Automation in Construction 18 (2009) 605–623

Contents lists available at ScienceDirect

Automation in Construction

journal homepage: www.elsevier.com/locate/autcon

Benchmarking-based process reengineering for construction management

Min-Yuan Cheng [a,1], Ming-Hsiu Tsai [b,*], Wiraputra Sutan [a,2]

[a] Department of Construction Engineering, National Taiwan University of Science and Technology #43, Sec. 4, Keelung Rd., Taipei 106, Taiwan, ROC
[b] Department of Civil Engineering, TamKang University 151 Ying-chuan Road, Tamsui, Taipei County, 25137 Taiwan, ROC

ARTICLE INFO

Article history:
Accepted 8 December 2008

Keywords:
Benchmarking
Business process reengineering (BPR)
Semantic similarity
Trend model

ABSTRACT

In order to determine the most suited best practice processes to be implemented, a benchmarked company must conduct an accurate analysis of the gaps between best-practice processes and its own processes in order to redesign business processes successfully. This study applies benchmarking to BPR and meanwhile integrates semantic similarities and trend model concepts to develop a benchmarking-oriented process reengineering (BOPR) approach that will enable a project team to determine the best-practice company process most suited to benchmarked company needs. In BOPR approach, the concepts of semantic similarities analysis was applied to find the semantic-related objects between best-practice processes and benchmarking process; and the trend model methodology was applied to evaluate the degree of communication ease for best-practice processes once such are implemented in the benchmarked company. Finally, a procurement process case study from best-practice companies was analyzed to validate the feasibility of the developed BOPR method. In the case study, the BOPR method was implemented for the benchmarked company to assist the project team to determine the best choice paradigm for their benchmarking project.

1. Introduction

The phrase “business process reengineering” (BPR) first appeared in 1990 in a paper written by Michael Hammer and published in the Harvard Business Review entitled, “Reengineering work: Don't automate, obliterate” [1]. BPR attempts to achieve dramatic improvements in critical measures of performance by using the power of current information technology (IT) to rethink and redesign the business process fundamentally and radically [2]. However, most research works related to BPR to date have employed this tool on business process performance evaluation rather than on business process redesign. In this circumstance, to apply BPR philosophy to construction management process, Cheng and Tsai (2003) proposed the Construction Management Process Reengineering (CMPR) model to reengineer the critical processes of construction companies based on the process performance evaluated by the proposed method [3]. Moreover, Cheng and Tsai (2008) extended process reengineering scope from in-house processes to cross-organizational processes, and addressed the Integrated Design-build Framework (IDBF) to redesign a collaborative process model integrated from the architecture/engineering (A/E) and the general constructor (GC) companies within a design-build team [4,5].

Using the process redesign methods, respectively in CMPR and IDBF, construction management processes can be redesigned according to identified shortcomings such as non-valued added, redundant (overlap) and low-efficiency activities. Managers, thus, may redesign processes aiming at defect removing with their experience and iterative redesign procedure. For the construction companies with sound constitutions, CMPR and IDBF provide useful methodologies to collect and analyze essential information for designing new process based on their original processes. However, on the contrary, analyzing for original processes may not be a practical manner for some weak or new companies due to their defective processes or lack of experience, especially the small/medium construction company in Taiwan. Furthermore, the effectiveness of the new process redesigned based on the original process cannot be insured until the validation works were done by practice. Process reengineering, an approach that provides no definitive framework from which to work, is usually treated as a high risk solution to business performance enhancement. Therefore, redesigning a process based on the best-practice company's processes is somehow an efficient and lower risky solution, comparing with the previous methodologies. Based on this idea, this study applies benchmarking philosophy to BPR in order to redesign the business process.

Benchmarking, originating in the mid-1970s, is a process of continuously comparing and measuring an organization against industry leaders worldwide to gain information that will help organization leaders take action to improve performance [6]. Benchmarking offers an easier way to redesign processes by providing a

* Corresponding author. Department of Civil Engineering, Tamkang University 151 Ying-Chuan Road, Tamsui, Taipei County, 25137 Taiwan, ROC. Tel.: +886 2 26215656 x 3261; fax: +886 2 26209747.
E-mail addresses: myc@mail.ntust.edu.tw (M.-Y. Cheng), mht@mail.tku.edu.tw (M.-H. Tsai), m9405807@mail.ntust.edu.tw (W. Sutan).
[1] Tel.: +886 2 27336596; fax: +886 2 27376606.
[2] Tel.: +886 2 27333141x7535; fax: +886 2 27376606.

0926-5805/$ – see front matter © 2008 Elsevier B.V. All rights reserved.
doi:10.1016/j.autcon.2008.12.004

blueprint of targeted process from best-practice companies and serves to motivate project teams by establishing realistic goals demonstrated to be achievable in best-practice companies. Thus, within the framework of BPR philosophy, this study proposes identifying best-practice processes through a benchmarking approach and employing BPR to implement identified best-practice processes in a benchmarked company.

In Spendolini's process [7], identifying benchmarking partners and collecting/analyzing benchmarking information are generally two problems for benchmarking companies. This could be the reason that many researches in the construction industry have focused on identifying the best-practice companies within the industry [[8–10]. However, once the best-practice companies have been identified and relevant information has also been collected, how to determine whether the best-practice companies' processes are suitable for the benchmarked company would become another problem for managers. Relatively few have focused on approaches to determining which of the identified companies would be most suited to act as a model to emulate and follow. As this study focuses on process redesign, an approach based on the semantic similarity and trend model analysis was proposed to assist managers determining the most suited process in accordance with process similarity and communication efficiency of each best-practice process.

Summarily, in order to assist BPR team to redesign a process based on the most suited best-practice process, this research combines BPR technique with the semantic similarity analysis and the trend model methodology to develop a benchmarking-oriented process reengineering (BOPR) approach that enables a BPR team to determine the best-practice company process most suited to benchmarked company. Four phases , namely (1) business process modeling, (2) process similarities analysis, (3) process communication index analysis and (4) process adaptability calculation, constitute BOPR. Meanwhile, a case study of a general constructor's procurement process in Taiwan was analyzed with BOPR for feasibility validation.

2. Problem description

To develop BOPR method, several problems inherited from BPR and benchmarking philosophy need to identify previously. Since BOPR combines BPR philosophy with the benchmarking idea, not only the process perspective is focused, but also the implementation aspects of benchmarking needs to considered so that the scope and the assumptions of BOPR can be identified. Three primary problems were necessarily described; namely (1) benchmarking information collection, (2) what is the most-suited process and (3) how to find the most-suited process out. The BOPR scheme could be proper and practicable as the three problems were considered.

2.1. Benchmarking information collection

Benchmarking information collection is a critical and tough issue for benchmarking implementation. For benchmarking implementation, Spendolini [7] developed a five-stage benchmarking process model, including (1)determining what to benchmark, (2)forming a benchmarking team, (3)identifying benchmark partners, (4)collecting and analyzing benchmarking information and (5)taking action. In the competitive environment of an industry, competitors treat their business model as confidentialities so that “identifying benchmark partners” and “collecting and analyzing benchmarking information” are generally two tasks with the most difficulties in a benchmarking project. Alliance is a common solution for this tough circumstance. Naturally, BOPR method inherits this feature from benchmarking; i.e., the process information collecting from benchmarking companies is an essential task for preparing the implementation of BOPR.

To keep the study purpose explicit and to dismiss the uncertainties of the benchmarking information collection, the scope of BOPR was limited in the way to distinguish the most-suited process from the collected best-practice companies; i.e., the necessary benchmarking information, especially the process-related information, is assumed to be collected previously.

2.2. Definition of the most-suited process

The second problem is what the most-suited process is. Based on Hammer and Champy's enterprise framework [11], an enterprise system is composed of four primary elements, namely, (1) process, (2) organization, (3) institution/mechanisms and (4) enterprise culture and value, where the organization supports process implementation; institution (or mechanisms) regulates staff behaviors in the organization, and enterprise culture/value, also influencing process's performance, is the internalization of institution in an organization. Each element needs to coordinate each other to achieve enterprise's goals and vision. Hammer and Champy's framework provides a global view of business process, and reveals that process relies much on organization. Accordingly, this study defines the most-suited process from organization aspect and self-attributes of process.

On the one hand, aiming at process attributes, the most-suited process should function the same tasks, data items and targets with the benchmarked process. Based on this point of view, the best-practice process with most similar functional and informational characteristics with the benchmarked process should be prioritized as the most suited candidate. On the other hand, aiming at organization view, the more smoothly the process can be performed in the benchmarked company's organization; the more suitability the process has. Therefore, this defines the most-suited process as a referable process which possesses most similar information and functions with the benchmarked process, and which executes with most smoothness in the benchmarked company.

2.3. The way to determine the most-suited process

To determine an external process whether it is properly adopted in an organization is the problem mixing with subjective and objective issues; i.e., the process context of both subject and object needs to reveal during a process benchmarking project. This complicated nature results in difficulties in decision-making about determining the best-to-learned company. Experts with experience in a specific industry may recognize proper processes for their companies in accordance with their subjectivities, while the others may not. A method bringing scientific objectivity into what can be a highly subjective practice of determining most-suited process is critical for this study.

Based on the definition of the most-suited process, the method to determine the most suited process needs being able to (1) discover the commonalities between a best-practice and the benchmarked processes, and (2) evaluate the efficiency of each best-practice process performed in the benchmarked company's organization. Meanwhile, according to ARIS process modeling technique[12], a process is an aggregation of data, function and organization views; therefore, this study discoveries process commonalities and efficiency in the three aspects of ARIS methodology.

Firstly, for discovering process commonalities, the compositions of two processes, data and functions, need to be compared. Therefore, the process commonality could be measured by pair-wise comparing of the meanings of two entities respectively in two processes. Following this idea, the semantic similarity analysis methodology was applied due to its capabilities to deal with duplicate descriptors for processes in different organizations, resulting from using different names for denoting the same entities or operations of different contexts [13].

Secondly, to evaluate the best-practice process's efficiency in the benchmarked company, this study takes the communication efficiency