Business Process Management Systems for Supporting Individual and Group Decision Making

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INTRODUCTION

The complexities involved in managing intrafunctional as well as interfunctional activities have triggered many organizations to deploy large information technology (IT) systems such as ERP and CRM. While such systems have focused mainly on providing solutions to problems such as enterprise-wide application integration and customer driven revenue management, one of the prime issues of managing coordination among activities in organizational processes has not gained adequate attention and support. Business process management (BPM) systems have emerged as a key technology primarily in the past two decades with a goal of providing process support to organizations and supporting better decision making.

This article focuses on highlighting this role of BPM systems while discussing some of the recent advances and approaches from a decision making standpoint, both for supporting individual and collaborative decision making activities.

BACKGROUND

The original ideas upon which BPM systems are founded upon can be traced back to several different areas of computing and management. It is worthwhile to glance at the history to better understand the motivating factors for the advancement and role of BPM systems. One such area is that of office information systems. In the 1970s and 1980s, researchers like Holt (1985) focused on modeling routine office procedures with mathematical formalisms such as Petri Nets. These efforts did not gain much momentum due to the functional nature of organizations. Later, in the mid-1990s, management initiatives such as Business Process Re-engineering (BPR) (Hammer, 1990), and Total Quality Management (TQM) (Harrington, 1991) highlighted the importance of process oriented thinking in organizations, which helped in rejuvenating the interest in business process modeling and management.

During mid-1980s and early-1990s, another research stream of organizational decision support system (ODSS) emerged. It built upon Hackathorn and Keen's (1981) key ideas of decision support: individual, group, and organizational. From a decision standpoint, it laid out a foundation for focusing on organizational activities and further decomposing them into a sequence of subactivities performed by various organizational actors. Although process coordination was not the primary focus of ODSS, it supported the notion of coordinating and disseminating decision making across functional areas and hierarchical layers such that decisions are congruent with organization goals and management's shared interpretation of the competitive environment (Watson, 1990). The term ODSS was sometimes also referred to as "distributed decision support system" in the literature.

Also in the early 1990s, document imaging and management systems fostered the notion of automation of document-driven business processes by routing documents from person to person in an organization (Smith, 1993).

BPM AND RELATED TERMINOLOGY

The term BPM is often used by commercial vendors with different connotations. It is therefore essential to present operational definitions of related terms. Firstly, the term *process* itself is very broad. Medina-Mora,

Wong, and Flores's (1993) classification of organizational processes into material processes, information processes, and business processes is noteworthy here. Material processes relate human tasks to the physical world (e.g., assembly of machine parts). Information processes relate to automated tasks (i.e., performed by computer programs), and partially automated tasks (i.e., tasks performed by people with the assistance of computer programs). Business processes are a higher level abstraction of organizational activities that are operationalized through material processes and/or information processes (Georgakopoulos, Hornick, & Sheth, 1995). The term process in the BPM context relates to business processes implemented primarily as information processes, and is used in the discussion in this article.

Workflow is a related concept to automating business and information organizational processes. The Workflow Management Coalition (WfMC) defines *workflow* as: "The automation of a business process, in whole or part, during which documents, information, or tasks are passed from one participant to another for action, according to a set of procedural rules" (WfMC, 1999). Also, WfMC defines the term *Workflow Management System* (WFMS) as: "A system that defines, creates and manages the execution of workflows through the use of software, running on one or more workflow engines, which is able to interpret the process definition, interact with workflow participants and, where required, invoke the use of IT tools and applications" (WfMC, 1999). It can be seen that WfMC places strong emphasis on the execution aspect, which is limiting in many ways. While managing execution of workflows is essential, making use of information about workflows to analyze, diagnose, and redesign business processes at a conceptual level is critical to reap benefits from the technology, rather than focusing merely on process design, system configuration, and process enactment. With this realization, the term *BPM* has emerged, which involves "supporting business processes using methods, techniques, and software to design, enact, control, and analyze operational processes involving humans, organizations, applications, documents, and other sources of information" (Weske, van der Aalst, & Verbeek, 2004). Similarly, a *BPM system* can be defined as "a generic software system that is driven by explicit process designs to enact and manage operational business processes" (Weske et al., 2004).

The BPM life cycle can be viewed as the one involving process (re)design, system configuration, process enactment, and diagnosis. Thus, along with a strong workflow management component, BPM systems involve decision-making support for business managers through the diagnosis phase. The diagnosis phase mainly involves *business process analysis* (BPA) and *business activity monitoring* (BAM). In this context, a visionary characterization of workflow management infrastructure provided by Georgakopoulos et al. (1995) fits closely with the current BPM systems characterization. It indicates that workflow management involves a distributed computing infrastructure that is component-oriented (i.e., supports loose coupling between heterogeneous, autonomous, and/or distributed systems), supports workflow applications for accessing organizational information systems, ensures the correctness (in case of concurrency) and reliability (in case of failures and exceptions) of applications, and supports re-engineering business processes through modification of workflows.

WORKFLOW CHARACTERIZATION

Workflows can be classified in several different ways. The most widely accepted classification, one that has been used by the trade press and endorsed by the WfMC, divides workflow in four categories: *production*, *administrative*, *ad hoc*, and *collaborative* (Georgakopoulos et al., 1995; Stohr & Zhao, 2001). Different aspects of these workflows are shown in Figure 1.

Production workflows deal with highly structured and repetitive tasks, providing automation support for which can lead to great improvements in productivity. These workflows are characterized by minimal human intervention in process management (e.g., handling exceptions). From a system support perspective, production workflows are supported as either autonomous workflow engines or as embedded workflow components within enterprise systems such as ERP. Since various decisions in the process are made by the workflow system component, rather than humans, they involve high task complexity in addition to integration and interoperatibility of different enterprise applications. Also, with high transaction volumes, these workflows are mission critical and demand high accuracy, reliability, efficiency, security, and privacy. Typical examples