# PERFORMANCE MANAGEMENT IN CONSTRUCTION: A CONCEPTUAL FRAMEWORK

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#### Abstract

This paper presents a review of literature of performance management/measurement in various industries with the aim of transferring best practise into construction. A framework is presented which ensures that effective strategies are deployed to form the performance management system that construction organisations can adopt. The Process Performance conceptual Framework (PPF) adopts the balanced scorecard (BSC) with the addition of a number of elements/perspectives and it rationalises the relationships between performance measures and goals derived from strategy. In doing so, the impact of those measures to an organisation's performance can be examined and analysed to indicate potential improvement areas. The paper also identifies a number of areas that can be used to validate the PPF.

#### Introduction

Throughout the last two decades a number of industries, primarily manufacturing, have introduced new methods and techniques to shift traditional paradigms in order to improve their performance. This has led to the creation of new philosophies such as concurrent engineering/construction, lean production/construction and many others such as JIT, TQM, TPM etc. The main driver behind those philosophies is to optimise an organisation's performance both internally and externally within its respective marketplace. Inevitably, this has led to the 'rethinking' of performance management systems through effective performance measurement. Bititci *et al.* (1997) explain the distinction between performance management and measurement in that the first "... is seen as a closed loop control system which deploys policy and strategy, and obtains feedback from various levels in order to manage the performance of the system"

whereas the performance measurement system "... is the information system which is at the heart of the performance management process and it is of critical importance to the effective and efficient functioning of the performance management system." Therefore, performance measurement is the process of "... determining how successful organisations or individuals have been in attaining their objectives [and strategies]" (Evangelidis 1992). To achieve this, the outputs of organisational strategic and operational processes are measured, in a quantifiable form, to monitor the vital signs of an organisation (Hronec 1993; Euske 1984). The relationship between performance management and measurement can be seen in its wider context from a process view i.e. input-process-output, in fig.1.

Fig. 1

This paper examines the elements of the process as illustrated in fig.1 providing a critical review of the literature in order to develop the Performance Process conceptual Framework (PPF) for predominantly the construction industry.

#### **Background to performance measurement**

The importance of identifying an organisation's performance is evident throughout the world-wide markets, the results of which are to attract future investment, increase share value and attract high calibre employees. Therefore, it is important to consider how an organisation's performance is measured and how it can be communicated to the wider market i.e. how can it be understood and interpreted by the potential investors, employees and customers. The basis of formulating performance indicators that achieve the latter have been in operation as early as the beginning of our century (Chandler 1997). Those performance indicators have traditionally concentrated on finances e.g. return on investment, sales per employee, profit per unit production, which as Sanger (1998) suggests "...financial measures are useful - but they tend to measure the past - and they tend to measure the easily-measurable." The apparent inadequacy of financial measures for contemporary businesses has been identified by a number of authors, for example Johnson (1994), Crawford & Fox (1990), Hayes et al (1988), Johnson and Kaplan (1987) to mention but few. Neely (1999) identified that the reasons why these types of measures are criticised is because they:

- Encourage short-termism
- Lack strategic focus and fail to provide data on quality, responsiveness and flexibility
- Encourage local optimisation
- Do not encourage continuous improvement

The main reason for the above failings of financial measures is they are 'lagging metrics' (Ghalayini & Noble 1996) in that they report on results and decisions made in the past and therefore of little use in improving current performance. In effect, they are reporting on the organisation's past performance rather its current performance. A simplistic analogy to illustrate this point can be drawn from the field of sports, and in particular football, where knowing the result of a match offers you an indication of how the team performed but it does little to suggest future improvements, identify mistakes and wrong strategies, assess individual performance or identify weaknesses. In any case the match was either lost or won. Similarly, organisations that rely on

financial measures alone can identify their past performance but not what contributed to achieve that performance. Therefore, in addition to measuring 'what' the performance of an organisation was, the 'how' that performance was achieved should also be identified on an on-going basis. It is only by understanding how the organisation arrives to a particular performance, and designing metrics (leading as opposed to lagging) to measure the 'how' that an organisation might start to improve and increase market share. This has been the focus of research since the late 80's when increased globalised competition has forced companies to consider nontraditional measures (Ghalayini & Noble (1996) provide an interesting comparison of traditional and non-traditional measures). As a result of this a new field of study has emerged which aims to identify the right number and type of performance metrics, in an integrated, to the organisation, manner. One of the tools created to do that is the balanced scorecard.

#### **Balanced Scorecard**

The Balanced Scorecard (BSC) is a performance management system which incorporates four main measurement categories (perspectives) each of which with a wide range of potential sub-measures. It was devised by Harvard business school professor Robert Kaplan and Renaissance Solutions president David Norton. The difference with traditional approaches to performance measurement is that it includes a range of "leading and lagging" indicators - customer perspective, internal/business processes, learning and growth, and financial - to evaluate whether a business is moving toward its strategic goals (Gentia Software 1998 p5). Indeed, the BSC emphasises that on order to manage strategy an organisation must measure its performance through performance indicators after analysing its operations in an iterative way (Gaiss 1998). The BSC recognises that the financial measures are lagging indicators and therefore the result of the other three leading indicators. In other words the leading indicators deal with issues that will eventually impact on the financial performance, but crucially, before they have had time to have any effect. Therefore, failures or shortcomings can be seen and addressed before they impinge on the bottom line (Penn 1998). This is achieved by setting goals for each of the perspectives and develop respective measures or performance indicators as shown in Figure 2.

Figure 2

Since its original inception by Kaplan and Norton (1991) the BSC has received favourable support by academia and industry but also critised for over simplicity (Brignall 1992) and for not providing a complete performance measurement system (Sinclair & Zairi 1995a). Letza (1996) has identified a number of potential mistakes that can happen when implementing a BSC, like measuring the wrong things right; measure all the necessary activities rather than assume that some of them are unmeasurable or the people undertaking those activities are "too professional"; conflict between managers along functional lines. Also, a number of the strong points of the BSC include:

• It guards against sub-optimisation by forcing senior managers to consider all the important operational issues (Letza 1996)

- It communicates objectives and vision to the organisation (Roest 1997)
- If implemented properly then it focuses the organisation's efforts in a relatively small number of measures with relatively low costs

However, the authors suggest that there may be two omissions in the way the BSC is compiled and implemented within an organisation but more importantly when joined ventures between companies are in operation under a project environment. Firstly, the BSC does not make an attempt to identify the relationship between the measures developed for certain goals (see figure 2), assuming that all measures will *only* be specific to a particular goal. In fact, the reality is that the performance of internal and external business and operational processes will have an effect in the customer perspective and perhaps vice versa. Secondly, a large number of organisations and in particular within the construction industry, operate by undertaking projects with a number of collaborators and suppliers. For those companies the 'projects perspective' and the 'supplier perspective' may be explicit. Indeed, Letza (1996) has identified in three case studies that BSC is generic and that the perspectives might be different for different businesses. For example other perspectives might include competence, people etc. These two issues will be further discussed later on in the paper.

# **Performance Metrics**

An effective performance management system will greatly depend on the performance metrics used to define the performance of the organisation from a number of perspectives. It is very important to design those metrics as to relate directly to the various perspectives that an organisation decides to adopt. This relationship between the performance management system and the metrics used to measure performance is shown in figure 1, illustrating that an organisation cannot claim to have an effective performance management system if the metrics used do not relate to the strategic goals of the organisation. The design of performance metrics has been the subject of research for some time now and a number of interesting studies have illustrated the benefits and potential pitfalls of performance metrics. Letza (1996) among others stressed the dangers of measuring the 'wrong things right' when the sole purpose of an exercise is to design performance metrics, which might not necessarily relate to strategy. This can usually occur when a large number of performance metrics is present in an organisation where "everything is measured but little that matters." Ghalayini & Noble (1996) state that this is not only unnecessary but it is performed at a great expense to the organisation, in terms of the efforts made to capture and manage the necessary data.

Neely et al. (1997) have suggested that "the design of a performance measure is a process...[with] inputs ... and an output." In providing a structure to support this process they have suggested the 'performance measure record sheet.' The various elements of this sheet are based on research and a number of case studies, and they include the following (Neely et al 1997):

- Title
- Purpose
- Relates to
- Target
- Formula
- Frequency of measurement

- Frequency of review
- Who measures?
- Source of data
- Who owns the measure?
- What do they do?
- Who acts on the data?
- What do they do?
- Notes and comments

The performance measure record sheet offers a solid framework for designing performance measures, but it does not necessarily provide a framework by which performance measures can be evaluated to the extent to which they relate with strategy and with other performance measures. This issue will be considered later on in this paper.

#### Performance Measurement in the Construction Industry

The construction industry's core business is undertaking projects in generating new buildings or refurbishing existing ones for a variety of clients. Therefore, it is not a surprise to find that traditionally performance measurement in construction is approached in two ways:

- a) in relation to the product as a facility
- b) in relation to the creation of the product

In particular, the latter of the two has been the prime performance assessment (in terms of success or failure) of construction projects. Ward et al (1991) describe how when assessing the success/failure of construction projects "a common approach is to evaluate performance on the extent to which client objectives like cost, time and quality were achieved". Indeed, those are seen as the 'three traditional indicators of performance' (Mohsini & Davidson 1992) used in the UK construction industry. Although the 'three measures' provide an indication as to the success or failure of a project they do not, in isolation, provide a balanced view of the project's performance. Furthermore, their implementation in construction projects is usually apparent at the end of the project, and therefore they can be classified as 'lagging' rather than 'leading' indicators of performance. Ward et al (1991) also suggest that "Looking back on the conduct of a project, what sticks in the mind is often not so much financial success or early completion, but memories of other people involved and abiding impressions of harmony, goodwill and trust or, conversely, of arguments, distrust and conflict. The client's willingness to pursue a given procurement route to achieve a future project is likely to be strongly influenced by these factors." Therefore, it is clear to see that the traditional measures of the performance of construction projects are not enough to assess their 'true' performance. It can be argued that the methods used to measure performance in construction projects fall into the three main categories of the BSC:

- 1. Financial Perspective: how do the project's financial stakeholders view the project? For example cash flow forecasting and cost benefit analysis.
- 2. The Internal Business Process Perspective how are we performing in our key process activities? For example critical path analysis
- 3. The Customer Perspective how do our existing and potential customers see us? For example quality assurance.

However, during the 1990s there has been some interest in 'emerging' techniques and philosophies such as total quality management (TQM), benchmarking, business process re-engineering (BPR) and business process management that have shifted the focus from 'lagging' towards 'leading' indicators of performance. The majority of those concepts have been imported to construction from the manufacturing industry (see for example Koskela (1992), Mahamed (1995), Kagioglou et al (1998)). Furthermore, these measures have tended to concentrate on construction productivity and those factors that influence it (Motwani et al 1995), with the aim being to achieve continuous improvement. Therefore, the fourth perspective of the BSC was also introduced in the 'organisational learning.' This however can be problematic since the participants of construction projects are 'joined' temporarily until the completion of the project where the aim is to achieve consistency of application by the integration of 'traditional' and 'matured' practices.

Recently the UK best practice programme (cbpp) has launched the 'key performance indicators' (KPIs) for construction (bprc 1999). These KPIs give information on the range of performance being achieved on all construction activity and they comprise of:

- 1. Client satisfaction product
- 2. Client satisfaction service
- 3. Defects
- 4. Predictability cost
- 5. Predictability time
- 6. Profitability
- 7. Productivity
- 8. Safety
- 9. Construction cost
- 10. Construction time

These KPIs are intended for use as benchmarking indicators for the whole industry whereby an organisation can benchmark itself against the national performance of the industry and identify areas for improvement i.e. where they perform badly. It is clear to see that those measures are specific to projects and offer very little indication as to the performance of the organisations themselves from a business point of view apart perhaps from the 'customer perspective' of the BSC. A casual observation of the results of the above KPIs for the year of 1998 (cbpp 1999) can be used to raise a number of issues. The following are some examples:

- 1. The predictability of design and construction cost seems to be quite accurate since the means of the cumulative values represent zero and one percent respectively. However, the productivity value is very low. Does this mean that the predicted costs are over estimated to cover low productivity or the measures used to derive the figures are wrong?
- 2. The client satisfaction in terms of the product and service is quite high (eight out of ten) but the productivity is very low which raises the issue of: do the clients really know what the productivity levels of their projects are?

The above illustrate the importance of not only using the 'right measures' to measure the 'right things' but the relationship between the different measures is important and a source of identifying potential collective improvements. Another area that is generally poorly covered in the construction industry is the performance of the suppliers in projects. None of the measures mentioned in this section could identify the performance of suppliers in a project. For example if the construction cost in a project is lower than predicted does this means that the productivity was higher, there were less defects than 'expected' or were the suppliers able to reduce their costs? Furthermore, none of the measures deals successfully with the 'innovation and learning perspective' apart perhaps from the predictability indicators whose accuracy can illustrate some form of learning from previous projects.

#### The Performance Process Conceptual Framework

The previous sections of the paper have identified the various elements that one needs to consider when developing a performance management/measurement framework. This was achieved by looking at an appropriate framework such as the balanced score card and by identifying a number of limitations in its implementation. Furthermore, the state of performance measurement in the UK construction industry has been identified. This section introduces the Process Performance conceptual Framework (PPF) and it describes its various elements as illustrated in figure 3.

Figure 3

The main aim of the framework presented in Fig. 3 is to present a complete performance management/measurement process as shown in Fig. 1, in that it satisfies the need to represent the input, process and output of the process.

# The Input

Sinclair & Zairi (1995b) suggested that the first level of a performance measurement system model is the development of the organisational strategy. Indeed the importance of strategy in performance management has been identified by a number of authors (Neely et al 1997; Letza 1996; Globerson 1985). The development of strategy for an organisation is one of the most fundamental management activities that provides a vision of where the organisation wants to be in the short and long term future. It is inevitable therefore, that any performance management system will need to have strategy as the main input, so that any results coming out of the system could be used to evaluate the extent to which the organisation has met its strategic goals.

# The Process

Harrington (1991) refers to a process as "any activity or group of activities that takes an input, adds value to it and provides output to an internal or external customer. Processes use an organisation's resources to provide definitive results." Therefore, a performance process framework will take strategy as an input (see previous section); deploy the strategy so that it can derive a number of measures which are effectively activities; add value to the strategy by examining its validity and implementation; and deliver the performance results to the organisation or its shareholders and customers. This is in essence the approach followed by the balanced score card (BSC) through the deployment of strategy to a number of goals and the development of measures to measure the effectiveness of those goals as shown in figure 4.



However, as described in a previous section the construction industry is involved with undertaking projects, utilising the involvement of usually a complex supply chain. Therefore, the perspectives of 'project' and 'supplier' should be added to illustrate this emphasis (as shown in figure 3). These two additions to the BSC ensure that the prime function of construction companies can be considered in detail and that the 'internal' customers to the projects i.e. the suppliers are considered as an integral part of the project. This is illustrated widely in the area of supply chain management and Beamon (1999) provides a framework for selecting appropriate supply chain performance measures. Therefore, it is possible now to construct the matrix shown in figure 3, where the performance metrics, their methods of measurement and the goals of all perspectives can be illustrated. The matrix can have the following advantages:

- It illustrates all the different goals and performance measures at the same time
- It considers performance management i.e. strategy and goals framework, and performance measurement i.e. metrics and methods, at the same time

Furthermore, the development of a simple measurement scale (one to five as shown in figure 3) can illustrate the degree to which a specific performance measure or rather the result of it, influences the achievement of a specific goal. This can be seen in the example in figure 3 where if we assume that the goal is to assess the performance of a supplier, the number of defects that the supplier provides can be the performance metric, and if the parts provided are very small and of everyday use then the result of the measurement is of:

- little importance to a financial performance goal of the company (score 1)
- some importance to the customer perspective goal if the faulty parts find their way to them (score 3)
- great importance to the internal business perspective goal and in particular to a number of processes which will depend on the specific part (score 4)
- some importance to the innovation and learning perspective goal since it might illustrate the ability of the company to learn from previous experiences with the particular supplier or part (score 2)
- some importance to the project perspective goal since the faulty part can have 'knock on' effects to other components (score 3)
- high importance to the supplier perspective goal since the supplier's performance is assessed (score 5)

The latter, very simplistic example illustrates two more attributes of the framework in that:

1. it is possible to accumulate the results of each performance measure and derive a result which indicates the *metric importance in terms of perspective interdependency*. This measure illustrates that the specific measure developed for a specific goal can be used to measure another goal from a different perspective, say for cases where it scores more than 'three'. Therefore, the performance measures can be analysed to illustrate which are the critical ones e.g. when they have a high score and therefore can have a great influence in the achievement of goals in a number of perspectives. In other words, a small improvement in the performance metric can have significant benefits for the organisation.

2. It is possible to accumulate the results for each perspective goal and derive the *goal dependency on different measures*. This can have as a result to minimise the number of metrics used to determine the achievement of a goal or to illustrate the fact that no one goal can be measured by only one measure.

The rationalisation of performance measures offered by the matrix presented in the process framework (see figure 3) is simple in its design, but can have a significant number of benefits as they were illustrated in this section.

# The Output

The number/percentage (if the metric is quantitative) or other result (if the metric is qualitative) forms the output of the 'process'. The results form an indication to which an organisation achieved its goals. However, an organisation is as successful as its customers perceive it to be and the degree to which the marketplace i.e. competition 'allows' it to be. Increased competition in the 1990s forced companies to review what they use to view as 'acceptable' performance measures. In the example presented in the previous section it can be seen that the result of measuring the amount of defects out of 1000 components provided is 2%. This means that twenty parts are faulty. This might have been acceptable in the 1970s but a large number of Japanese companies are demanding and in many cases achieving the same percentage out of a million parts.

Therefore, it is important for an organisation to compare itself against what is perceived to be best practice in the industry. This benchmarking can be achieved both for a performance metric and for a particular goal or perspective (see figure 3). Indeed benchmarking has been identified as a significant tool for identifying improvements within organisations and industries (Elmuti & Kathawala 1997; Ramabadron et al 1997; Voss et al 1997).

#### Summary

The measurement of an organisation's current and past performance is an important issue, which has been considered closely in the past decade. It involves the development of a framework upon which performance measures can be developed and implemented as to identify the degree to which an organisation is able to implement its strategy.

This paper has presented a performance process conceptual framework (PPF) which integrates the main themes of performance management in a simple matrix like arrangement. It is based on the balanced scorecard (BSC) but with the addition of the 'project' and 'supplier' perspectives, which can be considered specific for the construction industry. Furthermore, it illustrates the relationship of the measures used to measure the goals identified by strategy, as to provide indicators for effective performance management. Therefore, the principles (best practice) upon which the PPF is based can be considered generic, in that the PPF can be adapted for any organisation and/or indeed industry.

The limitations of the PPF are implicit in its conceptual nature, in that it lacks validation from empirical evidence and it is the intention of the authors to test the PPF to derive to its final form. Also, no attempt was made to identify explicit performance measures for construction based on research findings and therefore presents itself as a further field of study.

However, the PPF can form the basis for effective performance management / measurement for organisations.

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Figure 1 The performance management/measurement process



# Figure 2 Lagging and leading indicators in the balanced scorecard



