PERFORMANCE MEASUREMENT SYSTEMS FOR BENCHMARKING IN THE CONSTRUCTION INDUSTRY

Dayana B.Costa[1], Carlos T. Formoso[2], Michail Kagioglou[3], Luis F. Alarcón[4]

ABSTRACT

Performance measurement is an essential element of business management. It provides the necessary information for process control, and makes it possible to establish challenging and feasible goals. It is also necessary to support the implementation of business strategies. Despite the importance of performance measurement, it has not been widely implemented in construction companies and information on the performance of the construction industry as a whole is also scarce. In the last few years, there have been some initiatives concerned the establishment of performance measurement systems for benchmarking in different countries. The objective of this paper is to describe the scope of those initiatives and discuss its potential role for benchmarking construction companies, specially those involved in the development and implementation of new operations management ideas. This investigation is focussed on four initiatives, carried out in Brazil, Chile, the UK and the USA. The paper concludes by proposing some further directions on this research topic.

KEY WORDS

Performance measurement, benchmarking, construction industry

1 M.Sc., Ph.D. candidate, Federal University of Rio Grande do Sul, Building Innovation Research Unit (NORIE), Osvaldo Aranha Av., 99, 3° floor, Porto Alegre–RS, Brazil, fone: +55 51 3316 3959, e-mail: dayana@cpgec.ufrgs.br

2 Ph.D., Associate Professor, Federal University of Rio Grande do Sul, Building Innovation Research Unit (NORIE), Osvaldo Aranha Av., 99, 3° floor, Porto Alegre–RS, Brazil, fone: +55 51 3316 3959, e-mail: formoso@vortex.ufrgs.br

3 Ph.D., Centre Manager, University of Salford, Salford Centre for Research and Innovation (SCRI) in the Build and Human Environment, Meadow Road, Salford, M7 9NU. UK. Tel: +44 (0) 161 2953855 e-mail: m.kagioglou@salford.ac.uk

4 Ph.D., Professor, Universidad Católica de Chile, Escuela de Ingeniería, Casilla 306, Correo 22, Santiago, Chile, e-mail lalarcon@ing.puc.cl

INTRODUCTION

Since the early eighties, the dissemination of the Total Quality Management (TQM) philosophy in Western countries has encouraged many companies to develop and implement performance measurement systems. In fact, some of the basic principles of TQM are strongly related to the use of measures, such as: provide feedback based on actual data, build continuous improvement into the process, and encourage participation of employees in the decisions making. This is why having an effective performance measurement system is a major requirement in the ISO9001: 2000 standard and also in several quality awards.

The application of the Toyota Production System (or lean production) concepts and principles in several industries has also contributed to the widespread use of performance measurements. In the Toyota Production System, measurement systems are strongly related to decentralised control. Measures are intensively used in the learning process at the operational level, by helping the employees to see how they are performing, rather than simply to provide feedback data for the central control function. According to Maskell and Baggaley (2004), lean organizations should use simple and well-designed performance measurements to provide operational and financial control, to motivate people towards lean behaviours, to direct and initiate continuous improvement, and provide focus for decision-making and management direction.

However, the lack of performance measurement is a problem that affects the construction industry in general. This is related to the attitude and lack of training of managers to a great extent (Formoso and Lantelme, 2000). In fact, several companies measure and control a wide range of project variables, but only a few have performance measurement systems that provide key information for supporting decision-making (CDT, 2002).

Moreover, some companies have too many measures; most of them related to supporting rather than critical processes (Costa and Formoso, 2003). This tends to make it difficult for the company staff to understand what should be the priority and also to define the key indicators that should be used for comparisons to other companies (Schiemann and Lingle, 1999).

Performance measurement must shift from the traditional historical orientation, which looks only at the results and their main causes. Instead, the causes of the desired performance must be identified beforehand and then the measurement and control process that maintain these causes within prescribed limits can be designed (Maskell and Baggaley, 2004). This new focus is concerned with identifying goals and linking them to the critical factors required to achieve them.

Despite the importance of performance measurement, information on the performance of the construction industry as a whole is relatively scarce. For that reason, there have been some initiatives concerned with the establishment of performance measurement systems for benchmarking in different countries, such as Australia, Brazil (Formoso and Lantelme, 2000), Chile (CDT, 2002), Denmark (Byggeriets Evaluerings Center, 2002), the UK (KPI, 2001) and the USA (CII, 2000). Such initiatives typically aim to (a) offer some guidance for performance measurement, (b) provide some benchmarks that could be used by individual companies to establish their business goals and objectives, and (c) to identify best practices in the industry.

Benchmarking is about comparing and measuring the organisation performance against other similar organisations in key business activities, and then using lessons learned from the best ones to introduce breakthrough improvements (KPI, 2001; Koskela, 1992). It provides a focus on the external environmental and may contribute to strengthen the use of factual information in developing plans. Besides, such approach is used to improve performance by understanding the methods and practices required to achieve higher performance levels (Camp, 1995). It can be use to the dissemination of new operations management ideas, such as lean production, in which companies can mutually share and discuss their practices and learn from each other.

The objective of this paper is to raise some key issues related to the use of performance measures for benchmarking in the construction industry and identify some key factors on the effective design and implementation of such performance measurement systems. This investigation is focussed on four initiatives: KPI - Key Performance Indicators from the UK; (b) National Benchmarking System for the Chilean Construction Industry; (c) Construction Industry Institute Benchmarking and Metrics form the United States of America; and (d) Performance Measurement System for Brazilian Construction Industry (SISIND). The information about these initiatives was obtained in their web sites, from published papers, and also from interviews carried with some of the people involved.

KEY PERFORMANCE INDICATORS (KPI) IN THE UNITED KINGDOM

The KPI Programme was launched by the UK Best Practice Programme in 1998. This programme is supported by the government, through national and regional offices. Recently the Constructing Excellence body was created, which is the amalgamation of Rethinking Construction and the Construction Best Practice Programme (CBPP).

The purpose of the KPI programme is to enable measurement of project and organisational performance throughout a large number of projects and hence provide indications about performance of the construction industry. This information can then be used for benchmarking purposes, and is assumed to be a key component of any organisation's move towards achieving best practice (KPI, 2001). The Programme has been conceived to monitor the performance of the industry with the use of simplistic and across the board indicators.

The first set of KPIs was produced in November 2000. The second set was completed in 2002, based upon projects completed in 2001, and the current set of KPI is based upon projects completed in 2002 (KPI, 2003). The design of the first set of KPI was the result of an initiative involving extensive reviews by a panel of experts and the publication of a report. This is the current set of performance measures: (a) client satisfaction–product; (b) client satisfaction-service; (c) construction cost; (d) construction time; (e) defects; (f) predictability-cost; (g) predictability-time; (h) profitability; (i) productivity; and (j) safety.

This set of indicators was classified as headline indicators, since it provides a measure of the overall state of health of the projects that a firm delivers or help to deliver. There are also secondary indicators, which are classified into the following categories: (a) operational indicators, which bear on specific aspects of a firm's activities and should enable management to identify and focus on specific areas for improvement; and (b) diagnostic indicators, which provide information on why certain changes may have occurred in the

headline or operational indicators and are useful in analysing areas for improvement in more detail (KPI, 2001). For the implementation of the KPIs, companies receive a support handbook and guidance for measurement and access to an online software. The companies are responsible for collecting data and introducing them in the database. They are also responsible for updating the project data. This software supports the analysis of the project performance in relation to the benchmarks.

The companies involved can also access reports and wall charts (all-in-one illustration of current KPI performance levels), which contain graphs of performance (ranking curve and radar chart) for 10 key issues for construction such as client satisfaction, cost and time. The wall charts show the benchmark scores and allow an organisation's score to be benchmarked against a large sample across industry. The set of KPIs is annually updated by the Construction Best Practice Programme (Constructing Excellence, 2004). A few hundred companies have been participating in this programme, on a voluntary basis for demonstrations projects. The companies present their projects, which are reviewed by a panel of experts. Two main reasons have encouraged these companies to enter the KPI programme: marketing of the company and the opportunity to improve their performance.

The companies involved can participate in the KPI Benchmarking club and they can have access to all main Benchmarking initiatives, clubs and organisations that provide services to the construction industry (Constructing Excellence, 2004). The focus of the Benchmarking club is the exchange of benchmarking practices. Despite the initiatives of the KPI Programme in promoting the comparison between companies, a fairly limited number of companies are really involved to the benchmarking programme. Kagioglou et al. (2001) raise some main problems identified in KPI:

- The KPIs 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;
- It is important not only to use the "right measures" to measure the "right things", but also to show the relationships between the different measures from a holistic viewpoint, since this is a way of identifying potential mechanisms for improvements. For this reason, one of the improvement opportunities of KPI is to link the metrics together and make sense of the outcomes in terms of the business drivers and what they mean in terms of the industry structure and future directions;
- 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 the KPI could identify the performance of suppliers in a project environment; and
- In general, the main difficulties in the whole process of the KPI programme are concerned with the availability of data and their validity.

According to Beatham et al. (2004), the most significant problem with the KPIs (in their current format) was that they do not offer the opportunity to change. They are designed to be used as post-result lagging KPIs. This kind of indicator is used only as historic review. By

contrast, leading measures do offer the opportunity to change. They are measures of performance that can be used to predict the future performance of the activity being measured. Those authors recommend the use of leading measures aiming to give an early warning, identify a potential problem and highlight the need for further investigation.

Furthermore, there are some concerns with regard to the methods used for identifying, measuring and presenting performance measures by companies. Companies themselves devise the measures, which may come together to determine the value of a particular indicator. Hence, different measures can potentially be used to determine the value of an indicator. The usefulness of benchmarking those values across the industry can then be questioned. Another concern with the method of collection is the subjective nature of measurement that many times bears no scientific relevance both in terms of analysis and validity. The above exemplify the need to introduce standard measures that are the same across similar companies. This similarity will depend on most cases on the nature of the companies and the nature of the projects undertaken i.e. providing the context of the measurement environment. Alternatively, generic measures that are independent of the project and company context need to be established.

NATIONAL BENCHMARKING SYSTEM FOR THE CHILEAN CONSTRUCTION INDUSTRY

The National Benchmarking System was developed by the Corporation for Technical Development (CDT) of the Chilean Chamber of Construction, with the support of the Program for Excellence in Production Management of Pontificia Universidad Católica de Chile (GEPUC). This project started in 2001. By comparing key performance indicators, the CDT hopes to identify best practices and generate short-term improvement opportunities for participating companies (CDT, 2002).

The selection of performance indicators was based on previous studies that included an extensive literature review and empirical research (Alarcón and Serpell, 1996; Grillo, 1997). Initially, there were over 30 performance indicators that were analysed in several meetings with company representatives. The indicators were later prioritised by the participants in a seminar with the purpose of reducing the number of indicators, based on the experience and needs of the companies. The objectives of this set of indicators were to promote continuous improvement and benchmarking between companies (Alarcón et al., 2001). This is the current set of indicators used: (a) deviation of cost by project; (b) deviation of construction due date; (c) change in amount contracted; (d) accident rate; (e) risk rate; (f) efficiency of direct labour; (g) productivity performance; (h) rate of subcontracting; (i) client cost complaints; (j) urgent orders; (k) planning effectiveness.

In the first phase of the project, the construction companies adopted a set of indicators that were fairly easy to measure, using existing control systems in the organisations (Alarcón, 2001). For the implementation of these indicators, the companies involved received a support guidebook and had access to an information system, which had specific tools that enable comparisons to be performed (CDT, 2002). The National Benchmarking System use quantitative and qualitative tools for data analysis, such as: (a) mean; (b) ranking curves; (c) radar graph and (d) tables displaying companies result. Also, a correlation analysis is carried

out on the data using Pearson's correlation, factor analysis and multivariate linear regressions (CDT, 2002; Ramírez et al, 2004).

The set of indicators is concerned with five sub-sectors of the Construction Industry: (a) high-rise building; (b) low-rise building; (c) civil works; (d) heavy industrial construction; (e) light industrial construction. For each sub sector, four main indicators were collected and analysed.

A complementary management evaluation system whose objective is to provide a continuous improvement tool for construction companies through a benchmarking of management practices has been recently developed (Ramírez et al 2004). The outlined system seeks to support the National Benchmarking System by incorporating qualitative management aspects in addition to performance indicators. The management evaluation system aims to compare management practices, identify relationships between performance data and determine industry trends. It can be applied independently of the presence of "hard" performance data, increasing the feasibility of applying the system periodically as part of a continuous improvement program. In addition, the system also helps to determine how employees perceive their work environment and how well informed they are concerning company initiatives.

By 2001, the National Benchmarking System of Chile had in its data base 120 projects provided by 22 Chilean companies. These companies are members of the Chilean Chamber of Construction and they committed themselves to keep using the performance measurement system until the end of the project (CDT, 2002). According to Alarcón et al. (2001), these were the main difficulties in the implementation of the set of indicators:

- The indicators were not easy to measure for all of the companies involved. For example, not all of the companies had quality management systems that would enable them to measure the extent of re-work;
- The essence in the approach is to create a measurement culture within the organisation that will facilitate future implementation. Most of companies had difficulties in introducing performance measurement and in involving their work force in this initiative (Alarcón et al., 2001). For this reason, Alarcón et al. (2001) suggest that the implementation should start with few performance indicators that are easy to measure and focus afterwards in the critical processes.

According to the research team, the main difficulties in the implementation of the system were: (a) the lack of corporate commitment to benchmark at the company level; (b) poor standardisation of measures; (c) lack of continuity of measurement; and (d) inexistence of a regular and committed project team in many companies.

CONSTRUCTION INDUSTRY INSTITUTE BENCHMARKING AND METRICS

The CII Benchmarking and Metrics Programme started in 1993 (CII, 2000). It aims to provide performance norms to the industry, quantify the use and value of best practices, and to help focussing CII research and implementation efforts. A committee of industry representatives working with the CII staff has developed its policy and is in charge of overseeing the execution of the program. This committee has defined critical performance

measures that can be used in practice and developed a strategic approach to CII's collection, analysis, and dissemination of industry data. The Benchmarking and Metrics Committee meets on a regular basis for continuous development and improvement of the program (Construction Industry Institute, 2003).

The first data collection of CII Benchmarking and Metrics was in 1996 and the current set of indicators was established in the fifth review, in 2000 (CII, 2000). These are:

- Cost: project cost growth; project budget factor (contractor data only), phase cost factor (owner data only) and phase cost growth (owner data only);
- Schedule: project schedule growth, project schedule factor (contractor data only), phase duration factor (owner data only), total project duration and construction phase duration;
- Safety: recordable incident rate (RIR) and lost workday case incident rate (LWCIR);
- Changes: change cost factor;
- Rework: total field rework factor.

The CII Benchmarking and Metrics program collects the project data as an ongoing process through its website. The web site has an easy-to-use interface and is designed to collect data over the life of a project (Construction Industry Institute, 2003).

Participants receive real-time evaluation on their projects' performance using the web-based Progress Key Report. In this software, the projects can be immediately compared to the database and the reports show metrics score, performance quartiles, and graphic comparisons of individual project performance to the database (Construction Industry Institute, 2003).

Besides the web site and guides to support the implementation of the system, this program provides annual training the Benchmarking and Metrics Programme company members. aiming to improve the reliability of the benchmarking process (Construction Industry Institute, 2003). The system is also used to analyse the impact of CII Best Practices on projects, but there is limited analysis or correlations with more specific management practices that may lead to learn about the principles that lead to improved project performance.

In January 2003 CII's benchmarking database had over 1100 projects from more than 70 CII owner and contractor companies, 11 ECI (European Construction Institute) companies and 4 BMPPs (Benchmarking Participants). This represents $55 billion in total construction cost. The projects are from the heavy industrial, building, light industrial, and infrastructure industry groups, with the majority representing heavy industry (Construction Industry Institute, 2003).

According to the CII Benchmarking and Metrics staff, each company nominate its "Benchmarking Associate" who has a leading role of in-house training and validation of project data before submission to CII. Each project manager can fill out the questionnaire based upon his or her best knowledge. Senior management should also decide to commit and support benchmarking activities throughout the company.

In addition, the main difficulties identified in the CII Benchmarking & Metrics is getting corporate commitment to benchmark at the company level and to implement a company wide improvement process based upon the findings from the benchmarking program. They also have found that companies have been using the benchmarking to varying success, and mostly it depends on their commitment for improvement at the executive level by use of benchmarking.

PERFORMANCE MEASUREMENT SYSTEM FOR THE BRAZILIAN CONSTRUCTION INDUSTRY (SISIND)

The SISIND Project was established in 1993, involving the Building Innovation Research Unit (NORIE) of the Federal University of Rio Grande do Sul (UFRGS), the Association of Building Contractors of the State of Rio Grande do Sul (SINDUSCON/RS) and the Agency for the Support of Micro and Small Businesses (SEBRAE/RS). The aim of this project was to disseminate performance measurement concepts, principles and practices in the construction industry, by devising a performance measurement system for the sector, named SISIND (System of Quality and Productivity Indicators for the Construction Industry). The SISIND Project has been focused on small sized construction firms, since they correspond to a very large percentage of the industry in Brazil both in terms of the number of companies and output.

Since then, several initiatives have been established involving academic institutions, research funding agencies, industrial bodies and the Federal Government. The most recent initiative is the SISIND-NET project, which involves the conception and implementation of a performance measurement system for benchmarking for the Brazilian Construction Industry through (a) the development of a web-site for disseminating and collecting data; (b) the development a web based tutorial that can be used for training; and (c) the promotion of workshops and training courses in different places in Brazil, aiming to disseminate and implement the set of measures.

The SISIND project initially devised a set of 35 performance indicators for the residential and commercial building segment of the industry, which can be used as a starting point for establishing sets of measures for specific companies. For the benchmarking initiative, ten indicators have been jointly chosen by the research team and industry representatives. This is the set of measures that will be used as a starting point for devising the benchmarking system: (a) cost deviation; (b) time deviation; (c) non-conformity index for critical processes; (d) PPC (percentage of plan completed); (e) supplier performance; (f) degree of user satisfaction (product); (g) sales time; (h) ratio between the number of accidents and total man-hour input; (i) construction site best practice index; and (j) degree of internal client (workers) satisfaction.

The following activities were carried out in the SISIND project: (a) production of a publication describing the set of indicators; (a) dissemination of the project through presentations in seminars; (c) production of five reports based on the data collected by partner companies; and (d) development of research studies related to the definition and use of new measures for a number of key processes. Since the launching of SISIND, several construction firms have joined the project and participated in training courses aimed at enabling managers to implement the proposed measures in their organisations. A database

including data of approximately 80 companies and 200 projects has been created (Lantelme and Formoso, 2000). In spite of the interest and motivation showed by the construction companies involved in the project, only a relatively small number of them have been able to apply performance measurement in a continuous basis. In most of them, managers have pointed out the lack of people and time to do the job as the main causes for not implementing measures (Lantelme, 1994). According Formoso and Lantelme (2000), the main problems identified in the SISIND Project were:

- The lack of human resource argued by company managers is related to the fact that performance measurement is not properly integrated in process control at the operational levels;
- Companies tend to collect some indicators that are not related to critical processes only because those are easy to collect;
- Most firms do not have clearly stated objectives or strategies, and, for that reason, they are not able to establish their priorities in terms of improvement actions to be carried out;
- The measures that demand the investigation of root causes, such as "number of complaints from users in relation to the total number of units delivered", are relatively complex to implement, since they require both quantitative and qualitative data to be processed, and the effort of several people working as a team;
- The lack of training was also identified as an important barrier for the implementation of performance measurement system.

A more recent study (Costa and Formoso, 2003) identified other problems related to the lack of effectiveness of performance measurement systems in construction companies: (a) lack of definition of the team responsible for data collection, processing and analysis; (b) little use of measures in strategic decision making; (c) little use of measures for benchmarking; (d) centralisation of data collection, processing and analysis; (e) lack of cost-effectiveness analysis of measures; and (f) ineffective communication and dissemination of results.

POTENTIAL ROLE FOR BENCHMARKING IN CONSTRUCTION

The main interest of the construction companies that get involved in benchmarking initiatives is to compare their performance to other companies, especially from the same market segment. However, it was observed in the four initiatives of PMS for benchmarking that many companies find difficult to become involved in such initiatives on a permanent basis.

Holloway et al. (1997) pointed out some common difficulties in carrying out benchmarking: (a) the lack of suitable partners for comparing information; (b) resource constraints, including time, money and expertise; (b) lack of data access transparency; (c) staff resistance; and (e) confidentiality of data. These difficulties were observed in the four initiatives.

The lack of resources is particularly critical in small sized construction companies. According to Hudson et al. (2001), a strategic performance measurement development

process for small and medium companies must be very resource effective and produce notable short-term, as well as long term benefits, to help maintaining the momentum and enthusiasm of the development team. In addition, it must be dynamic and flexible enough to accommodate strategic changes, which tend to be frequent in companies that have emerging strategies. For those authors, in practical terms, this means that the process should be iterative, in order to maintain the strategic relevance of performance measurement.

Due to the difficulties and problems raised above, construction companies should design their own performance measurement, according to their strategy and capabilities, inserting some benchmarking measures in their measurement system.

Such companies should see benchmarking as a source of new ideas, or route to improvement based on observed best practices. Therefore, the information provided by benchmarking initiatives should enable a better understanding of the workings of business (their own or their competitors'), which could lead to improvement actions, instead of only being used for data comparison. This is an interesting way to share good practices concerning lean construction, for instance.

Based on the experiences of benchmarking initiatives in UK, Chile and USA, it is important to emphasise some key issues for the design and implementation of benchmarking performance measurement systems for the construction industry. First, the set of measures for benchmarking should be simple and well designed in order to support improvement initiatives. The set of measures must give a holistic, company-wide view including a mixture of leading and lagging indicators (Beatham et al., 2004). The KPI and CDT programmes mostly involve lagging measures, based on outcomes. Such measures are important for accessing the success of strategies, but do not support improvement opportunities during the period for which the measure has been taken (Beatham et al., 2004). By contrast, the design of CII benchmarking system includes a set of performance measures that can be used during the whole life of the project.

The procedures for data collection should be also simple, aiming to facilitate the creation of the database and to make it simple to evaluate the project performance in relation to other projects in real-time. Three of the initiatives (KPI, CDT and CII) offer an online tool for the collection and evaluation of the benchmarking measures. For this reason, it is useful to design an interactive online tool, which allows the user to access an assortment of documents and provides feedback. Beatham et al. (2004) suggest that the online tool must also be used throughout the life of a project, aiming to offer to the companies the opportunity to analyse the results and to promote improvements. Another key issue of the implementation of the online benchmarking process is data security. Finally, the benchmarking system must be fully understood by all people involved. Therefore, it is also important to promote training courses for the companies involved, including the communication of results, analysis of the evolution of the set of indicators, and the exchange of practices between practitioners, such as the ones promoted by the KPI and CII initiatives

FUTURE DIRECTIONS

The description and analysis of the various performance measurement systems used across the countries presented in this paper provides an interesting and insightful dimension in determining future directions in this area. These directions aim to raise the main problems

and limitations of the existing systems and to indicate relevant studies opportunities concerning performance measurement for benchmarking and the link with lean concepts.

(a) Understanding the differences between the different approaches used by different countries, enabling international benchmarking: this area can look at the local reasons why different approaches are used in different regions to measure what is essentially a common goal – the measurement of the construction sector. This should enable the identification of generic (i.e. applicable across countries) measures that can form the basis of international benchmarking. This direction can promote the exchange of lean practices among companies, which can lead to the development and learning of new operations management ideas in the construction sector.

(b) Establishing a classification of performance measures: clear distinctions should be made for measures that relate to the process of construction, the performance of the organisation, the translation of the client or end-user needs to product specifications, the performance of the facility etc. A useful approach will be to consider the product development process as a starting framework but which extents to the whole life issues as well. This is a particularly emerging area as data from projects in the last 5-7 years can be revisited and examinations could be performed as to the degree that a facility still satisfies the needs of its original conception. Useful lessons can be learned through this, in particular if this is extended to the organisational level – rates of improvement or otherwise might be observed.

(c) Developing frameworks that migrate performance measurement to performance management systems: this is the arena where relationships between performance measures can be examined and used to improve overall performance of projects and organisations rather than of measures. It is necessary to go one-step further in understanding project performance factors. New and improved frameworks are needed that consider cause and effect relationships on actions taken at the operational and strategic levels. Performance modeling (Alarcón and Serpell 1996) using benchmarking data can be a way of making progress in that direction, but it is probably necessary to review many of the existing indicators used in performance measurement systems in order to match them to the level required to develop models that can explain the mechanisms that affect project performance. Only if these mechanisms are fully understood it will be possible to fully explore the potential of benchmarking systems. Dynamic simulation of such models can be used to perform what-if analysis.

(d) Developing collaborative learning processes: further investigation on collaborative initiatives, in which companies can mutually share their benchmarking experience and learn from each other. Recent experiences in benchmarking clubs around the world have demonstrated the benefits of this win-win approach that helps companies to accelerate the improvement process. Such initiatives should be fully described and critically analysed.

(e) Devising new measures: new performance measures that can better explain the performance of production systems in the new operations management paradigm are necessary. For instance, measures on how much uncertainty and variability in the project processes exist are probably necessary to understand the dynamic of the production system. PPC measures are an example of such type of performance measures that can be related to project performance. Moreover, qualitative measures of organizational and cultural

characteristics of companies and projects are also needed to have a more comprehensive picture of the different aspects that explain project performance.

(f) Developing a theoretical framework for performance management. This can be achieved at two levels. Firstly, extensive reviews of literature in general management and social disciplines, and secondly through good practice implementations. For instance, large amounts of data can be used to perform data mining analyses that could identify critical success factors (CSFs). These might turn out to be quite different to the ones currently perceived. For example, relationships between safety and and lean production systems could be investigated. The establishment of a theoretical framework for performance management can be used for assessing existing performance measurement systems.

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