Performance Indicators of the Companies Quality Management Systems with ISO 9001 Certification

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Abstract

The performance measurement has been identified as a key issue for quality management. However, despite the need of controlling and monitoring the processes of quality management systems in order to attend the normative requirements of certification, the use of indicators is not carried through systematically in most construction companies. This article aims to present the results of a research that has investigated how the construction companies are measuring their performance and what is the development stage of the indicators system used by them. The study was conducted with 20 certified companies in the Brazilian state Pernambuco, from which it was possible to identify the processes belonging to the quality management system and the goals, targets and indicators that support the activities developed by the companies. The research also identified a set of 173 indicators divided into 10 different processes. Other important establishments of the research are associated to monitoring indicators by the company's direction, the dissemination of results and the use of indicators. There are still a series of problems involving the process of performance measurement, particularly regarding the definition of indicators and establishment of appropriate targets for them.

Keywords: performance measurement, indicators, quality management system

1. Introduction

The civil construction industry faces a period of changes. According to Lordsleem Jr, Franco and Bezerra (2007), there are new forms of organization and performance in the industry, strongly marked by the increase of market share, geographical expansion and diversification through partnerships, joint ventures, perspectives of public investments in habitation, increase in home loans by banks and entrance of foreign capital.

In face of this scene, the companies aim to improve their processes and products as a competitive differential. As consequence, it is noticed a greater interest in monitoring the performance of construction firms through the implementation of indicators systems, both by the many participant agents of the enterprise, but also by other stakeholders.

There is also an important movement in countries around the world for the accomplishment of initiatives in order to compare the performance between companies for the implementation of benchmarking. The process of benchmarking is identified as a mechanism that aims support the implementation of the performance measurement, allowing the evaluation of the company's performance comparing to the standards achieved by others, and setting new challenges for continuous improvement. Moreover, the indicators directed toward benchmarking make possible the generation of values of reference for the sector (COSTA et al., 2005)

Given the above, this article aims to describe the research carried out through the data collection from a total of 20 (twenty) construction firms with the certification standards NBR ISO 9001:2000 and Conformity Assessment System of Civil Construction Services and Works (SiAC) of the Brazilian Program for Quality and Productivity in the Habitat - PBQP-H (level A), in the State of Pernambuco.

2. Theoretical review

The measurement of performance has been identified as a key issue for Quality Management. Several authors (LORDSLEEM JR., 2002; LANTELME; FORMOSO, 2003; SOUZA, 2005) emphasize the importance of measuring performance through indicators for achieving efficiency and effectiveness in the various processes that constitute the production system of the companies.

The interest for the implementation of systems of measurement in the civil construction was intensified with the quality programs based on the requirements of the ISO 9000 standards, as well as the Brazilian Program of Quality and Productivity in the Habitat (PBQP-H). Particularly, the goals of quality measured and quantified through indicators, allow to express the evolution of a process, product or business of the company, being basic for monitoring the Quality Management System - QMS and, consequently, for the progress of the company.

Souza et al. (2005) defines indicators as quantitative expressions that represent specific information, from the measurement and evaluation of a production structure, it processes and/or the resultant

products.

A system of indicators can provide a view of the current performance of a company; for that it must show its strengths or weaknesses, or call the attention for its shortcomings. This type of evaluation allows establishing priorities, indicating which sectors of the organization are more important to undergo interventions (Cavalcanti, 2004).

The indicators need to have credibility, to be well defined, properly disseminated and systematically analyzed so that can be accepted and become valuable subsidies for decision making. They must be established in order to measure not only specific stages of a process, but also to evaluate the overall company performance.

According Lantelme and Formoso (2003), the civil construction sector in Brazil, already recognizes the importance of implementing systems for measuring performance. However, the use of performance indicators in the construction business has been limited due to many factors, such as: difficulty in establishing and clarifying goals, use of inappropriate measures, and degree of commitment of the company to improve the quality, among others.

3. Research methodology

The research methodology used for the achievement of this research was divided into 03 distinct stages, which is:

- development of operational element (questionnaire) for the identification of performance indicators and the methodology of data collection inserted in the quality management systems of the certified construction companies;

- accomplishment of research with the application of the questionnaire developed in 20 construction companies;

- analysis of the gotten results and assessment of existing indicators.

For the initial development of the research, it was carried out to select bibliography of reference for the necessary theoretical concepts to the subject.

4. Data analysis and interpretation

The study involved an investigation using data collection from a total of 20 (twenty) construction firms certified under the standards ISO 9001:2000 and Conformity Assessment System of Civil Construction Services and Works (SiAC) of the Brazilian Program for Quality and Productivity in the Habitat - PBQP-H (level A), in the State of Pernambuco.

The analysis of the collected data was sub-divided into three different stages:

1 – Analysis of Quality Management System (QMS) processes;

2 – Indicator management;

3 – Objectives, indicators and goals of the Quality Management System.

The requirements were to complete a questionnaire for data collection; a macro-flow of the companies' processes; the matrix worksheet of indicators, objectives and goals, and some results from measuring the indicators.

The specific analysis of the indicators was undertaken based on the provision of such information. It should be stressed that the majority of the firms did not have all the data necessary for the detailed study of the indicators, and five firms - corresponding to 25% of the sample studied - had no data at all.

The construction firms participating in the study operate in the construction and incorporation of buildings; 100% are certified under the ISO 9001:2000 standard; while 90% have the PBQP-H certification awarded by SiAC. The companies without the SiAC certification did not renew their PBQP-H certification, the earlier version of which was called SiQ-C.

4.1 Quality management system processes

Table 1 lists what are considered to be the main processes in the macro-flows comprising the QMS of construction firms participating in the research.

Table 1: Processes identified in macro-flows of companies

Processes	Indicators by process
Commercial	38
Human resources	9
Production plan	9
Design	6
Supplies	13
Management	4
Finance	8
Works	62
Technical assistance	19
Training	5

In general it was possible to identify 173 indicators, stressing the quantity of 62 indicators relating to the works process and 38 indicators to the commercial process, the processes being most considered as indicators.

It was also possible to ascertain from the results of the study that two firms had indicators for the safety and environment management process included in the performance measurement system of the quality management system.

This aspect demonstrates, albeit incipiently, the concern of these firms to use the methodology adopted in the QMS for collecting indicator data for overall business management.

Among the companies studied, 20% said that they had unidentified processes in their macro-flows. These processes are shown in Table 2, stressing that all processes unidentified in the macro-flows are considered by the companies as support processes, and only four are monitored using performance indicators.

Table 2: Processes unidentified in macro-flows of companies

Unidentified process in the macro-flows	*Process monitored by performance indicators*	
	Yes	*No*
Supplies	X	
Training	X	
Management/Finance		X
Control of quality documents, data and records		X
Finance	X	
Internal audit		X
Treasury		X
Accounting		X
Reforms	X	

Some processes in Table 2 had already been listed by other companies, as shown in Table 01, as follows: supplies, training and finance.

The following justifications were listed by the companies for not including them in these processes identified in the macro-flow of their QMS:

- the processes only attend to the main processes indicated in the macro-flow;

- the processes were associated with all other processes;

- the processes were not processes directly linked to quality.

In the general analysis about processes of the quality management system, it is worth mentioning: the high quantity of indicators for monitoring some processes (works and commercial) in detriment to other processes (namely, the design process); the difficulty of companies to rate the process as a main or support process, and the existence of indicators for processes considered by the companies as support.

4.2 Management of quality management system indicators

4.2.1 Follow-up of indicators by company administration

Concerning the administration's follow-up of the results of the indicators, 55% of the firms participating in the survey stated that all indicators are periodically accompanied by the administration. However, 20% of the firms mentioned that only some indicators are accompanied by the management.

Figure 1 shows the percentage of follow-up frequency of indicators by the administration of the companies.
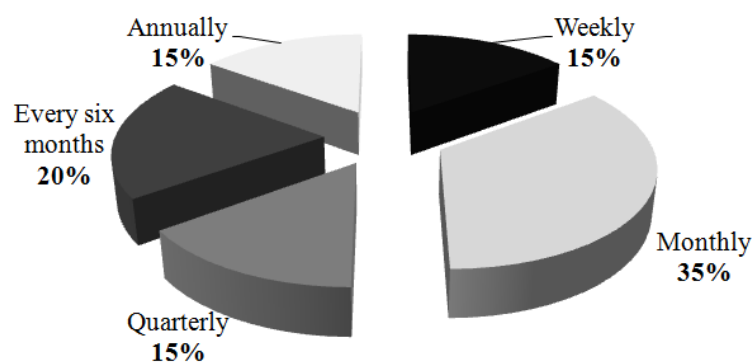

Figure 1: Follow-up frequency of indicators by company administration

The results in Figure 1 demonstrate that the hierarchy of following up the indicators by the company administration is as follows: every month, every six months and weekly/quarterly/annually.

4.2.2 Disseminating the construction firm results

The main forms of disseminating indicator results by the companies to the collaborators of each process are listed below:

- monthly meetings with office employees and onsite administration team;

- e-mailing monthly reports, when in the office, and onsite by fixing them to a wall panel for the indicators;

- e-mailing the results;

- weekly issue of report to each collaborator;

- use of the quality wall panel;

- networking availability (intranet);

- holding weekly and/or monthly meetings.

The above indicated alternatives reveal which media are mainly used by the companies for internal communication of the indicators.

In general, it is apparent that the companies are concerned with disseminating the indicator results, making them more accessible to the collaborators.

4.2.3 Use of indicators by construction firms

The study with regard to the use of performance indicators by the companies showed that 15% of them already use indicators even before adopting a Quality Management System. The absolute majority of the firms, that is, 75%, only began using indicators after adopting the QMS.

In terms of comparing the results, Figure 2 shows the percentage values of the alternatives relating to the comparative analysis of the indicators by the companies.
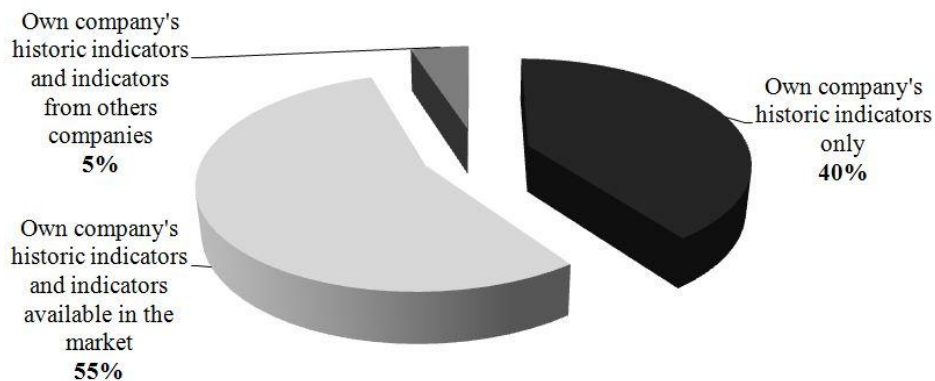

Figure 2: Comparative analysis of indicators by companies

The graph in Figure 2 shows that most companies (55%) compared the results of their indicators with their own company's historic indicators and indicators available in the market, while 40% of the companies compared them only with the results existing in their own company.

4.2.4 Decisions based on indicators

The company administrations took the following decisions as a result of monitoring the results obtained using the indicators:

- change in procedures in order to reduce waste;

- technical staff enhancement;

- periodical monitoring of appropriations;

- need to create new indicators and change in collection methodology of existing indicators;

- marketing actions based on the result of the Sales Velocity Indicator (SVI);

- alteration in designs to make improvements;

- change suppliers.

The decisions relate to the different processes identified in the firms' macro-flow. It should be pointed out that the decisions were taken within a context experienced by the construction firm at a certain time, and this must be understood in order to be adopted as a benchmark for other companies.

As a general analysis on the management of indicators of the companies' quality management system, emphasis is given to analyzing the compatibility of the indicator's speed of response with the decision taken by the administration, the relevance of the indicators to the administration, and even the need for monitoring them by the companies.

4.2.5 Objectives, indicators and goals by processes of quality management system

From data provided by the companies participating in the study, the results relating to the objectives, indicators and goals were organized by processes in order to synthesize the collected information. It should be mentioned that the data was provided by a group of 15 out of the 20 companies participating in the survey.

We found that some companies do not define their indicators by process. Therefore, it was necessary to undertake a specific analysis of each macro-flow provided in order to properly fit these indicators to one of the processes relating to the quality management systems of the companies.

A total of 173 indicators in 10 different processes were identified, and the structured collected data structured closely to those provided by the participating construction firms.

Chart 01 shows some objectives, goals and indicators of the works process, organized and set out for easier analysis of the indicators.

Chart 1: Objectives, goals and indicators of the works process

Nº	Objective	Indicator	Goal
1	*To reduce future problems with technical assistance*	*Final works inspection*	*Seven (7) defective items per unit in inspection period*
2	*To reduce waste in the works and increase productivity*	*Checking sub-floor thickness*	*To reach average thickness of 3 cm*
3	*To reduce waste in works and increased productivity*	*Checking thickness of external coating in a single mass*	*To reach average thickness of 4 cm*
4	*To minimize mortar consumption per m² and check brick consumption per m²*	*Checking bricklaying services*	*Mortar consumption (to reach 12 kg/m²); brick consumption (to reach 25 bricks per m²)*
5	*To create a better working environment*	*Employee satisfaction level*	*To achieve an internal satisfaction rate of 80%*
6	*To add new technology*	*Number of new technologies*	*≥ 1 per year*
7	*To reduce ratio between number of errors found and number of items inspected in checking services of those performed by bricklayers*	*(Number of items rejected/ number of items inspected) * 100*	*To achieve a 10% ratio or less*
8	*To reduce waste of structural concrete*	*Total volume used in paving/total volume calculated in blueprint*	*To reduce by half waste of structural concrete in works in the past*

Chart 1 presents a sample of eight indicators identified in this work. It was possible to observe some aspects:

- some indicators do not meet the goals they were set, as is the case for indicators 2 and 3, which aims to reduce waste in the construction and increase productivity. Both the indicator and the target were defined only for measuring the thickness, so not measuring productivity;

- in some cases, the targets presented are broad, or even defined. This is the case of indicator 7 presented in Chart 1, which aims to monitor the productivity of services through the RUP - Unitary Reason of Production, however without a goal set.

Chart 2: Objectives, goals and indicators of the Supplies process

Nº	Objective	Indicator	Goal
1	Control number of non-conformities found in materials per month	Analysis of non-conformities verified in the Materials received form	Keep directors informed monthly
2	Getting a better qualification of suppliers	Suppliers Evaluation	Only 5% of the suppliers evaluation considered unsatisfactory
3	Reduce the amount of purchased materials	[(R$ total budgeted - R$ total purchased)x100]/Total budgeted	Reduce 5%
4	Deadlines purchase	Check the time table supply	No delay
5	Control the number of equipment repaired in the month	-	Keep directors informed monthly
6	-	Number of requests out of date / number of requests in the month	Request for 95% of the materials within the time limits

Chart 2 presents some goals, indicators and targets of the suppliers process. Some flaws in the measuring performance systems could be also identified, for example:

- there is no target set appropriately for the indicator 1, which aims to control the number of non-conformities found in materials in a month;

- there is also an inadequate characterization of some indicators, including the failure to define it (goal 5 of Chart 2);

- indicators defined without a specific goal, such as the indicator 6 (number of requests out of date / number of requests in the month).

In the same way, it was ordered and subsequently analyzed all 173 indicators divided in the ten process identified by the survey. Chart 1 and 2 show a small sample of all indicators examined, depicting important aspects identified in the whole sample of indicators.

It is important to note that the full details of this survey will be available in the document being edited by the Union of Construction Industry in the State of Pernambuco (Sinduscon / PE).

5. Conclusion

The article herein shows the results of the survey designed to discover how civil construction firms are measuring their performance. From this study it was possible to collect and process key data

relating to the performance indicators used by certified construction firms in the State of Pernambuco.

From the detailed analysis of the collected indicators, it was possible to ascertain that most companies in the study are concerned to establish indicators for each process relating to their quality management systems. We also found that there was an initiative, albeit by the minority of the companies under study, to use indicators defined in specific bibliographies and reference values for comparing performance.

Some problems were found in the performance measurement systems analyzed, such as, for example, problems in aligning indicators with their objectives and fitting them properly in their processes.

One of the main failures in the indicator systems under analysis concerns the inadequate characterization of the indicator itself. In many cases, not only was there a lack of definition in periodicity for collection but also of clear goals.

The following aspects were found in an overall analysis relating to the collected indicators:

- the existence of similar indicators included in different processes. On the other hand, there are also similar objectives, but with different indicators;

- it is necessary to analyze the suitability of some indicators to the objectives, since they did not reflect the set purpose;

- some very open goals which need to be more clearly demarcated.

Lastly, it is worth mentioning that the research was able to collect, process and organize key data relating to the indicators used by certified construction firms in the State of Pernambuco. After being analyzed and properly used, the result will be a modification (quantitative or qualitative) in the understanding of the information system of the companies.

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