BENCHMARKING BASED PERFORMANCE MANAGEMENT FOR CONSTRUCTION CONTRACTORS

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Abstract: In a competitive industry, effective performance management is an essential element of business success. However, despite their importance, performance management systems have not yet been widely implemented in construction companies. That said, many construction companies have become increasingly aware of the need to more systematically identify, implement, and sustain performance improvements in recent years. The objective of this paper is to develop benchmarking based performance management for construction contractors. This paper investigates examples of PMSs in the U.K., U.S., Brazil, and Chile and discusses the lessons learned. Then, to overcome the limitations of existing PMSs, a new performance measurement framework, in the form of a 'Construction' BSC, is presented. And a learning process using knowledge push is proposed. Finally, this paper develops a PMS for benchmarking in construction companies and recommends further areas of study for this research topic.

1 INTRODUCTION

In a time of globalization and an increasingly competitive environment, measuring performance has become critical to business success (H.A.Bassioni, et al., 2004). Indeed, across industries, the issue of measuring the performance of organizations has risen in importance in academic and business agendas over the past 15 years, in what Neely (1999) has described as a revolution (H.A.Bassioni, et al., 2005). The construction industry is no exception. In particular, the importance of performance management has been emphasized in construction companies responsible for complex managerial work involving the simultaneous implementation of various projects and the control of many input resources. Therefore, various construction companies have attempted to develop efficient and systematic performance management systems.

However, despite these efforts, only a few companies have performance management processes which provide key support for decision-making (Lynch and Cross 1995; Kaplan and Norton 1992). This often makes it difficult for company managers to determine management priorities and define the key indicators that should be used for comparison with other companies (Schiemann and Lingle 1999). Moreover, the effective implementation of a performance management system is not only a matter of selecting the right measures, but also a matter of initiating a deeper change in the decision-making processes and the learning approaches adopted within an organization (Lantelme et al. 2001; Costa D.B., et al., 2006). As a tool for efficient performance management, benchmarking has become more commonly discussed in construction industry.

However, as a result of investigating examples of performance management system using benchmarking, there are several limitations. Most performance measurement indicators are lagging indicators and concentrated on management at the project level. Moreover, there is still a lack of learning process that can be used for improving performance.

Thus, to overcome the limitations of existing performance management system, this paper aims at proposing new performance management methodology and developing benchmarking based performance management for construction contractors. The procedures deployed in this research are divided as follows:

(1) Investigating examples of performance management systems in practice
(2) Discussing the lessons learned and limitations

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(3) Proposing new performance management methodology to overcome limitations
(4) Developing performance management system

2 PERFORMANCE MANAGEMENT IN CONSTRUCTION

2.1 Performance Management and Benchmarking

Performance management is a managerial process that contributes to the effective management of individuals and teams to achieve high levels of organizational performance (Armstrong et al. 2004). The effective implementation of performance management is not simply a matter of selecting the right measures. It also implies a much deeper change in the decision-making processes and the learning approaches adopted within an organization (Lantelme et al. 2001). As a method of encouraging continuous learning for both managers and organizations, benchmarking has used.
Camp (1989) defines benchmarking as the continuous process of measuring products, services, and practices against the toughest competitors or those companies recognized as industry leaders. The Construction Industry Institute (CII) has adopted the definition of benchmarking as a systematic process of measuring one's performance against results from recognized leaders for the purpose of determining best practices that lead to superior performance when adapted and implemented (Hudson 1997).
According to Garvin (1993), the greatest benefits of the benchmarking process are that is allows more efficient work and that it involves managers proactively in the process rather than depending exclusively on results.

2.2 Performance Management in Practices

In the last few years, benchmarking have mainly been related to the creation and implementation of performance management system. Several performance management systems for benchmarking have been developed in Australia, Brazil, Chile, Denmark, the United Kingdom, Hong Kong, Singapore, and the Netherland. This study focuses on the U.K.'s key performance indicators, the Chilean construction industry's National Benchmarking System, the Construction Industry Institute Benchmarking and Metrics Program in the U.S., and the Performance Measurement System used in the Brazilian construction industry.

Table 1: Comparison of PMSs in different countries.

Factors	U.S.	U.K.	Chile	Brazil
Project level	○	○	○	○
Company level	X	△	X	X
Leading indicators	△	X	X	△
Lagging indicators	○	○	○	○
Benchmarking club	○	○	○	○
Learning process	△	△	△	△
Web-based	○	○	○	○

Based on the analysis of the performance management systems used for benchmarking in four countries, key factors for the design and implementation of a PMS for benchmarking were identified:

(1) A learning environment is created within the companies through benchmarking clubs, motivating them to apply the knowledge gained from that forum to the context of their specific companies.
(2) These PMSs offer an interactive online tool for the collection and evaluation of performance indicators. The participating companies submit data to a database manager. Then, the users are allowed to access an assortment of documents and provide immediate feedback to the benchmarking club members.

However, the existing PMSs also have limitations; they are as follows.

(1) Most performance indicators are KPOs (key performance outcomes, or 'lag indicators'), which are based on project outcome. Although, KPOs are important in assessing the success of a company's strategic objectives, KPDs (Key performance drivers, or 'lead indicators') are also necessary because KPDs help anticipate the impact on future desired results. Moreover, many of the existing indicators are more adaptable to individual projects. This limited view communicates only a single metric performance for a specific project, and no insight is provided into the overall performance of the company. Clear distinctions between project level performance indicators and

company level performance indicators, and their relationships, are needed.

(2) In these systems, the performance management process is mainly focused on comparing companies' performance. Therefore, to develop a more comprehensive PMS, the transmission of knowledge must be emphasized. In fact, a new performance management process is needed that is not only aimed at the identification of common measures for data comparison among companies, but also geared towards taking advantage of potential learning opportunities through the sharing of managerial practices among companies.

3 BENCHMARKING BASED PERFORMANCE MANAGEMENT METHODOLOGY

In an attempt to overcome existing PMSs' limitations, a new performance management metrology is proposed.

3.1 'Construction' Balanced ScoreCard (BSC)

Construction is a technology-intensive industry as well as a labor-intensive industry. Improving the core capability of the overall industry, and yielding higher value, is required. In regard to this notion, there is a wide range of opinion on linking strategy to performance management. Recently, construction companies have used a more balanced approach for the monitoring of nonfinancial measures (H.A.Bassioni, et al., 2004). The Balanced Scorecard (BSC) has the advantage of making up for the weaknesses in existing frameworks by selecting leading measures as well as lagging measures. The BSC has been described as one of the most influential business ideas of the past 75 years by the Harvard Business Review, and it is estimated to be used by 50% of the Fortune 1,000 companies, which is 45% of the major companies in Europe.

Therefore, the proposed framework adopts the BSC framework. However, for construction companies that operate many projects, this framework can be limited. Construction companies' performance must be evaluated by measures of performance of each project, and by activities of the head office and supporting organizations. However, with the original BSC, it is difficult to measure performance at both the project level and company level.

Thus, in an attempt to provide a balanced approach to construction performance measurement, the framework is customized for construction companies. This 'construction' BSC consists of two levels (company level, project level) and four perspectives (financial perspective, customer perspective, internal business perspective, innovation and learning perspective) at each level.

Figure 1: 'Construction' BSC with two levels and four performance perspectives.

The four perspectives and their associated key performance indicators are adapted to the specific characteristics of the construction industry. Figure 2 shows the procedures of the KPI derivation.

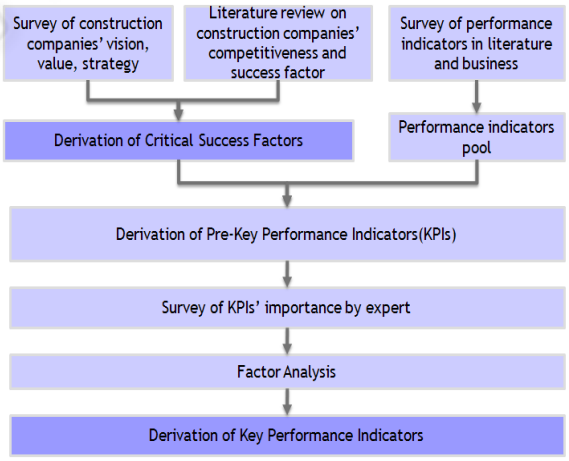

Figure 2: Procedures of the KPI derivation.

To determine management priorities, the relationships between KPIs are showed in form of strategy maps. The concept of strategy maps was introduced to the business world by Robert S. Kaplan and David P. Norton as a mean to illustrate

and elaborate their earlier concept, the BSC. Strategy maps are a way of providing a macro view of an organization's strategy, and provide it with a language in which they can describe their strategy, prior to constructing metrics to evaluate performance against their strategies. Strategy maps show the cause and effect links by which specific improvement create desired outcomes.

According to Walsh (1996), KPIs can be classified as two types: Key performance outcomes (KPO) and Key performance drivers (KPD). Key performance outcomes (KPOs) are measures of performance that indicate progress towards company objectives. Key performance drivers (KPD), on the other hand, are measures of performance that have a direct influence on these outcomes. Improving KPOs will result in the improvement of the KPDs (Paul Walsh, 1996). By determining the relations between KPOs and KPDs, companies can subsequently decide which actions need to be taken. For example, if the attainment of sales goal(KPO) is low, a company will have to check the schedule delay(KPD) and rework(KPD) which are linked to the attainment rate of sales goals. In the proposed 'Construction' BSC strategy map, it shows the relationships not only between KPO and KPD but also between company level and projects level.

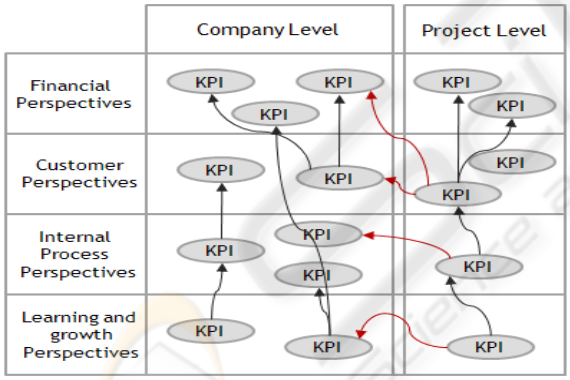

Figure 3: Framework of 'Construction' BSC strategy map.

3.2 Learning Process using Knowledge Push

Benchmarking process can be used to improve performance by helping managers understand the methods and practices required to achieve higher performance level (Camp 1995). In the benchmarking process, it is important to understand how practices and measures can be translated into practical knowledge. It is equally important that the company knowledge transfer is actively encouraged (Hinton et al. 2000). Therefore, by the means of effective and efficient benchmarking process, knowledge push is suggested. Knowledge push is a mode of knowledge service can accelerate knowledge transfer, eliminate the asymmetric phenomenon of knowledge, and promote the application and innovation of knowledge (Yong Feng 2008). Figure 4 shows operational mechanism of knowledge push. The server retrieve knowledge based on KPI derives to manage, company information and post-knowledge requirement and push it to user. User can acquire knowledge through knowledge push and pushed knowledge is evaluated by users.

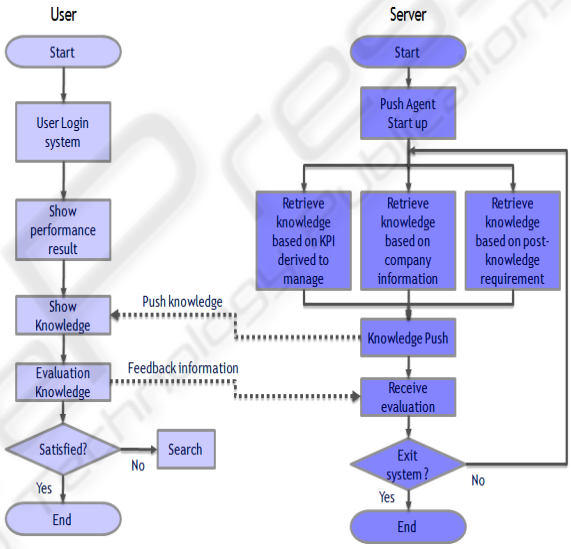

Figure 4: Operational mechanism of knowledge push.

4 SYSTEM DEVELOPMENT

To have a learning opportunities and process, knowledge sharing between companies is needed. Mills (2007) recognized the importance of sharing knowledge and has insisted that the Blog can be used as a knowledge management tool in the construction industry. Indeed, it has proven to be an effective and efficient means to share performance information, knowledge, and Best Practices among companies. While project level performance measures and knowledge are stored in a project blog, company level data are kept in a company blog. Also, as construction companies deal with a variety of projects, the company blog connects different project blogs together.

Figure 5 shows the key components of the proposed performance management system. This system

integrates project blogs and company blogs in the information system, and these blogs are synchronized. Project managers store performance measures in the performance management system, which, in turn, is stored in the project blog. Then, all the projects' measures of performance are displayed together in the company blog. Consequently, company managers can compare all projects to determine Best Practices and identify performance reports, ranking lists, and etc. On the other hand, in the company blog, the performance management system and knowledge management system are linked. Therefore, knowledge that is related to performance measures is pushed from the knowledge management system to the performance management system. As a sharing database, both a company's own knowledge and the knowledge of other companies can be pushed.

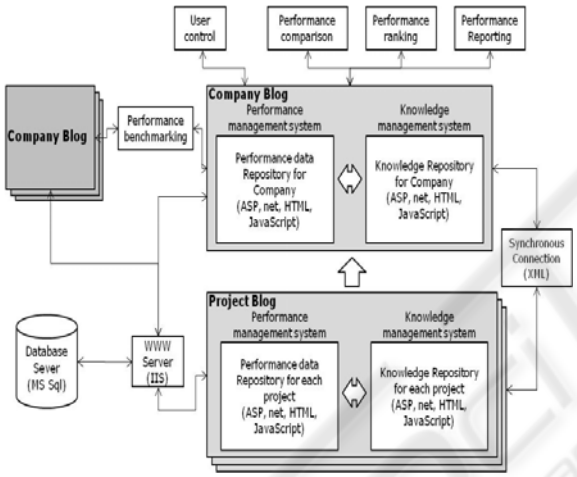

Figure 5: Performance management system architecture.

Furthermore, the project blog and company blog are developed based on ASP.net, HTML, and java script. Performance measures and knowledge are sent to the company blog in XML format in real-time. The application is based on the Internet Information System (IIS) and Microsoft SQL server (MSSQL).

5 CONCLUSIONS

This paper analyzed existing performance management systems in the U.K., U.S., Chile, and Brazil and identified limitations; (1) focusing project level's indicators which is KPO (2) lacking learning opportunities to improve performance. To overcome these limitations, a new performance measurement framework customized for construction companies named 'Construction' BSC was proposed that incorporates the four perspectives of the original BSC and two levels for measuring project and company performance. Then, 'Construction' BSC strategy map, which is aimed at finding out related KPIs and managing both lagging KPIs and leading KPIs, was suggested. Based on resulting of performance measurement, Knowledge is automatically retrieved and pushed though the knowledge management system, which is linked to the performance management system.

By adopting 'Construction' BSC, construction companies can use a more balanced approach for the monitoring of KPO and KPD as well as company and project level. Moreover, the benefit of the proposed PMS is that can be used to improve performance by pushing knowledge that is related to performance results measured by 'Construction' BSC.

The proposed performance management system will enable construction companies to enhance their competitiveness by providing them with information pertaining to other companies' performance and by pushing knowledge. However, to be a generalized performance management system, verification should be conducted in future research.

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