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An integrated BSC-AHP approach to support the strategic management of small technology companies

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***Abstract*—** *As monitoring and strategic management issues become increasingly important in the daily lives of small technology companies, a broadening of the understandings that motivate these changes is extremely useful due to the globalized market they are in. To support these understandings, the Balanced SCorecard (BSC) can be used as a tool that helps strategic management. Within this context, possibilities arise that measurements can be balanced between measures of results and measures that drive future performance. This work presents a hybrid approach that uses KPI (Key Performance Indicator) grouped in the BSC perspectives and which are selected through the AHP multi-criteria method, thus composing a strategic map. The results allowed us to understand that although the proposed approach synthesizes evaluation indices extracted from the literature, it can be parameterized and adapted to different realities and, from that, the relative weights of these indices are calculated using the AHP. This work provides guidance on strategies that can help improve organizational performance beyond the financial perspective.*

I. INTRODUCTION

Market relations and their developments in the 21st century are constantly expanding, so, to accompany this expansion, the margin for mistakes in the strategic management of companies also becomes more limited. This is an important reason that drives the need to define strategic plans and practices that constantly align the company with the market.

In the opinion of Kaplan and Norton (1996), the context of cyclical and, at times, occasional changes motivates the need to go beyond the use of strategic indicators. Corroborating this opinion, Alnoukari and Hanano (2017) highlight that opinion currently needs to be preceded by a broad discussion among peers involved in the planning, management and strategic operations of companies. Durmuşoğlu (2018) also considers the idea of going beyond the use of indicators and, with this, employing multiple criteria in strategic management discussions as a resource for expanding voices.

In the context of small companies, Demuner et al. (2020) emphasize that organizational strategy can be seen as a complex issue, as it is a phenomenon composed of

multiple criteria and sub-criteria, with components that have different priorities and forms of management. For Moraes and Lima (2019) and, Moraes Silva et al. (2020) in Brazil, the diversified scenario in which small technology companies requires them to be prepared for continuous changes and short-term strategic adaptations.

Considering this context and also an approach to acting in an increasingly globalized market, Chong et al. (2019) point to the use of the Balanced SCorecard (BSC) as an important and efficient strategic management tool that, in general, offers adequate conditions for benchmarking and assistance in market positioning decision-making for small companies in various sectors. Complementing this thought Álvarez Jaramillo et al. (2019) emphasize the vision of associating the need to consider multiple perceptions and consolidate opinions.

Corroborating this view, Sorooshian et al. (2020) emphasize that performance measurement systems should be seen as part of the strategic management model, as they are part of the success and failure of organizations; especially in small and medium-sized enterprises. For this reason, these authors recommend the use of multi-criteria methods in order to homogenize opinions, and thereby expand horizons and paths. According to Demuner et al. (2020) the use of techniques, tools and methods of planning and strategic management in organizations are changing. In the past, according to Prashar and Sunder (2020), only graphical tools such as the SWOT matrix (Strengths, Weaknesses, Opportunities, and Threats) were popular in the business environment, which purely presented the organization's strengths and weaknesses, threats and opportunities. of the environment and, as a result, provided managers with a general vision and solutions. However, according to Alnoukari and Hanano (2017) and Moraes Silva et al. (2020) due to the complexity of the environment and the conditions of competition that are currently established and, if they change, managers began to need more efficient tools that can be used hybridly, such as the BSC and the Analytic Hierarchy Process (AHP) method.

Although studies have emphasized financial and non-financial performance indicators for use in the BSC, the way in which they were selected is not clear, and also, the performance measurement systems proposed in the literature are focused on the classification of indicators (Chandra & Kumar, 2019, Chowdhury & Paul, 2020, Cvetkoska & Eftimov, 2021). And, within this context, a vast majority of researchers did not properly address how to select, prioritize and integrate performance indicators through an overall score that gathers opinions. This limitation denotes research biases on dynamic methodological approaches that can be replicated and, at the same time, contribute to the strategic decision-making process.

More research is needed to broaden discussions on a systematic approach that can consolidate Key Performance Indicator (KPI) into an overall performance score that is replicable and adaptable to different scenarios. For these reasons, this work had the objective of presenting an analysis of classification of KPI grouped in the perspectives of the BSC, being these proposed in a hybrid form based on the AHP multicriteria method and, later elaboration of a strategic map. To assist in the operationalization of the KPI selection, a survey was used with managers and small technology companies.

II. BSC TO ASSIST STRATEGIC MANAGEMENT

The need for the daily use of performance evaluation and monitoring systems at different levels of decision-making is not something new in the different organizational market realities (Rosa et al., 2021).

For Demuner et al. (2020) these different organizational marketing realities give rise to methods, techniques and tools that are adaptable to strategic planning and different business scenarios.

When reflecting on the choice and use of the BSC in an organization, Pedro (2004) highlights that these are mainly due to the assertiveness and technical boldness in the steps that relate to the establishment of strategic objectives and measurement of goals and results. Furthermore, this author emphasizes that the main target of the BSC is based on the rule: “what is measured is managed”, thus expanding control beyond financial indicators, and differentiating it from other traditional management systems. From this perspective, the methodology is structured in two main aspects: (*i*) a measurement framework that translates the strategy into measures, goals and initiatives and (*ii*) a management system that creates focus, alignment and leadership (Russel, 2015, Hasan & Chyi, 2017).

Among its advantages, the BSC is recognized for providing a systemic view of the business strategy, enabling the compatibility of variables, indicators and goals for the monitoring and quantitative analysis of activities that are part of the organization's strategic plan (Hasan & Chyi, 2017). Furthermore, Alvarez et al. (2019) assess that this methodology allows the consolidation of an important theoretical framework that contributes to decision making and mapping of initiatives that should be prioritized by management members.

The implementation of the BSC is outlined by a set of steps that must be carefully evaluated in order to ensure the performance of the considered management project.

Among these steps, there are: definition of the theoretical objectives of the perspectives most used by the organization; analysis of the vision and organizational model; development of a strategic map; identification of critical points; definition of relevant indicators for monitoring objectives in a quantitative manner; setting goals; assessment of participants' perceptions of the client; measurement of internal capacity and financial perspectives; evaluation of institutional performance and employee productivity (Alvarez et al., 2019).

In this context, Gębczyńska and Brajer-Marczak (2020) mention that the performance measurement model emerges as a comprehensive business management tool, while allowing the prospection and analysis of empirical evidence (performance indicators) related to the creation of value for the different groups of stakeholders (internal and external). Thus, these authors conclude that the BSC has a broad potential, and is therefore applied on a large scale in companies of different natures, such as: educational institutions, hospitals, hotel chains, public administration bodies (government) and non-profit organizations. to profit.

Finally, the literature (Mehralian et al., 2018) shows that the BSC can be used in conjunction with other systems, enabling the measurement and evaluation of a range of financial and non-financial indicators, such as the 3Es models (Economy, efficiency and effectiveness) and "IOO" [input, output and outcome]. Therefore, despite the strengths and limitations of each model, the joint use of these methodologies contribute to the optimization of results, enabling the continuous improvement and progress of management activities and processes.

The financial prospects of a BSC system are outlined by four basic assumptions: revenue growth, lower unit costs, profitability and shareholder value (Kaplan, 2005). For government and non-profit organizations, Russell (2015) points out that the financial perspective is replaced by a "mission perspective", which is responsible for identifying the main objectives of stakeholders that are linked to growth and productivity or efficiency and effectiveness.

In a BSC system, according to Kaplan (2009), the financial perspectives are guided by productivity strategies (improvement of the cost structure and increase in the use of assets) and growth strategies (expansion of revenue opportunities and increase in the value perceived by the customer). As for the objectives, Alvarez et al. (2019) opine that the financial perspective aims to raise questions about the value perceived by providers of financial resources, customer perspective and mapping opportunities to obtain additional revenue. Other authors, such as Modak et al. (2019), highlight that the BSC indicators, within the financial perspective, are related, in general, to the variation of profit, to the operational cost and to the reduction of fines.

The customer perspective aims to identify the customer and market segments in which the organization competes. Therefore, it is first necessary to define the best performance measures for the target segments and the central measures that are related to the adequate formulation of the organizational strategy. Among the main measures considered from the customer's perspective, there are: customer satisfaction, retention, acquisition of new customers, customer profitability and market and account share, building a sustainable relationship with the customer, differentiated value proposition and loyalty of target customers (Kaplan, 2005).

According to Kaplan and Norton (1996), these measures fall into three classes:

a) Attributes of products and services (functionality, quality and price);

b) Customer relationship (purchase quality, experience and personal relationship); and

c) Brand building (image and relationship).

The BSC is also capable of reconciling the growth strategy with business excellence, which requires greater focus on non-financial initiatives (Kaplan, 2005). Consequently, it is important to highlight that the prospect of long-term revenue growth serves as an important parameter for validating the company's perpetuity and sustainability, in the face of market variations and threats, in addition to acting as an instrument to measure organizational performance. (Kaplan & McMillan, 2020).

Currently, organizations aim to increase their earnings or, at least, sustain them by reducing production costs. Regarding this understanding, Bataineh et al. (2018) reflect that a considerable part of these organizations adopts cost reduction as a business strategy factor, prioritizing strategic management accounting techniques to minimize waste, burdens, costs and expenses, among other commercial advantages.

Generally speaking, a costing system starts with a comparison between allowable cost and approximate cost estimate, then goes through several iterative steps of gap decomposition, value engineering, and cost estimate comparison. result with the goal. In view of this, the BSC appears to help organizations find a balance between lead time (delivery time), cost and quality/functionality (Rasolofo-Distler & Distler, 2018).

Performance appraisal is one of the main criteria for achieving customer satisfaction. Furthermore, it is noted that this parameter serves as a valuable guideline for manufacturing companies to achieve better customer satisfaction through sustainable product-service system practices. To this end, organizations must adopt proactive measures that maximize the learning capacity of the business, improving internal processes and efficiently managing customer relationships (Modak et al., 2019).

Another important variable with regard to the customer's perspective is the availability of the product and/or service. In most cases, the conditions relating to the availability of goods and services are closely related to customer satisfaction, allowing us to infer that the level of customer satisfaction can be affected as a result of failures in availability and supply, leading, consequently, to economic and credibility losses (Tjader et al., 2014).

The internal business perspective requires a focus on the effectiveness of internal processes, thus making use of indicators and tools to monitor and measure the activities with the greatest influence within the operating system (Rahayu et al., 2022). Given the above, it can be highlighted that effective internal business processes provide high quality products and services to meet customer needs (Park & Gagnon, 200, Rahayu et al., 2022).

Kaplan and Norton divided the company's generic value chain activities into four high-level process areas: (a) innovation; (b) customer management; (c) operations; and (d) regulations and environment. Each of these areas can include main processes and sub-processes. Thus, it appears that the organizational pie can be sliced in several ways (Huang et al., 2011).

The operation optimization approach is considered an efficient and effective alternative for achieving sustainable goals and objectives. It is also observed that the optimization of the operation is configured as one of the main attributes necessary for the continuous improvement of processes and internal activities, in addition to acting in favor of improving the level of performance (service of organizations). In addition, it is worth mentioning that optimization strategies comprise three levels: interconnection of the components that make up the system, design optimization and operations optimization (Zailan et al., 2021).

Continuous improvement is directly linked to dynamic open innovation, leading to the natural development of the organization and innovation processes. In view of this, organizations cannot stick only to internal measurements, given that dynamic indicators require an understanding of the organization's performance in relation to the external environment. Therefore, it is concluded that continuous improvement is stimulated in an open, dynamic and innovative environment (Medne & Lapina, 2019).

On the other hand, measuring innovation performance presents itself as a challenge, due to the complexity and multidimensionality of innovation processes. Thus, an alternative is the use of the BSC method, which is evaluated as adaptable to the needs of the organization in any of its strategic areas (Hájek et al., 2018).

Customer orientation should not be restricted to gathering information about competitors and customers in the current environment, as it needs to anticipate changing trends in regulations or relating to the external macro environment (Ramakrishnan et al., 2019). In addition, Tanaamah et al. (2019) emphasize the need to consider some variables such as the level of customer satisfaction and the requirements related to project compliance.

The learning and growth perspective is probably the area that most companies value the least. However, this perspective is the “key piece” for the sustainable success of the organization in the future, as it is important to understand that growth must focus on measurable results to move the company forward.

In view of this, evidence indicates that the perspective on growth and learning fosters technical-scientific innovation and, consequently, the economic development of the company (Massingham et al., 2019). To achieve this goal, according to Park and Gagnon (2006), the perspective of learning and growth is based on several aspects, of which the following stand out: adequate infrastructure and work environment, maintenance of employee satisfaction and motivation, skills of employees and information systems.

Employee capabilities and skills are one of the necessary requirements to achieve business process improvement, as well as learning and growth to develop the organization, information systems capabilities and a favorable corporate climate (Yoshikuni & Albertin, 2017). According to Yang and Islam (2012), employee training is an internal business advantage, thus enabling the employee to react positively to changes. Therefore, it is worth mentioning that an organization must provide opportunities for growth and learning to employees to enable the achievement of goals and results (Dias Jordão & Casas Novas, 2013).

Another relevant point for the performance of a company is the organizational culture, which is linked to the behavioral expressions of certain groups of people, that is, the set of customs, dogmas and habits of a community. In other words, organizational culture is seen as the concrete manifestation of shared values and beliefs that

directly affect the behavior of employees, bringing benefits and challenges to the organization. It is important to note, however, that the nature of organizational culture implies how significant the collective assumptions of the members must be, both in the maintenance and in the articulation of the cultural pattern fostered by the company, thus allowing the determination and interpretation of its course of action. over time (Kim & Chang, 2019).

Industry 4.0 increasingly focuses on disruptive technologies that are capable of having a series of significant impacts on supply chains (Tjahjono et al., 2017, Frederico et al., 2020). Among these technologies, the following stand out: virtual reality, simulation, 3D printing, big data analysis; cloud technologies, cyber security, Internet of Things; radiofrequency identification; machine-to-machine communication; automatic identification and data collection; robotics, drones, nanotechnology and business intelligence (Tjahjono et al., 2017, Frederico et al., 2020).

According to Iddris (2018), the current technological framework has significant potential to radically change supply chain operations and needs to be aligned with customer demands. Furthermore, these new technologies, especially Internet of Things and cyber-physical systems, may impact products and services, business models, markets, economy, work environment, organizational skills, profoundly modifying supply chains and traditional models of management (Pereira & Romero, 2017, Frederico et al., 2020).

III. THE AHP

The daily planning of micro and small companies has been influenced not only by marketing issues, there is even evidence that this transformation is encompassing a large number of criteria and sub-criteria (Oliveira et al., 2017).

From another point of view, there is also an indication of the need to review paths and positions in a shorter period of time than before the COVID-19 pandemic (Fitriasari, 2020), in addition to the emphasis that has been requested for the use of technologies in different sectors of the economy (Papadopoulos et al., 2020).

At the same time, there is the emergence of several organizational demands associated with new problems, as well as the need to gather opinions. To meet these reasons, in this work the hybrid use of the Analytic Hierarchy Process (AHP) with the BSC was selected.

Thomas Lorie Saaty (Saaty, 2008) proposed the AHP method in the 1970's, being a robust approach that helps decision making through the use of multiple criteria. According to Gonçalves (2016), this method makes it possible to analyze complex and unstructured problems in different circumstances that involve decision making, not being limited to areas for its application.

The main feature of the AHP method is the use of peer comparisons, in which alternatives are compared on different attributes (criteria and sub-criteria) using weights (Louro et al., 2017). In a peer-to-peer comparison, this technique uses the judgment of a decision maker, using the nine-point Saaty scale as presented in Tab. 1. According to Santos et al. (2019), it is important to highlight that the decision maker's broad experience and/or in-depth knowledge of the problem help in this paired comparison.

Table 1: Scale for operationalization of the AHP

Numerical scale	Verbal scale
1	Equal importance.
3	Moderate importance.
5	Strong importance.
7	Very strong importance.
9	Extremely important.
2, 4, 6 e 8	Intermediate values between adjacent opinions.

Source: Saaty (1991).

In general, the AHP has been used to guide, support, evaluate, classify, select, among other objectives present in the literature, and there is also a wide variety of alternatives for different decisions, in which the indication of possibilities depends on a process. systematic and quantitative (Gonçalves et al., 2020). Usually, due to its versatility of use, this method makes it simpler to evaluate the relative weights of attributes compared to others (Câmara et al., 2020). The AHP operationalization procedure requires it to be carried out in four phases (Saaty, 2008). The first phase must be preceded by the understanding of a given problem and, therefore, in addition to the objective to be achieved, it is necessary to decompose this problem into a hierarchy, as shown in Fig. 1.

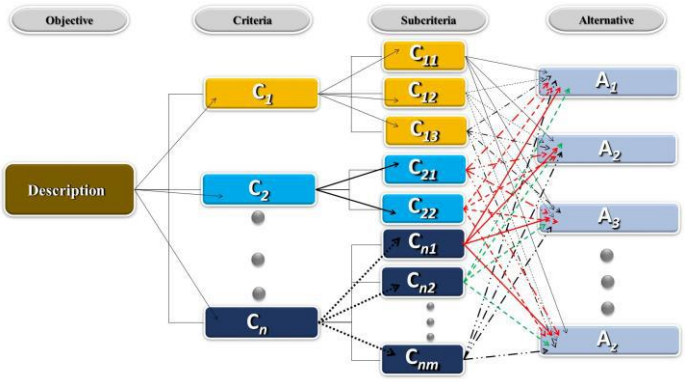

Fig. 1: AHP operationalization hierarchical structure

The decomposition of the problem studied allows obtaining feedback on trade-off information through peer comparison of elements that help decision making (Demuner et al., 2020). Therefore, according to Yaghoobi and Haddadi (2016), the different attributes that form a hierarchy can be remodeled into a matrix structure to elaborate a comparison matrix.

Thus, according to Santos et al. (2019) the term 'eigenvalue' is used to determine the relative weight of the attributes of the hierarchy. And, from this, according to Saaty (2008), the very principal value of Lambda max (λmax) can be determined in Eq. 1 as follows:

$$\lambda_{max} = \sum_{i=1}^{n}\left(\sum_{i=1}^{n} a_{ij}\right) w_j \quad (1)$$

Criteria weights are obtained through a combination of relative weights in order to allow an aggregated comparison of all alternatives (Louro et al., 2017). From the consideration of this combination, as a consistency metric, the Consistency Index (CI) is derived from the following Eq. 2, where λ_{max} is the significant eigenvalue matrix and n is the number of classes (Saaty, 2008).

$$CI = \frac{\lambda_{max} - n}{n-1} \quad (2)$$

However, to verify the Consistency Ratio (CR), as described by Eq. 3, is calculated as the consistency assessment between the peer comparison matrix (Saaty, 2008).

$$CR = \frac{CI}{RI} < 0.1 \equiv 10\% \quad (3)$$

The Random Consistency Index (RI) is the consistency identifier of a randomly generated reciprocal matrix, shown in Tab. 2 (Saaty, 1991).

Table 2: Random Index as a function of the matrix

n	**2**	**3**	**4**	**5**	**6**	**7**
RI	0.0	0.58	0.90	1.12	1.24	1.32

IV. METHODOLOGICAL APPROACH

This work sought to investigate strategic management practices that use KPI and, later, formulate a strategic map through a multidimensional approach in 5 steps. For this purpose, seven small technology companies located in the State of Espírito Santo (Brazil) were used as units of analysis. A survey was used with forty-two employees at the most varied organizational levels, namely: senior managers; supervisors; senior analysts; and financial, customer relationship and human resources managers considered to be specialists in these companies.

Thus, according to Rocha et al. (2020) the data collection instrument of the survey was a structured electronic questionnaire, applied through institutional e-mail, adopting a confidence level (Z) of 90%, maximum sampling error of 5%, maximum percentage of certainty of 5% and, 24 the *n* considered as valid. Additionally, according to Gonçalves et al. (2020) the occurrence of missing values elements (missing data in the questionnaire) and outliers (Z score with interval $|z|<3$, for a value of $p<0{,}001$). The internal consistency of the data collection instrument was also investigated, as indicated by Acuña-Opazo et al. (2017), and Cronbach's alpha with a value greater than or equal to 0.7 was used as a verification measure. To help carry out these statistical analyses, the trial version SPSS 28.0 software was used.

KPIs were raised through a literature review, being used to compose the survey and then used in the operationalization and comparative judgments of the hybrid BSC-AHP approach (Doná et al., 2017). This approach was carried out through the concept of data triangulation, which enabled a broader understanding of the phenomenon studied (Gonçalves, 2016).

Within this context, the first step of the approach aimed to carry out a diagnosis of the internal and external environment of the units of analysis, being verified products offered, organizational processes, customers, competitors, suppliers and social and economic aspects. From this, it was possible to generate brief sectorial knowledge - small technology companies (Espírito Santo/ Brazil) and, thus, generate elements to support the other stages.

Continuing, the second stage was carried out to detect business strategies. The third step aimed at distinguishing BSC-related KPIs based on the literature (Kaplan & Norton, 1993, Hasan & Chyi, 2017, Kaplan & McMillan, 2020, Rahayu et al., 2022) and conceptual development of a hierarchical structure for operationalization do AHP (Saaty, 2008, Gonçalves, 2016).

After identifying the weights of the KPIs obtained through the survey, the Expert Choice trial version software was used to operationalize the use of the AHP (fourth step). And, finally, the fifth stage carried out the investigation of strategies and perspectives, and consolidation of performance indicators through the weights obtained in the AHP for the elaboration of the strategic map.

V. RESULTS

In the initial sample of thirty-nine respondents previously selected through intentional sampling, 3 questionnaires were suppressed due to incomplete and missing information, and also to be considered outliers,

resulting in a total of 36 usable responses, which meet the interval $|z| < 3$, for a value of $p<0.001$, thus, this sampling can be considered as valid (Gonçalves et al., 2020). The internal consistency of the data collection instrument, in general, was favorable with a Cronbach's alpha of 0.86, indicating - indirectly - good understanding on the part of the respondents (Acuña-Opazo et al., 2017).

Thus, to develop the strategic map based on the market realities of small companies in the technology segment that served as units of analysis, the five steps proposed in the methodological approach were developed. By compiling the survey results, it was possible to synthesize a general profile for the development of the necessary information to form the strategic map (first stage). In this way, in the second stage, different business strategies of the analysis units were identified (Table 3), such as the alternatives: lean; agile; postponement and Speculation as general solutions to the strategic objectives found, which also formed the support framework for the elaboration of this map. Continuing, considering the results of the previous steps in the third step, it was possible to obtain the proposed KPIs (Table 3).

From these results, the hierarchical structure used in the operationalization of the AHP was formed (Fig. 2), which was implemented in the Expert Choice software trial version (Gonçalves, 2016). In this way, considering the values assigned to the criteria (BSC perspectives), sub-criteria (KPI) and to the alternatives indicated by the companies' specialists (units of analysis), the data was modeled in this software (Doná et al., 2017).

In the fourth stage, compilations of peer judgments were performed based on the defined hierarchical structure (Fig. 2). Table 4 presents the weights assigned to each perspective, as well as the inconsistencies matrix linked to the comparison matrix. There was also a low degree of inconsistency, that is, a consistency index lower than the maximum specified ($CR < 0.1$) by Saaty (2008).

Table. 3: Framework synthesis of the component elements of the BSC-AHP hybrid approach

Criteria	Subcriteria
Financial	Assets utilization customer; Revenue growth; Cost reduction.
Customer satisfaction	Customer satisfaction; Avaibility; Functionality.
Internal business	Operation optimization; Innovation process; Customer orientation.
Learning & growth	Employee capabilities; Organizational culture; IT capabilities.

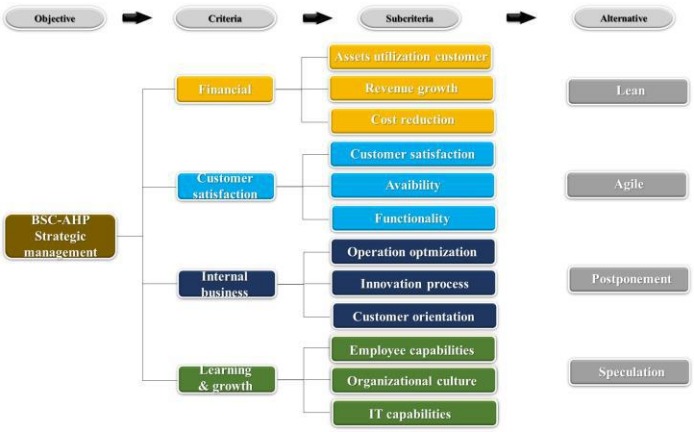

Fig. 2: Structuring the operationalization of the AHP

Table 4: Weights perspectives and inconsistency related to the comparison matrix

Criteria	Weights	Inconsistency
Financial	0.446	0.06
Customer satisfaction	0.365	
Internal business	0.131	
Learning & growth	0.058	

The global weight of each perspective and its contribution to the achievement of the general objective can be evidenced due to the low inconsistency observed (Table 4) and, therefore, an important indicative element for ordering the BSC. Regarding the perspectives of "Financial" and "Customer satisfaction", these can be highlighted as fundamental in the preference of the respondents, something that corroborates the opinion of Moraes e Lima (2019) and Demuner et al. (2020), who emphasize as relevant the establishment of strategies that bring the company closer to the customers, with special attention to the relationship and final costs.

Learning & growth (0.058) can be seen as a criterion of less relevance when looking at the strategic horizon of small technology companies in the opinion of employees (Table 4). This is explained by Doná et al. (2017) that highlight the need to survive in a highly competitive and constantly changing market. On the other hand, Moraes Silva et al. (2020) predict that a continuous view of what happens to the company in its day-to-day is one of the determining factors of success in the segment of these companies.

KPIs related to different organizational levels (strategic, tactical and operational) and perspectives were identified in the survey. However, it is important to note that these KPIs must be cyclically reviewed and, along with that, strategic objectives and targets, in order to always be checking the company's market share and

positioning (Medne & Lapina, 2019, Rahayu et al., 2022). Sequentially, Table 5 shows the perspective weights for each relative KPI, plus each inconsistency related to each set of consistent responses.

Although there is diversity in the weights attributed to the perspectives, the results of the judgments that led to the knowledge of these weights, considering the fragment of small technology companies located in the State of Espírito Santo (Brazil), denote an understanding of what customers want. Another important evidence is the focus on basing the review of activities based on knowledge and on sharing information about customer needs.

Table 5: Subcriteria weights and inconsistencies

Criteria	Subcriteria	Weights	Inconsistency
Financial	Assets utilization	0.345	0.05
	customer		
	Revenue growth	0.547	
	Cost reduction	0.109	
Customer satisfaction	Customer satisfaction	0.761	0.07
	Availability	0.166	
	Functionality	0.073	
Internal business	Operation optimization	0.229	
	Innovation process	0.696	0.07
	Customer orientation	0.075	
Learning & growth	Employee capabilities	0.205	
	Organizational culture	0.078	0.02
	IT capabilities	0.717	

And, finally, the fifth stage, also considering the survey carried out, investigated the relationships between existing strategic objectives between the perspectives of the BSC, in addition to the targets to be achieved, and the accomplishment of the KPI consolidation through the weights obtained in the AHP to the elaboration of the strategic map (Fig. 3).

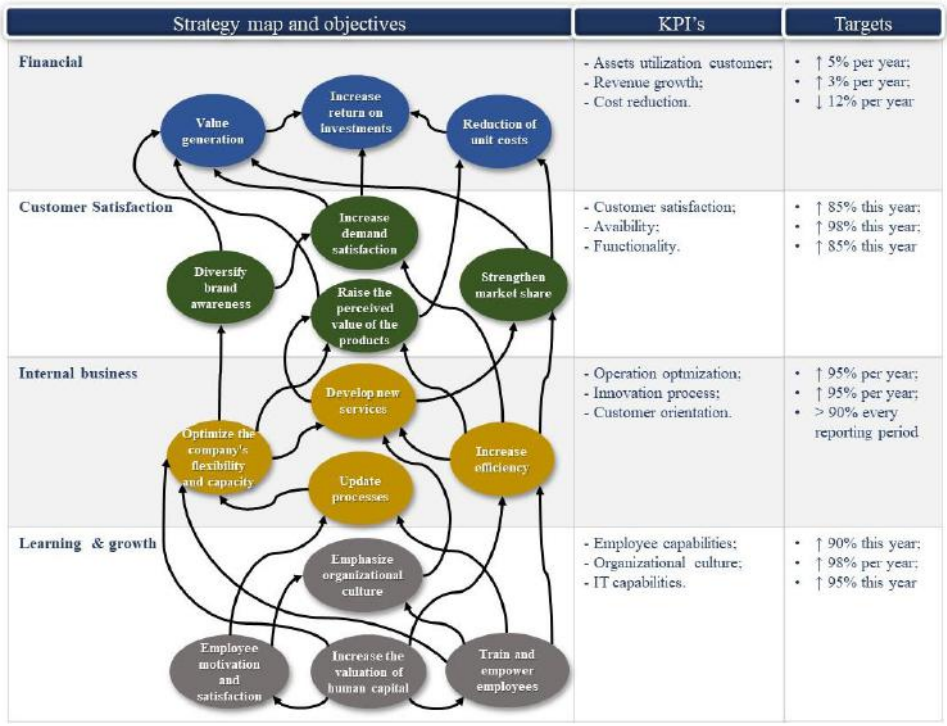

Fig. 3: Strategy map for small technology companies based on the BSC

The use of the hybrid approach BSC-AHP allowed to approximate the diversity of judgments in the hierarchical levels, being important to arrive at a more consensual and organizational opinion on the performance that could better represent the distinction of visions of the financial area, of customer relationship and of human resource Management.

VI. FINAL CONSIDERATIONS

The BSC-AHP integrated approach, as a decision-making tool presented in this article, proved to be efficient in dealing with problems of strategic management of small technology companies. The AHP added value to the process of choosing among several alternatives based on

multiple criteria and sub-criteria. For this reason, decision makers can perform simulations and sensitivity analysis on selection options and on criteria and sub-criteria to account for variations (changes) in paired comparisons and have a high degree of confidence in their judgment.

The strategic management and performance evaluation nowadays is a problem faced by the decision makers of small technology companies, mainly in the globalization era. In this way, the results of this work promote beneficial insights that contribute to prioritizing different perspectives of the BSC. Within this context, an approach is presented that extends the rational view to deciding which decision-level performance plays the most important role in overall performance measurement. At the same time, it also considers different BSC perspectives to sensibly prioritize them in the usual business operations.

We can assume that the future of BSC implementation and use will have no other form than the constant balance with other resources that help strategic management. Thus, in the process of applying the BSC, organizations will seek common sense and harmony between long term and short term, financial and non-financial, individual and organizational management, internal and external criteria, cause and effect, and effectiveness and justice, particularly in the sector of small technology companies. However, our concern is that the needs of customers have not reached the center of the BSC of these companies. Importantly, we do not underestimate the importance of the other perspectives, but argue that, especially for small tech companies, customer needs should be more central to the BSC.

For future research, an expansion of this work can develop such an approach with the help of different strategic approaches such as the SCOR® model (Supply Chain Operations Reference), SMART method, SWOT (Strengths, Weaknesses, Opportunities and Threats), etc., associated or used hybrid with resources that can allow a multi-criteria view such as AHP, Fuzzy Logic, FDA (Fuzzy Decision Approach), Fuzzy-AHP, ANP (Analytic Network Process), ELECTRE (Elimination et Choix Traduisant la Realité), MACBETH (Measuring Attractiveness by a Categorical Based Evaluation Technique), PROMETHEE (Preference Ranking Method for Enrichment Evaluation), TOPSIS (Technique for Order Preference by Similarity to Ideal Solution), etc.

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