

SAPEVO-BSC MULTICRITERIA METHOD: A METHODOLOGICAL PROPOSAL FOR DECISION SUPPORT IN A CORPORATE SCENARIO

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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, the ability to make efficient decisions is a critical competence for success. However, the modern corporate environment is becoming increasingly complex and dynamic, where interconnected variables, real-time information, and constant competitive pressures are at play.

(Fan et al., 2017a) In this context, response time becomes a critical factor that can determine the success or failure of an organization. (Gomes et al., 2020) The ability to make agile and precise decisions is, therefore, a strategic competence for companies seeking to excel in highly challenging environments. We intend to explore how the growing complexity of corporate environments demands a more structured and prioritized approach to decision-making. By establishing a theoretical foundation with elements from real corporate daily life, this article aims to highlight how the incorporation of concrete and organized elements in decision-making can become a crucial differentiating factor for organizations seeking to thrive in increasingly volatile business environments.

(Kumar et al., 2017) In the following sections, we have 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 elements of multi-criteria decision analysis with prioritization elements to provide a methodology for prioritizing strategic actions and projects.

This methodological proposal aims to be a support tool for organizations to offer optimization and allocation elements of people, time, and resources in prioritizing strategic projects. (Machado et al., 2015) In a business world characterized by uncertainty and the acceleration of change, the ability to make informed, rapid, and strategically prioritized decisions is essential.

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 was 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 the harmonization of an organization's actions and resources with its long-term strategic objectives. It involves integrating all parts of the company to work together towards common goals, like an integrated organism.

(Silva Júnior et al., 2021) This alignment is essential for decision-making, as it guides the organization's choices towards achieving its vision for the future. (Silva et al., 2022) To achieve this alignment, defining priorities is elementary because when an organization defines its strategy, it must allocate resources, such as capital, personnel, and time, to initiatives that are aligned with that strategy. The decision of where to allocate resources is strongly influenced by the organization's strategic objectives.

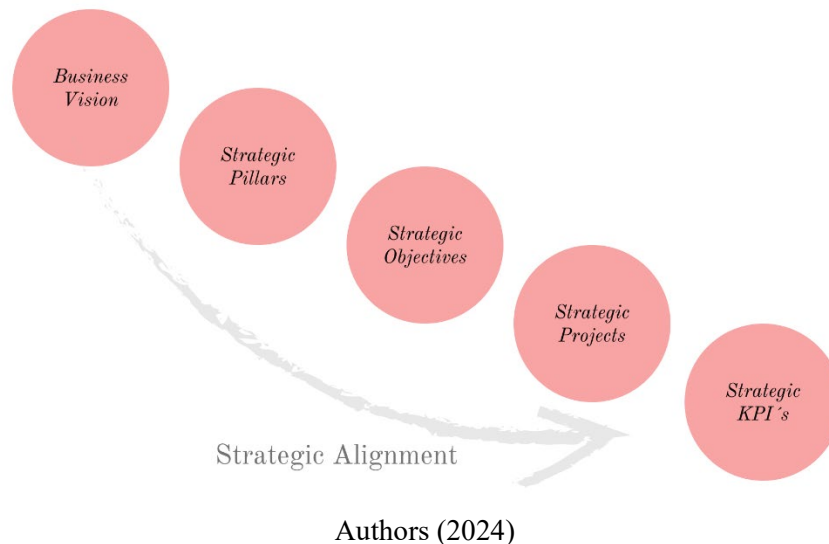
It is crucial to establish clear objectives and goals for the entire organization. This provides a framework for evaluating decisions, ensuring that they align with strategic objectives. By being aligned with its strategy, a company can assess opportunities and threats more effectively. (Tenório et al., 2022) Decisions are made based on their potential contribution to achieving strategic objectives.

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

The business vision, which 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 (Dror, 2019). Therefore, this is a fundamental element to guide decision-making. Such decisions are made with consideration of how they will contribute to realizing this vision over time (Figure 1).

Figure. 1: Representation of strategic alignment



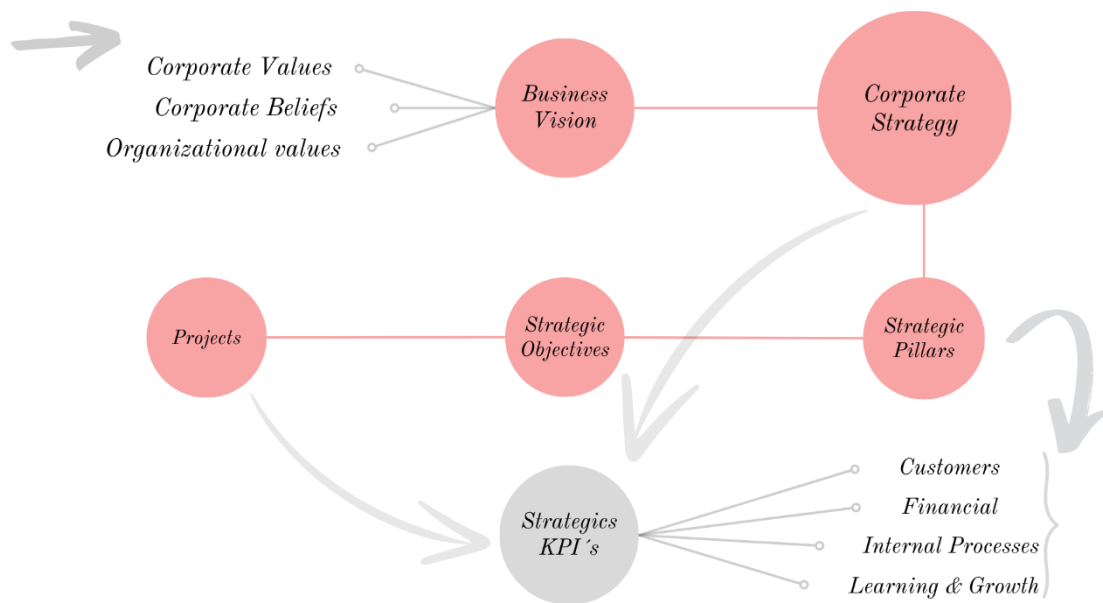
2.1 Corporate Strategy

(Wahyudin & Hasibuan, 2015) 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 aims to explore 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.

(Sabherwal et al., 2019) 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, and values, as well as what it proposes (Figure 2).

Figure 2: Business vision deployment into KPIs



Authors (2024)

2.2 Impact & Probability Matrix as a strategic prioritization element

This consists of guidance and support for decision-making classified by two axes: probability and impact. Through these dimensions, it is possible to calculate the risk, which consists of evaluating the impact versus the probability. In the global business environment, applying an appropriate methodology to understand and mitigate operational risks is a fundamental element. (Fan et al., 2017b) KPIs should be safeguarded and responsive to timely decision-making.

Considering that strategic decision-making is an essential element for the organization's success, it is necessary that the classification of actions and projects follows a priority scale. This is a risk management tool that visually identifies the risks that should be understood as a priority by DM. (Zhang et al., 2018) 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. It is evident that this is a fundamental element for the allocation of 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 by 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 (Russo et al., 2013).

The decision-making process generally involves a choice between several alternatives. The efficiency in decision making consists of choosing the alternative that, as far as possible, offers the best results. The feasible alternatives of meeting the objective, and selected for evaluation, are compared according to criterion and under the influence of attributes (Maêda et al., 2021).

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 take into account not only the degree of importance but also their impact, acting as tactics within the strategy.

(Hora & Costa, 2015) The various decision analysis tools are developed in the decision-making process, each with its strengths and weaknesses. Fits decision-maker, based on the modeling of the respective problem, identify post and counter aspects and requirements of these tools and their suitability for the process decision-making.

Four elements characterize MCDM methods: Set of “alternatives”, from which the decision is chosen; set of “criterion”, or factors related to making a good decision; the “preferences” of the decision maker, being clear, then the problem becomes more understandable; and the “result” of each choice, measured in terms of criterion according to the decision maker's preferences (Venâncio et al., 2022). Given this perspective, it is necessary to highlight complex environments, such as corporate structures, where multiple decision-makers (executives) tend to create opposing and competing forces between indicators and metrics. there are competing metrics between people and areas of the organization.

(Kong et al., 2021) Thus, aligning decisions with the organization's strategic objectives, considering multiple criterion and preferences. This synergy between different methods results in a more robust and efficient decision-making process, capable of leading to choices that are more aligned with the organization's vision and strategy.

2.4 SAPEVO-M multicriteria method

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

Problems involving multiple criterion and multiple 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 (Machado et al., 2015).

(Gomes et al., 2020) 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. (Silva Júnior et al., 2021) 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:

C_i e C_j = criteria of a set or degree of preference

C = {C₁, C₂, C₃, ..., C_i, ..., C_j}

δC_iC_j = 1 ↔ C_i ≅ C_j

δC_iC_j > 1 ↔ C_i > C_j

δC_iC_j < 1 ↔ C_i < C_j

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

The DM:

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

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

$$MDMk = [\delta C_i C_j]$$

By applying a relation with the 7-point scale, a column vector $[v_i]$ 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).

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).

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

	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

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

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

This sequence of steps should be applied considering the number of DM involved in the evaluation. (Silva et al., 2022) Once this step is completed, the process of global scoring among criterion 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 greatest factor of importance of the alternatives considered in the respective problem will be obtained (Tenório et al., 2022).

3. Methodology

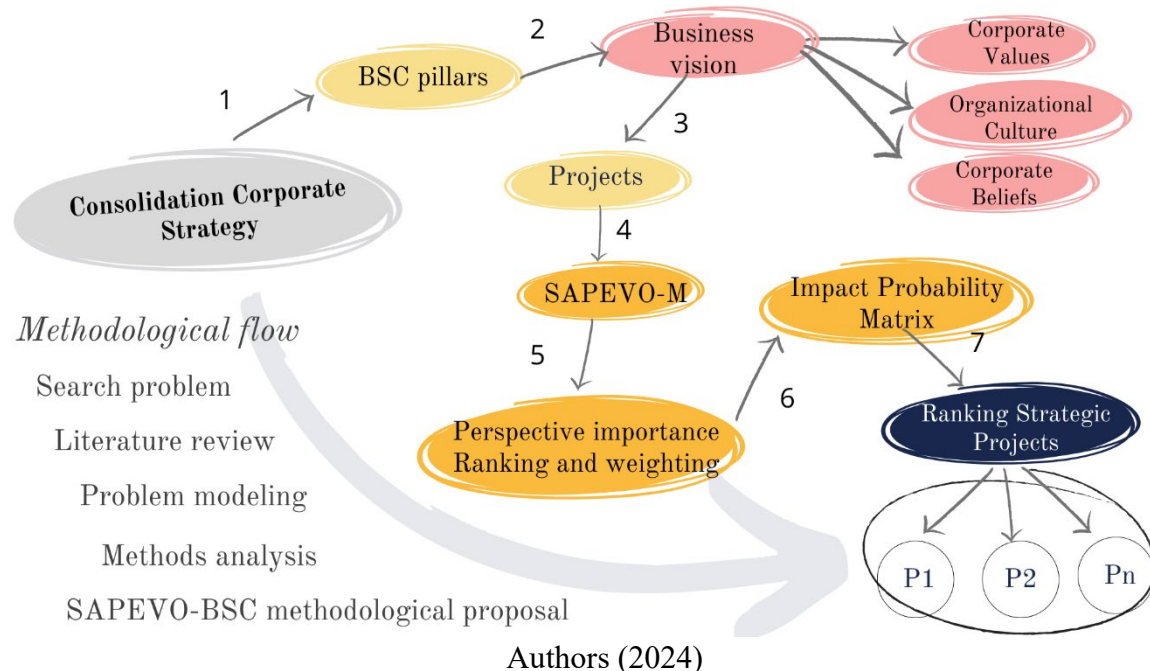
The methodology used consists of a multi-methodological approach where elements from the BSC, I&PM, and the SAPEVO-M Multicriteria Method are integrated (Figure 4).

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;
- iv. considering the structure of the BSC, the four pillars will be considered as criterion 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 so that the projects with the highest priority are executed.

This way, you will obtain a sorted list with 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



4. Results Analysis

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 and objectives, aligned with the business vision. This will allow 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 (EBTIDA, ROI, satisfaction index, market share, etc.).
- 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

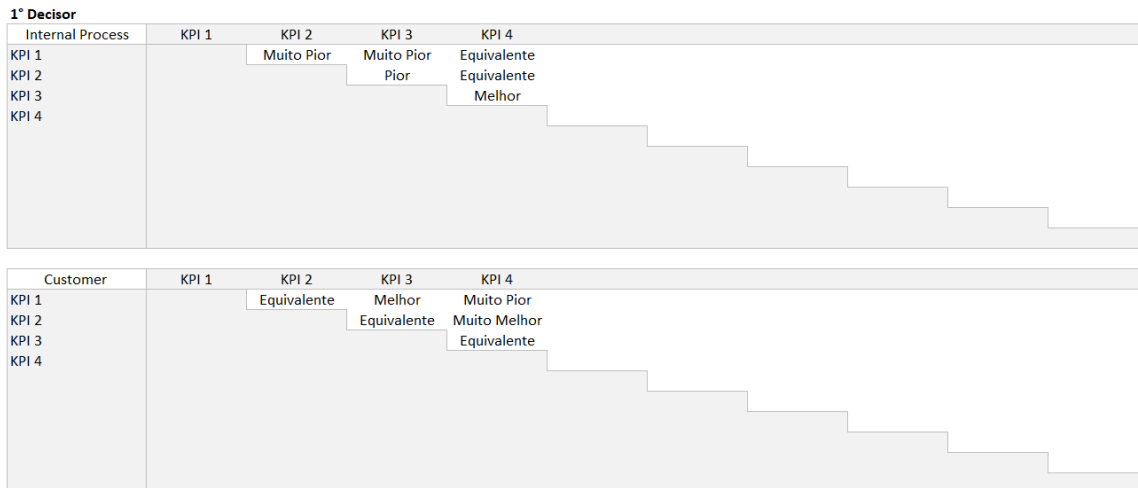
The assigned criterion are related to the strategic perspectives, and the alternatives are related to the strategic KPI designated in the business structure. The proposal of this structuring is to find a common importance vector for business executives, decision makers (DM) (Figure 5).

Figure 5: Decision matrix

Matriz 1 Decisor Decision Maker 1				
	Internal Process	Customer	Learning & Growth	Financial
Internal Process		Absolutamente Melhor	Equivalente	Muito Melhor
Customer			Muito Pior	Equivalente
Learning & Growth				Melhor
Financial				
Matriz 2 Decisor Decision Maker 2				
	Internal Process	Customer	Learning & Growth	Financial
Internal Process		Muito Melhor	Melhor	Equivalente
Customer			Equivalente	Muito Melhor
Learning & Growth				Absolutamente Melhor
Financial				

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. Therefore, each indicator will have its relevance within the 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).

Figure. 7: Final weighting

Alternatives	Internal Process	Customer	Learning & Growth	Financial		Criteria	Weight		Alternativas	Final weight
KPI 1	0,363636364	0,16666667	0,142857143	2,1	x	Internal Process	2,875	=	KPI 1	3,278764069
KPI 2	2,086538462	2	2,75	1		Customer	0,63325		KPI 2	15,45279808
KPI 3	2,090909091	1,833333333	1,125	2,15		Learning & Growth	2,675		KPI 3	11,96888447
KPI 4	0,451923077	1,61904762	0,625	0,35		Financial	0,83125		KPI 4	4,287353251

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 ($p1, p2, \dots, pn$) 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).

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

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).

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;"")))))

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

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;" "))))))

Conclusion

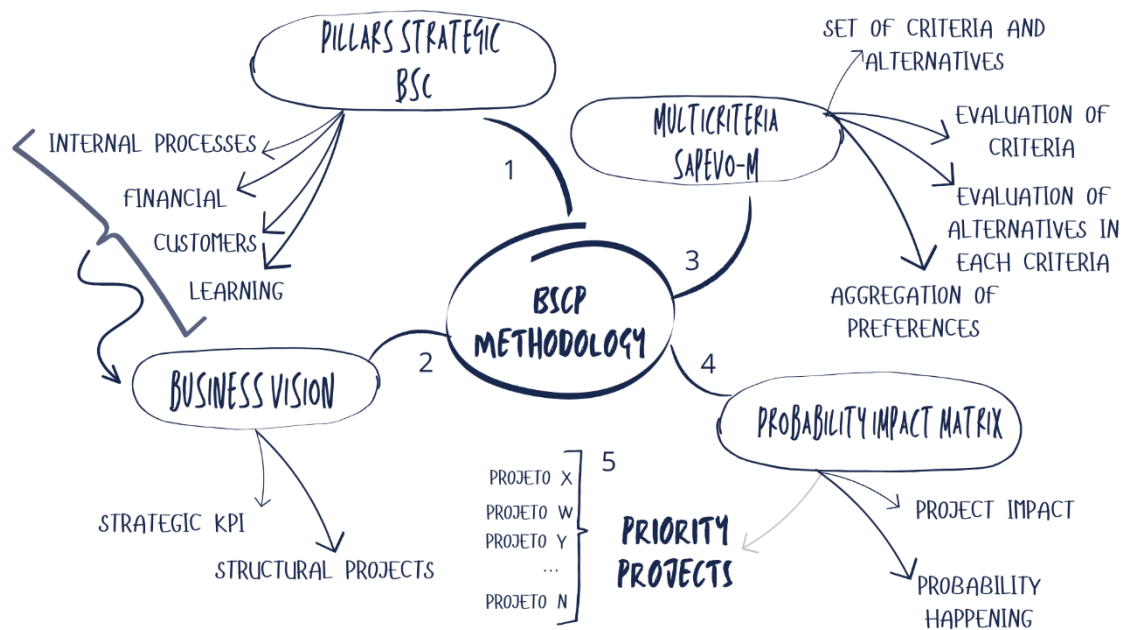
At this stage, it is possible to assess the alignment with priorities and the importance of each project from the perspective of each decision maker. To do this, it will be necessary to analyze the scores given by the DM to each project for each criterion. Thus, this approach is suitable for structuring 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, the allocation of resources (financial and human) becomes manageable and predictable, focusing effort and attention on the right action at the right time. While the SAPEVO-M method 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, favouring 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 with the objective of validating actions and projects, depending on their relevance, which significantly contributes directly to obtaining the result projected in the business strategy (Figure 9).

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 taking into account 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.

To use 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&rtfpof=true&sd=true>

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