

**Marcus Vinícius Gonçalves
da Silva¹**

¹Exército Brasileiro, Comando Militar
da Amazônia
Manaus, Amazonas, Brasil
Email: (marvin.gsilva@gmail.com).



ORCID ID:
orcid.org/0000-0003-2145-0871

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Analysis of the Organizational Performance of a Strategic Defense Company in Brazil: Conceptions from the Perspective of Defense Studies in Europe

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Abstract

This study proposes, based on scientific production carried out in Europe, the adaptation of the Balanced Scorecard (BSC) method by Kaplan and Norton, for the analysis of the performance of Brazilian Strategic Defense Companies (SDC). The investigation is carried out in a comparative way, in two stages. In the first one, a bibliometric research was carried out to identify the characteristics of the European Defense Industrial Base. In the second stage of the research, the BSC-Defense indicators, developed based on the literature found, were empirically analyzed in a Strategic Defense Company in Brazil. The results indicate that the BSC-Defense instrument can serve as a guiding element for Strategic Defense Companies, as it includes an integrated and dynamic set of capabilities, processes and activities related to the strategic performance of the organization.

Keywords: National Defense, Defense Industry, Organizational Performance, Strategy, Balanced Scorecard.

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Introduction

The structure of the armaments industry has different characteristics, and they are usually large companies that form national monopolies. In the European Union (EU), the combat aircraft industries are characterized by monopolies compared to oligopoly in the United States of America (USA). Likewise, in the construction of nuclear submarines, there is a monopoly in France and the UK compared to a domestic duopoly in the US.

Regarding the future of the weapons industry, there will be fewer types of new equipment, but more complex, which will require technical changes in the demands of the armed forces and

defense industries. Such changes may be evolutionary or revolutionary, the latter of which will require further adjustments, including in relation to military doctrines.

Technological capabilities are one of the main factors for entry into international defense markets (Duch-Brown and Fonfría 2014). For this reason, exporting companies tend to be capital-intensive, diversified, and highly committed to Research and Development (R&D). In this context, in the defense market, customer integration in product development occurs more frequently than in civil industries, and this is recognized as a critical success factor for projects (Dvir and Peled 2012).

The real perception of innovation and the need for interconnections between the actors involved in the process create a supportive environment that triggers increasingly efficient policies and actions in generating conditions that increase productivity, competitiveness, economic growth and the national development, seeking autonomy in strategic areas for National Defense (Galdino et al. 2020). Therefore, evidence indicates that Brazilian policymakers, when formulating the National Defense Strategy (NDS) (Ministério da Defesa do Brasil 2020), must know the capabilities of the strategic companies belonging to the DIB and that the strategic planning of strategic defense companies must be aligned with the NDS.

In this way, the strategies of industries and companies belonging to DIB can be developed under the operational methodology of the Balanced Scorecard (BSC), based on the perspectives and dimensions of the defense area. Therefore, the question that guides this study is: how can the BSC contribute to the analysis of the performance of Strategic Defense Companies?

To answer this question, the use of the BSC as a tool in strategic management is initially presented. Then, the path and the methodological operationalization are described. Next, the systematic review of the literature is presented, which had the scope to identify the theoretical foundations and empirical studies with the objective of providing subsidies for the proposition of the BSC-Defense model.

Subsequently, the indicators and constructs of the BSC-Defense are detailed. The following section is devoted to describing the company researched in the study. Finally, the results and discussions are presented and, also, the main conclusions.

Defense Industrial Base

The importance of the Defense Industrial Base (DIB) stems both from its strategic character, resulting from the production of the country's defense equipment — essential for ensuring defense and autonomy — and from its economic aspects, related to the mastery of sensitive technologies, many of a dual-use nature, as well as the generation of innovation, highly skilled jobs, and high-value-added exports (Silva and Del Corso 2022).

In the European case, in the current scenario of reduced domestic demand, exports of defense materials have become increasingly important (European Union 2014). This is particularly

significant in the case of France, which is traditionally one of the largest arms exporters in the world and where foreign markets play a fundamental role for the defense industry (Moraes 2014).

Unlike countries such as Russia and France, where the state plays an active role, directly assisting or even guiding the exports of the defense industry, in Brazil, the government's involvement is limited to approving or vetoing negotiations conducted directly by companies in the sector. There is, therefore, no government structure exclusively dedicated to promoting the exports of this industry.

In this context, it is important to emphasize that an innovative and self-sustainable defense industry cannot be considered a utopia, given that the growth of exports generates benefits for the entire society, while strengthening the projection of power and contributing to the efforts of Brazilian foreign policy.

The DIB corresponds to the set of state and private companies, as well as civil and military organizations, that participate in one or more of the stages of research, development, production, distribution and maintenance of Strategic Defense Products (Ministério da Defesa do Brasil 2005). Among the public policies aimed at national defense, the National Defense Industry Policy (Ministério da Defesa do Brasil 2005) has a prominent role in emphasizing the Defense Industry.

This policy establishes, among its specific objectives, the progressive reduction of external dependence on Strategic Defense Products, in order to develop and produce them internally and increase the competitiveness of the Brazilian BID to expand exports (Ministério da Defesa do Brasil 2005).

The opportunities for technological development in the DIB are directly related to increased interaction with institutions in the area of Science, Technology and Innovation (STI), and to the absorption of knowledge from countries with recognized technological development. Therefore, with regards to the DIB, the NDS emphasized the need to prioritize the development of independent technological capabilities, the subordination of commercial considerations to strategic imperatives, and the use of defense technology development with a focus on the development of operational capabilities.

However, Melo (2015) points out that the BID's productive capacity presents some challenges, including partial technological autonomy; incomplete productive structure; few national anchor companies with a business, production and financial scale, compatible with the standard of international competition; still deficient educational, scientific and technological infrastructure; and reduced densification of the production chain, which prevents further productive and technological linkages.

Organizational Performance

Organizational performance is associated with achieving results (Sonnentag and Frese 2002), expressing the idea of action to achieve objectives, subject to judgment in terms of adequacy,

efficiency and effectiveness. The performance of an organization refers to the results achieved by it in a certain period, which can be evaluated through quantifiable parameters called indicators (Fernandes et al. 2006).

However, Bourne et al. (2003) argue that the measurement of organizational performance cannot be just a process of quantification, because its effects must be aimed at stimulating consistent actions that lead to the realization of strategies. For these authors, indicators must measure the resources used to generate new products, but they must also consider effectiveness measures, as these indicate the level of achievement of organizational objectives.

To achieve this, several perspectives must be considered in the evaluation, covering objective, subjective and comparison measures (benchmarking), to verify whether a certain objective has been achieved. An indicator is a measurable variable, which uses specific reference scales, at a desirable stage of development for the organization or part of it, and is associated with the concept of goal, which designates a standard or reference to be achieved. Thus, a defined indicator such as, for example, customer satisfaction, could have as a standard or goal to be achieved (Brandão and Guimarães 2001).

According to the criteria to be used in the evaluation, an organization can have a high or low performance. This is essential, as executives determine their future actions based on how they perceive and judge current organizational performance. Therefore, it is observed that indicators can be managed in different ways and time frames, as is the case with the Balanced Scorecard (BSC), which will be discussed below.

The Balanced Scorecard as a tool in Strategic Management

Marinho (2006) argues that the formulation and implementation of organizational strategy are inseparable. As a result, inserted in the discipline of strategic management, the interest of academic researchers has been recurrent in the search for knowledge about the measurement of organizational performance, observing the emergence of a variety of models for this purpose.

According to Simons (1991), management control systems have three major elements: (a) setting performance standards, (b) measuring performance against the standards, and (c) taking corrective action if the standards are not being achieved. Thus, the systems provide feedback on the effectiveness of competitive activities, enable learning from internal and market-oriented experiences, and provide guidance for strategic change and renewal. Performance measurement is central to the management control process for any business.

For Neely et al. (1995), performance measurement can be literally defined as the process of quantifying an action, where measurement is the process of quantification, and action is what causes performance. Reinforcing this idea, Kaplan and Norton (2000) emphasize that companies can only succeed in implementing their strategies through the use of an organizational performance measurement model.

As the organizational strategy represents a set of hypotheses about cause-and-effect relationships, the BSC assumes that the objectives and respective indicators in each performance perspective influence each other, in such a way that the achievement of goals in the perspective of learning and growth, for example, would have a positive effect on outcomes associated with internal processes, and so on (Kaplan and Norton 1997).

The BSC proposes to translate organizational strategy into objectives, actions, and measures, organized according to four performance perspectives (Kaplan and Norton 1997):

- Financial: indicates the economic-financial results, normally expressed by measures of profitability and return on equity.
- Customers: directs the organization's efforts to conquer and maintain customer segments, based on indicators such as customer satisfaction, complaint rate, market share, image and reputation of the organization.
- Internal processes: guides the improvement of critical processes for the success of the organization, based on indicators such as productivity, quality of products and services, warranty (repair rates and product returns) and others.
- Learning and growth: acts on factors that the company must consider to generate growth and improvement in the long term, using indicators such as organizational climate, employee skills and retention of qualified employees, among others.

As noted, the BSC enables the creation of an operational and manageable model for strategic management, which can be adapted through studies, assessments, preparation, and implementation of a pilot project. The implementation of the BSC has increased the attention paid to broader aspects of organizational effectiveness in management research. Although primarily used in management and internal control, the BSC explicitly includes measures of financial performance, customer outcomes, innovation, and internal processes (Kaplan and Norton 1996).

It is important to note that the BSC is tailor-made for each company, and this adaptation makes it almost impossible to compare the results of the BSC between companies, since the implementation of a balanced scorecard for a single company is already complex and difficult (Bourne et al. 2003).

In the study by Saraiva and Alves (2017), the authors demonstrate that the evolution of the BSC is closely related to the fact that the concept, since its creation, has always had a wide practical application. It is for this reason that organizational performance dominates organizational effectiveness for management researchers, and the narrower domain of organizational performance provides the useful potential for making meaningful comparisons between companies and sectors.

However, even with a narrower domain, organizational performance is not a one-dimensional theoretical construct, nor is it likely to be characterizable with a single operational measure. Although the multidimensionality of performance is recognized and discussed theoretically in the

management literature (Venkatraman and Ramanujam 1986), empirically, there lacks consistency in the measurement of organizational performance.

For Ferraz and Martins (2002), the field of organizational performance studies has sought new ways and models for measurement, in view of the inadequacy of traditional models. This can be corroborated by Marr and Schiuma (2003), who emphasize that the measurement of business performance is the focus of business managers and, similarly, of academics.

In the field of competitive strategy studies, choice patterns are related to what managers do, in which markets they should operate and how the company creates more value for buyers than its competitors. In studies by Michael Porter (1980) and Miles et al. (1978) strategy typologies are the structures that have most frequently been shown to effectively represent managerial choices.

Although the BSC has proved to be a widely adopted management tool, there is a lack of empirical research carried out to assess the organizational performance of companies belonging to the Defense Industrial Base (DIB) in Brazil.

Methodology

The investigation is carried out in a comparative way, with two cases: the European DIB and the Brazilian War Material Industry (IMBEL). In the first stage of the research, a bibliometric search was carried out in order to identify the characteristics of the European BID, to identify performance indicators for the elaboration of the BSC-Defense.

The platform used for the search and collection of scientific publications was the Web of Science (WoS). The search was performed by using the topics <defen* industr*> and <european>, the period of <2010-2021>, with the boolean operator <and>, having initially found 62 documents.

Based on the descriptors, 21 articles were selected for reading, however, the objectives of six of them, even if they contained some of the keywords used in the search, were not related to the research theme. Therefore, they were excluded, leaving 15 articles, which were analyzed in the following topic.

In the second stage of the research, the BSC-Defesa indicators were developed based on the theory found in the SLR, which were sent through a survey to the managers of the IMBEL, in order to analyze the use of indicators in strategic management and the relevance for the company.

Method Operationalization

Intending to identify the current status according to the use of indicators and the relevance of the proposed model of the BSC-Defense, a questionnaire on Google Forms with 30 (thirty) indicators was created.

For that, the Likert scale (1 to 5) was used, in a continuum from 1- Never to 5-Always, for the question [How often is the indicator used in the performance analysis of this company?] and, 1- None to 5- Extreme, for the question [What is the level of relevance of the indicator for analyzing the performance of IMBEL?]

The bibliometric search made it possible to identify the dimensions of the defense area, and to relate them to the perspectives of the original BSC by Kaplan and Norton (1992), enabling the elaboration of 30 (thirty) indicators for the formulation of the BSC-Defense.

In the analysis of the dimensions, it was decided to score the indicators existing in IMBEL according to the Likert scale: 1-never to 5-often, with the maximum score corresponding to the maximum number of indicators ($NI^{\max}$ of each of the BSC perspectives: financial [9 indicators], customers [5 indicators], internal processes [9 indicators] and learning and knowledge [7 indicators]). Therefore, the $NI^{\max}$ of the perspectives are **financial** (45 points), **customers** (25 points), **internal processes** (45 points) and **learning and knowledge** (35 points).

Results and Discussions

Bibliometric Search

This topic presents the 15 articles (Table 1) selected through recurring themes, and data from different sources, in order to have an in-depth understanding on the strategies of European defense industries.

Table 1 - Result of the bibliometric search

Title	Authors	Journal	Year
Conditions of intergovernmental armaments cooperation in Western Europe, 1996-2006	Thiem	European Political Science Review, 3(1)1-33	2011
Alternative Military Keynesianism as a Tool of Civil-Military Cooperation in the Framework of the EU Defence Policy	Šavriņa and Tiltins	European Integration Studies, 9, 20-33	2015
The evolution of concentration in the Arms market	Dunne and Smith	The Economics of Peace and Security Journal, 11(1)	2016
Strategic Management of Development of the Military-Industrial Complex Enterprises with the Use of Dual Technologies under the Resource-Based Approach	Brovko and Petruk	Economic and Social Changes: Facts, Trends, Forecast, 3(45)	2016
Study of Technology Transfer Processes in Brazilian Aerospace Sector	Camargo, Hoffmann and Spiandorello	Revista Tecnologia e Sociedade, 13(28), 152-170	2017
The European defense market: Disruptive innovation and market destabilization	Bellais and Fiott	Economics of Peace and Security Journal, 12(1), 37-45	2017

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The European space-industrial complex: new myths, old realities	Zervos	Economics of Peace and Security Journal, 12(1), 28-36	2017
The restructuring of the European land armaments industry: Between political incentives and economic pressures	Caralp	Economics of Peace and Security Journal, 12(1), 12-19	2017
The EU, NATO and the European defence market: do institutional responses to defence globalization matter?	Fiott	European Security, 26, 3, 398-414	2017
What Impedes Universities from Creating Dual-Purpose Technologies?	Dovgiy et al.	Foresight and STI Governance, 11(4)	2017
Innovative Project Management: EU Common Defence Policy	Lewicki	Marketing and Management of Innovations, 4	2018
Arms industry data: Knowns and unknowns	Hartley	The Economics of Peace and Security Journal, 13(2)	2018
14 empty airframes: public-private relations in the Swedish arms industry	Åkerström	The Economics of Peace and Security Journal, 15(1)	2020
Global RandD in the Aerospace and Defence Industry. Knowledge Creation with Local Firms in Host Countries	Garcia and López-Otero	Revista de Estudios Andaluces (REA), 39, Feb.	2020
Croatian Defense Industry Competitiveness Cluster: Knowledge Management and Innovation Perspective	Jurčić et al.	Business Systems Research, 11(1), 59-72	2020

Source: search data

European Defense Strategies from the Clients' Perspective

The evolution of concentration in the global arms market and its prospects were examined during the period 1990-2013 (Dunne and Smith 2016). The authors found that there have been changes, but also continuity, particularly in the nature of markets and in the relationships between the main producers of the international arms industry and governments.

The economic forces pressure for more competition, although, at the end of the day, it is always determined by political forces, so that transparency and governance will become increasingly important (Dunne and Smith 2016). In short, it is the political rather than the economic logic that shapes the evolution of the defense market.

Analyzing the strategic management of the military-industrial complex in the global defense market, particularly the development of JSC, a Russian helicopter industry, it is clear that one of the ways to develop the defense industry is to diversify the civil production, in order to increase production, improve the financial situation and reduce dependence on the demands of the state (Brovko and Petruk 2016). One factor that affects the performance of defense companies is the government's order policy.

From an economic point of view, in Europe, domestic arms producers are interested in creating export opportunities, increasing capital investment and reducing the cost of maintaining

indigenous capabilities. It is noted that these companies are increasingly seeking to capture foreign market shares through acquisitions that integrate their operations vertically, thus increasing the technological experience, or horizontally, in order to increase management skills and product differentiation (Hayward 2001).

An increase in the global market share of defense products tends to favor national development, bringing economic benefits. And exports in this sector function as a means of projecting power in the international context, demonstrating the country's capacity to develop advanced and highly complex technologies, essential to face the challenges of future wars (Azevedo and Ramos 2022).

It is possible to observe that the conflict between Russia and Ukraine has had repercussions on the defense apparatus of several countries. The amount of ammunition currently used in Ukraine, for example, is a challenge both for defense companies and the strategic stocks of the armed forces of the member countries of the North Atlantic Treaty Organization, as well as of the European Union (Mansoor 2023).

European Defense Strategies from a Financial Perspective

Compared to the US, the EU has fewer integrative industries in its DIB (Caralp 2017). The lack of Europeanization of the defense industry, combined with limited cooperation between companies at the EU level, "has resulted in unwanted side effects such as unnecessary duplication of product manufacturing, fragmented RandD efforts, excess production capacity as well as the lack of standardization of military equipment" (Caralp 2017, 13).

Regarding exports, unlike American defense companies, which depend less on exports, Europeans see them as an opportunity to obtain cost reductions through economies of scale and longer production cycles. However, exports can imply a progressive drain of knowledge through technology transfer to potential future competitors (Fleurant and Quéau 2014).

The importance of the state's role as a regulatory and protective agent is thus evident, so that the DIB can meet export requests and, above all, ensure that these are economically viable, as is the case of the broad support of the Swedish state for the agreement between SAAB and the Brazilian Air Force (Åkerström 2020). In the Swedish case, the state's ability to offer financial solutions to guarantee compensation agreements and technology transfers is a way for SAAB to gain a competitive advantage in the international defense market.

In the Resource Based Vision (RBV), one of the most important directions in the strategic planning of defense industries is product diversification, with a view to increasing production and improving the financial situation, as well as reducing companies' dependence on state purchase orders (Brovko and Petruk 2016). The diversification approach is supported by the experience of international companies, in the sense that production that uses dual technologies allows for a more efficient system in RandD, unique equipment and highly qualified personnel.

The conflict between Russia and Ukraine highlighted the importance of a diversified and autonomous Defense Industrial Base (DIB), independent of the global supply chain. Furthermore, it emphasized the need for defense products to be treated as a state issue, receiving distinct government support compared to other production chains within a nation (Almeida 2022). In this context, directing investments toward defense products that are exclusively domestic or developed in cooperation with other nations stimulates the country's economy, creating a virtuous cycle.

Defense Strategies from the Perspective of the Internal Processes

Global companies in the military-industrial complex show trends in their development, such as the increase in RandD and production costs of high-tech equipment, increasing the need for companies to have access to cheap capital and sufficient long-term manufacturing capacity (Brovko and Petruk 2016), as well as increasing the cost of products, improving their functionality lead and reducing the supply of military products, forcing producers to expand their operations in the civil market segments, which include the use of dual technologies (Brovko and Petruk 2016).

These trends provoke a change in the strategic management model of companies in the military-industrial complex. In Russia, for example, there is a concentration of manufacturers of defense technology products, especially aircraft (Brovko and Petruk 2016).

Considering this, the establishment of strategic partnerships is of great importance for the country to acquire the ability to master sensitive technologies through the transfer of knowledge provided by this type of agreement. The search for more developed technologies triggered a transaction model called technology transfer (offset), understood by the transmission of knowledge held by a generating organization that passes to another with a distinct organizational context (Bloedon and Stokes 1994).

There are several legal modalities for carrying out technology transfer transactions, including offset agreements, defined as practices based on significant imports in the defense products sector (Camargo et al. 2017). In the analysis, the European defense market must adjust to the industrial changes that have been experienced in countries with developed economies, arising from the 4th Industrial Revolution, or Industry 4.0 (Bellais and Fiott 2017).

Although the advancement of technologies may maintain the strategic dominance of arms-producing countries, RandD in the field of defense has become increasingly expensive, generating less disruptive technologies. In Europe, partly for cost reasons, most arms-producing countries have become unable to sustain a domestic DIB. On the other hand, European arms companies have not sought cooperation with other countries intending to share the costs of developing new advanced systems.

Building on this, states should establish industry and technology policies intending to support the transformation of defense industries toward attracting civilian companies to integrate the field of defense capabilities (Bellais and Fiott 2017).

European Defense Strategies from the Perspective of Learning and Knowledge

There are two combinations that lead to high rates of participation in intergovernmental cooperation in Western Europe for the production of armaments: i) collective creation of technological and industrial defense benefits and ii) confidence in the capacity and integrity of partners (Thiem 2011). This makes governments assess whether capabilities are preferentially, or functionally, homogeneous.

The cooperation reduces unnecessary duplication of expenditure on research and testing and generates economies of scale and learning, contributing to the competitiveness of the European DIB (Lowell and Lorell 1995). A key area for implementing research and innovation potential in the higher education sphere is the creation of knowledge, products and technologies designed for security and defense purposes, or as a potential for dual-use application.

Thus, the educational institutions have the potential to carry out RandD activities for the defense industry. However, some obstacles prevent the development of academic research activities in industries, including: i) the culture of companies to carry out research internally; ii) companies' lack of information about research opportunities; and iii) the universities' inadequate dissemination of their research and competences, as well as the dissemination of their innovation centers and institutes (Dovgiy et al. 2017).

In some EU member states, whose DIB is small or non-existent, such as Poland, the concept of civil-military cooperation can be used to attract foreign producers of military equipment or equipment with dual use, through the implementation of tax benefits (Šavriņa and Tiltinš 2015). While in NATO, the cooperation challenges faced at the European level, as competition and rivalry result from the specialization between alliances and the difficulties of those involved in attributing benefits (Zervos 2017).

The EU is immersed in learning and knowledge processes, especially through the leverage of capacity development and innovation strategies in defense (Fiott 2017). However, NATO has shortcomings in regards to these strategies, as it does not have the same levels of financial resources as the EU. In June 2017, the European Commission implemented the European Defense Fund (EDF), with the purpose of financing the development of technologies, acquiring new military capabilities and guaranteeing independence from the US military. The EDF's priorities are unmanned aerial vehicles, satellite communication and cyber capabilities (Lewicki 2018).

The expansion of the production process in the aerospace industry is accompanied by an increase in R&D activities, encouraging companies in the sector to seek joint efforts with other countries so that they can take advantage of technological advances (Chen and Liu 2012).

Croatia, through clusters, has sought to promote knowledge management and innovation among its members (Jurčić et al. 2020), focusing on the development of new technologies and innovative products for the national and international market in order to improve defense potential (Croatian Defense Industry Competitiveness Cluster 2017). In light of this, in Europe there are many efforts to strengthen cluster policy, as they have a significant impact on company performance, especially regarding innovation (Ketels et al. 2012).

In the case of defense industries, clusters have emerged in large numbers, fostered by the opportunities that this cooperation provides for the development of innovative products and the penetration of new markets.

Balanced Scorecard in the area of Defense

The analysis of the articles made it possible to identify the characteristics of the EU BID, in order to relate them to the perspectives of the original BSC (Kaplan and Norton 1992), leading to the elaboration of 30 (thirty) indicators for the formulation of the BSC-Defense, in the promotion, market, innovation and cooperation dimensions (Table 2).

The questionnaire, prepared in Google Forms, was sent by email to the President of IMBEL, on November 5, 2021. The questions were answered on November 7, 2021 by IMBEL's Management and Planning Advisor, who informed that the President, Administrative Director, Industrial Director and the Market Director of the company were consulted for the elaboration of the answers.

Table 2 - Dimensions of BSC in the strategy of the European DIB

Perspective	N	Indicators	References
Finance [Foment]	I1	% of income from tax and fiscal credits granted by the state for export	Åkerström (2020)
	I2	% of income from tax and tax credits granted by the state for importation	Åkerström (2020)
	I3	% of revenue from tax credits and tax credits granted by the state for importing revenue from national companies to carry out joint projects	Dunne and Smith (2016)
	I4	% of revenue from tax credits and tax credits granted by the state for importing revenue from foreign companies to carry out joint projects	Dunne and Smith (2016)
	I5	% of state revenues to finance the acquisition of external technology	Dunne and Smith (2016), Brovko and Petruk (2016)
	I6	% of the company's own resources for the acquisition of external technology	Dunne and Smith (2016)
	I7	% of resources from joint venture	Caralp (2017)
	I8	% of resources from projects and programs of the Ministry of Defense/Armed Forces	Dovgiy et al. (2017)
	I9	% of spin-in technologies (from civil markets)	Dunne and Smith (2016), Fiott (2017)

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Clients [Market]	I10	% of revenues from sales in the foreign market/domestic exclusivity/product differentiation	Hayward (2001), Brovko and Petruk (2016)
	I11	% of sales revenue in the foreign market	Zervos (2017)
	I12	% of sales revenue to meet the demand of the Armed Forces and Public Security agencies	Dunne and Smith (2016)
	I13	% of production capacity to serve the civil market (dual products)	Dunne and Smith (2016), Zervos (2017)
	I14	% of resources from technology spin-off (for civil markets)	Zervos (2017)
Internal Process [Innovation]	I15	% of outsourced production	Brovko and Petruk (2016)
	I16	% of assets related to the acquisition of equipment and technologies in the international market	Camargo et al. (2017)
	I17	% of assets related to the acquisition of equipment and technologies in the national market	Brovko and Petruk (2016)
	I18	% of investment in technologies and infrastructure from the perspective of Industry 4.0 (3D, autonomous systems, augmented virtual reality, artificial intelligence, etc.)	Bellais and Fiott (2017)
	I19	% of investment in intra-organizational RandD	Dunne e Smith (2016), Fiott (2017)
	I20	% of investment in RandD of dual-use products and technologies (civil and military)	Brovko and Petruk (2016)
	I21	% of innovations carried out in partnership with incubators and accelerators	Caralp (2017)
	I22	% of incremental innovation	Bellais and Fiott (2017)
	I23	% of disruptive innovation	Bellais and Fiott (2017)
Learning and Knowledge [Cooperation]	I24	Number of patents registered through offset contracts	Šavriņa and Tiltinš (2015), Camargo et al. (2017)
	I25	Number of partnerships with national educational institutions for RandD	Dovgiy et al. (2017)
	I26	Number of partnerships with international educational institutions for RandD	Camargo et al. (2017)
	I27	Number of partnerships with international companies for RandD and products	Chen and Liu (2012)
	I28	Number of cooperation agreements through public-private partnerships	Thiem (2011), Šavriņa and Tiltinš (2015), Camargo et al. (2017)
	I29	Number of cooperation agreements with governments of other countries (gov to gov)	Lewicki (2018)
	I30	Number of partnerships with small and medium-sized companies through clusters	Jurčić et al. (2020)

Source: the author

The indicators in Table 2 were used in the questionnaire submitted to IMBEL, and for each of the indicators, we asked: “How often is the indicator used in the analysis of IMBEL’s performance?” and “What is the level of relevance of the indicator for the analysis of IMBEL’s performance?”

The Brazilian War Material Industry: the case of Imbel

IMBEL is a company incorporated under Law No. 6,227 of July 14, 1975, with a private law legal personality, linked to the Ministry of Defense, through the Army Command, and is part of the Brazilian DIB, established as a Strategic Defense Company (EED) since 2013. The Company consists of a head office, located in Brasília/DF, and five Production Units (PU), with a total number of 1.963 employees.

It is currently classified as a Dependent State Company, under the terms of article 2, III, of Complementary Law No. 101, of May 04, 2000 (Presidência da República Federativa do Brasil 2000). A non-dependent state-owned company is considered to be one that is not maintained by the controlling entity and does not depend on the allocation of resources provided for in the Federal Budget Law (LOA), with its financial resources for covering personnel expenses or general operating costs being covered by its own revenues (Araujo 2020).

Given that its capital is fully subscribed by the Union, IMBEL has legal and statutory obligations that limit its operational capacity, especially in budgetary and financial terms, giving it distinct characteristics in relation to other companies in the defense sector.

It is also worth noting that due to the restrictions imposed by Constitutional Amendment 95 (Presidência da República Federativa do Brasil 2016), the company faces difficulties in paying its taxes or producing, even when there are internal demands or financial resources available in its single account (National Treasury). As a result of this situation, in 2020, the Ministry of Defense prepared a business plan to make IMBEL a state-owned company, no longer dependent on resources from the Union.

The action has two objectives: to remove the company from the National Privatization Plan (PND), in order to prevent it from being privatized, and to free it from the constraints of the spending cap, allowing the company greater investment capacity (Araujo 2020).

BSC-Defense: Financial Perspective - Foment

The indicators defined for the financial/promoting perspective of the BSC-Defesa will be described below, according to the responses indicated by IMBEL’s senior management.

- **Regarding frequency:** of the 9 (nine) indicators, 3 (three) are frequently used in the analysis of IMBEL’s performance: **I2-** % of income from tax and fiscal credits granted by the state for importation, **I8-** % of resources from Ministry of Defense/Armed Forces projects and

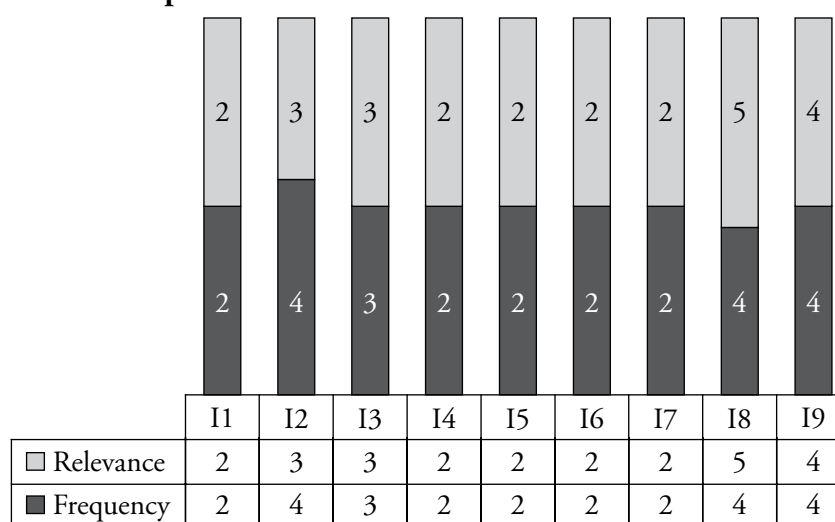
programs and, **I9**- % of spin-in technologies (from civil markets), and sometimes the company uses the **I3**- % of revenues from national companies to carry out projects sets. And the following indicators are rarely used: **I1**- % of revenue from tax and fiscal credits granted by the state for exports, **I4**- % of revenue from foreign companies for joint projects, **I5**- % of revenue from the state to finance the acquisition of external technology, **I6**- % of the company's own resources for the acquisition of external technology and **I7**- % of resources from a joint venture.

It is noted that in the DIB environment, companies lack the creation of a legal framework that guarantees permanent sources of financing for defense and security programs, as well as the improvement of budget legislation to allow the commitment of long-term budget resources, linked to strategic projects of the Armed Forces.

Technological capabilities as one of the main factors to penetrate international defense markets and to set a strategy to maintain the competitive advantage of defense companies. However, these resources are not enough to innovate and sell their products and services on their own (Duch-Brown and Fonfría 2014).

- **Regarding relevance:** IMBEL points out as extremely and very relevant indicator **I8**- % of resources from projects and programs of the Ministry of Defense/Armed Forces and **I9**- % from spin-in technologies (from civil markets), respectively, and of medium relevance. The indicators **I2**- % of revenue from tax and fiscal credits granted by the state for imports and **I3**- % of revenue from national companies for carrying out joint projects. Regarding the state's ability to offer financial solutions to defense companies, the case of SAAB in Sweden is illustrative, given that the state seeks to guarantee compensation agreements and technology transfers, which allows SAAB to gain competitive advantage in the international defense market. Indicators **I1**, **I4**, **I5**, **I6** and **I7** were considered of little or no relevance by IMBEL managers in the analysis of organizational performance.

Graph 1 - BSC-Defense – Dimension Foment



Source: search data

When scoring indicators according to the Likert scale, from 1-never to 5-often, the maximum score considered ideal is 45 points (9 indicators x 5 points). However, the current status of IMBEL is 25 points, that is, the use of indicators corresponds to 55% of the indicators indicated by the European DIB. As for relevance, IMBEL considers that 55% of the European DIB indicators are relevant in the analysis of its organizational performance.

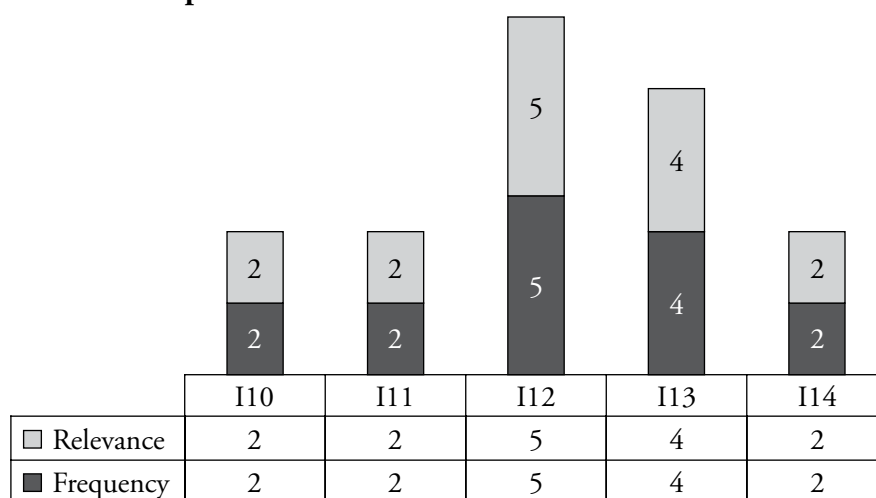
BSC-Defense: Clients Perspective – Market

The BSC-Defense indicators defined for the **customer/market perspective** are described below.

- **Regarding frequency:** from the 5 (five) indicators, 1 (one) is always used in the analysis of IMBEL's performance: **I12**- % of income from sales to meet the demand of the Armed Forces and national Public Security organizations, and 1 (one) is frequently used: **I13**- % of income from the sale of products to serve the civil market. In the context, governments determine the structure of the arms industry through procurement policy and contract concessions, allowing or prohibiting mergers and allowing or preventing competition for national arms contract (Hartley 2018). Indicators **I10**, **I11** and **I14** are rarely used by IMBEL managers.

- **Regarding relevance:** IMBEL points out as extremely relevant the **I12** indicator - % of income from sales to meet the demand of the Armed Forces and national Public Security organizations, and very relevant the **I13** indicator - % of income from sales of products to serve the civil market. Indicators **I10**, **I11** and **I14** were considered of little relevance by the IMBEL managers. It should be noted that in the defense market, customer integration into product development occurs more often than in civil industries, and this is recognized as a critical factor in the success of projects (Dvir and Peled 2012).

Graph 2 - BSC-Defense – Dimension Market



Source: search data

With regard to the BSC-Defense from the clients/market perspective, the current situation of IMBEL is 15 points (60%) of the 25 points, considered ideal in comparison with the performance indicators indicated by the European DIB. As for relevance, IMBEL considers that 60% of the European DIB indicators are relevant in the analysis of its organizational performance.

BSC-Defense – Internal Processes Perspective – Innovation

The BSC-Defense indicators defined for the **internal processes/innovation perspective** are described below.

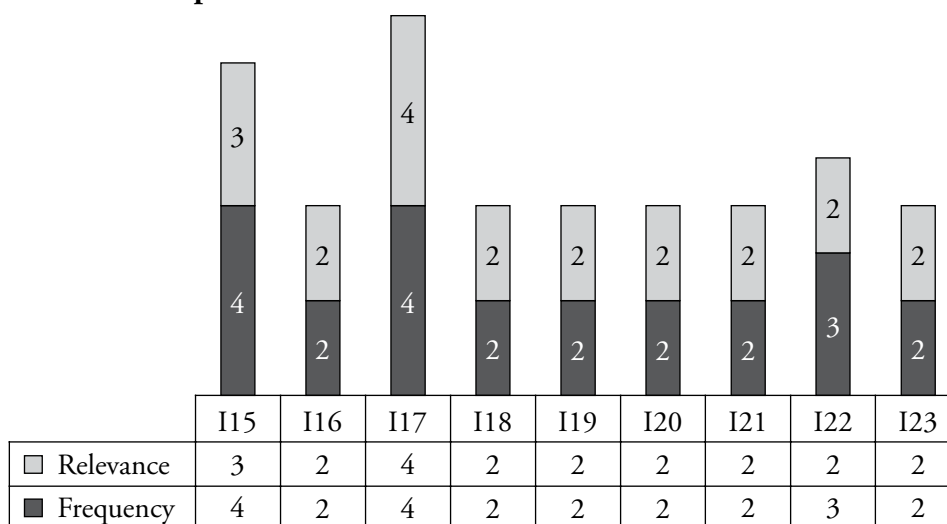
- **Regarding frequency:** of the 9 (nine) indicators, 2 (two) are frequently used in the analysis of IMBEL's performance: **I15**- % of production that is outsourced and **I17**- % of assets related to the acquisition of equipment and technologies in the national market and, 1 (one) is sometimes used: **I22**- % of incremental innovations. It appears that the indicators **I16**, **I18**, **I19**, **I20**, **I21** and **I23** are rarely or never used.

From the perspective of internal processes, there is need for interconnections between the actors involved in the innovation process, in order to create a supportive environment that allows the triggering of policies and actions that can generate increased productivity and competitiveness (Galdino et al. 2020).

- **Regarding relevance:** IMBEL points out that only 01 (one) indicator: **I17**- % of assets referring to the acquisition of equipment and technologies in the national market, is very relevant. Indicator **I15** - % of production that is outsourced has medium relevance, and the other indicators, **I16**, **I18**, **I19**, **I20**, **I21**, **I22** and **I23** have little relevance.

IMBEL has similar limitations to cooperation between companies as seen at EU level, which can result in unwanted side effects, such as unnecessary duplication of product manufacturing, fragmented RandD efforts, excess production capacity, as well as lack of standardization of military equipment (Caralp 2017).

Graph 3 - BSC-Defense – Dimension Innovation



Source: search data

Regarding the BSC-Defense from the perspective of internal processes/innovation, the current situation of IMBEL scores 23 points (51%), out of 45 points considered ideal in comparison with the performance indicators indicated by the European DIB. As for relevance, the IMBEL considers that 47% of indicators (21 points) are relevant in the analysis of its organizational performance.

BSC-Defense – Learning and Knowledge Perspective – Cooperation

The BSC-Defense indicators defined for the learning and knowledge/cooperation perspective are described below.

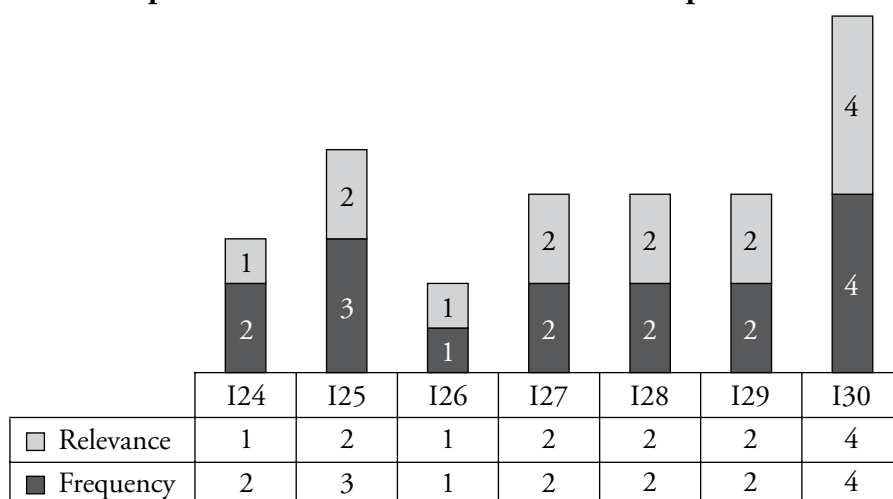
- **Regarding frequency:** of the 7 (seven) indicators, only 1 (one) is frequently used in the analysis of IMBEL's performance: **I30**- Number of partnerships with small and medium-sized companies through clusters and 1 (one) is used, sometimes: **I25**- Number of partnerships with national educational institutions for RandD.

The other indicators, **I24**, **I26**, **I27**, **I28** and **I29** are rarely or never used. There is an alignment of IMBEL with European defense companies in relation to partnerships through clusters, as they aim at the development of new technologies and innovative products for the domestic and international market, and the improving defense potentials, through new business models (Jurčić et al. 2020).

The defense industry is considered a knowledge industry, and the companies' greatest asset is the knowledge they accumulate. In this context, the focus on learning goes beyond the internal scope of the company, so that interaction and cooperation with other agents of the innovation system are differentiating factors between companies (Kim and Nelson 2005).

- **Regarding relevance:** IMBEL points out that only 01 (one) indicator: **I30**-Number of partnerships with small and medium-sized companies through clusters, is very relevant, indicators **I25**, **I27**, **I28** and **I29** have little relevance and indicators **I24** and **I26** have no relevance.

Graph 4 - BSC-Defense – Dimension Cooperation

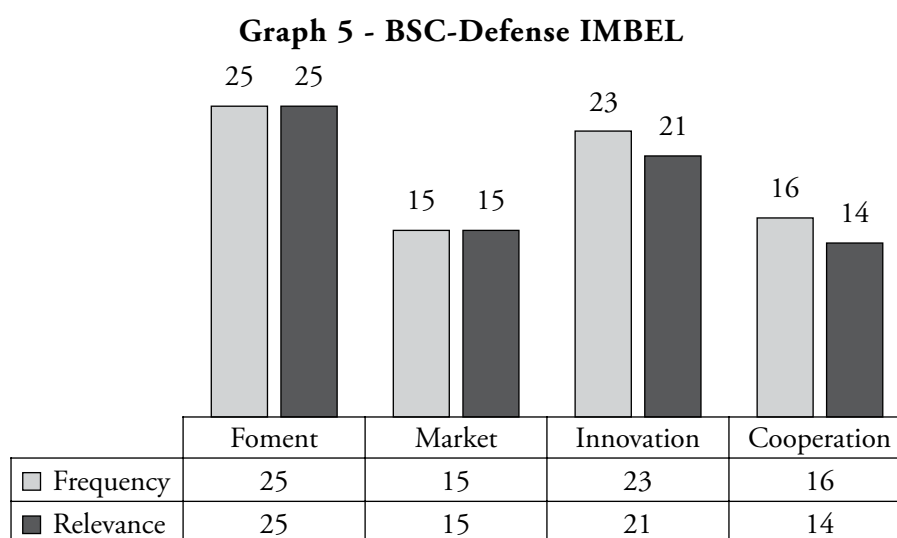


Source: search data

Despite the low relevance pointed out by IMBEL, in the cooperation dimension, strategic partnerships play a fundamental role in promoting organizational development and the DIB itself, since the country does not have the financial self-sufficiency and the necessary know-how to develop certain capacities, requiring the expansion of partnerships and cooperation agreements with other countries.

Regarding the BSC-Defense from the perspective of learning and knowledge/cooperation, the current situation of IMBEL scored 16 points (46%), out of 35 points considered ideal compared to the frequency of performance indicators indicated by the European DIB. As for relevance, IMBEL considers that 40% of the indicators (14 points) are relevant in the analysis of its organizational performance.

In the general context of the BSC-Defense, when listing the indicators proposed and analyzed at IMBEL, compared with the indicators identified in the literature on the European DIB, it appears that the company, in terms of frequency of use of indicators, obtained 79 points (25 foment + 15 market + 23 innovation + 16 cooperation) out of the total of 150, corresponding to 53%, while in the category of relevance of the use of indicators, it obtained 75 points (25 foment + 15 market + 21 innovation + 14 cooperation) of the total of 150 points, that is, 50%.



Source: search data

IMBEL's analysis made it possible to evaluate the organizational performance of a company belonging to the national Defense Industrial Base, which corroborated the relevance of indicators proposed in the BSC-Defense construct, based on European defense studies.

This reveals the existence of asymmetries in planning and strategic management between the national and European DIBs, which may be caused by the heterogeneity of the geopolitical environment, industrial defense policies, the demand of the Armed Forces for defense products and, mainly, fiscal policies, tax and government incentives.

Conclusion

The defense area has a list of important actors, mainly in the relationship between government, academy and defense industries, but the policies that guide the participation and development of the DIB are formulated in a top-down manner, with insufficient alignment between the National Defense Strategy and Defense Industrial Base capabilities.

It was possible to take a new look at the use of the BSC, through the development of other indicators putting the BSC-Defense on the agenda, but from the same perspectives as its original structure (financial, internal processes, customers and learning and knowledge).

However, the proposed model contributes in terms of performance evaluation, including the analysis of **foment**, from a financial perspective; from the defense **market**, from the client's perspective; **innovation**, from the perspective of internal processes and **cooperation**, from the perspective of learning and knowledge, even serving as a benchmark for the consolidated BSC, by Kaplan and Norton (1997).

The indicators included in the BSC-Defense were prepared under the bias of a defense industry, and the suggested development for strategic management tends to be a simple and easy-to-use organizational performance analysis instrument. Thus, this research achieved its objective insofar as it managed to answer the research question: **How can the BSC contribute to the analysis of the performance of Strategic Defense Companies?**

Although we sought to carry out a study to meet the objective of this research, taking the necessary methodological precautions, some limiting factors were identified, such as the fact that the research was carried out in a single company. However, methodologically, as the use of the BSC-Defense is seminal, the single case study allowed a more in-depth analysis.

As a continuation of this research, it is suggested to expand the application of the BSC-Defense to other strategic defense companies, evaluating the results transversally, with the objective of rectifying or ratifying the data in a qualitative way, or even on a quantitative approach, with a larger sample of companies.

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