

## **Balanced Scorecard applications in the Production Engineering: an analysis based on the ENEGEP publications.**

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### **Abstract:**

This article aims at demonstrating the applications of Balanced Scorecard in the Production Engineering. Publications of the Production Engineering National Meeting - ENEGEP, organized by the Production Engineering National Association from 2001 to 2005 were used. Articles with the central theme of Balanced Scorecard were selected through exploratory research of the proceedings and posterior analysis of content. Such methodology permitted to identify the areas and sub-areas of the event which pointed out the areas of application in the Production Engineering. These applications are presented with a balanced number of articles with theoretical and empirical discussions, highlighting the necessity of tools for the development of Organizational Strategies and Measurement of the Organizational Performance.

**Keywords:** Balanced Scorecard, Production Engineering, ENEGEP.

## **1 Introduction**

The notorious current globalized competition forces organizations to seek strategic planning methods, which enable them to survive and compete in their market share at present and in the future.

In this search, two American researchers David P. Norton and Robert S. Kaplan, developed a method in 1990 that has outstood internationally, called *Balanced Scorecard*. This method appeared as a system of organizational strategies performance indicators, but, its creators claim that besides such use, its main usefulness is to be applied as a strategic management system.

Strategic management is usually considered a field of knowledge and studies restrict to Administration. However, specialists such as Mintzberg, Ahlstrand and Lampel (2000), in a dense review of 2.000 items of literature on the topic, highlight that other fields of knowledge such as Biology, History and Psychology have contributed significantly to the comprehension of the strategic process.

As an example of contribution of the other areas, Production Engineering appears, which due to its own nature is correlated and closer to the administration sciences. Such correlation, as Cunha (2002) explains, results from the fact that the focus of Production Engineering concentrates on production systems management, and one of its areas of concentration of studies is the Strategy in Organizations.

In Brazil, the ENEGEP (Production Engineering National Meeting), the most traditional event in the area has raised great scientific contribution. At that event, Brazilian researchers have produced articles, which demonstrate the Balance Scorecard applicability both theoretically and empirically. Therefore, the objective of this article is to demonstrate the Balance Scorecard applications to the Production Engineering, through the ENEGEP scientific production from 2001 to 2005.

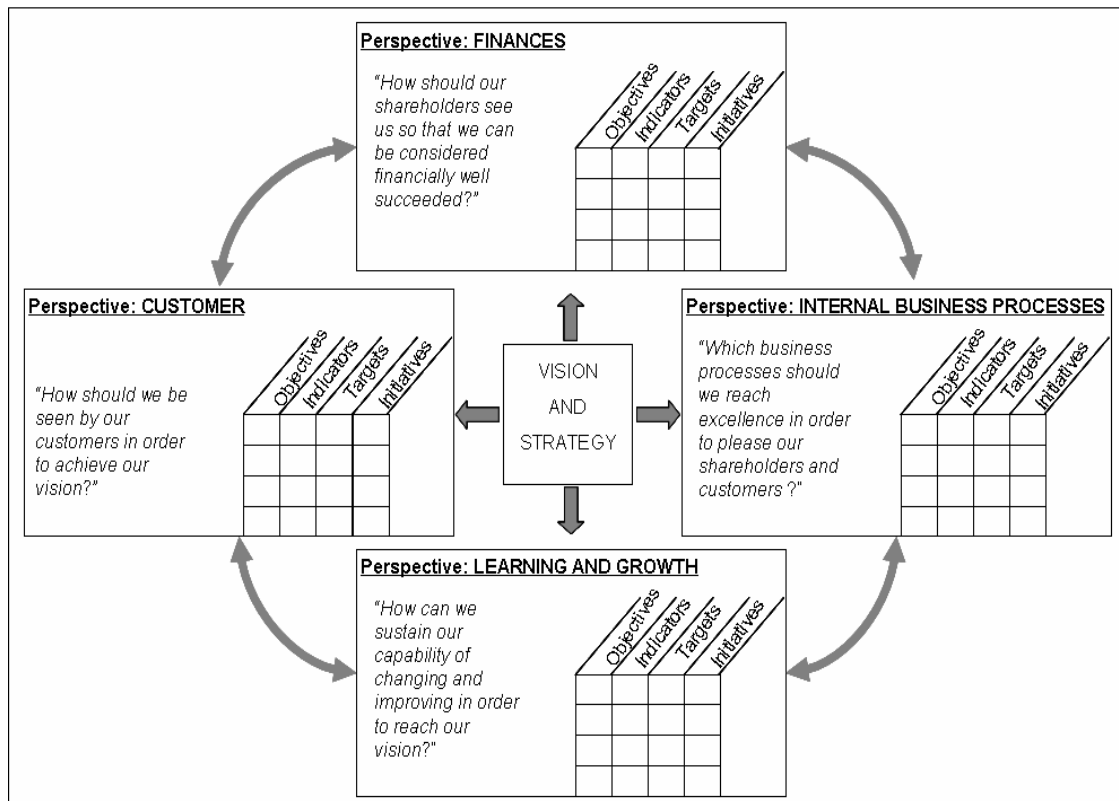
## **2 The Balanced Scorecard, by its creators**

Developed by Kaplan and Norton, as mentioned before, the *Balanced Scorecard* (BSC), is a method to evaluate the strategic performance and consequently question the strategic system of an organization. It has become one of the most important tools in the strategic planning area. Thus, to fundament the BSC, the works of its creators were used in this study.

In an interview given to the HSM Management magazine, Kaplan (2004), explains that the BSC success is due to the fact that it comprises a terminology which can be used

as a bridge between the strategies defined by high executives and the workers' daily actions. "It translates the abstract strategy into clear priorities and relates them with tangible strategic results that the company and its employees must achieve. The *Balanced Scorecard* transforms the strategy into a task for the team" (KAPLAN, 2004).

The BSC is based on a performance measurement system using indicators and financial and non-financial objectives (intangible assets), derived from the organizational view and strategy. According to Figure 1, "the objectives and measures focus on the organizational performance considering four perspectives: financial, customer, internal business processes and learning and growth" (KAPLAN & NORTON, 1977).



**Figure 1: BSC perspectives: Structure needed for the translation of the strategy into operational terms / Source: Adapted from Kaplan & Norton (1997)**

After indicators and objectives are defined, they are incorporated among the perspective relations of cause and effect, where the vectors which represent objectives,

which will have measuring indicators, form the strategic maps that serve as instruments for the strategic management, according to Figure 2.

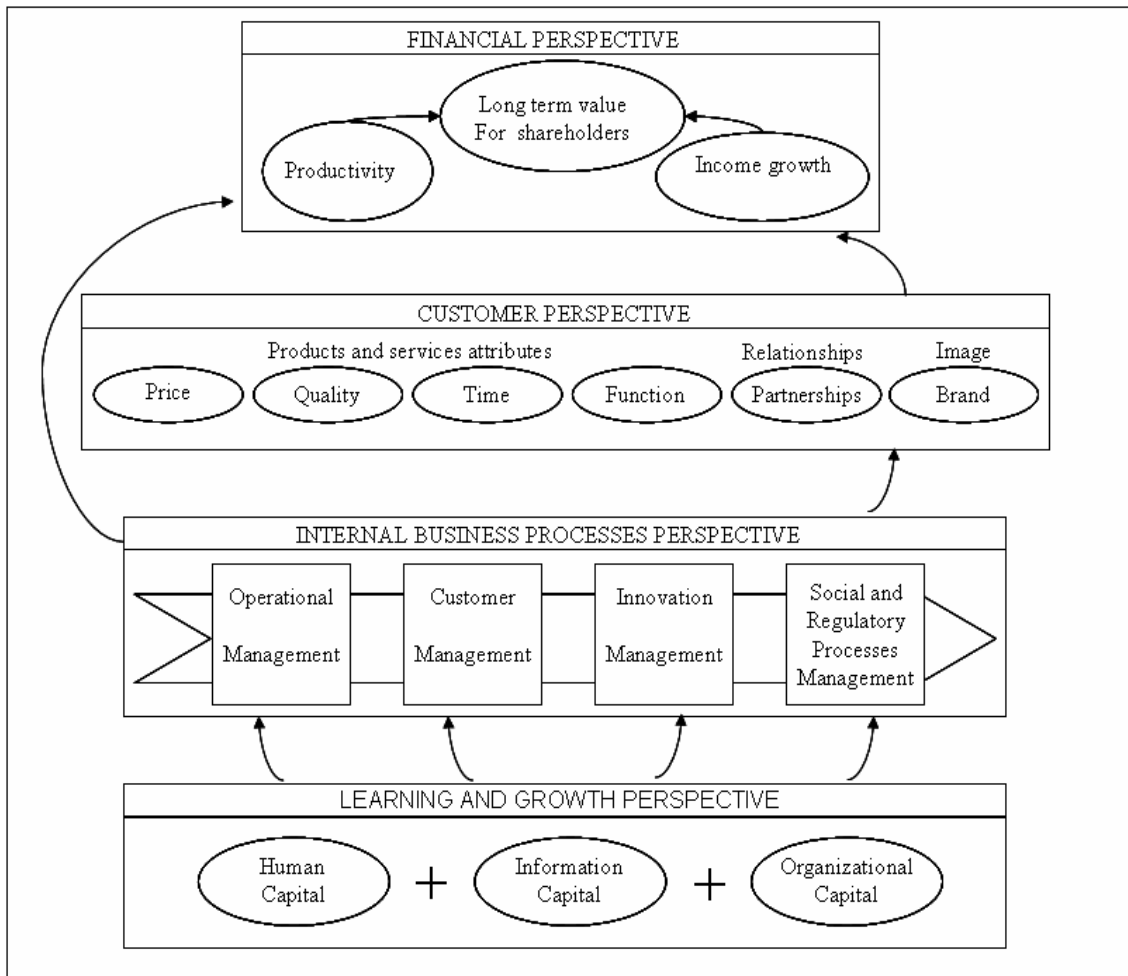


Figure 2: Balanced Scorecard with Strategic Map Sample / Source: Adapted from Kaplan & Norton (2004)

For its creators, the strategic map sample for the BSC represents:

The relations of cause and effect that define the logical chain through which the intangible assets will be converted into tangible value; the proposition of value for the customer, which sets the conditions that will create the value for the customer; the value creation processes, identifying the processes that will transform the intangible assets into results for the customers and into financial results; the grouping of activities and assets, which determinate the intangible assets to be aligned and integrated to generate value (KAPLAN & NORTON, 2004, 0. 33).

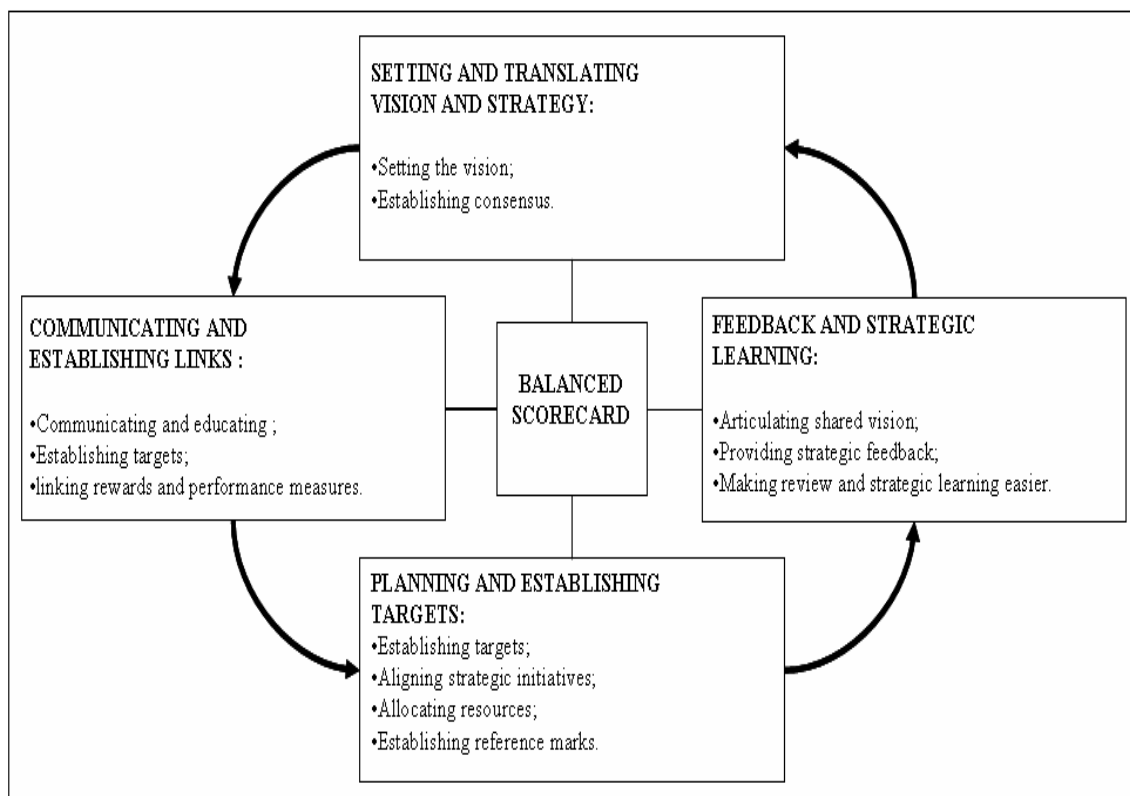
The strategic maps, through relations of cause and effect, show the links where each perspective value creation reflects the value creation in the form of a strategic process.

Starting from the strategic maps the BSC becomes a management system for the organization strategy.

Rather than a performance measurement system, or a system of strategies control, the BSC should be used as strategic management system with a long term focus. Kaplan & Norton (1997), suggest that the BSC should be adopted to make critical strategic management processes viable such as:

- Setting up and translating the vision and strategy;
- Communicating and associating objectives and strategic measures;
- Planning, establishing targets and aligning strategic initiatives;
- Improving feedback and strategic learning.

Previously shown in Figure 1, these processes must be integrated into a strategic management system according to Figure 3.



**Figure 3: Balanced Scorecard as a Management System and Strategic Action Structure / Source: Adapted from Kaplan & Norton (1997)**

The BSC fills in the gap created by the inexistence of a systematic process to implement the feedback on strategy. The management processes developed from the BSC allow the organization to be aligned and keep focus on the implementation of the long term strategy. (KAPLAN & NORTON, 1997).

The samples presented, obviously in a summarized version, demonstrate the strategic process through BSC. In its creators works case studies of successful implementation are presented, emphasizing that such methodology works.

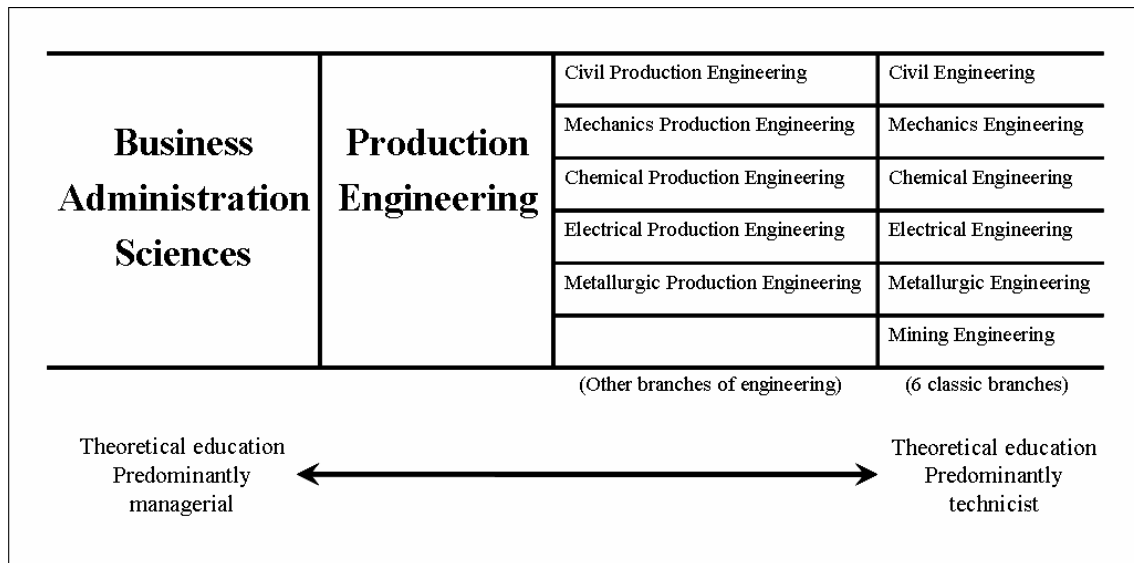
Ultimately, this is a matter of each organization adapting BSC to its own strategic objectives, creating indicators that will be suitable to ensure the efficiency and efficacy of its strategies. Therefore, it is relevant to analyze the BSC applications in the Production Engineering.

### **3 Production Engineering and the ENEGEP**

Production Engineering, an ascending area, plays an important role in the organizations management, mainly in industries. Historically, it developed throughout the XX century, as an answer to the necessity of methods and techniques for the productive means management, and following the market and technological demands (CUNHA, 2002).

It is an area of the organizations knowledge, with major focus on industrial activities, but lately it has produced knowledge to suit other areas. Duarte, Gaspar Pinto & Oliveira Filho (2004) highlight that Production Engineering, initially restrict to operational improvement at the factories, started to stretch its participation to other segments such as service and shops, even evolving into studies of business management strategies.

In Brazil, there are basically two courses in the area, one is closer to the administration sciences and is called Production Engineering, the other, closer to six classic branches of engineering is called Habilitation in Production Engineering. This correlation with Administration and the traditional Engineering, can be better understood through Figure 4.



**Figure 4: The relation between Production Engineering with the other areas / Source: Adapted from Cunha (2002)**

According with the Production Engineering National Association (ABEPRO), knowledge is produced in the following areas:

- Production management;
- Quality;
- Economic Management;
- Ergonomy and safety at work.
- Product Engineering;
- Operational Research;
- Strategy and organizations;
- Technology management;
- Environmental management;
- Production Engineering Teaching.

With the increase in courses in the area, there was also increase in the scientific production, taking as reference the ENEGEP, Production Engineering National Meeting, which has been held for 25 years. The ENEGEP selects the works in the areas previously mentioned, and the publications involve works related with the study of planning and organizational strategies management, from which studies related to *Balanced Scorecard* were spotted, and gathered to produce this article.

## 4 Methodology

In order to survey the applications of *Balanced Scorecard* some scientific publications in the ENEGEP proceedings from 2001, 2002, 2003, 2004 and 2005, available in CD-ROM were used.

The first criteria, using the article edition software ACROBAT ADOBE READER, was the exploratory search using the key-word "*Balanced Scorecard*" and its conventional abbreviation "BSC" in each of the proceedings.

The result of this search was the collection of articles that at any point of their text presented the key-word. Once not all articles treat specifically this theme, but rather cite the term or refer to its creators' literature, a second criteria of analysis of content was applied, in order to check whether the main theme of the article was the BSC or not.

If the article analyzed presented the BSC as the main theme, the theoretical or practical applicability of the article was analyzed, that is BSC being used in Production Engineering as shown in the results analysis. Thus, the articles that comprise the results analysis are only the ones that met the second criteria. Table 1 shows the article selection process.

Table 1: BSC articles selection.

YEAR	ARTICLES	
	SELLECTED THROUGH THE FIRST CRITÉRIA	SELLECTED THROUGH THE SECOND CRITÉRIA
2001	19	10
2002	27	11
2003	41	15
2004	43	18
2005	32	13
<b>TOTAL</b>	<b>162</b>	<b>67</b>

## 5 Results Analysis

The articles were classified according to the thematic areas and sub-areas of the meeting, therefore permitting a quantitative analysis of the BSC application in Production Engineering, according to table 2. It is important to mention that in all ENEGEP thematic areas, there is a sub-area called 'Others', where the articles which do not belong to specific sub-areas but are somehow linked to the area central theme are found.

**Table 2: Articles on *Balanced Scorecard* per area and sub-area in the ENEGEP - 2001 to 2005**

AREA	SUB-AREA	2	2	2	2	2	TOTALS	TOTALS
		0	0	0	0	0	PER	PER
		0	0	0	0	0	SUBAREA	AREA
		1	2	3	4	5		
PRODUCTION MANAGEMENT	Business planning			2		2	4	
	Logistics		1	1			2	
	Development measurement			3	3	2	8	16
	Civil Engineering Management		1				1	
	Others		1				1	
QUALITY	Quality management	1			2	1	4	
	Quality Normalization and Certification	1					1	5
ECONOMIC MANAGEMENT	Projects analysis and management					1	1	2
	Costs management	1					1	
PRODUCT ENGINEERING	Product Marketing			1			1	1
ESTRATÉGIAS AND ORGANIZATIONS	Strategic Planning	4	2	4	8	2	20	
	Production Strategies	2	2				4	32
	Companies Chains					1	1	
	Others		3	2	1	1	7	
INFORMATION SYSTEMS	Management Information System	1				1	2	
	Information System Planning				1	1	2	11
	Information Strategic Management		1	2	3	1	7	
<b>ANUAL TOTALS</b>		<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>GENERAL</b>	<b>67</b>
							<b>TOTAL</b>	

BSC was developed to be an organizational strategy and management performance measurement system. Regarding its functioning, the major number of applications in

Production Engineering, has been in the areas where the focus is strategy management, and the measurement of performance and management systems. Therefore, the areas Strategy and Organizations, Production Management and Information Systems outstand.

A lower number of applications in other areas can be observed, consecutively being Quality, Economic Management and Product Management, showing that the BSC can have new applications, rather than its specific focus. This fact can be correlated with the BSC logic functioning, once these areas have direct relations with its perspectives. Quality correlates with the Internal Business Processes, and the Economic Management with the Finances Perspective, while Product Marketing correlates with the Customer perspective.

The BSC applications occur in the form of theoretical and empirical articles. The theoretical discussions about the method are used to affirm its validity or even to criticize it, showing strengths and drawbacks. The empirical research is presented in the form of an only case or multi-case studies, development of computerized tools and surveys. Table 3 shows the number of BSC theoretical and empirical applications per area in the ENEGEP, pointing out some unbalance in the total of theoretical versus empirical applications.

**Table 3: BSC Theoretical and empirical applications per area in the ENEGEP – 2001 to 2005**

AREA	ARTICLE	
	THEORETICAL APPLICATIONS	EMPIRICAL APPLICATIONS
PRODUCTION MANAGEMENT	8	8
QUALITY	4	1
ECONOMIC MANAGEMENT	1	1
PRODUCT ENGINEERING		1
STRATEGIES AND ORGANIZATIONS	15	17
INFORMATION SYSTEMS	5	6
<b>TOTALS</b>	<b>33</b>	<b>34</b>

The empirical applications are in several organizations such as universities, industries, service businesses, big and small corporations, and incubators, showing that the BSC can be applied to the most varied kind of organizations.

## 6 Final Considerations

*Balanced Scorecard* has been considered a strategic management performance measurement system of great relevance for the organizations. Understanding its systematic and surveying its applicability has been the constant search of organizations, managers, students and researchers concerned with keeping the organizations long term strategic competitiveness.

This search for methods of strategic management, should not stick to the administrative sciences only, but also reach other areas of knowledge. It can be seen that Production engineering, through the ENEGEP publications, represent a source of BSC theoretical and empirical applications, constituting excellent reference for the organizations application.

Regarding the main use of this tool, the major number of applications, both theoretical and empirical, happens exactly in the areas where the strategic management and the performance management are the focus. However, other areas also show applications that suggest the use of this tool as a support for the management, for instance, the joint application of *Balanced Scorecard* and quality management tools.

It is important to emphasize that publications where the central theme was the *Balanced Scorecard* were analyzed, but there are also a great number of publications focusing on strategic management in the ENEGEP Proceedings, mainly in the area of Strategy and Organizations, which might be of use to researches, companies and managers, in order to provide the organizations with tools for the strategic management.

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