Developing and Customizing Federated ERP Systems

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ABSTRACT

Small and Medium Enterprises (SMEs) are the most important drivers in many economies. Due to their flexibility and willingness to innovate they can stand up to larger industry players. However, SMEs – as every other company – need to further reduce costs and optimize their business in order to stay competitive. Larger enterprises utilize ERP systems and other IT support for reducing costs and time in their business processes. SMEs lack behind because the introduction and maintenance of ERP systems are too expensive, the return on investment is achieved too late and the associated financial risks are too high. However, SMEs would like to have IT support for their business. The research behind the Federated ERP System (FERP) addresses the problems SMEs face with conventional ERP systems and offers reasonable and scalable IT support. This is done by decomposing the whole business logic of the ERP system into Web services, which are linked at run-time. The service composition is realized by a workflow system that is also responsible for creating and managing the user interfaces and the data-flow. By integrating only the Web services that are needed (possibly from third parties) the cost is reduced and the functionality can be scaled to the actual needs. However, not only a technical solution is needed but also the development process must be tailored towards SMEs. Small companies cannot afford highly-skilled staff and often do not have defined business processes. [Article copies are available for purchase from InfoSci-on-Demand.com]

Keywords: Business Process; Federated ERP System; Generation; SOA; Use Case; Web Service

INTRODUCTION

The business world is rapidly moving and Small-to-Medium Size Enterprises (SMEs) are competing within this vibrant marketplace with their flexibility and ability to innovate. They are an important part of the economy. For example, according to the IfM Bonn (2008) SMEs in Germany account for 38.3% of the overall turnover and employ 70.6% of all employees nationwide. In order to operate efficiently, SMEs need enterprise software, like ERP systems, for managing their business operations efficiently. However, ERP systems impose high costs due to their expensive purchase, customizing costs and re-customizing costs whenever business processes are changed. Thus, business process changes that are necessary to stay competitive become more costly as before.

This inevitably leads to the question how to make ERP systems better suited to SMEs in order to make them more competitive in the long run. The answer to this question is decomposed into two parts. The first part is a new architecture for such systems that can be introduced, operated, and maintained cheaper.
The second part is engaged with the question on how to come to (new) requirements for the ERP system based on the business processes. A system that can be flexibly changed is worthless if no one knows what the desired result is.

Within this chapter we introduce the Federated ERP System as a new architecture for ERP systems that are especially suited to SMEs. We describe the overall architectural ideas as well as our implementation. In the second part we present a technique for deriving and discovering business processes from textual scenarios – so called use cases known from the software engineering domain.

FEDERATED ERP SYSTEMS

Problem Addressed

An ERP system is a standard software system which provides functionality to integrate and automate the business practices associated with the operation or production aspects of a company. The integration is based on a common data model for all system components and extents to more than one enterprise sector (see Robey et al., 2002; Rautenstrauch et al., 2003).

However, there are some disadvantages associated with conventional ERP systems. The main ones are:

- In most cases not all of the installed components are needed,
- high-end computer hardware is required to run the system, and
- customization of ERP systems is very expensive because product specific know-how of experts is necessary.

Due to the expensive process of installation and maintenance only large enterprises can afford complex ERP systems, which provide business logic for all sectors of the functional enterprise organization. Contrary to these aspects, FERP systems allow the separation of local and remote functions whereby no local resources are wasted for unnecessary components. Furthermore, single components are executable on small computers and due to decreasing complexity of the local system installation and maintenance costs subside, too.

Reference Architecture

Figure 1 gives an overview of the reference architecture of a Web Service-based FERP system. The architecture consists of several subsystems, which are interconnected. Because one of the main objectives of an FERP system is to integrate business components of different vendors, all components have to comply with standards. In this approach these standards are described by using XML schema documents. In order to separate the three different layers of a typical layered architecture of conventional ERP systems, each layer is assigned its own standard.

The subsystems of the proposed architecture are the following:

FERP Workflow System (FWfS)

The FWfS coordinates all business processes which have to be described in an appropriate XML-based workflow language. A workflow in this context is a plan of sequentially or parallelly chained functions as working steps. Each step represents an activity which leads to the creation or utilization of business benefits. Workflows implicitly contain the business logic of the overall system. The function types that can be contained in a workflow in FERP systems are the following:

- Model-based user interface functions, e.g. show, edit, select, control
- Database access functions, e.g. read, update
- Application tasks which are connected to Web Service calls

FERP User System (FUS)

The FUS is the subsystem which implements functions for the visualization of graphical
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