Chapter 13
Inter-Workflow Patterns in Logistic Processes

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ABSTRACT

In logistic environments, a process, in that it manages the flow of materials among partners, inherently involves more than one organization. In this regard, a logistic process can be considered as a combined process consisting of multiple sub processes, each of which is managed by a single participant. In achieving systematic management of a logistic process, traditional Business Process Management (BPM) cannot be used for the entire flow, since it lacks the ability to manage interactions among partners. In this paper, then, we propose inter-workflow patterns that represent the relations among separate processes. We specify the inter-workflow patterns between processes, which patterns enable the generation of ECA (Event-Condition-Action) rules to control the execution of the logistic process. A rule engine can then take charge of managing the interactions among processes. A prototype system was developed for the purpose of demonstrating the effectiveness of our approach.

INTRODUCTION

In rapidly revolutionizing business environments, collaboration with partners is considered to be an essential element of success (Liu, 2007; Rhee, 2007b), because the competitiveness of a company is derived from the entire scope of business activity that delivers products to end users. Such collaboration is especially required in logistic environments (Jung, 2008), since a logistic process inherently involves multiple participants. Collaborative success is achieved by means of systematic interfaces among business partners, to the overall end of enhancing customer satisfaction (Gunasekaran, 2004; Liu, 2007; Rhee, 2007b).

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For the efficient management of supply chains, Supply Chain Management (SCM) has been introduced to plan, implement, and control collaboration among partners (Gunasekaran, 2004). SCM research has focused on a variety of areas such as strategic network optimization, strategic partnership, inventory decision (Seo, 2006), production scheduling (Mendez, 2006) and demand forecasting (Liang, 2006). However, execution issues such as the execution of inter-organizational processes have rarely been examined by SCM researchers. Inter-organizational process execution can be achieved by means of a systematic logistic process support.

Business Process Management (BPM) has been widely accepted as an effective and integrated way of managing and executing business processes (Basu, 2002; WfMC, 1995). The BPM system is considered to be a general methodology for increasing a company's productivity through the systematic design, management, integration and improvement of business processes (Basu, 2002; Rhee, 2007a; Rhee, 2007b). However, whereas logistic processes pursue inter-organizational optimization through the effective sharing of information, BPM, in its basic functionality, cannot be applied to the management of multi-organizational business processes.

In order to circumvent this obstacle, we employed a pattern-based approach to the management of interoperations among independent processes. Although the pattern-based approach has been actively researched for over a decade, existing workflow patterns are defined only within a single process, by specifying split and merging patterns such as 'AND', 'OR', 'LOOP', and others. Thus, those patterns cannot support logistic flow. For example, let us consider a delivery process. When goods flow from a manufacturer to customers, they are transported, by a truck, sometimes together in a box, and separately. This process will be repeated several times until the goods finally are delivered to respective customers. Such a process cannot be supported by any commercial BPM systems. In the present research, then, we defined inter-workflow patterns to support logistic processes involving multiple sub processes managed by multiple organizations. Accordingly, these patterns are converted into ECA (Event-Condition-Action) rules, which enable a logistic process to be executed by triggering the action of another process without requiring any separate process engine.

We admit that the pattern based approach to process modeling and execution has contributed to computerized process automation to some extent. At the same time, we claim that it is difficult, with a limited number of process patterns, to represent complex processes in real environments. However, inter-workflow patterns enable the predetermination of relations among independent processes, thereby providing a sound basis for systematic interoperations among participatory organizations. Furthermore, by utilizing ECA rules in implementing interactions among organizations, a third party rule engine can take charge of meditating processes. Thus, we can avoid the problem of where to locate a process server.

The main objective of this research is to develop a systematic method for managing inter-workflow logistic processes. We also established the following sub objectives, which are, at the same time, the three steps necessary for attaining the final goal.

- **Classifying inter-workflow patterns by modeling multi-organizational processes**: We develop a methodology to represent the logistics of business processes among companies and, based on that, establish a process model library.
- **Representing relations among processes using ECA rules**: We derive a process model and rule-based representation of relations among the processes in an environment, where materials and products flow among different partners.