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**Performance management in SMEs: a design method and a software program for
continuous improvement**

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Abstract

Performance management is most often addressed in the literature regardless of the size of firms. However, various aspects may hamper the implementation of performance measurement systems (PMS) in small and medium-sized enterprises (SMEs), especially the time and investments required for this type of project. The objective of this article is to build on previous research on performance management in SMEs and propose a simple PMS design method tailored for such firms. A software program to assist in the management of performance measures and improvement actions is also described. Both the design method and the software were applied through action research in a Brazilian SME. Despite the time and investment constraints faced during the research, the method and software were found to be effective in the selection and tracking of performance measures. Besides the design method and the software program, this paper contributes with empirical evidences on the factors that

either facilitated or hindered the PMS implementation, which are in accordance with those pointed out in the literature.

Keywords: performance management, PMS design, information technology, continuous improvement

1. Introduction

Performance measurement has been widely studied by researchers and is of great interest to practitioners. However, many of the existing approaches to performance measurement have been designed for large companies. Literature thus fails to address this topic with respect to small and medium-sized enterprises (SMEs) and more empirical research is required to evaluate the effectiveness of PMS in such companies (Hudson, et al. 2001; Garengo et al., 2005). Research on performance measurement in SMEs is relevant due to the ever increasing competition, which has led companies to undertake quality programs and certifications. SMEs are realizing the importance of quality norms, such as ISO 9001, but its implementation in smaller companies requires different approaches (Aldowaisan and Youssef, 2006). The ISO 9000 series emphasizes that companies should continuously improve their processes, and thus their performance. This, in turn, requires the establishment of measurement and feedback systems so that companies can learn from continuous improvement results (Kaye and Anderson, 1999). The literature however indicates that the implementation of PMS in SMEs differ much when compared to large companies (Hudson et al., 2001), which raises several challenges for researchers and practitioners.

The objective of this paper is to provide some empirical evidence on the factors that influence the implementation of PMS in SMEs. More specifically, we reviewed the literature on

performance measurement in SMEs in order to define a simple set of steps to assist SMEs in designing their PMS. We also developed a software program to enable the use, reporting and communication of measures. The software and the design method were applied through action research in a Brazilian SME.

The paper is organized as follows: Section 2 brings the literature review on PMS and performance measurement in SMEs; Section 3 introduces the proposed PMS design method; Section 4 describes the software program; Section 5 discusses the factors that influenced the design and use of the PMS and software program. Finally, Section 6 concludes the work and outlines topics for future research.

2. Literature review

2.1 Performance measurement systems

Many authors like to refer to Lord Kelvin's words "you cannot manage what you cannot measure" to explain how performance measures are vital in today's management practices (Lebas, 1995; Neely, 2002). Indeed this is valid, given that organizational improvement is usually demonstrated in numerical terms. Until the 1980's PMSs relied basically (or even solely) on financial measures to show how well companies performed. However, during those years, many authors criticized the use of financial measures because they emphasized short-term results (Skinner, 1971; Kaplan, 1984). Neely (1998) contended that such PMSs did not address properly other important areas of performance as quality, delivery and flexibility. This caused the emergence, mainly in the 1990's, of many performance management frameworks that attempted to balance financial and non-financial measures. Some examples are:

- Performance Pyramid (Cross and Lynch, 1989);

- Performance Measurement Matrix (Keegan et al., 1989);
- Performance Prism (Neely et al., 2002);
- Balanced Scorecard (Kaplan and Norton, 1992)

There is no consensus in the literature on which framework is the most effective for PMS design, though there is empirical evidence that the balanced scorecard (BSC) has enjoyed great commercial success and is found today in many organizations (Neely, 2005). The BSC organizes performance measures into four performance perspectives: financial, customers, internal processes and learning and growth (Kaplan and Norton, 1996). According to its proponents, the strength of the BSC lies in the way it translates strategy into a set of performance measures that cover both tangible and intangible aspects of the organization. Kaplan and Norton (2001) introduced the strategy maps to help PMS designers determine the cause and effect relationships among measures. These maps are expected to show how intangible assets can be converted into better financial performance.

Indeed, many frameworks feature cause and effect relationships. For example, Neely et al. (2002) use success maps to outline the relationships among measures in their framework, the performance prism. Other remarkable contributions that value causality, even though not explicitly, were made by Cross and Lynch (1989) and Lebas (1995). In spite of the importance of clarifying cause and effect relationships, Bititci et al. (2002) claim that few are the organizations that understand the chain of reactions interconnecting their performance measures.

Despite the great variety of frameworks that have been proposed, the literature lacks methods for deciding on which performance measures should populate the PMS (Neely et al., 2000; Lohman et al., 2004). Frameworks are useful in showing the areas in which performance

measures may be necessary, but provide little guidance in identifying, introducing and using such measures (Neely et al. 2000). Lohman et al. (2004) add that the literature does not address properly the impact of exiting PMSs in the process of designing a new PMS.

2.2 Performance measurement in SMEs

In this paper we referred to the European Commission's (EC) definition of small and medium-sized enterprises. The EC classifies as SMEs companies with a headcount ranging between 10 and 249 and with an annual turnover ranging from 10 and 50 million Euros (European Commission, 2005). We thus exclude micro enterprises with less than 10 employees. Some authors use a headcount of 20 as the cutoff criterion (Hudson et al. 2001).

Interest on the topic of performance measurement in SMEs has gained attention both by researchers and practitioners due to the evolution of the quality concept and the introduction of the ISO 9000 series and the diffusion of quality awards (Garengo et al., 2005). Many researchers claim that performance measurement is needed to support continuous improvement processes (Atkinson and Waterhouse, 1997; Neely et al., 2000).

Literature often addresses performance measurement regardless of the size of firms. Indeed, most of the approaches found in the literature have been designed for and tested in large companies (Hudson, 2001). In spite of that, only recently have some authors started seeking ways to overcome the peculiarities of SMEs with respect to performance measurement. Studies from Webb et al. (1999) and Hudson (2001) have shown that PMS in SMEs are typically financially focused, informal and unstructured, which may inhibit, rather than facilitate, the achievement of strategic objectives. Greatbanks and Boaden (1998) add that SMEs usually have poor strategic planning and do not understand what their critical success

factors are. Next is a summary of the factors influencing performance measurement in SMEs (Garengo et al., 2005):

- SMEs tend to have limited human resources, which prevents them from performing additional activities other than the daily work;
- Managerial capabilities are often lacking and management tools and techniques are perceived as being of little benefit to the company;
- The implementation of a PMS requires capital resources, which are often limited in SMEs;
- SMEs usually make decisions in a reactive way instead of following a predefined process, which may lead to short-term orientation;
- Gathering the information to implement and use a PMS is hindered because knowledge in SMEs is mainly tacit and processes are rarely formalized;
- SMEs often do not fully understand the performance measurement concept and thus they do not perceive the potential advantages of implementing a PMS.

Garengo and Bititci (2007) conducted a broad literature review and on performance measurement in SMEs and synthesized this knowledge in four contingency factors: corporate governance and structure; management information systems; business model and; organizational culture and management style. An interesting finding from these authors is that information management practices play a crucial role in creating a favorable context for the introduction of PMS.

3. Method for PMS design

In this section we describe our method for PMS design. The method was based in three other contributions found in the literature: the balanced scorecard from Kaplan and Norton (1996),

the measurement system development process (MSDP) from Rentes et al. (2002) and the process for PMS design in SMEs from Hudson et al. (2001). Although only the third is tailored for SMEs, all of them agree that performance measures should be derived from strategic objectives. We highlight some of the recommendations that we found useful for our method.

- Meetings with top management and other key operational areas are necessary to determine the strategic objectives (Kaplan and Norton, 1996);
- Performance measures should be related to the organization's key performance areas – KPAs (Rentes et al., 2002) or classified into performance perspectives (Kaplan and Norton, 1996);
- An incremental approach suits better the needs of a SME. Therefore, several iterations may be necessary to reach the final version of the PMS (Hudson et al., 2001);
- The company should provide mechanisms, such as visibility boards, to communicate performance results to interested parties (Rentes et al., 2002);
- Measures should be cascaded down to the operational level (Hudson et al., 2001; Rentes et al., 2002);

We prepared a set of steps based on these recommendations. An external facilitator may be necessary to conduct all the steps. Next we describe them in detail:

- Step 1: understand the company's business through preliminary interviews with the directors. During these interviews the directors should be questioned about the organization's primary strategic objectives. Top management can also contribute with suggestions of key performance areas, which later will inspire the SMD perspectives, and preliminary performance measures.

- Step 2: interview the employees in charge of the organization's key areas in order to determine the performance measures currently in use. They must be questioned about new indicators that should be implemented according to the performance areas to which their work is related;
- Step 3: compile data obtained during the interviews to build a first version of the PMS. This includes performance perspectives, strategic objectives, metrics, deployment of metrics to the operational level and the cause and effect relationships among measures and strategic objectives. At this stage, a visibility board should be designed. This first version should then be presented to the top management and managers of the organization's key areas in a workshop so that improvements can be discussed;
- Step 4: reformulate the PMS according to the suggestions given during the workshop. An additional workshop should be scheduled. Steps 3 and 4 need to be iteratively carried out till agreement is reached on the structure of the PMS. After that, an implementation plan should be written;
- Step 5: execute the deployment plan and define policies for a periodic system's update and maintenance.

4. Software development

In this section we describe the software program that was developed in such a way that it is compatible with the PMS resulted from the method proposed in Section 3. In this sense, we defined the following requirements to guide us during the software development:

- *Requirement 1:* The software program should organize strategic objectives according to the KPAs identified. Performance measures and improvement actions should be associated with strategic objectives;

- *Requirement 2:* Drill-down functions are necessary to detail performance measures and improvement actions;
- *Requirement 3:* The software should provide a mechanism to demonstrate cause and effect relationships among measures and strategic objectives;
- *Requirement 4:* The software and its data should be accessible in every organization's computer terminal;
- *Requirement 5:* User accounts and passwords are required so that users can log onto the program. The user accounts should also restrict the data to which each user has access.

A clearer explanation of the first requirement is given in Figure 1, which shows how performance measures are organized. The application of the method from Section 3 should result in a set of KPAs (performance perspectives), strategic objective and performance measures. The performance perspectives are at the top of the hierarchy. A number of strategic objectives can be associated with a unique performance perspective (*1 to n* relationship). Again, a number of performance measures can be associated with each strategic objective so as to assess its level of achievement. However, the type of relationship for this case is *n to m*, which means that a performance measure can be associated with more than one strategic objective.

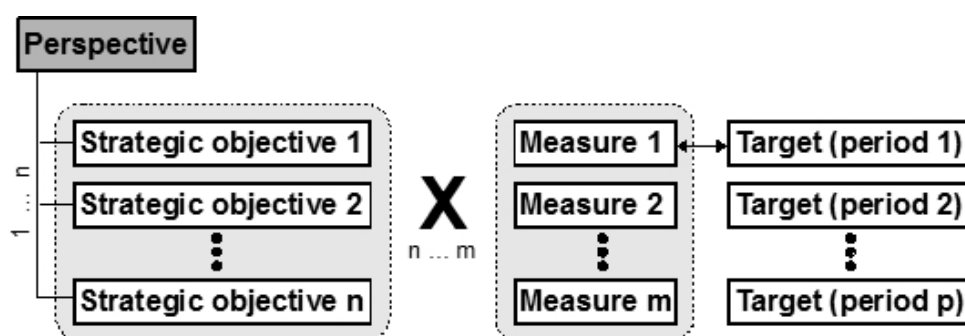


Figure 1 – Organization of performance measures

The requirements listed in this section were translated into usable software functions. The following subsections describe such functions, which are classified into four categories: configuration, performance measurement, improvement actions and reporting.

4.1 Configuration functions

After the PMS design, some PMS elements need to be configured into the software program. Hence, some functions were implemented so that the software administrator can customize the software with the KPAs, strategic objectives and performance measures identified during the design phase. Note that we used the term “perspective” in the software to refer to the KPAs. Next is a summary of the functions implemented for this purpose:

- *PMS elements*: this function determines the structure of performance perspectives, strategic objectives and performance measures according to the hierarchy determined during the design phase;
- *Targets*: this function allows the administrator to set targets for measures and determine the time span during which the targets will be valid;
- *User accounts*: this function manages user accounts. The administrator can configure the performance measures that should be visible to each user;
- *Cause and effect relationships*: a cause and effect diagram can be built through this function to show the relationships among measures;
- *Data importing/exporting*: the software has a default file format to import and export records from performance measures.

Note that these functions are accessible only to system administrators. We thus enforce that they should be carefully used, or else inconsistencies may occur in the database. After the first configuration, further changes must be planned and executed only by software administrators, who should keep track of the database versions.

4.2 Performance measurement functions

On their daily work, users have to either insert or view data about measures. In order to perform such actions, the following functions were developed:

- *Cockpit*: whenever a user logs onto the system, all measures related to his work are shown under the form of a cockpit with gauges and basic information. The user can drill down and check additional information about each measure, such as previous results, targets or associated performance perspectives;
- *Performance measurement tree*: by navigating this tree the user has quick access to all performance measures. They are organized according to the performance perspectives to which they belong. Colors are used to show whether a measure is below, within or above its target. If the user selects a measure from the tree, detailed information are shown in a similar way to that of the *Cockpit*;
- *Data insertion*: this form shows the user which performance measures need to be fed with data.

4.3 Improvement actions management

The software manages improvement actions as though they were projects with tasks, teams and deadlines. Every improvement action is associated with one strategic objective. The user should also point to which measures will indicate whether the action is successful or not. The following functions were implemented to manage improvement actions:

- *Improvement actions tree*: this navigation tree allows the user to have a general view of all the actions being executed and check their details, attributes and status;
- *Creation of new actions*: this function consists of a form through which new actions can be created. Here the user needs to inform the objective, method, expected results, final dates, associated measures and the people in charge of each task. The action's owner can also organize subtasks and delegate them to other users;
- *Discussion forum*: every action has a forum through which the people involved can exchange messages and share opinions, experiences and ideas with respect to the action.

4.4 Reporting

Users can generate customized reports on the following three elements:

- *Performance measures*: these reports show the results from one or more performance measures over a user-defined period of time. Data are shown in tables and graphs;
- *Improvement actions*: this report compiles all information about an improvement action into a report, including its planning, subtasks, status, events, etc;
- *Overall company's performance*: the objective of this report is to gather the latest results from all measures and organize them according to their perspectives and strategic objectives so as to provide the user with an overall understanding of the company's current performance.

5. Action research

The design method and the software were applied in a Brazilian SME through action research. One of the authors acted as the facilitator during the method application and software deployment. The company chosen for this application produces equipment for sugar and

alcohol plants. No formal PMS was in use by the time the company was chosen for this application. In this section we describe how the steps from the method and the software deployment turned out.

During the first step, the aim was to understand the company's business and formalize its strategic objectives. We used the BSC perspectives to stimulate the top management during the interviews. Managers from the main company areas (sales, quality, production planning and control, human resources, information systems, marketing, costs, finance, engineering, accountancy and purchasing) were also interviewed to get a better picture of how information and processes flowed. We highlight the participation of the information system manager, who had a holistic view of the company and sponsored the SMD design.

The second step was executed together with the first step to optimize the interviews, since the managers of all areas were supposed to be interviewed for the identification of existing performance measures. Although the company had no formal PMS, about 70 measures were found. Most of them were ad-hoc controls that were neither communicated nor resulted in improvement actions. Despite these shortcomings, the list of existing measures was useful to inspire the third step, in which the information gathered during steps 1 and 2 were compiled to set down the first version of the PMS. Table 1 shows the strategic objectives classified according to their performance perspectives.

Performance perspective	Strategic objective
<i>Financial</i>	<ul style="list-style-type: none"> • Increase return over employed capital • Reduce costs
<i>Customer</i>	<ul style="list-style-type: none"> • Increase company's perceived value
<i>Internal processes</i>	<ul style="list-style-type: none"> • Reduce waste of material and resources
<i>Learning and growth</i>	<ul style="list-style-type: none"> • Reduce employee absenteeism

Table1 – Strategic objectives extracted from Step 1

The list of performance measures was then compared with the strategic objectives to check which of them were related to the strategic objectives. The performance measures chosen were refined and standardized so that all of them had a formula, periodicity and a sector responsible. Table 2 shows the performance measures chosen for the first version of the PMS.

Measure	Description	Sector
<i>Monthly revenue</i>	Monitors monthly the company's revenue	Accountancy
<i>Profitability</i>	Measure based on the company's balance sheet. It represents the ration between the net income and total sales.	Accountancy
<i>Number of prospective buyers</i>	Number of prospects that got in touch with the company to question about products, prices, etc.	Sales
<i>Project financial result</i>	Difference between a project's total costs and its projected budget.	Costs
<i>Rework</i>	Percentage of hours spent on repairing itens or products in relation to the total number of worked hours.	Quality
<i>Absenteeism</i>	Percentage of hours lost due to employees's absence in comparison to the total working hours available	Human resources

Table 2 – Performance measures chosen for the first version of the PMS

The final activity during Step 3 was to determine the cause and effect relationships among measures and strategic objectives. This was facilitated due to the small number of measures selected for the PMS. Figure 2 shows the cause and effect diagram.

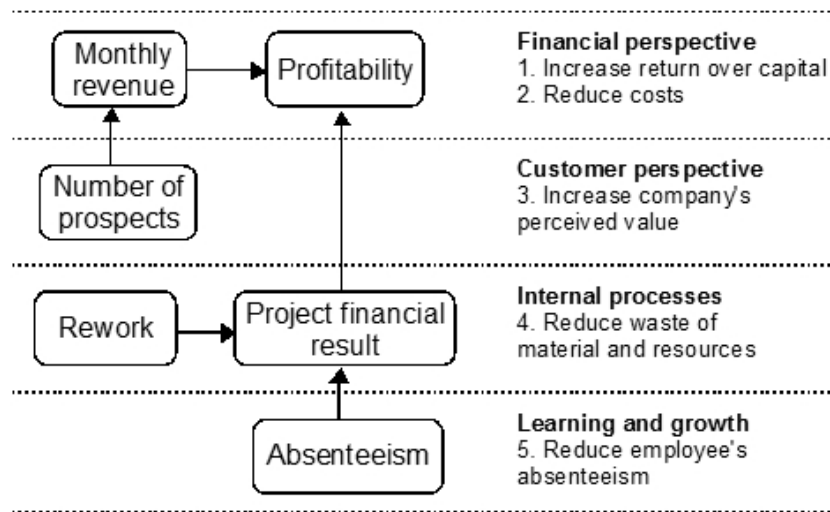


Figure 6: Cause and effect relations among measures

For the fourth step a workshop was scheduled to present the PMS to the people interviewed during its design and other potential users. No suggestions were made to change the PMS due to its simplicity. It thus received the company's approval and a schedule for the implementation of the PMS (Step 5) and the software was devised.

The software program described in Section 4 was installed onto the company's intranet server. It was then parameterized according to PMS designed and historical data could be imported into the database. Software users received special training on how to insert and query data, navigate the menus and generate reports. After the software was deployed, the facilitator continued providing assistance to the company for additional three months. The following subsections discuss the factors that affected the PMS implementation and software deployment, both positively and negatively.

5.1 Facilitating factors

Some factors influenced positively the design and implementation of the PMS. First, though the company did not have a formal PMS, it was eager to develop an information system through which they could establish performance measures and communicate targets. The

sector responsible for the organizational information systems fully supported the project and provided all the information required. Top management also supported the project, which opened the doors of all sectors so that they felt secure in providing data to the facilitator.

Because the company had never had a formal PMS, the facilitator chose to design a simple set of strategic objectives and a limited amount of measures. This is coherent with Hudson's et al. (2001) suggestion that PMS design in SMEs should be incremental. It is expected that the company learn from this initial experience so that future versions of the PMS become more advanced by covering more strategic objectives. Finally, the use of a facilitator during the design process was fundamental so that the method could be properly executed. It is doubtful whether the PMS could have been finished without the assistance from the facilitator.

5.2 Hindering factors

The PMS implementation was hindered by factors similar to those found in the literature. Interestingly some of the hindering factors are complementary to those that facilitated the implementation. For example, whilst the company recognized the need of a PMS, it had little knowledge about the subject. The consequence was that the people involved with the PMS project did not know what benefits they could expect from the PMS and neither the amount of effort that would be required to design it.

Top management faced difficulties while deciding on the KPAs and organizational strategic objectives. The performance perspectives from the BSC were thereby employed to inspire top management, which resulted in a trivial set of objectives. It indicates that the company had neither a strategic plan nor objectives on the short and long run. There was a lack of leadership from top managers. Although they provided data and approved the PMS designed,

they seemed not to perceive any benefits from using performance measures for decision making. This caused measures to be collected but no changes occurred in the way top managers made decisions. This may lead to a halt in the use of the PMS.

The lack of human resources was also found to be hindering the execution of the design method. Although the interviewees were willing to collaborate, it was often difficult to set up dates for meetings, which caused deadlines and milestones to be postponed.

The new PMS changed the way some measures were computed, which caused some resistance. As for the software, a major change was the way data from measures were communicated and stored. This also caused some resistance because before the software many of the performance measures were kept inside each sector and never got communicated. With the software, data would be available to the entire company, which caused fear in case negative results were inserted into the database. The accuracy of the data was also questionable, because many of the data sources were manual records written in electronic spreadsheets or even paper forms.

6. Conclusion

In this paper we dealt with performance measurement in SMEs, which is a topic that has been poorly addressed in the literature. We reviewed the literature on the topic to devise a design method tailored to the needs of smaller companies. Our intention was to come up with a method that was simple and incremental. A software program was developed to support the PMS designed with our method.

The design method and the software were applied in a Brazilian SME so as to evaluate its effectiveness in managing the company's performance. As a result of the application we could determine some factors that either facilitated or hindered the PMS implementation and the software deployment. Among the facilitating factors we highlight the incremental approach, the involvement of mid-level managers and the sponsorship provided by the information system manager, who had a comprehensive view of the entire organization. As for the hindering factors we pointed the lack of human resources and time for data collection, lack of leadership from the top management and the resistance for change showed by some sectors.

With this article we contribute to the field by providing more empirical evidences on the factors that influence PMS implementation in SMEs. We also contributed with a new method for PMS design and with a set of software requirements to computerize performance measurement. Further research must be conducted to identify more influencing factors and improve both the method and the software.

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