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Building a conceptual framework for measuring business performance in construction: an empirical evaluation

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The importance of business performance measurement across industries has elevated in the last decade in what has been described as a revolution. Meanwhile, the construction industry has been criticised for its underperformance and the Latham and Egan reports emphasized the need for performance improvement and measurement. Companies have had to face the dilemma of choosing among different performance measurement frameworks. Hence, a need has been identified for a comprehensive framework. The aim of this research is to fulfil this need by building a conceptual framework for measuring the business performance of construction organizations. The framework had been formulated in previous research upon the principles of the Balanced Scorecard and Business Excellence Models. The research attempts to empirically evaluate and revise the framework through a series of expert interviews and case studies. In addition, empirical feedback has been used to: express the revised framework in a more communicative form, illustrate how business performance can be measured; and highlight the differences between the proposed framework and contemporary performance frameworks.

Keywords: Balanced scorecard, construction, empirical evaluation, excellence model, performance measurement

Introduction

The construction industry has been criticised for its underperformance (Lee *et al.*, 2000; Kagioglou *et al.*, 2001; Smith, 2001), and industry reports such as Egan (1998) and Latham (1994) have indicated the need for improvement and highlighted the role of performance measurement. Across industries, the issue of performance measurement of organizations has risen in the academic and business agenda over the past 15 years, in what Neely (1999) described as a revolution. Many frameworks have been developed in the interim and have coexisted despite their different approaches. Organizations are thus faced with the dilemma of choosing among the available frameworks. Using a single framework could result in the organization missing important information of other frameworks, yet using more than one simultaneously can cause the additional use of valuable resources. The need for developing a comprehensive business framework has been described in Bassioni *et al.* (2004a), and Neely and Adams (2001). In addition, Mbugua *et al.* (1999) identified the importance of using a comprehensive measurement of company's performance. The aim of this paper is to respond to this need and propose such a framework.

Many authors have emphasized the need of defining critical success factors in measuring performance (Birchard, 1996; Murray and Richardson, 1998). Furthermore, scholars have advocated that critical success factors should be related to one another in underlying relationships (Johnston *et al.*, 2002). In what has been termed as: a mental strategy in Eccles and Pyburn (1992); or theory of the business in Niven (2001); or a success map in Neely and Bourne (2000). Moreover, Kaplan and Norton (2000) suggested mapping a company's strategy in the form of causal relationships in order to monitor it, thus indicating that

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performance measurement should be based on a map of the company's critical success factors. In line with this methodology, this paper aims to develop a comprehensive framework in the form of a success map that relates critical success factors in an underlying logic. Hence, acting as a conceptual framework for measuring business performance in construction organizations. The focus of this research is on large construction contractors, as a proof of concept. Future generalizations/revisions of the framework can be conducted for different size and scope of organizations. The paper includes a brief description of the theoretical development of the framework that had been previously formulated in Bassioni *et al.* (2004b). The outcome of an empirical evaluation of 16 expert interviews and five case studies is described to confirm/revise the framework and evaluate its use in business performance measurement. Furthermore, representation of the framework and the type of underlying relations are discussed, along with how it measures business performance.

Business performance measurement and success factors in construction

Performance measurement in construction has predominantly focused on project performance in the form of time, cost and quality (Ward *et al.*, 1991; Love and Holt, 2000; Kagioglou *et al.*, 2001). However, this is shifting towards an increased focus on the organizational level. Bassioni *et al.* (2004a) reported the increased use of performance measurement frameworks in UK construction organizations, such as the European Foundation for Quality Management (EFQM) excellence model, key performance indicators (KPI), and the Balanced Scorecard. Cases of using these frameworks have been reported in construction management literature: Kagioglou *et al.* (2001) described a modified Balanced Scorecard for construction; Watson and Seng (2001), and Beatham *et al.* (2002) showed how the EFQM could be implemented in construction; and Beatham *et al.* (2003) identified and critically evaluated the use of KPIs in construction. Furthermore, cases of mixed use of these frameworks have been discussed: Robertson (1997) reported the development of company KPIs with influence from EFQM criteria and using them in a balanced manner; Beatham *et al.* (2002) used company KPIs in an EFQM context that were cascaded from a strategic to an operational level; and Samson and Lema (2002) based their performance measurement framework on modifying each of EFQM and Balanced Scorecard for construction contractors.

Success factors have been discussed in construction at project level (Chua *et al.*, 1999) and organization level (Mbugua *et al.*, 1999). McCabe (2001) identified critical success factors as being the building blocks and a first-step to benchmarking. Whereas, Sommerville and Robertson (2000) took a scorecard approach to measuring performance based on the identification of key success factors to the business and embraced in total quality management (TQM). Furthermore, identifying underlying relations among success factors has been cited in construction management literature, in a manner similar to the success map concept. Yasamis *et al.* (2002) used a representation of a construction company's quality performance to establish a framework for its measurement in contractors. Causal relationships between relevant factors have been modelled for construction rework in Love *et al.* (1999). Furthermore, Tang and Ogunlana (2003) used the same concept to model the dynamic performance of construction organizations, focusing on the interactions between a country's construction market and the organization's financial, technical and managerial capabilities, whereas this paper focuses on using performance measurement for internal management purposes. In addition, the concept of identifying success factors for internal business measurement is not new to construction research, for example, Mbugua (2000) developed a framework for evaluating the business performance of UK construction companies, based on the identification of success factors. His framework, however, did not identify the underlying relationships among the success factors.

Theoretical formulation of the framework

Contemporary performance measurement frameworks have been reviewed and critically evaluated in Bassioni *et al.* (2004a). Each framework focuses on different facets of performance. Therefore, in developing a comprehensive framework, it is only logical to build upon the principles of the existing frameworks. Relevant literature, along with well-established frameworks, namely, the Balanced Scorecard (Kaplan and Norton, 1993) and the EFQM and Baldrige Business Excellence Models (Baldrige National Quality Program, 2002; British Quality Foundation, 2002) were used to formulate the framework. The selection of the Balanced Scorecard and Excellence Models was based on their popularity and establishment in industry and research, thus enhancing the initial validity of the formulated framework. The formulation process started by integrating the performance factors of the Balanced Scorecard perspectives, and the EFQM and

Baldrige criteria, into a comprehensive set of factors. Underlying logic in each of the founding frameworks, as well as in literature, were used to identify the causal logic of the framework, thus converting it from a set of performance factors into a causal map. Furthermore, the map was adapted to suit construction organizations with the aid of relevant literature. An evaluation of formulation process and the comprehensiveness of the developed map were assessed by comparing it to the founding frameworks and other frameworks in literature. More details on the theoretical formulation of the framework can be found in Bassioni *et al.* (2004b). The resulting framework is illustrated in Figure 1.

The logic of the framework starts with leadership as the main driver for change and improvement in organizations. Leadership should guide the focus on customer, people and other relevant stakeholders, which in turn should guide the development of strategic plans. The strategic plans are further detailed into functional or programmatic business plans that are translated into processes for implementation. Once implemented on projects and throughout the organization, improved project results should start to appear after a period of time. Improved various project results should affect customer, people and other stakeholders' satisfaction on the organizational level, which would finally reap organizational business results. Information and analysis is driven by leadership and supports all other factors throughout the framework.

Expert interviews

Sixteen interviews were conducted on a varied sample of 11 industry practitioners and five academic researchers that differed in their business performance measurement experience. Semi-structured interviews were selected as a style of interviewing to give form to the interviews whilst allowing probing (Hussey and Hussey, 1997; Fellows and Liu, 2003). The interviews sought both qualitative feedback and quantitative rating of the framework, and following is a discussion of the outcome of the interviews.

Qualitative feedback

Within the interviews, qualitative feedback was sought on possible missing driving/results factors, operational definitions, underlying logic among factors, and any other comments on the framework. The interview sessions were taped, at the interviewee's discretion, transcribed and coded. The outcome was analysed for patterns and relevant comments/revisions, and the framework was accordingly modified. The following

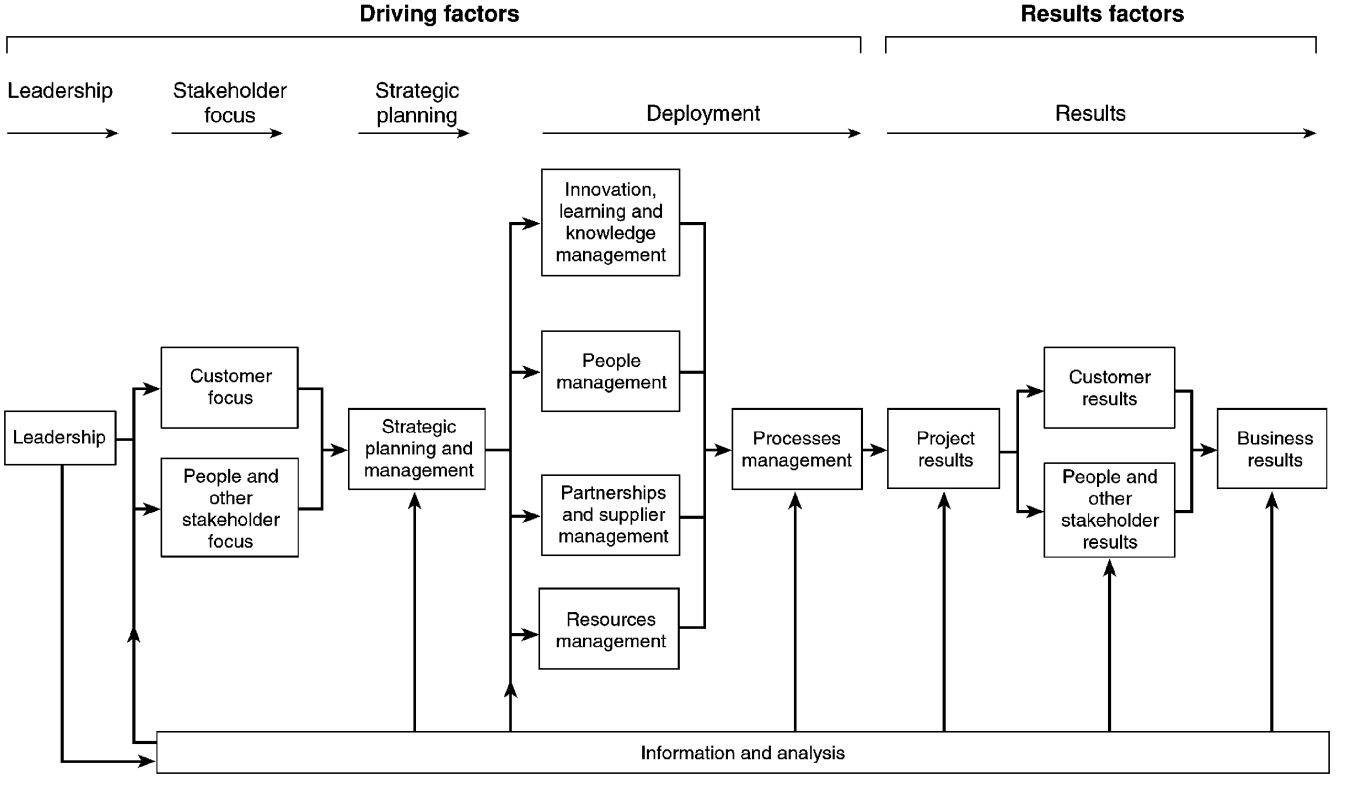

Figure 1 The theoretically formulated framework

points summarize these outcomes, and the consequent modifications. The revised framework is shown in Figure 2.

(1) Additional factors were identified and added to the framework. Risk management was added as another possible strategic deployment factor. Work culture was identified as a driving factor that required monitoring by organisations. It was seen as driven by leadership and affecting all other factors.

(2) People, suppliers and partnership results were seen as to affect project results, not vice versa, and there results should therefore precede project results. Customer and society results, such as their satisfaction were seen to be more of a result of project results, and were therefore situated after project results.

(3) Operational definitions for each factor were prepared prior to interviews and based on the EFQM and Baldrige excellence models' sub-criteria, and definitions in relevant literature. Feedback was obtained in the interviews, and they were accordingly modified. The resulting operational definitions are available in Tables 1 and 2.

(4) The linear business flow of the framework from left to right was confirmed and several participants could relate to it by giving examples that reflected this logic.

(5) Feedback on how to measure performance in the framework was given by interviewees. Initial feedback preferred the framework to be flexible where indicators would be identified for each performance factor (driving factors and results factors). This would be cumbersome, however, for factors such as leadership, strategic management and work culture, among others. Based on this argument, the general feedback was that driving factors should be measured using appropriate criteria and scoring, in a manner similar to how excellence models enablers are measured, but with appropriate operational definitions. Furthermore, the measurement of results factors should be measured via indicators relevant to the company, in a manner similar to how the Balanced Scorecard measures performance.

(6) The qualitative feedback on the framework's usefulness, practicality, and applicability was very positive. The framework was mostly seen as more aligned to construction and project based industries than other frameworks, providing a logical frame that people could easily relate to, and explicitly addressing the key issues management would need to monitor.

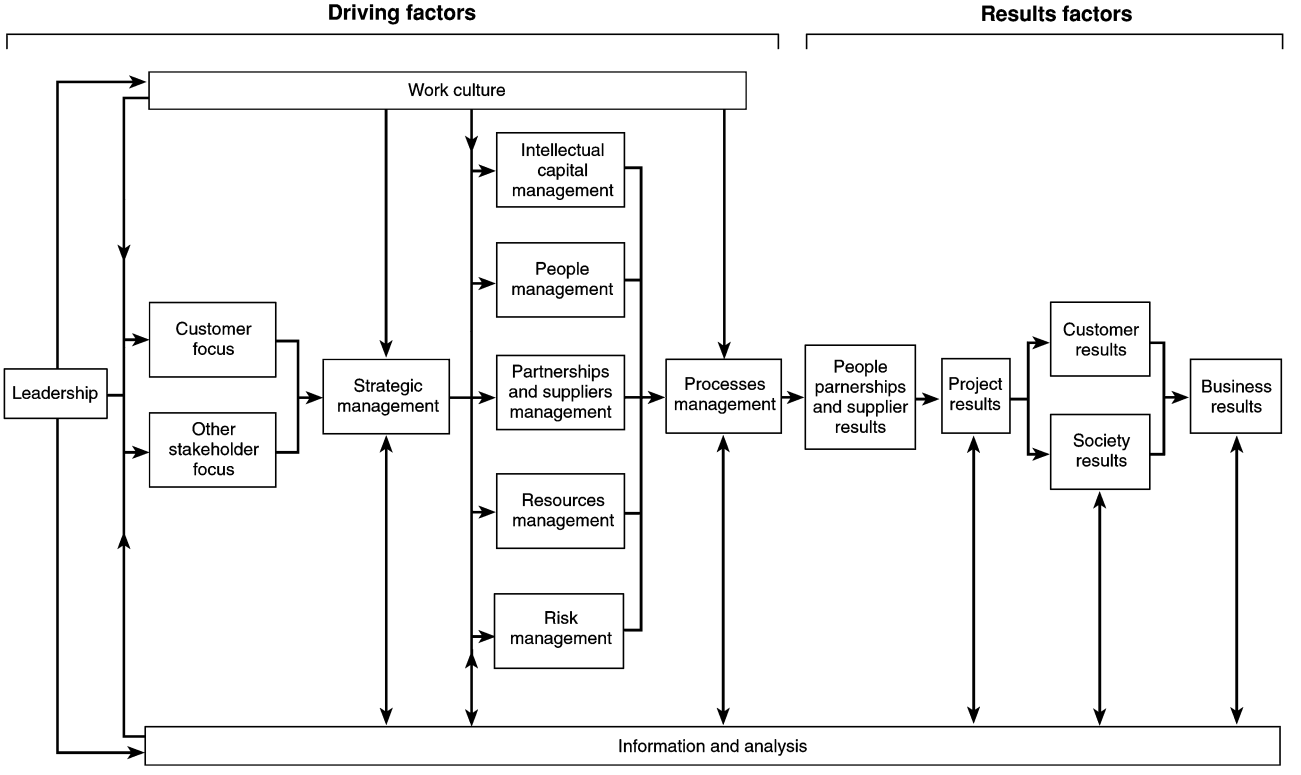

Figure 2 The revised framework as a block diagram

Table 1 The operational definitions of the performance driving factors

A. Leadership 1. Leaders develop and communicate mission, vision, and values. 2. Leaders are actively involved in ensuring management systems are developed, implemented and continuously improved. 3. Leaders measure organizational performance and translate results into improvements. 4. Leaders are actively involved with customers. 5. Leaders are actively involved with stakeholders. 6. Leaders create an environment for empowerment, innovation, learning and support.	B. Stakeholder focus B.1 Customer focus 1. Systematic identification and monitoring of customer requirements and needs. 2. Translation of customer requirements and needs into actions and expressed in company's products/services. 3. Organisation staff are actively involved with customers. B.2 Other stakeholder focus 1. Systematic identification and monitoring of stakeholder requirements and needs. 2. Translation of stakeholder requirements and needs into actions and expressed in company's products/services. 3. Organisation staff are actively involved with stakeholders.	C. Information and analysis 1. Availability of appropriate, relevant and updated data/information to employees and stakeholders. 2. Raw data and information are analysed to provide meaningful information. 3. Data and information are used to take necessary actions and direct improvements. 4. Information gathering, analysis and interface systems (hardware & software) are efficient, reliable and current with business needs	D. Strategic management 1. Presence of strategic planning or thinking. 2. Strategic planning is a systematic process. 3. Strategic planning is based on gathering of data and information and reflects customer and stakeholder needs and requirements. 4. Strategic plans and objectives are communicated throughout the organisation. 5. Monitoring mechanisms and/or measures exist to track strategic deployment at corporate and operational levels.
E. Functions & programmes management 1. Innovation is encouraged and managed. E.1 Intellectual capital management 2. Technology (e.g. techniques, methods, inventions) is planned and managed. 3. Knowledge and organisational learning are planned and managed.	E.2 People management 1. People resources and capabilities are planned, managed and improved. 2. A healthy and safe work environment exists. 3. People are communicated with, involved and empowered. 4. People are motivated, rewarded and recognised. 5. Teamwork is encouraged and enabled. E.3 Partnership and supplier management 1. Partnerships & supplier relations are planned. 2. Partnerships & supplier plans are controlled and managed. 3. Partnerships & suppliers are planned based on their needs, contributions and a teamwork culture.	E.4 Resources management 1. Financial resources are planned and managed. 2. Physical operational resources (e.g. material and equipment) are planned and managed. 3. Physical long-term resources (e.g. building and land) are planned and managed. E.5 Risk management 1. Project and company risks are identified and evaluated 2. Plans are set to mitigate relevant risks 3. Effects of risk management plans are evaluated and controlled. 4. Actions are taken to improve the risk management programme.	F. Processes management 1. Processes are identified and designed. 2. Processes are clearly communicated to staff and stakeholders. 3. Processes are implemented and controlled. 4. Processes are updated and improved. 5. Process design is based on customer and stakeholder needs and requirements. G. Work culture 1. Existing behavioural norms and organisational values are identified. 2. Desired behavioural norms and organisational values are planned for. 3. Behavioural norms and organisational values are measured to control plans. 4. Work culture programme is improved.

Table 2 The operational definitions of the performance results factors

H. People, partnership an supplier results	I. Project results	J. Customer and society results	K. Organizational business results
1. Employee satisfaction.	1. Project predictability/ variance of costs and time.	1. Direct customer satisfaction.	1. Financial performance (e.g. profits, sales, liquidity).
2. Partner and supplier satisfaction.	2. Project safety.	2. End user of facility satisfaction.	2. Non-financial performance (e.g. market performance, company image, flexibility).
	3. Project teamwork and harmony.	3 Other key stakeholder satisfaction.	
	4. Society and environmental impact of projects.	4 Impact on society.	
	5. Quality of the constructed facility, as per specifications.		

Quantitative feedback

Interviewees were asked to rate different aspects of the framework concept on five point Likert scales to gain quantifiable feedback. The structured questions concerned rating the importance of each performance factor in achieving business results, and rating the operational definitions of each factor. Fifteen full responses were obtained from the interviews. To conduct a quantitative analysis on a small sample, the use of multivariate techniques might not be statistically significant. However, other statistical techniques, such as the *t*-distribution, can be used for samples as small as twelve (Fleming and Nellis, 1991; Healey, 1993; Van Belle, 2002). It is essential though, that the response distributions are tested for normality (Van Belle, 2002). Normality was evaluated on SPSS software using the Kolmogrov-Smirnov test with Lilliefors significance correction. All the performance factor responses were found to be normal using the significant value of 0.05 (Field, 2000). The mean value of responses and the five percent confidence limits, as per the *t*-distribution (Fleming and Nellis, 1991), were calculated on an Excel spreadsheet, and have been presented in Figure 3. The values of 1, 2, 3, 4, and 5 in the calculations correspond to not important, slightly, moderately, very and extremely important. By observing the figure, it can be concluded that on average all the performance factors are very or extremely important to business success, and there exists a less than five percent chance that they could be rated as moderately important.

Using the framework as a conceptual framework for measuring business performance was rated according to the criteria of usefulness, practicality and applicability. The meaning of these criteria were explained to the interviewees according to their definitions in the Oxford dictionary (Fowler and Fowler, 1995): usefulness being the serviceability of the framework and its ability to produce results as per its intended use; practicality being the inclination towards action rather than theory and

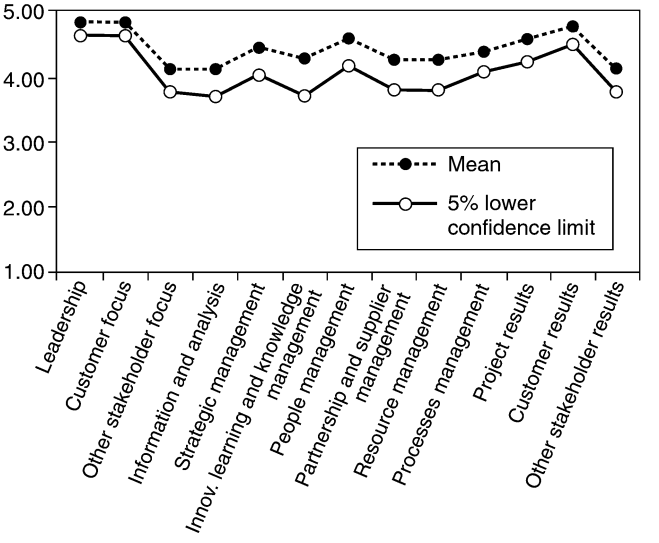

Figure 3 The importance of performance factors in achieving business success

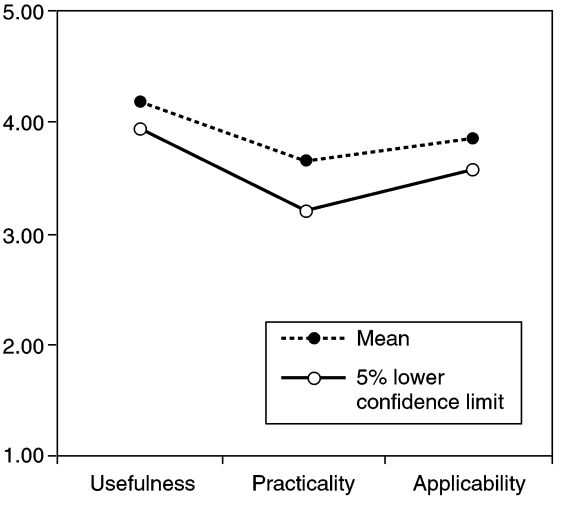

Figure 4 Evaluation of the performance measurement framework

speculation; and applicability being the extent to which it can be applied. The response means and five percent confidence limits, as discussed before, are presented in Figure 4, and show that on average the framework is rated very useful, very practical and very applicable, with less than a five percent possibility of rating it moderately on each of the three criteria.

Case studies

The case studies complemented the semi-structured interviews by providing deeper insights (Rowley, 2003) and illustrating how the framework differs from other contemporary frameworks. The building of the case studies involved a triangulated approach in data collection that used evidence from interviews, documentation and archival records. A holistic approach to the case studies was used, i.e. a single unit of analysis in each case, since the nature of the study is the whole organization's approach (Yin, 1994). Follow-up calls/emails were used for clarifications, obtaining additional information, and validating the case study content and presentation. For the analysis of the case studies, the theoretically formulated framework acted as a prior proposition and evidence was trawled to either confirm or revise the framework (Rowley, 2002; Sekaran, 2003). Five case studies were conducted (four major contractors and a leading civil consultancy firm) to provide a mixture of approaches to performance measurement and gain a varied feedback. Samples of two case studies that are most informative are presented in this paper. A summary of the outcomes of all five studies is presented to illustrate the differences perceived by companies between the proposed framework and existing frameworks used in industry.

Case study 1

The company is a major UK construction contractor with employees in excess of 2000 and an annual turnover of over two billion pounds, enjoying one of the healthiest operating profit margins in the industry. The company also aims to deliver excellence to customers, providing strong growth and enhanced value to shareholders and being socially responsible to the community in which it operates. The company's performance measurement system constitutes a set of in-house KPIs that cover areas such as human resources, resources management, financial management and customer satisfaction. These KPIs are different than the national KPIs, outlined by the Construction Best Practice Programme (CBBP-KPI, 2004). The dilemma that the company faces is that large customers have recently used the national KPIs to select and prioritise companies for bidding, to the extent that league tables have been used. The company is considering what other companies have done to solve this dilemma, which is to use two sets of KPIs, one to present to customers and the other for internal management purposes. In addition, the company conducts annual EFQM exercises to benchmark its own performance and to identify areas of improvement. The company had previously looked at the Balanced Scorecard and rejected it, but is reconsidering using it to track strategic performance. In working with EFQM, the company had identified its generic nature, which might not deliver the needs of construction companies. Construction is predominantly focused on projects, yet excellence models do not explicitly emphasise a project focus. Furthermore, project quality is overlooked in the model and trying to achieve zero defects in EFQM does not say enough about projects' as quoted by an interviewee. The emphasis of the framework on factors such as project results and its possible inclusion of project quality results were encouraged by the company. The overall construction orientation of the framework was a favourable trait encountered in the feedback.

Case study 2

The company is a leading UK contractor that was founded over 50 years ago and became publicly financed in the past decade. The company has an annual turnover of over half a billion pounds. The company is a leader in implementing business performance measurement, starting its efforts in the early 90s. The first attempts of business-measurement were in the form of a set of KPIs that were designed to measure its mission in being 'best in the business' in a quantifiable manner. The initial KPIs had two measures for customers, two for people, one in waste and one in efficiency. The company then came across the EFQM model and realized that other factors were also important to the business. Hence, the set of KPIs has been evolving ever since. In addition, the CBPP-KPI were required/preferred by some customers, and thus affected the evolution of the in-house KPIs. The company currently has 18 KPIs, covering the areas of: safety; teamwork and leadership; innovation; partnerships; training and development; supply chain management; risk management; reduction in construction costs; predictability of costs; customer satisfaction; quality system; star sites; employee satisfaction; delivery; productivity; defects; impact on the environment; and profits. The principles of the Balanced Scorecard and EFQM are used in mapping the company's KPIs to ensure a balanced and comprehensive view of the business. However, both approaches to business measurement are not conducted in their entirety. The

framework concept was perceived as very useful to top management in measuring the organisation's business performance. It was seen to explicitly set out the factors that leaders need to monitor. In addition, the underlying relationships and business logic were seen as specifically important in interpreting performance measurement data and possible outcomes and showing management the probable future consequences on different performance areas of the company and business results.

Empirical evaluation of framework compared to contemporary frameworks

As a result of the expert interviews and case studies, feedback was gained on how using the framework for measuring business performance conceptually differs to other frameworks, especially the EFQM model and Balanced Scorecard, as summarized below.

(1) The framework is more structured than EFQM and the Balanced Scorecard. An EFQM assessor quoted 'This is much more structured' and another interviewee said 'I think it has a very strong logic, certainly I can see the strength of that'.
(2) The framework is more detailed having additional performance factors such as work culture, risk management and information and analysis, that were all thought of as important factors in determining business success.
(3) The framework emphasizes performance factors that are relevant to construction, such as project results. A business improvement manager of a leading construction contractor stated: 'You can see the underlying logic from a construction point of view. Project results are one thing that we have had to deal with in terms of those models, some say it is implicit in business results, but this framework makes it very explicit.'
(4) The framework was seen as easier to understand and is more user friendly, albeit being more detailed, because it follows a linear business flow and it makes explicit what managers need to look at. A quality assurance manager commented: 'I think it is written more as a process, as a single line, and the simplest process is a single line. Therefore, it is possibly easier to understand, than when you go with the blocks of EFQM.' Another interviewee said 'EFQM can get quite cumbersome and this framework focuses more on what the company needs to achieve'.
(5) The framework was seen as a compromise between EFQM and the Balanced Scorecard. Feedback prompted that it could be used in the case of a company already using one of them and a merger, acquisition, or client forces it to use the other.

The proposed framework

Framework representation

Upon evaluating the theoretical framework through empirical interviews and case studies, the resulting relationships among performance factors became complicated. Furthermore, the type of relationships among factors was not clear in the framework representation. The interviews identified that each underlying relationship among factors is naturally intricate, and is not necessarily causal. They also preferred to express these relationships as sequential in a process manner than strictly causal. Therefore, a process modelling technique (IDEF0) was used to visualize and present the framework. The modelling notation used was a simplification of the IDEF0 activity box syntax (Standard for IDEF0, 1993; Feldmann, 1998), as shown in Figure 5. The framework comprises two main processes: the management of driving factors; and the achievement of performance results, as shown in Figures 6 and 7.

The notion of modelling performance has been expressed in literature. Beretta (2002) advocated process-based performance measurement in organisations. O'Donnell and Duffy (2002) modelled design performance using the IDEF0 process modelling language, in order to measure it. Yusuf and Smith (1996) modelled the business processes of steel fabrication using SADT-IDEF0 as a step in improving its performance in terms of productivity and competitiveness. Furthermore, Bryde (2003) modelled project management performance based on the EFQM excellence model, and advocated the resulting framework to assess successful project management. The advantages

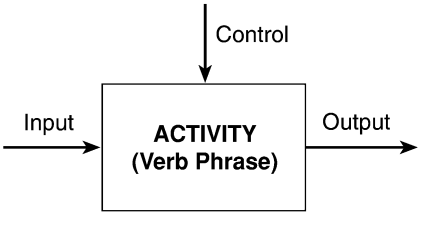

Figure 5 Simplified activity box syntax

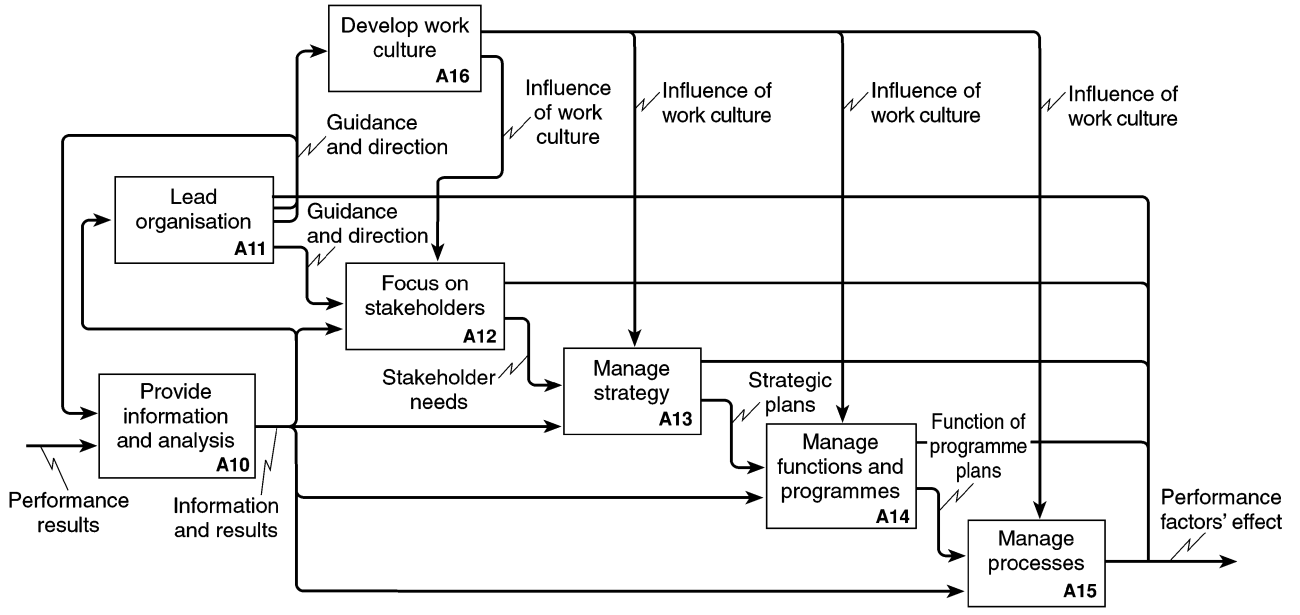

Figure 6 Managing performance drivers process

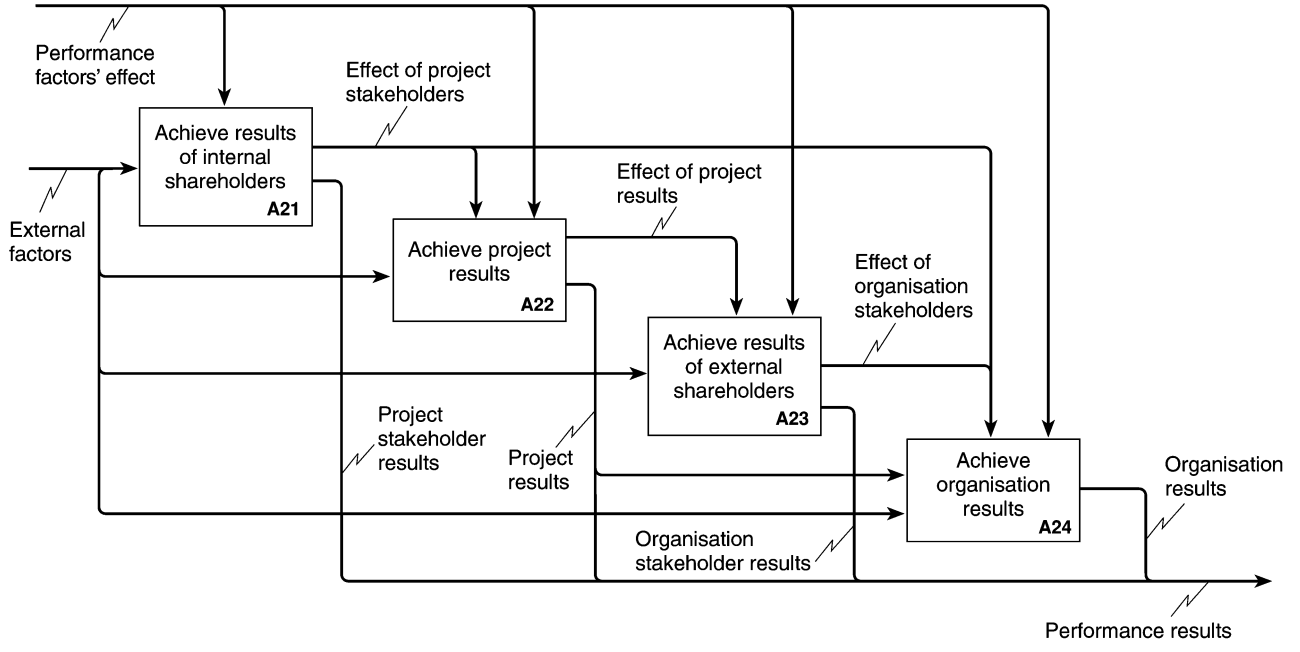

Figure 7 Achieving performance results process

of using IDEF0 over other modelling techniques have been discussed by Kamara *et al.* (2000) and comprised the following.

(1) Better in dealing with functional/activity modelling – which is the type of model the suggested framework is categorized under. Further explanation can be found in Brown *et al.* (1995) and Luo and Tung (1999).
(2) Serves linear processes – the suggested framework parallels this characteristic and this was clearly revealed from the interview feedback.

(3) Relatively easy to use and understand and has been proven suitable for use in construction – this requirement is a trait in communicating the framework to potential users. A practical example of ease of use can also be seen in Lo *et al.* (2001).

Measuring performance

Business performance measurement has been described to address two basic purposes in construction organizations, as per the outcomes of a survey and in line with business literature, measuring general business health and measuring strategic performance (Bassioni *et al.*, 2004c). Organizations need to have a general and comprehensive view of how they perform in various aspects of the business. Excellence models have been used to provide such a wide and general view of performance. On the other hand, strategic management and hence strategic performance advocates focusing on a critical few areas relevant to strategic objectives. The Balanced Scorecard has been used to monitor the performance of such strategic objectives. Companies need both types of performance and therefore need to measure both their general business health and their strategic performance. The framework suggested in this paper provides a wide spectrum of performance, and is thus more suited to measure the general business health of organizations. It differs than the EFQM model in that it is targeted towards construction and provides a more comprehensive view as it is also based on the Baldrige excellence model and encompasses additional performance factors identified by the interviews and case studies.

The measurement method of performance in the framework is essentially twofold: measurement of the performance driving factors and measurement of performance results factors, and is described in Table 3. For example, the driving factor of 'other stakeholder focus' is measured by using perception measures, documentation or interviews to identify how well the company is achieving this performance factor as per its operational definitions described in Table 1. Another example is the results factor of 'society results', the organization needs to develop relevant indicators for this factor, and can use the environment KPI of (CBPP-KPI, 2004) or in-house developed KPI, such as community/charity spending, workforce gender composition, environmental pollution, construction waste and energy consumption.

Conclusions and further work

The aim within this research has been to fulfil the need for a comprehensive performance measurement framework in construction. A theoretical framework had been formulated in previous research that formed the basis of a conceptual business performance measurement framework. The work conducted in this research empirically evaluated and revised the framework to produce a more robust framework. Sixteen expert interviews were conducted to assess comprehensiveness

Table 3 Measuring performance in the proposed framework

	Performance driving factors	Performance results factors
Type of performance measurement	How well the organization performs in each driving factor, using perception measures, documentation and interviews	How much the organization has achieved in each results performance factor, using indicators expressing each factor
Factors of performance measurement	1. Leadership 2. Stakeholder focus – customer and other stakeholders 3. Strategic management 4. Function and programme management – people, partners, suppliers, physical resources, intellectual capital and risk management. 5. Process management 6. Information and analysis 7. Work culture	1. People; partners and suppliers 2. Project results 3. Customer and society 4. Organizational business results
Measurement method	1. Each operational definition of the driving factors is scored in a manner equivalent to excellence models' scoring systems 2. Aggregate scores are developed for each driving factor 3. Measurement scores are used to identify areas of excellence/ improvement in driving factors	1. Indicators are developed for each performance results factor 2. Target goals are developed for each indicator 3. Actual achievement of each indicator is measured against target goals 4. Indicator scores reflect the performance of results factors

and underlying logic of the framework. This resulted in the confirmation of the current performance factors and gaining a better understanding of their relationships. The interviews further resulted in the addition of the factors of risk management and work culture. Five case studies were conducted to gain empirical feedback on how the measurement framework conceptually differs from contemporary frameworks in different company contexts. The framework was found to have more detail and structure, is more oriented to construction, has appropriate flexibility, is easier to understand and is more user friendly.

The framework is divided into performance driving factors and performance results factors. The performance driving factors include: leadership; customer and other stakeholder focus; strategic management; information and analysis; people management; partnerships and suppliers management; resources management; intellectual capital management; risk management; work culture; and process management. The performance results factors include: people, partnership and supplier results; project results, customer and society results; and organizational business results. The relationships among the performance factors were described within the empirical feedback as intricate, and not necessarily causal. Hence, the framework was represented in a process manner using IDEF0 process modelling technique. Furthermore, the suggested framework was found to be more appropriate in assessing general business health, given its comprehensive nature and wide spectrum of performance factors, rather than measuring strategic performance, which requires focusing on key strategic areas relevant to the company.

The conceptual framework developed and the research conducted open several areas for future research. Detailed implementation and scoring techniques need to be investigated and suggested for the framework. The difference among contracting, consulting and owner organizations, with respect to the framework, is another area of research. The nature of relationships among various combinations of performance factors or in their entirety is another wide area of research. Furthermore, the issue of measuring strategic performance in construction is relatively untapped, and more work is required in this area.

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