Chapter 5
Dynamic and Context–Aware Process Adaptation

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ABSTRACT

This chapter re-examines the principles that underpin business process technologies to derive a novel approach that moves beyond the traditional assembly-line metaphor. Using a set of principles derived from activity theory, a system has been implemented, using a service oriented architecture, that provides support for dynamic and extensible flexibility, evolution and exception handling in business processes, based on accepted ideas of how people actually perform their work tasks. The resulting system, called the worklet service, makes available all of the benefits offered by process aware information systems to a wider range of organisational environments.

INTRODUCTION

Organisations are constantly seeking efficiency improvements for their business processes. To help achieve those goals, many are turning to Process-Aware Information Systems (PAIS) to configure and control those processes (Dumas et al., 2005; van der Aalst & van Hee, 2004) by supporting their modelling, analysis, enactment and management (zur Muehlen, 2004; Casati, 1998). The key benefits organisations seek by implementing PAIS solutions include: improved efficiency, better process control, improved customer service and business process improvement.

The use of PAIS has grown by concentrating on modelling rigidly structured business processes that in turn derive well-defined workflow instances (Bider, 2005; Joeris, 1999; Reichert & Dadam, 1997). However, the proprietary process definition frameworks imposed make it difficult to support (i) dynamic evolution and adaptation (i.e. modifying process definitions during execution) following unexpected or developmental change in the business processes being modelled (Borgida & Murata, 1999); and (ii) deviations from the prescribed process model at runtime (Rinderle et al., 2004; Casati, 1998).

But change is unavoidable in the modern workplace. To remain effective and competitive, organisations must continually adapt their business processes to manage the rapid changes demanded by the dynamic nature of the marketplace or service environment. Also, a large proportion of workplaces undertake activities that do not easily conform to rigid or constricting representations of their work practices. And even in the most concrete processes deviations will occur within almost every instantiation.

If PAIS could be extended to meet the challenges of evolutionary and unexpected change in business processes, then their applicability would widen to include a far greater proportion of workplaces. Such support would not only benefit existing users of process-aware technologies, but would also introduce those businesses which employ more creative or ad-hoc processes to the range of benefits that PAIS offer.

This Chapter offers one solution designed to meet that challenge. The primary objectives of this Chapter are to provide:

- An overview of literature on approaches to exception handling and flexibility in Process-Aware Information Systems;
- A discussion of theoretical underpinnings of work practices;
- A discussion of a comprehensive framework for exception handling;
- The introduction of a concrete approach for exception handling based on this framework;
- The introduction of a concrete approach to processes that require on-the-fly change;
- A description of an (open source) implementation of these approaches within a state-of-the-art workflow system; and
- The presentation of an elaborated example.

BACKGROUND

A business process can be defined as a composite set of tasks that comprise coordinated computer-based and human activities (Leymann, 2006). A business process model or schema is a formal representation of work procedures that controls the sequence of performed tasks and the allocation of resources to them (Oberweis, 2005).

The development of a business process model typically begins with an analysis of current business procedures and processes. Subsequently, a model is developed based on those practices and business rules, then input into a PAIS and repetitively executed, supporting and giving formal structure and flow control to those processes. However, translating abstract concepts and descriptions of business practices and rules into tangible process models is a far from trivial exercise. There are sizeable development costs involved in mapping an abstract process to a structured schema, which must be weighed against the perceived cost benefits that the system will deliver. Therefore, current systems are most advantageous

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