

Process performance indicators in project pre-design stage



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KEYWORDS:

Performance measurements, performance indicators, stakeholders' requirements, communication

ABSTRACT

Traditionally performance in construction is measured based on the “iron-triangle”- time, cost and quality. In recent years indicators have been developed to include the measurements of other aspects of project performance. The main shortcoming of these however is that most of them are lagging indicators and hence are of little use for controlling the performance during the projects. This paper reviews the existing key performance indicators, their types, use and shortcomings. The paper describes a proposed conceptual framework for developing performance indicators for the pre-design stage, of which the briefing process is an important part. In this framework a process mapping methodology is suggested to identify the main activities that take place in the pre-design phase, the dependencies between them and the stakeholders involved. Initial investigation of the proposed framework has shown that it is a viable model that has already helped in identifying the relevant processes of the pre-design phase and the related indicators.

INTRODUCTION

The construction industry is project-based, dynamic in nature and involves many participants and stakeholders. The concept of project success is not yet clearly defined in the construction industry. Project success is the ultimate goal for every project. However, it has different meanings for different people. While some consider time, cost and quality to be the predominant criteria, others suggest that success is more complex. The overall objective for all stakeholders is the same: they all want the project to succeed.

In many ways, performance measurement is ultimately aimed at improving performance and hence achieving success. In construction, attempts have been made over recent years in several countries to establish and measure construction management performance over a range of its activities to meet a set of improvement targets. The results of such attempts have produced a number of measures and indicators; see for examples KPI in the UK [KPI, 2000] and the construction performance measures developed by the CII in the United States [CII, 2000].

The aim of many of the developed indicators in different countries was to assess the overall project performance or to measure the performance of its main activities. However, most of those indicators are static in nature and are used to measure the performance after the work or the project is complete. Hence, they reflect a statement of the “post-event” without any opportunity to change the process while it is in progress. Many of indicators are also focused on product and not on the process. There are few existing indicators that inform stakeholders about how well their process is going during the various stages.

The work described here is part of a wider research project to develop performance indicators for the whole construction process. In this paper the work describes a proposed framework and a methodology for developing process performance indicators for the pre-design stage. The intention is not only to compare actual performance with target performance, but also to use the indicators to inform the management for the need for control during all stages of the phase including that of the briefing process.

PROJECT PERFORMANCE AND MEASUREMENT

Performance measurement process is an essential part of conducting and controlling projects. The process aims to establish goals and to provide a mechanism for controlling performance. Therefore it provides continuous improvement and prepares the ground for making decisions.

Performance indicators are some of the tools that have recently gained popularity in the field of performance measurement. They can be very diverse and include process or product related indicators, and can be either qualitative or quantitative. A performance indicator can be defined as 'a measure used to provide information about the performance of a process and the degree to which its objectives are achieved'. To be effective, performance indicators need to be valid, accurate as well as being relevant.

The concept of using indicators to assess performance originates from the theory of benchmarking used in many industries for improving business processes and products. The concept involves measuring one or more aspects of the business or part of it and comparing it with the best in its specific sector. The approach aims to continually improve the business activities and leads to the setting of higher targets. Benchmarking can be defined as a process of continuous improvement based on the comparison of organisation, processes or products with those identified as best practice. The best practice comparison is used as means of establishing achievable targets aimed at obtaining process or product improvement. Since most of indicators are based on the comparison of actual performance with targets or desired processes they therefore also provide a basis for project production and process control. There are many indicators that are proposed by other authors in previous studies for use in construction. Some of them are aimed at the industry while others are aimed at project or activity levels.

Different authors have classified performance indicators in different ways. Beatham [2004], for example, stated that performance measurements could be classified into the three groups, based on European Foundation of Quality Management (EFQM), as Key Performance Indicators, Key Performance Outcomes and Perception measures.

Robinson [2005] classified all performance measures as either financial which include turnover, return on capital and discounted cash flow or non-financial such as customer satisfaction, quality, environment and safety.

Costa & Formoso [2004] classified performance indicators as primary and secondary. Primary indicators include product client-satisfaction, service client satisfaction, construction cost, construction time, defects, predictability-cost, predictability-time, profitability; productivity and safety whilst secondary indicators are used for operational and diagnostic aspects of the project.

Other authors classify performance indicators as being "soft" and "hard". "Soft" measures include, for example, qualitative assessments whilst "Hard" measures include quantitative appraisal, see [Chan 2004] and [Beatham 2004].

Chan has also categorised indicators as objective and subjective. Often, the objective indicators are calculated, using mathematical formula. This group includes indicators such as construction time,

speed of construction and unit cost. The subjective indicators are normally based on personal judgment of the stakeholders involved in the construction process. Judgments about quality, functionality, stakeholders' satisfaction are examples of subjective measures [Chan 2004].

Other variations of indicators suggested by other authors include external, "iron-triangle" and psychosocial indicators [Bryde 2005]. External indicators focus on client perception. Psychosocial performance indicators are focused on team member and individual development, reward and recognition of project team from financial and non-financial aspects. "Iron-triangle" is related to the estimation of cost, quality and time. In fact many of the indicators developed in the past are based on this approach as can be seen from the various financial indicators developed by [CII 2000].

Ghalayini & Nobel [1996] distinguished between lagging and leading indicators. Lagging indicators are post-event oriented and self-evidently do not offer the opportunity to influence the construction process. Leading indicators are those, which measure the construction process during its execution and therefore allow the changes to be made during the process. Examples for the lagging indicators are almost all KPI, whereas for leading indicators all are perception measures, such as sickness, qualifications, training and team working.

In spite the aforementioned variations in the classification of indicators and their depictions of the various aspects of construction, many of them still have considerable shortcomings. These shortcomings include:

- they are static in their nature; most of them aim to measure the performance results after the project completion;
- most of them are product or production oriented and not process oriented;
- they are lagging type and hence are of little use for control;
- very few of them are useful for identifying communication problems between stakeholders during the process;
- they can be useful from the point of view of a particular stakeholder but of little use for measuring the overall project performance or those of other stakeholders.
- some indicators are purely theoretical and cannot be implemented in practice, and the required data for their measurement are not easy to collect;

In addition, many of the indicators developed so far are specific to their country of origin because of particular aspects of the construction industry, the economy and the business culture of the country. They have not gained universal acceptance, but they do appear to have had some success in improving the industry in their country of origin.

PROPOSED FRAMEWORK AND METHODOLOGY

The objective of this research is to develop indicators that are relevant for measuring the performance of the main activities and processes that take place within the pre-design stage. To achieve the objective of the research a research methodology has been adopted that consists of a number of steps that include: Dividing the pre-design phase into main sub-stages; Identifying the main activities with the sub-stages, their inputs, expected outputs and targets; Determining the stakeholders involved with each activity, their requirements and the way in which they communicate with each other and; Developing indicators that can be used to measure the performance of the activities involved.

Fig.1 depicts the framework adopted from Winch [2001] to facilitate this objective. The main sub-stages, which are considered as parts of the pre-design stage are: inception; feasibility and scheme design. The activities and processes within the sub-stages are identified and selected based on literature and experts' opinions. The targets and the main expected results of each activity are yet to be determined from interviews and questionnaires that will be conducted during the project. Based on information collected, the outcomes of the main activities and processes will be translated into indicators. The framework uses solid lines to represent the dependencies of the information and

processes between the activities and dotted lines to represent the communication lines between the stakeholders.

Initial investigation of the pre-design stage has shown that an important part of this phase in any construction process is the brief. Briefing is the process of defining and translating the client’s wishes into clear requirements. According to the RIBA plan of work, there are three main stages that can be recognized in the briefing process. The first stage of briefing represents an initial statement defining the client’s need for the project. The second stage is the strategic brief that follows the feasibility study stage. The final stage is when everything is summarized in the form of project brief at the end of the detailed proposal stage [RIBA 2000].

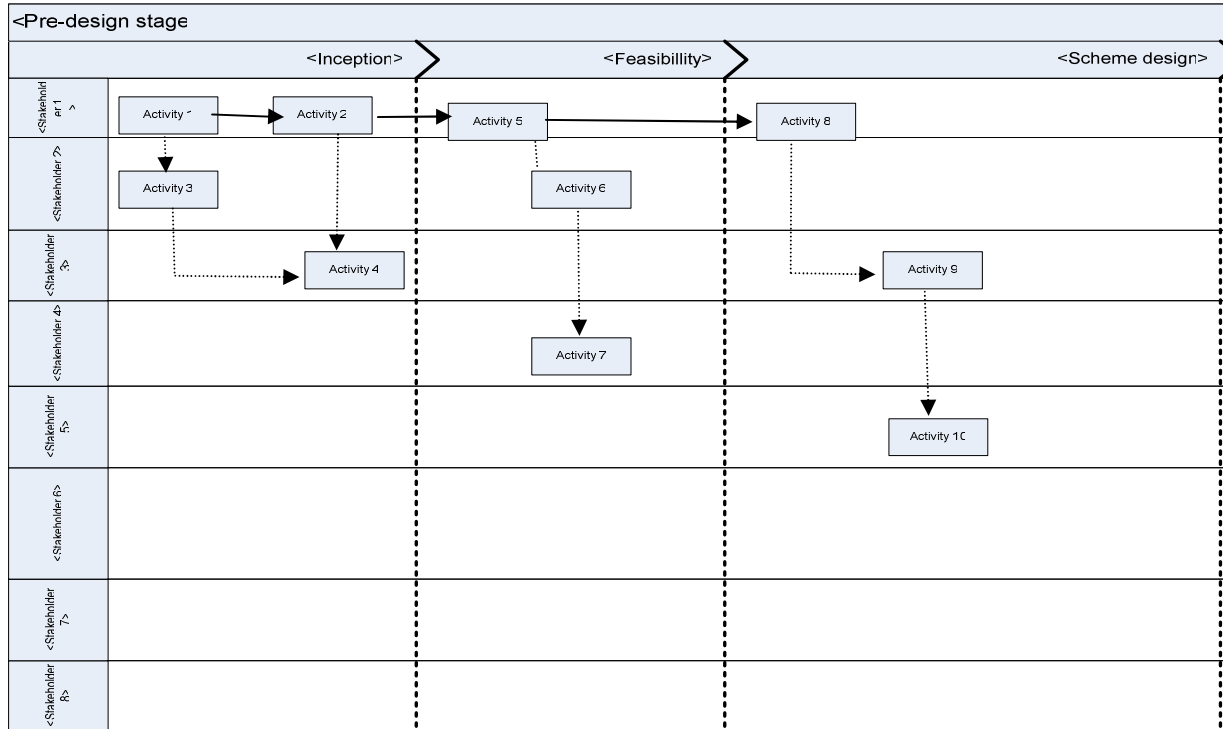


Fig.1 A conceptual framework for the pre-design phase

Barrett et al.[1999] have stated that an important problem of the briefing process in any project is that it can suffer from the subjective approach of the brief-taker. The brief-taker can include the information relevant for him in the project brief but skip the information important for other stakeholders. In this work it is assumed that the proposed framework will minimise this problem by providing clear assessment of the main activities and the stakeholders’ requirements relevant to these activities.

Another problem with the briefing process is that sometimes information collected and used in the brief has a contradictory character that increases time of selecting the “right” information. It is believed that the proposed framework will help to concentrate on the more relevant information and skip the irrelevant so that the time for the briefing process will be saved. Useful information will reduce uncertainty and will add value to the project [Browning, Deyst et al. 2002].

In construction there are usually many stakeholders involved in a project. These stakeholders are the parties which will gain direct benefits or suffer losses as a result of the project; see [Winch 2002]. There is also a basic assumption within construction project management that the client is capable of fully articulating the views of all of these stakeholders on the demand side. That is to say that the client has the capability to authoritatively brief the project team. Evidence however has shown that this

is often not the case and that, for example, the needs of a building's users are, in many cases, not fully understood or articulated by the client.

The identification of the main activities outputs proposed by the framework is aimed at creating a basis for measuring how the construction process is performing and to provide the information necessary for all the stakeholders involved in the process. The stakeholders will have the opportunity to follow and measure the progress of the process. As a result of this, it will improve their satisfaction of the project and increase the project's value.

The work carried out so far has shown that it is important that the stakeholders' objectives are aligned to achieve their own success and that of the overall project. Stakeholders' alignment is therefore one of the indicators that will be used to measure the alignment or lack of it in the pre-design phase of the construction process.

CONCLUSIONS

The paper has provided a review of the need for performance measurement in construction and the available tools. This review included descriptions of the many developments in the area of performance indicators reported by other authors, their types and use. The paper has shown that, despite of these developments, there are still many problems associated with the use of performance indicators and their suitability in construction.

The paper has described a proposed conceptual framework for developing the various indicators for the processes within pre-design stage. It has also outlined a methodology for achieving this objective. The work described in this paper is still in its early stage. However, the paper has demonstrated that the proposed conceptual framework is viable and that some indicators that are relevant for the pre-design phase have already been identified using this framework.

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