An Automated Workforce Clustering Method for Business Process Reengineering in Research and Development Organizations

Madjid Tavana, School of Business, La Salle University, Philadelphia, PA, USA
Alex F. Sisti, Air Force Research Laboratory, Rome, NY, USA
Dawn A. Trevisani, Air Force Research Laboratory, Rome, NY, USA

ABSTRACT

Business process reengineering (BPR) involves the radical redesign of functional organizations into cross-functional teams to achieve dramatic improvements in productivity. Redesigning complex and dynamic processes in research and development (R&D) organizations with multi-layer projects is a difficult task. Previous researchers have proposed many intuitive approaches for BPR utilizing intuition and subjective judgment from “experts” at various stages of their implementation. However, the complexities inherent in large R&D organizations have restricted the effectiveness of their use in practice. The authors present an automated and structured analytic algorithm that eliminates the need for subjective human judgment. The proposed method facilitates the reorganization of R&D processes into cross-functional work units and projects. The efficacy of the algorithm is confirmed with a small problem and the applicability of the proposed method is demonstrated at the Air Force Research Laboratory.

Keywords: Air Force Research Laboratory, Business Process Reengineering, Clustering Algorithm, Cross-Functional Teams, Organizational Design

INTRODUCTION

Innovation plays a prominent role in the current turbulent economy. For innovating organizations, workforce creativity is a crucial determinant of competitiveness and productivity (Lovelace et al., 2001). Team building is a strategy for combining the creativity of employees and promoting innovation (Hoegl & Gemuenden, 2001). Innovation requires teamwork and teams need to have high levels of collaboration to synergistically combine their
skills and successfully cope with the complex and dynamic nature of innovative projects (Stewart & Barrick, 2000; Hoegl & Praveen Parboteeah, 2007; Okhuysen & Eisenhardt, 2002; Seijts & Gandz, 2009; Thompson, 2003). The ability to form effective teams to take on challenges in this turbulent environment is a source of competitive advantage for most research and development (R&D) organizations. Several approaches have been proposed for team formation in the literature. For example, the team management wheel proposed by Margerison and McCann (1991) or the team role model proposed by Belbin (1991) can be used to form balanced and complementary workgroups. Other methods include multi-functional work-force team formation (Fitzpatrick & Askin, 2005; Tseng et al., 2004), project management team formation (Wi et al., 2009a, 2009b), and task force team formation (Tavana et al., 2007). The main objective of these methods is to organize a group of individuals into a useful set of teams such that the similarity of the individual members within a team is maximized while the similarity of the individual members between different teams is minimized (Wi et al., 2009a). More specifically, the staff in R&D oriented organizations is generally structured in work units and projects, which have an enormous influence on the performance of the entire organization (Wi et al., 2009a).

Previous researchers have proposed many intuitive approaches for team formation utilizing intuition and subjective judgment from “experts” at various stages of their implementation. However, the complexities inherent in large R&D organizations have restricted the effectiveness of their use in practice. In order to achieve maximum benefits, teams have to be formed carefully and placing individuals randomly in a group and assigning them a task is not sufficient (Soller, 2001). We propose an alternative method for business process reengineering (BPR) and multi-functional team formation in R&D organizations based on group technology (GT) problems in manufacturing. GT is a methodology for organizing work into independent groups each responsible for the production of a given family of products (Burbridge, 1979). GT simply states that similar things should be done similarly. These problems are also known as the machine-part cell formation (CF) problems where parts and machines in a manufacturing process are assigned to independent cells so that the machine utilization within a cell is maximized and the between-cell movement of parts is minimized (Ahi et al., 2009; Bajestani et al., 2009; De Lit et al., 2000; James et al., 2007).

We extend the machine-part CF method to model the team formation problem in R&D organizations. Our model is simple, easily implemented, and it is based on well-known and widely used GT concepts. A typical R&D organization can be explained in a similar manner by replacing the word machine with employee and part with job. A business process requires skills from employees in many different departments. By analyzing a business system from a process point of view, it becomes evident that it is logical to form business process cells. These business process cells are essentially process teams described by Hammer and Champy (1993, p. 66) as work units that naturally fall together to complete a process. Hammer and Champy (1993) also suggested replacing functional departments with process teams to take advantage of GT benefits.

This paper is organized into eight sections. In the next section, we present a brief review of the clustering literature. Following this brief review, we discuss the criteria for evaluation of clustering solutions. In the following section, we present the business process team formation approach proposed in this study. We then present the details of our clustering algorithm and discuss the complexity of our algorithm. Next, we present a case example at the Air Force Research Lab and we summarize with our conclusions and future research directions.
BIM-Based Knowledge Management in Construction Projects
[www.igi-global.com/article/bim-based-knowledge-management-in-construction-projects/199792?camid=4v1a](www.igi-global.com/article/bim-based-knowledge-management-in-construction-projects/199792?camid=4v1a)

Integrated-Services Architecture for Internet Multimedia Applications
[www.igi-global.com/chapter/integrated-services-architecture-internet-multimedia/14472?camid=4v1a](www.igi-global.com/chapter/integrated-services-architecture-internet-multimedia/14472?camid=4v1a)