KPI 4	0,451923077	1,61904762	0,625	0,35

x

Criteria	Weight
Internal Process	2,875
Customer	0,63325
Learning & Growth	2,675
Financial	0,83125

=

Alternativas	Final weight
KPI 1	3,278764069
KPI 2	15,45279808
KPI 3	11,96888447
KPI 4	4,287353251

Figure 7. Final weighting

After obtaining the importance ranking of each strategic objective, the NPR principle of the I&PM was applied. Therefore, after inputting these characteristics in each project or action (*p1, p2,…,pn*) established in the strategy, the product between impact and probability and the respective weights (*w*) linked to the perspectives will result in a prioritization ranking score.

Having the product of the corresponding weights and the weighting of the impact and probability matrix generates a vector, considering the groups of the I&PM, classified as: very low, low, moderate, high, and very high. This score obtained the following scale (1, 3, 5, 7 and 10). To obtain a weighted scale, these were summed and then each term was divided by the sum (Equation 2).

$$\frac{x_i}{\sum x_i} \qquad (2)$$

This resulted in the respective weights:

i. very low - 0.03
ii. low - 0.11
iii. moderate - 0.19
iv. high - 0.26
v. very high - 0.38

When analysing each project in relation to strategic objectives, the decision-maker should score the relevance of the respective project in order to align with the long-term strategic vision (Figure 8).

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Formula for obtaining the I and P indices: =if(C2="very low";0,03;if(C2="low";0,11;SE(C2="moderate";0,19;if(C2="high";0,26;if(C2="very high";0,38;" "))))))

Project	Strategic Objectives	Impact	Probability	I	P	W	Index	Ranking
P1	KPI 1	Moderate	Very low	0,19	0,03	3,278764	0,018689	12
P2	KPI 2	Very low	Low	0,03	0,11	15,4528	0,050994	9
P3	KPI 1	Low	Low	0,11	0,11	3,278764	0,039673	11
P4	KPI 3	Very high	High	0,38	0,26	11,96888	1,182526	2
P5	KPI 3	Moderate	Very high	0,19	0,38	11,96888	0,864153	3
P6	KPI 2	Very low	Very high	0,03	0,38	15,4528	0,176162	8
P7	KPI 1	Very high	Moderate	0,38	0,19	3,278764	0,236727	6
P8	KPI 3	Moderate	Very high	0,19	0,38	11,96888	0,864153	3
P9	KPI 4	Very low	Very high	0,03	0,38	4,287353	0,048876	10
P10	KPI 1	High	High	0,26	0,26	3,278764	0,221644	7
P11	KPI 1	High	Very high	0,26	0,38	3,278764	0,323942	5
P12	KPI 3	Very high	Very high	0,38	0,38	11,96888	1,728307	1

=SE(C2="very low";0,03;SE(C2="low";0,11;SE(C2="moderate";0,19;SE(C2="high";0,26;SE(C2="very high";0,38;" "))))))

Figure 8. Hooper list of strategic projects and their respective weights

Conclusion

At this stage, it is possible to assess the alignment with priorities and the importance of each project from the perspective of each decision-maker. It will be necessary to analyze the scores the DM gave to each project for each criterion. Thus, this approach is suitable for structuring strategic planning, where it is necessary to prioritize projects with high adherence to short- and long-term cycle objectives.

With this, a prioritized hooper list is obtained (ranking), making it more effective and austere in fulfilling the corporate strategy. Consequently, allocating resources (financial and human) becomes manageable and predictable, focusing effort and attention on the right action at the right time. While the SAPEVO-M approach aims to structure long-term characteristics, the impact and probability matrix considers the short-term perspective. However, the combination of both methodological approaches contemplates the preservation of the business vision and consequent strategy.

This prioritized list of strategic projects will define the implementation sequence, favoring optimized resource allocation without compromising the management of strategic actions. This element can be used as a differential factor with your competitors. Now, it is understood that a limitation is to have a management team capable of reading and inputting market data that reflects reality and is suitable for decision-making studies.

Therefore, this methodology was proposed to validate actions and projects, depending on their relevance, which significantly contributes directly to obtaining the result projected in the business strategy (Figure 9).

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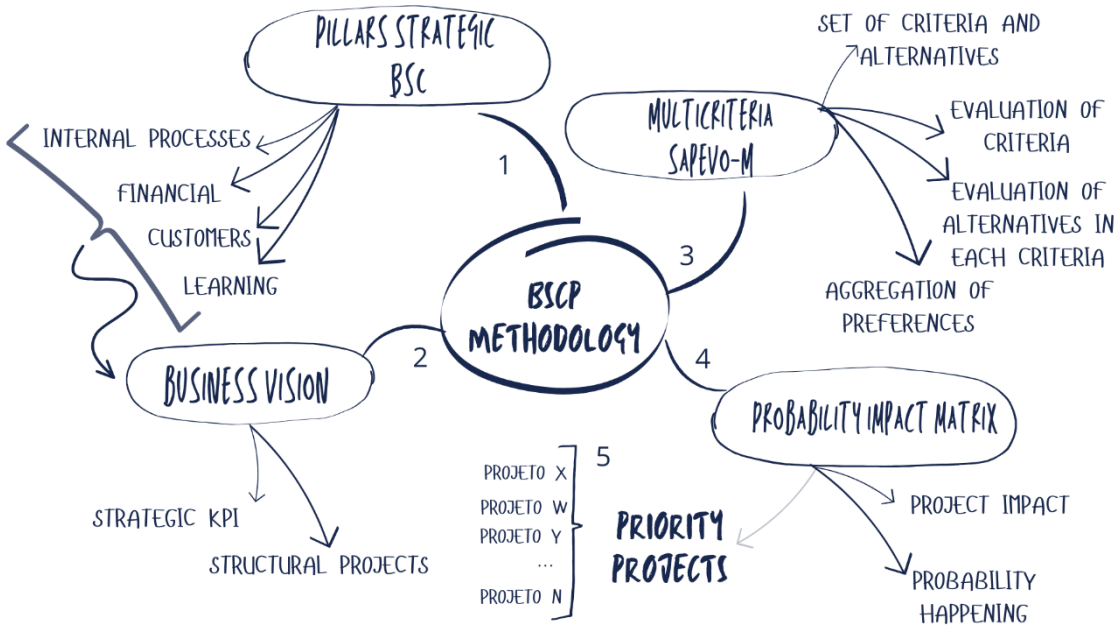

Figure 9. Methodological dynamics

A limitation in complex scenarios, such as the corporate environments of global companies, is that their executives remain aligned regarding the level of priority of elementary strategy objectives and tend to apply weight in judgment based on recent events without considering the timeline. Thus, it is understood that the proposition of this axiomatic and mathematical method is aligned and coherent with corporate demands, facilitating decision-making by its executives.

For this method, please use the respective link while the authors try to structure an online platform for a better user experience.

https://docs.google.com/spreadsheets/d/1UGAl2jPpHnsYSmyvcPHJmTBeG9wGmjb6/edit?usp=sharing&ouid=105968914249626792064&rtpof=true&sd=true

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