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Performance management in construction: a conceptual framework

MICHAIL KAGIOGLOU[1], RACHEL COOPER[1]* AND GHASSAN AOUAD[2]

[1]*Design and Innovation Research Group, University of Salford, Centenary Building, Peru Street, Salford M3 6EQ, UK*

[2]*School of Construction and Property Management, University of Salford, Salford M5 4WT, UK*

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This paper presents a review of the literature on performance management and measurement in various industries with the aim of transferring best practice into construction. A framework is presented which ensures that effective strategies are deployed to form the performance management system that construction organizations can adopt. The performance measurement process (conceptual) framework (PMPF) adopts the balanced scorecard (BSC) with the addition of a number of elements and perspectives. It rationalizes the relationships between performance measures and goals derived from strategy, so the impact of those measures on an organization's performance can be examined and analysed to indicate potential areas for improvement

Keywords: Performance management, performance measurement, construction industry, balanced score care, relationship matrix

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 the optimization of an organization'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: 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 a 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 organizations or individuals have been in attaining their objectives [and strategies]' (Evangelidisz, 1992). To achieve this, the outputs of organizational strategic and operational processes are measured in a quantifiable form, to monitor the 'vital signs' of an organization (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 Figure 1.

This paper examines the elements of the process as illustrated in Figure 1, providing a critical review of

*Author for correspondence. e-mail: r.cooper@salford.ac.uk

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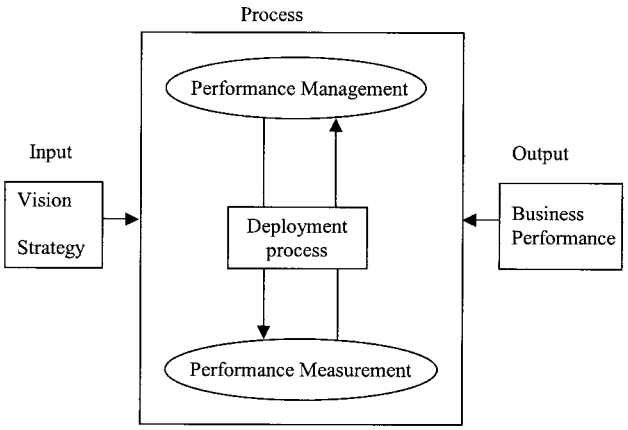

Figure 1 The performance management/measurement process

the literature in order to develop the performance measurement process conceptual framework (PMPF) for predominantly the construction industry.

Background to performance measurement

The importance of identifying an organization's performance is evident throughout the markets worldwide, 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 organization's performance is measured and how it can be communicated to the wider market, i.e. how it can be understood and interpreted by the potential investors, employees and customers. The basis of formulating performance indicators has been in operation as early as the beginning of our century (Chandler, 1997). Those performance indicators traditionally have concentrated on finances, e.g. return on investment, sales per employee, profit per unit production; according to Sanger (1998), '. . . financial measures which 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 and Kaplan (1987), Hayes *et al.* (1988), Crawford and Fox (1990) and Johnson (1994) to mention but few. Neely (1999) identified that the reason why these types of measure are criticized is because they:

- encourage short-termism,
- lack strategic focus and fail to provide data on quality, responsiveness and flexibility,
- encourage local optimization, and
- do not encourage continuous improvement.

The main reason for these failings of financial measures is they are 'lagging metrics' (Ghalayini and Noble 1996) in that they report on results and decisions made in the past and therefore are of little use in improving 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, organizations 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 organization was, the 'how' that performance was achieved should also be identified on an on-going basis. It is only by understanding how the organization arrives at a particular performance, and by designing proactive or leading metrics (as opposed to lagging metrics) to measure the 'how', that an organization might start to improve and increase its market share.

This has been the focus of research since the late 1980s, when increased globalized competition has forced companies to consider non-traditional measures; Ghalayini and 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 a manner which is integrated to the specifics of the organization. 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 with a wide range of potential submeasures. It was devised by Harvard Business School Professor Robert Kaplan and Renaissance Solutions President David Norton. The difference from 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 towards its strategic goals (Gentia Software, 1998, p. 5). Indeed, the BSC emphasizes that to manage strategy an organization must measure its performance through performance indicators after analysing its operations in an iterative way (Gaiss, 1998). The BSC recognizes that the financial measures are lagging indicators,

and therefore are 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, significantly, provide the information before the issues 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 developing respective measures or performance indicators as shown in Figure 2.

Since its original inception by Kaplan and Norton (1991) the BSC has received favourable support by academia and industry, but also has been criticized for over simplicity (Brignall, 1992) and for not providing a complete performance measurement system (Sinclair and Zairi, 1995a). Letza (1996) has identified a number of potential mistakes that can happen when implementing a BSC: e.g. measuring the wrong things even if they are measured in the right way; assuming that some of them are un-measurable or that the people undertaking those activities are 'too professional' to measure (rather than measuring all the necessary activities); and yielding to conflict between managers along functional lines.

The strong points of the BSC include:

- guarding against sub-optimization by forcing senior managers to consider all the important operational issues (Letza, 1996);
- communicating objectives and vision to the organization (Roest, 1997); and
- if implemented properly, focusing the organization's efforts on a relatively small number of measures with relatively low costs (Roest, 1997).

However, the present authors suggest that there may be two omissions in the way the BSC is compiled and implemented within an organization, and that these omissions have a more important impact when joint ventures between companies are in operation under a project environment. First, the BSC does not make any attempt to identify the relationship between the measures developed for certain goals (see Figure 2), seeming to be assuming that all measures will be specific only to a particular goal. In reality, the performance of internal and external business and operational processes will have an effect on the customer perspective, and perhaps vice versa. Second, a large number of organizations, and in particular within the construction industry, operate by undertaking projects with a number of collaborators and suppliers. For those companies, the 'project's perspective', and the 'supplier's perspective' may be diverged. Indeed, Letza (1996) has identified, in three case studies, that BSC is generic and that the perspectives might be different for different businesses or different business environments. For example, other indicators 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 organization from a number of perspectives. It is very important to design those metrics so that they relate directly to the various perspectives that an organization decides to adopt. This relationship between the performance management

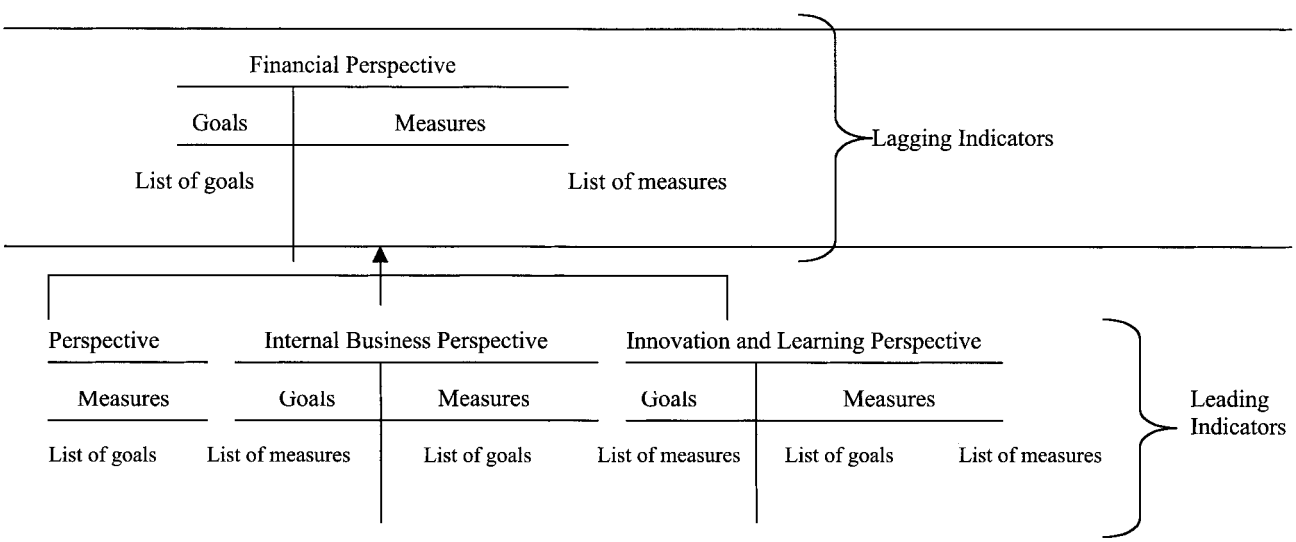

Figure 2 Lagging and leading indicators in the balanced scorecard

system and the metrics used to measure performance is shown in Figure 1, illustrating that an organization cannot claim to have an effective performance management system if the metrics used do not relate to the strategic goals of the organization. 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 organization where 'everything is measured but little that matters'. Ghalayini and Noble (1996) state that this is not only unnecessary but also it performs at great expense to the organization, 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 use of a '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 in terms of the extent to which they relate to strategy and to other performance measures. This issue of a holistic approach that identifies the relationships between individual measures 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, and (b) in relation to the creation of the product as a process. In particular, the former 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 and 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, usually their implementation in construction projects is 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 that the traditional measures of the performance of construction projects are not sufficient 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, use of cash flow forecasting and cost benefit analysis.
2. The internal business process perspective: how are we performing in our key process activities? For example, use of critical path analysis.
3. The customer perspective: how do our existing and potential customers see it?

The performance will be addressed on an induction basis by all companies involved in the project. Therefore the measures will include both company and project performance issues. However, during the 1990s

there has been some interest in 'emerging' techniques and philosophies to measure and manage performance, 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 these concepts have been imported into construction from manufacturing industry, see e.g. Koskela (1992), Mohamed (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 balanced scorecard (BSC) (see Figure 2) is also emerging in the 'organizational learning' indicator. However, this can be problematic since the participants in construction projects are 'joined' temporarily until the completion of the project, where the aim is to find methods for measuring and managing performance that can be consistently applied to the set of project participants; these methods are likely to involve an integration of the 'traditional' and 'emerging' techniques.

Recently the UK best practice programme (cbpp) launched the 'key performance indicators' (KPIs) for construction (Bprc, 1999). These KPIs give information on the range of performance being achieved on all construction activities and they include the following.

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 organization can benchmark itself against the national performance of the industry and identify areas for improvement, i.e. where they perform badly. Clearly these measures are specific to projects and offer very little indication as to the performance of the organizations themselves from a business point of view, apart perhaps from the 'customer perspective' of the BSC (see Figure 2).

A casual scan of the results obtained with the above KPIs for the year 1998 (Bprc, 1999) can be used to raise a number of issues, and the following are examples.

1. The predictability of design and construction costs seems to be quite accurate, since the means of the cumulative values represent zero and 1 %, respectively. However, the productivity value is very low. Does this mean that the predicted costs are overestimated 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 (8 out of 10) but the productivity is very low, which raises the following issue: do the clients really know what the productivity levels of their projects are?

The second example not only illustrates the importance of using the 'right measures' to measure the 'right things' but also shows that the relationship between the different measures from a holistic viewpoint is important and is a source for identifying potential collective improvements. Another area that generally is 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 environment. For example, if the construction cost of a project were lower than predicted, would this mean that the productivity was higher, there were less defects than 'expected' or that the suppliers were 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 measurement 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 scorecard and by identifying a number of limitations in its implementation. Furthermore, the state of performance measurement in the UK construction industry has been identified briefly. This section introduces the performance measurement process conceptual framework (PMPF) and it describes its various elements, as illustrated in Figure 3. The main aim of the framework presented in Figure 3 is to present a holistic performance management/measurement process framework, developed from the concept show in Figure 1, in that it satisfies the need to represent the input, process and output.

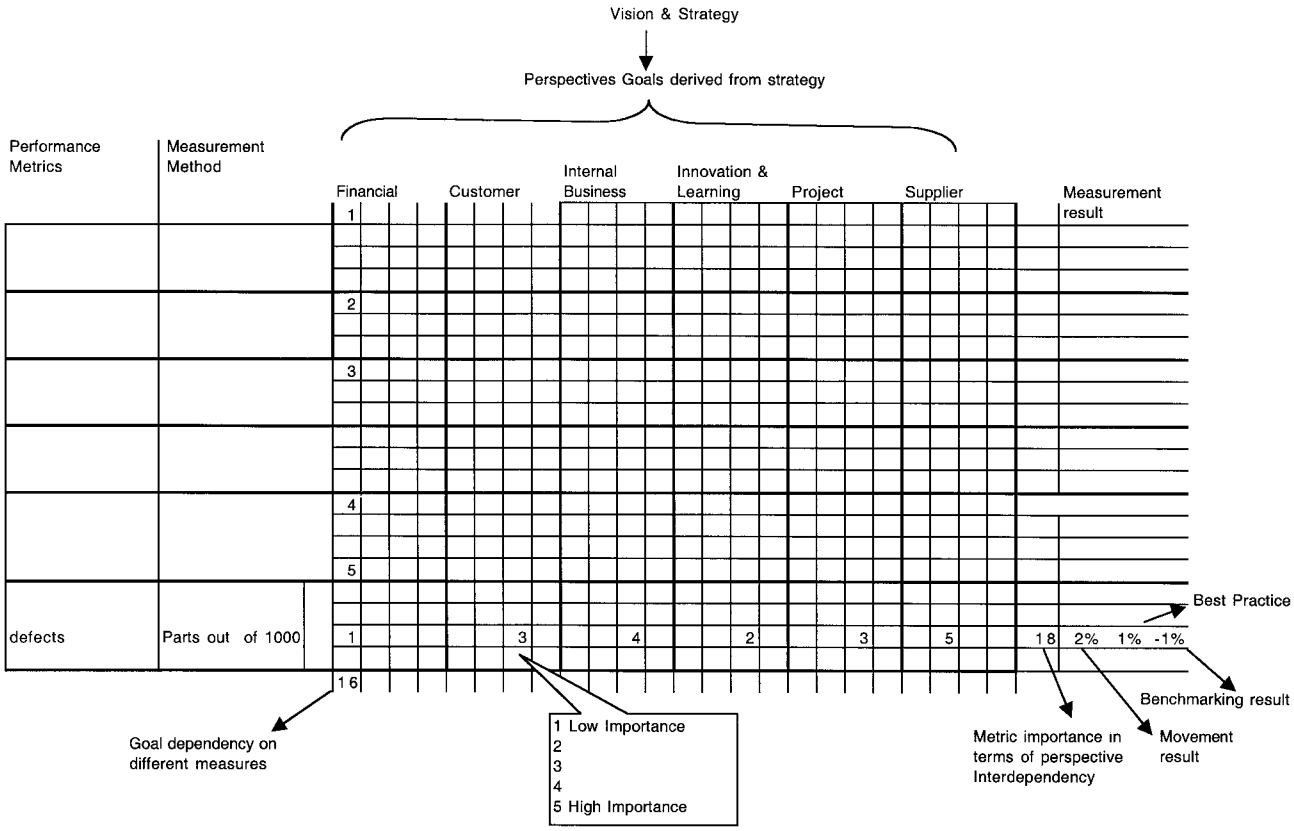

Figure 3 The process performance conceptual framework

The input

Sinclair and Zairi (1995b) suggested that the first level of a performance measurement system model is the development of the organizational strategy. Indeed the importance of strategy in performance management has been identified by a number of authors (Globerson, 1985; Letza, 1996; Neely *et al.*,1997). Strategy development for an organization is one of the most fundamental management activities that provides a vision of where the organization 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 organization has met its strategic goals.

The process – performance measurement relationship matrix

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 organization'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 organizational goals/objectives; develop measures which in this context are effectively 'activities' and are directly related to strategy; add value to the strategy by examining its validity and implementation; and deliver the performance results to the organization or its shareholders and customers. This is in essence the approach followed by the balanced scorecard (BSC) through the deployment of strategy to a number of goals and the development of means to measure the effectiveness of those goals, as shown in Figure 4.

However, as described in a previous section, the construction industry is involved in undertaking projects, usually involving a complex supply chain. Therefore, the perspectives of 'project' and 'supplier' should be added to illustrate this emphasis (see Figure 3). These two additions to the BSC ensure that the prime function of all construction stakeholders can be considered in detail, including all customers for the project, 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 now

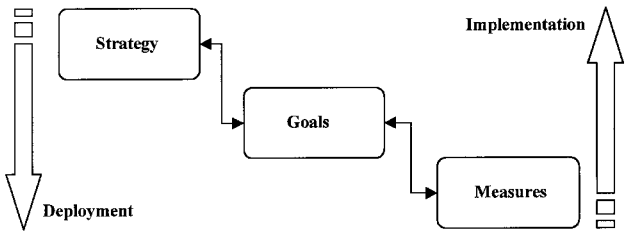

Figure 4 Deployment of strategy to performance measures

possible to construct the matrix shown in Figure 3, where the performance metrics, their methods of measurement and the goals that are appropriate for all perspectives are 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, is important and is a contributory factor to the achievement of a specific goal. This can be seen 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 experience 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), or
- high importance to the supplier perspective goal since the supplier's performance is assessed (score 5).

This example illustrates two more attributes of the framework.

1. It is possible to accumulate the results of each performance measure and derive a result which indicates the metric's importance in terms of goal interdependence. This illustrates that the specific measures developed for a specific goal have an influence on 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 the measure has a high score and therefore can have a great influence on 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 organization. This can be seen in Figure 3, where the 'ability to deliver' the performance metric has a great influence (score 5) on the achievement of other goals (score 4), although it was designed originally for the project perspective.
2. It is possible to accumulate the results for each perspective goal and derive the goal dependence on different measures. The result can be to minimize the number of metrics used to determine the achievement of a goal, i.e. it can decide that only certain measures are required to measure a goal. Or it can illustrate the fact that no one goal can be measured by only one measure in isolation. Furthermore it illustrates the importance of understanding and clarifying the relationships between measures. This can be seen in Figure 3, where the 'future potential' goal can be examined by using a number of measures one of which is the most important, such as the ability to deliver in a project (score 5).

The rationalization of performance measures offered by the matrix presented in the process framework (see Figure 3) is simple in its design but, as has been shown, can have a significant number of benefits.

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 of the extent to which an organization achieved its goals. 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 number of defects out of 1000 components provided is 2%. This means that 20 parts

are faulty. This might have been acceptable in the 1970s but a large number of Japanese companies, for example, are demanding and in many cases achieving the same number out of a million parts.

Therefore, it is important for an organization 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 organizations and industries (Elmuti and Kathawala 1997; Ramabadron *et al.*, 1997; Voss *et al.*, 1997).

Concept test

In order to test the concept of the performance measurement process framework, two companies were invited to use it in their strategic review process for determining key performance indicators. This enabled the authors to examine the managers understanding of the framework concept, the process by which it was completed and the results that may be achieved.

Company 1

This company is a large global telecommunications company, and the matrix was investigated and completed by the vice-president of performance measurement. In such a role this person and his team were familiar with analysing strategic goals and senior management objectives, which are measured quarterly against plans and goals, using appropriate and varying measurement techniques. As such he was ideally placed to complete the performance framework.

Table 1 presents the completed framework for this company, and illustrates that the key performance metrics from a number of perspectives are project requirements (20) and product defects (20), whereas the culture change (14) measured as percentage change in the staff survey is perceived to be relevant only from the people perspective.

The matrix also indicates that the goal dependence on different measures is highest for the infrastructure/process perspective (61), suggesting that, in order to get a realistic picture of process, performance measurement needs to use greater number of measurement methods.

Table 1 Large global telecommunications company

Performance metric and measurement method	Vision, strategy, perspective					Metric importance
	Financial (Goal: increase return)	Customer (Goal: customer satisfaction)	Infrastructure/ processes (Goal: reducing time to management)	People (Goal: develop organization capability)	Supplier (Goal: Exploit technology	
Revenue						
Sales	5	3	4	4	3	19
Profit	5	1	2	2	4	14
Cash/capital exp.	5	1	4	2	4	14
Costs	5	3	5		3	16
Customer satisfaction						
Product defect (No.)	4	5	5	3	3	20
Response time	1	5	5	4	2	17
Delivery time	3	5	5	2	3	18
Survey	2	5	5	4	3	19
Des. and Devel.						
Time to market	4	4	5	2	4	19
Cost man hours	4	1	2	3	5	15
Project management						
% Requirements met	4	4	5	3	4	20
Culture change						
Staff survey % change	3	1	4	5	1	14
Organizational capability						
Skills audit	1	4	5	5	3	18
Survey	1	2	5	5	3	16
Goal dependency – on different measures	47	44	61	44	45	

Table 2 Medium size construction contractor

Performance metric and measurement method	Vision, strategy, perspective					
	Financial	Customer	Infrastructure/ processes	People	Supplier	
Revenue						
Cost–value	5	1	2	1	2	12
Overhead/turnover	5	1	2	1	2	11
Insurance						
Gross cost settled claims/turnover	5	1	2	1	2	11
Frequency of settled claims	5	1	3	1	4	14
Gross recovery of CAR claims/turnover	5	1	2	1	2	11
Compensation events (project)						
Total claimed (UCV) total recouped	5	3	4	1	4	17
Proportion claim value/% of S/C to company work	5	1	2	1	4	13
Profitability (project)						
Margin/cost (excl UCV: uncertified value)	5	1	2	1	3	12
Margin/forecast margin	5	1	5	2	3	16
Customer satisfaction						
Client feedback questionnaire	1	5	5	3	3	17
Client satisfaction (project)	2	5	5	3	3	18
Nonconformities						
Time for remedial action on NCR	1	5	5	1	2	14
No outstanding defects at construction completion	3	5	5	1	2	16
Changes issued						
No. of instructions issued	5	3	3	1	2	14
Avg. value of instructions issued	5	3	3	1	2	14
Internal customer						
Satisfaction survey (each dept)	1	1	5	5	1	13
System audits						
Time for audit to report issue	1	1	4	3	1	10
Time from report to response by auditee	1	1	4	3	1	10
No. audit findings issued	1	1	5	1	2	10
Frequency and areas of audit findings issued	1	1	5	3	2	12
Nonconformance reporting						
% of projects responding with data	1	1	5	1	1	9
% of subject distribution of NCR's raised	1	3	5	1	2	12
Organizational capability						
Performance management review (staff appraisal)	1	2	2	5	2	12
Skills matrix	1	3	2	5	2	13
Suppliers and subcontractors						
Supplier KPI score (service level)	1	1	2	3	5	12
Performance review	1	1	2	3	5	12
No responses received from site	1	1	5	1	1	9
	74	54	96	54	66	

Company 2

This company is a medium size construction contractor, and the framework was completed by the managers in finance, projects and quality process. This group agreed on a number of metrics. However, Table 2 illustrates that the performance metric of most importance to all perspectives was customer satisfaction (18) using both customer questionnaires and a customer satisfaction project, alongside compensation events (17) and the total-claims-total-recouped measurement. In terms of the area which indicates goal dependence on different areas, again this test indicated infrastructure/process (96) demanded most measurement variables.

Both respondent companies found the matrix relatively simple to complete once the philosophy was understood, and considered it an interesting tool as a basis with which to structure the metrics being used, to determine perceptions of value and to illustrate metric importance. The tests for the authors illustrated that the framework needed further testing across a larger cohort within an organization to determine a more reliable score for each measure, but it did indicate the potential of such a tool to enable discussion and focus on performance management, measurement and metrics.

Summary

The measurement of an organization'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 so as to identify the degree to which an organization is able to implement its strategy.

This paper has presented a performance management process framework (PMPF), a conceptual framework which integrates the main themes of performance management in a simple performance measurement relationship matrix-like arrangement. It is based on the balanced scorecard (BSC) but with the addition of the 'project' and 'supplier' perspectives, which can be tailored to construction industry needs. Furthermore, it illustrates the relationship of the measures to strategy, providing indicators for effective performance management. Therefore, the principles upon which the PMPF is based can be considered generic, in that the PMPF can be adapted for any organization and/or indeed any industry.

The limitations of the PMPF are implicit in its conceptual nature, in that it lacks validation from extensive empirical evidence, and it is the intention of the authors to test the PMPF to derive its final form. However, it is believed that the PMPF can form the basis for effective performance management/measurement for organizations.

References

Beamon, B.M. (1999) Measuring supply chain performance. *International Journal of Operations & Production Management*, **19**(3), 275–92.

Bititchi, U.M., Carrie, A.S. and McDevitt, L. (1997) Integrated performance measurement systems: an audit and development guide. *The TQM Magazine*, **9**(1), 46–53.

Bprc (1999) *The Construction Industry Key Performance Indicators*, http://www.cbpp.org.uk/cbpp/themes/bm/KPIs/index.html

Brignall, S. (1992) *Performance Measurement Systems as Change Agents: a Case for Further Research*. Warwick Business School Research Papers No. 72.

Chandler, A.D. (1997*) The Visible Hand – Managerial Revolution in American Business*, Harvard University Press, Boston, MA.

Crawford, K.M. and Fox, J.F. (1990) Designing performance measurement systems for just-in-time operations. *International Research of Production Research*, **28**(11), 2025–36.

Elmuti, D. and Kathawala, Y. (1997) An overview of benchmarking process: a tool for continuous improvement and competitive advantage. *Benchmarking for Quality Management & Technology*, **4**(4), 229–2–43.

Euske, K.J. (1984) *Management Control: Planning, Control, Measurement and Evaluation*, Addison-Wesley, Reading, MA.

Evangelidis, K. (1992) Performance measured is performance gained. *The Treasurer*, February, 45–7.

Gaiss, M. (1998) Enterprise performance measurement. *Management Accounting*, December.

Gentia Software (1998) Balanced scorecards. In *Gentia & Balanced Scorecard*, Gentia Software and GartnerGroup.

Ghalayini, A.M. and Noble, J.S. (1996) The changing? basis of performance measurement. *International Journal of Operations and Production Management*, **16**(8), 63–80.

Globerson, S. (1985) Issues for developing a performance criteria system for an organisation. *International Journal of Production Research*, **23**(4), 639–46.

Harrington, H.J. (1991) *Business Process Improvement*, McGraw-Hill, New York.

Hayes, R.H., Wheelwright, S.C. and Clark, K.B. (1988) *Dynamic Manufacturing: Creating the Learning Organisation*, Free Press, New York.

Hronec, S.M. (1993) *Vital Signs: Using Quality, Time and Cost Performance Measurements to Chart Your Company's Future*, Amacom, NY.

Johnson, H.T. (1994) Relevance regained: total quality management and the role of management accounting. *Critical Perspectives on Accounting*, **5**(2), 259–67.

Johnson, H.T. and Kaplan, R.S. (1987) *Relevance Lost – The Rise and Fall of Management Accounting*, Harvard Business School Press, Boston, MA.

Kagioglou, M., Cooper, R., Aouad, G., Sexton, M., Hinks, J. and Sheath, D. (1998) Cross-industry learning: the development of a generic design and construction process based on stage/gate new product development processes found in the manufacturing industry. In Sivaloganathan, S. and Shahin, T.M.M. (eds), *Engineering Design Conference '98*, 23–25 June, Brunel University, pp. 595–602.

Kaplan, R.S. and Norton, D.P. (1991) The balanced scorecard – measures that drive performance. *Harvard Business Review*, January/February, 71–9.

Koskela, L. (1992) *Application of the New Production Philosophy to Construction*, Technical Report #72, Center for Integrated Facility Engineering, Department of Civil Engineering, Stanford University, CA.

Letza, S.R. (1996) The design and implementation of the balanced business scorecard: an analysis of three companies in practice. *Business Process Re-engineering & Management Journal*, **2**(3), 54–76.

Mohamed, S. (1995) Improving construction through QFD application. In *Proceedings of the 1st Pacific Rim Symposium on Quality Deployment*, Macquarie University, Sydney, Australia, February, pp. 238–44.

Mohsini, R.A. and Davidson, C.H. (1992) Determinants of performance in the traditional building process. *Construction Management and Economics*, **10**, 343–59.

Motwani, J., Kumar, A. and Novakoski, M. (1995) Measuring construction productivity: a practical approach. *Work Study*, **44**(8), 18–20.

Neely, A. (1999) The performance measurement revolution: why now and what next? *International Journal of Operations and Production Management*, **19**(2), 205–28.

Neely, A., Richards, H., Mills, J., Platts and Bourne, M. (1997) Designing performance measures: a structured approach. *International Journal of Operations & Production Management*, **17**(11), 1131–52.

Penn, B. (1998) Balanced scorecard – an explanation. *Financial Systems News*, March.

Ramabadron, R., Dean, J.W. and Evans, J.R. (1997) Benchmarking and project management: a review and organisational model. *Benchmarking for Quality Management & Technology*, **4**(1), 47–58.

Roest, P. (1997) The golden rules for implementing the balanced business scorecard. *Information Management & Computer Security*, **5**(5), 163–5.

Sanger, M. (1998) Supporting the balanced scorecard. *Work Study*, **47**(6), 197–200.

Sinclair, D. and Zairi, M. (1995a) Effective process management through performance measurement, Part I, Applications of total quality-based performance measurement. *Business Process Re-engineering & Management Journal*, **1**(1), 75–88.

Sinclair, D. and Zairi, M. (1995b) Effective process management through performance measurement, Part III, An integrated model of total quality-based performance measurement. *Business Process Re-engineering & Management Journal*, **1**(3), 50–65.

Voss, C.A., Ahlstrom, P. and Blackmon, K. (1997) Benchmarking and operational performance: some empirical results. *International Journal of Operations Management*, **17**(10), 1046–58.

Ward, S.C., Curtis, B. and Chapman, C.B. (1991) Objectives and performance in construction projects. *Construction Management and Economics*, **9**, 343–53.