

EVALUATING PERFORMANCE MEASUREMENT SYSTEMS FOR CONSTRUCTION COMPANIES

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ABSTRACT: construction companies usually have difficulties in identifying and selecting adequate performance measures related to their strategies and critical processes. In general, they are aware of the importance of measurement systems for monitoring and controlling their performance, but these are seldom well established. This article aims to propose and discuss some evaluation criteria for performance measurement systems in construction companies. The proposed criteria have been divided into categories: (a) measure definition; (b) alignment of measures to strategies; (c) insertion of measures into the company routine; and (d) learning achievement through measurement. This study was based on five case studies carried out in medium and small sized companies from the Metropolitan Region of Porto Alegre in the South of Brazil.

Keywords – Performance measurement, firm strategies, process management, best practices

1. INTRODUCTION

Performance measurement is an essential element in the management of construction companies. It provides the necessary information for process control, and enables the establishment of challenging and feasible goals. It is also necessary to support the implementation of business strategies.

Despite the importance of performance measurement, it has not been widely implemented in the construction industry (Alarcón et al, 2001; Kagioglou, 2001). Construction companies in Brazil often find difficult to identify and select an adequate set of measures, considering their strategies, and critical process. Many managers still make decisions mostly based on their intuition and common sense, and on a few broad financial measures that are inadequate in today's competitive environment. This problem has also been observed in other sectors (Berliner and Brimson, 1988; Kaplan and Norton, 1992; Neely, 1999).

Several models have been proposed to support the development of performance measurement systems, focussing mostly on establishing a balance set of measures. For example, Lynch and Cross (1995) devised a pyramid of measures that integrates performance measurement throughout the hierarchy of the organisation. Kaplan and Norton (1992) proposed a well known performance measurement framework associated to four strategic perspectives, named Balanced Scorecard.

Those models are usually multi-dimensional, in the sense that they focus on a broad set of both financial and non-financial measures and are concerned with different managerial levels. They provide mechanisms to facilitate the alignment of performance indicators to both the company strategic objectives as well as to link them to key managerial processes. However, very little has been published on the effectiveness of such models. Besides, none of them consider the needs of project-based industries, such as the construction industry.

Some studies have been carried out in the construction industry aiming the identification of factors that influence the difficulties in the design and the implementation of performance measurement systems (Lantelme and Formoso, 2000). Frequently, companies choose indicators that are easy to collect or that provide results in short-term, resulting in

performance measure systems that do not support decision making related to the company strategies and to critical processes (Formoso and Lantelme (2000).

There has been some initiatives aiming to devise a performance measurement system for benchmarking and to allow performance comparison between companies, such as the KPI Working Group (2000) in the UK and the Corporación de Desarrollo Tecnológico (2002) in Chile. Both projects indicated that a major barrier to conceive performance measurement system in construction companies is the difficulty to establish and make explicit their competitive strategies, including strategic objectives and actions. The top managers of these companies often lack of organisational flexibility and culture that are necessary for strategic planning (Barros Neto, 2002). When these companies formulate their strategies, the responsibility is carried out by top managers, whereas this process, in general, is highly intuitive, non-analytical, informal and rarely explained to the other members of the firm (Barros Neto, 2002).

In Brazil, there is a growing concern with performance measurement in the construction industry, for several reasons: (a) many companies have been involved in the development of quality management systems based on quality award criteria or on the ISO9001: 2000 standard, due to demands from public and private clients; (b) traditional measures used in production management, such as productivity rates, do not provide the necessary support for decision making in the current business environment; and (c) companies need measures that can be used by the sector as a whole so that they can do benchmarking.

This article proposes some evaluation criteria for the conception, implementation and use of performance measurement systems in the construction industry. Such criteria are related to (a) measure definition; (b) alignment of measures to strategies; (c) insertion of measures into the company routine; and (d) learning achievement through measurement. These evaluation criteria emphasise the need to establish a link between performance measurement and the firm strategy, as well as to introduce measures into the management of critical processes.

This study was based on five case studies carried out in medium and small sized companies from the Metropolitan Region of Porto Alegre in the State of Rio Grande do Sul, Brazil. It identifies some best practices in the conception and implementation and potential improvement opportunities for construction companies.

This project is part of a long term research and development program, carried out at the Building Innovation Research Unit (NORIE) of the Federal University of Rio Grande do Sul, named SISIND (System of Quality and Productivity Indicators for the Construction Industry).

2. RESEARCH METHOD

Case study was the research strategy adopted in the study. Multi-case studies were developed aiming to investigate guidelines to the conception, implementation and use of performance measurement system in five construction companies in Brazil (Table 1). The selection of these companies was based on three requirements: (a) the company had a fairly good performance measurement system; (b) there were favourable conditions to make the company strategy explicit; or (c) the company was interested in participating in this research study.

Each case study was divided into two main phases: (a) the evaluation of the company existing performance measurement system, and (b) the proposal of improvements in the measurement system. The evaluation of the performance measurement system involved the discussion and formalisation of the company strategy, the identification of the performance measures used by the company and the critical analysis of the performance measurement system using a set of evaluation criteria, decomposed into constructs and variables.

The data was analysed in two stages. In the first one, each case was analysed independently (within-case analysis), seeking to describe what happened with each one and to organise the existing data. In the second stage, the case studies were compared (cross-case study analysis), aiming to identify similar and different patterns between them.

The main objective of the study was to propose guidelines for the conception, implementation and use of performance measurement system. However, the focus of this paper is limited to the discussion of the evaluation criteria proposed to carry out the critical analysis of performance measurement systems.

Table 1- Description of the companies involved in the case studies

Company	Main Activity	Main Characteristic	People involved in the study
A	Development and construction of low income house building projects, construction of commercial and industrial for private clients	Small company. All labour subcontracted. ISO 9002 certification. Performance measurement system started in 1997, related to the employee reward program and critical processes. There was a previously formalised strategic plan	Three top managers and a corporate strategy consultant
B	Development and construction of residential buildings for higher middle class in Porto Alegre	Small family company. All labour subcontracted. Participated in Quality Awards since 1996. Competitive strategy was previously formalised. Performance measures were linked to strategies.	The quality director
C	Development of residential building projects for higher middle class in Porto Alegre	Development of residential buildings for two years. No formal strategic plan. Performance measurement system had only financial and production control measures.	The company top manager
D	Development and construction of residential buildings for higher middle class in Porto Alegre	Small family company. Most labour subcontracted. ISO 9002 certification. Performance measurement system started in 2000, due to employee reward program.	Two top managers and the quality co-ordinator
E	Development and construction of commercial and industrial buildings for private clients	Medium sized company. All labour subcontracted. ISO 9002 certification. Performance measurement system started in 2000, strongly related to the production planning and control system. There was a formalised strategic plan.	The finance director, the quality co-ordinator, and a project manager

2.1 Constructs for evaluating performance measurement systems

Four constructs were established to undertake the critical analysis of the performance measurement system for each company. These are: (a) measure definition; (b) alignment of measures to strategies; (c) insertion of measures into the company routine; and (d) learning achievement through measurement. The constructs were decomposed into several variables in order to make it easy to measure them. The definition of each construct is depicted below.

Measures definition

The definition of a measure involves the establishment of data collection procedures, formulae, data source and frequency, and the definition of the people in charge of data collection and analysis. It must consider the aim of the measure and the need for information from the managerial team.

Sink and Tuttle (1993) proposed a method for developing performance measure systems which has two steps related to measure definition. In the first one the need for information is classified according to the type of organisational system, and the type of information required

by the managerial team is identified. The same authors emphasise that the information required is variable and depends on the processes that are being managed.

The second step involves the definition of the data required to produce the information identified in the previous stage. The focus is to establish the format regarding the data source, data collection procedure, methods for data storage and access. Sink and Tuttle (1993) consider that this is a difficult stage, because it is necessary to give enough attention to the accessibility, availability, quality and reliability of data.

Therefore, this construct aims to evaluate the measures regarding adequate data collection, processing and analysis, as well as the consistency between the objective of the measure and the information provided. It also evaluates whether the measure is easy to collect and understand, and if the team responsible for data collection, processing and analysis is clearly defined.

Alignment of measures to strategies

The alignment of measures to the company strategies has been pointed out in the literature as a key point in the development, implementation and use of performance measurement systems.

According to Sink and Tuttle (1993) and Schiemann and Lingle (1999), the development of a measurement system linked to the company targets, objectives and strategies make those involved in the implementation of the strategies to reflect about cause-effect and cost-benefit relationships, and to be able to assess the implications of those strategies are suitable. Besides, the measures also provide information that can be used to evaluate the position of the company in relation to its internal and external environment (CDT, 2002).

Maskell (1991) points out that a company must initially choose a small set of key measures for monitoring the business progress. For that author, too many measures may cause confusion and misunderstanding on the understanding that people have on the company strategy. Due to the competitive environment in which most companies operate, it is necessary to consider that process changes tend to be frequent and continuous improvement must be encouraged. Maskell (1991) also suggests that each measure must have feasible and challenging goals.

The findings of Sink and Tuttle (1993), Kaplan and Norton (1992) and Neely (1999) indicate that the selection of measures aligned to the company strategies is an effective way to ensure that the chosen measures are the most appropriate. However, it is necessary to establish dynamic measurement approaches that involve proactive measures in relation to changes in the business environment.

Therefore, this construct aims to evaluate whether the performance measurement system is aligned to the business process and strategies and being used to support strategic decision making. It also evaluates if information is being used to monitor key process, and to establish targets for measures in order to use them for benchmarking.

Insertion of measures into company routine

The insertion of measures into company routine is strongly concerned with the implementation and use of the performance measurement systems.

According to Lantelme and Formoso (2000), one of the barriers for the use of a measure is the long period of time between data collection and analysis, because when the data returns to the people involved in the process, it is only historical data and as a consequence, the opportunity to tackle the problem is lost. In this sense, it is important to make an effort in terms of fast data processing and evaluation, information dissemination, and involving people in decision making.

The centralisation of the measurement process also makes the insertion of measures into company routine and the participation of people involved in the process difficult. Grief (1991) suggests that, if possible, data processing should be decentralized and close to the working place, in order to improve the visibility of measures and to allow that these are analysed by their users. The same author also suggests that the information should be clearly presented, for instance by using patterns, colors, graphs, and symbols, so that communication is facilitated.

For Schiemann and Lingle (1999), the managerial attitude is the most complex barrier to the implementation of performance measurement systems because it is related to the way that managers perceive the problem, captures, analyses and shares information, involving issues such as leadership and decision making. For those authors, the effectiveness of performance measurement depends on procedures for sharing information and empowering people in decision-making.

Olve et al. (1999) argue that it is necessary to involve all levels of the organization in performance measurement, since the participation of people directly involved in the process makes it possible to discuss and reflect on the influence and contribution of daily operations to the achievement of the company strategic objectives.

Based on these issues, this construct is concerned with whether the performance measurement system is inserted into the organisational routine. It evaluates: (a) the decentralisation of collection, processing and data analysis, (b) the use of measures for decision-making at the middle and lower managerial levels, (c) the analysis of measure cost-benefit, and, finally, (d) the effectiveness of communication and dissemination of results.

Learning achievement through measures

This construct is related to the improvement achieved by the company with the support of the performance measurement system.

Manoochehri (1999) and Schiemann and Lingle (1999) pointed out that a performance measurement system will only be fully implemented if the measures are relevant for the users, and if these are able understand and interpret the meaning of the information. In traditional companies, the role of performance measures is limited to monitor performance. By contrast, in more advanced companies, the aim of a performance measurement system is to align strategies and behaviour, and the integration of the company performance to self-evaluation mechanisms. According to Bourne et al. (2000; 2002), the effective use of measures depends on whether people develop a critical sense and learning on the potential of the information provided by measures in decision-making. In this sense, Lantelme and Formoso (2000) suggests that performance measurement must assume new roles in the companies, not only related to monitoring and control, but also as a facilitator in communication and organisation learning.

Therefore, this construct aims to assess whether the company has been using the measures to identify improvement opportunities. It evaluates if the company inserts the indicators in the organisation routine and if regular improvements are proposed for the performance measurement system. Finally, this construct also evaluates if the measures have an important role in the company's learning process, and if these direct people towards reflecting on the results.

3. EVALUATION OF THE PERFORMANCE MEASUREMENT SYSTEM IN CONSTRUCTION COMPANIES

The table 2 presents a general analysis of the performance measurement systems from companies A, B, C and E, based on the constructs and variables proposed in the research method. This analysis was not carried out in company D, because its performance measurement system was not sufficiently structured for it.

Table 2 – Analysis of companies’ performance measurement system

Constructs	Variable	High Satisfaction	Regular	Low Satisfaction
Measure definition	Adequate procedure for data collection, processing and analysis.	A, B, C, E		
	Consistency between the objective of the indicator and the information provided.	C, E	A, B	
	Easy data collection and understanding.	A, B, C	E	
	Definition of the team responsible for data collection, processing and analysis.	B, C		A, E
Alignment of measures to strategies	Use of measures to monitor and control the critical process.	A, C, E	B	
	Use of measures in strategic decision making.	C	A	E
	Establishment of targets for measures.	B	A,C, E	
	Use of measures for benchmarking.	B		A, C, E
Insertion of measures into company routine	Decentralisation of collection, processing and data analysis.	C	A, E	B
	Use of measures for middle and low managerial level decision making.		A, B, C, E	
	Measure cost-effectiveness	C	B, E	A
	Effective communication and dissemination of results.	C	A, B	E
Learning achievement through measures	Improvement in the process through the use of indicators.	A, E, B	C	
	Regular improvement of the measurement system.	A, B, C, E		
	Reflection about results.	A	B, C, E	

The main problems found in the four companies were: (a) lack of definition of the team responsible for data collection, processing and analysis; (b) little use of measures in strategic decision making; (c) lack of use of measures for benchmarking; (d) centralisation of data collection, processing and analysis; (e) lack of measure cost-effectiveness analysis; and (f) ineffective communication and dissemination of results. These problems are discussed below.

Some companies had too many measures, most of them related to supporting rather than critical processes. For example, company B had several human resource management and social accountability measures, mainly due to the demands of its Quality Programs rather than because those measures were related to their critical process. Some human resource management measures, such as labour turn-over, accident rate are much simpler to collect than, for instance, design and production measures. For that reason they tend to be popular among construction companies (Formoso and Lantelme, 2000).

However, if the number of measures is too large, it may be difficult for the company staff to understand what should be the priority. This also wastes company resources in data collection and processing. According to Schiemann and Lingle (1999), the number of metrics

is less important than the process used to produce them and the focus must be on linking measures to strategic capabilities, market place needs, and customer expectations.

In both companies A and D, the development of an employee reward program had a positive effect in the performance measurement system. This type of program demands the measures that are the basis for rewards to be linked to strategies and key processes. It also tends to favour the decentralisation of data collection and processing, since the company staffs becomes more interested in monitoring and improving performance.

In general, the development of quality management systems has also encouraged the companies to develop performance measurement systems - this is a major requirement in the ISO9001:2000 standard and also in several quality awards. The company should not only have their performance measures but also be able to compare them to other companies.

Regarding the alignment of measures to strategies, three of the companies had a formalised strategic plan. Both companies A and B had systematically evaluated whether their strategies have worked by comparing measures to the established targets. By contrast, company E had formalised its strategy, but the measures were not clearly aligned to the strategies. For that reason, the existing measures did not support strategic decision making. This problem was observed in companies C and D, which had only an implicit strategy.

The lack of alignment of measures to strategies is bound to happen in most companies from the construction sector, since most of them has difficulties in clearly stating their strategic objectives. According to Barros Neto (2002), a major cause for this problem is the fact that construction managers have not been properly trained for strategic thinking.

As far as the insertion of measures into the company routine is concerned, the existing performance measurement systems had several drawbacks. There were several measures that did not provide the necessary information for decision making about the critical processes. Another problem is that information was not available when it was needed. Therefore, the inadequate design of the measures is one of the main problems identified in the studies.

Another problem was the very modest use of information technology in data collection and processing. Only company D used information technology to automate most of the work involved in data collection and processing. However, there were several independent information systems - for instance, production planning and control, financial control, and customer servicing - that were not integrated.

Despite the lack of alignment of measures to strategies and the limited use of such measures to support decision making, all companies have recently attempted to assess whether the measures meet the needs of their users. Besides this, they have changed or incorporated new indicators to improve the quality of information provided. In fact, it is necessary to increase the effort related to data analysis and dissemination, in order to support managers' decision making.

Some of the difficulties in the implementation of performance measurement were related to the fact that construction is a project-oriented industry. Although there may be several repetitive processes from one project to another, each project is unique in terms of design, site conditions, organisation structure, and supply chain. For this reason, some additional problems exist:

- (a) establishing a project performance measurement system and incorporating the measures into the company routine require a fairly intense effort. If the company is involved in wide range of different project types, it is likely that a different performance indicator system has to be designed at the beginning of each project;
- (b) the responsibilities for data collection, processing and analysis must also be well defined at the beginning of the project;
- (c) each project usually has a different managerial team and the use of measures will depend on the capacity and involvement of each manager;

- (d) due to the large number of stakeholders and components, some of them with a diverse level of quality, it is difficult to use the same measures, specially the ones related to quality.

5. CONCLUSIONS

This article presents a contribution to the conception, implementation and use of performance measurement system in construction companies, emphasising the alignment of measures to the company's strategies and the insertion of measurement into the management of critical process.

The main contribution of this study is the establishment of the constructs and the variables that allow the evaluation of performance measurement systems as a whole (measure definition; alignment of measures to strategies; insertion of measures into the company routine; and learning achievement through measurement). The definition of a set of requirements made it possible to identify best practices and improvement opportunities for each measurement system, besides allowing the comparison between companies.

The current stage of performance measurement observed in the case studies indicate that, despite the existence of measurement systems and the interest of their managers, these are ineffective to a great extent. First of all, top managers do not have a clear understanding of the real meaning and the objective of establishing the company strategy. This has contributed to the selection of inappropriate measures, most of them not linked to the existing strategies.

Another problem is concerned with the fact that data is often collected but these are not properly analysed and, consequently, have not been used to support decision making for managers. In fact, the importance of data analysis is not clear for the companies. One of the main difficulties for managers is to define the information flow for performance measurement clearly, including the responsibilities for data collection, processing and analysis.

Therefore, it may be suggested for further research to investigate how to use the information related to performance measurement and strategies to create knowledge for the company and to facilitate strategic decision making, and, as a consequence, to ensure that the strategies and indicators selected have meaning for people involved and add value to the company.

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