Chapter 11
Architectures for Enabling Flexible Business Processes: A Research Agenda

Sietse Overbeek
Delft University of Technology, The Netherlands

Yiwei Gong
Delft University of Technology, The Netherlands

Marijn Janssen
Delft University of Technology, The Netherlands

ABSTRACT

For decades, information systems have been designed for controlling and managing business processes. In the past, these systems were often monolithic in nature and not made for interacting and communicating with other systems. Today, departments and organizations must collaborate, which requires distributed Web-based systems to support the enactment of flexible business processes. In this paper, four architectures of process management systems are investigated by studying the components and the relationships with the tasks that make up the business processes. These different architectures support automation of non-repetitive, customized processes, and are compared based on dimensions of flexibility. This evaluation showed that the process orchestration architecture scored best, but still has its shortcomings. The results from the comparison are used for developing a research agenda that includes the suggestion to develop reference architecture for connecting individual architectural components.

INTRODUCTION

In the early days of computing, information systems were often build as monolithics without having the need to interact with other systems. These monolithic systems also provided limited variety and were hard to change. Over time the need to interact with other systems and the pressure to open these systems increased. Nowadays, the creation of flexible business processes has received more and more attention by organizations to remain competitive, to satisfy customer wishes and to be able to react to the competitive environment (Aalst, Benatallah, Casati, Curbera,

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& Verbeek, 2007). Customization developments resulted in the need for the creation of demand-driven and unique business processes tailored to the specific need of customers. These are often hard to predefine in advance, as many variations are possible.

A business process can be defined as a time-dependent sequence of activities. These activities depend on each other and these dependencies need to be coordinated. The coordination of these activities is often supported by workflow management (WFM) (Georgakopoulos, Hornick, & Sheth, 1995) or business process management (BPM) systems (van der Aalst, ter Hofstede, & Weske, 2003). These types of systems have a variety of architecture often guided by the workflow reference model which is developed by the Workflow Management Coalition (WFMC, 2004). This model aims at promoting the interoperability between different WFMS. Central in the reference model is the workflow 'enactment service' that consists of one or more workflow engines. These engines execute the workflows, start new processes, select the people or applications that have to perform a task, send the necessary documents to the right people or applications, etc.

The demand on flexibility can be viewed from two complementary perspectives, which are the organizational (internal) and customer (external) perspectives. From the organizational perspective the properties of agility, adaptivity, and being able to anticipate on varying needs are important. By breaking up an organization in modular services, a new level of flexibility and agility can be reached (Cherbakov, Galambos, Harishankar, Kalyana, & Rackham, 2005). These services need to be orchestrated into a workflow, which has become an essential capability in a service-oriented enterprise (Tewoldeberhan & Janssen, 2008). The use of IT enables and improves the efficiency of business services and at the same time there should be a specific need to process the request. Furthermore, managers want to have insight in the performance of processes over time to be able to continuously improve them and they want to have insight in the current status of processes to take appropriate actions, if necessary. For example, by allocating additional resources to a task to ensure that it is finished in time.

From the customers' perspective a service provides high value if it satisfies needs like speed and convenience and provides the right answer to a request. This often requires the bundling of individual services and the handling of these services as one request, instead that a customer needs to make multiple requests. This aspect can be represented by the notion of 'value of service'. The customization trend results in the declining 'degree of repetition' of standardized business processes. Instead of having predefined business processes, a unique business process is created for each customer by determining the next step only after the previous step is completed. Consequently, whereas in the past customers were presented with a uniform process, such an approach enables customized service provisioning. Clients expect businesses to provide high quality services in a way that minimizes complexity and maximizes the users' ability to get what they need in a timely manner. In response, businesses have to integrate the service delivery to improve both service access and service quality. Therefore, dynamic and ad hoc processes are pursued by many organizations, so that flexibility stemming from various dynamic changes has become one of the major research topics in the area of today's management of business processes (Zhou & Ye, 2006).

The quest toward non-standardized, customized business processes providing high value can be characterized by the search for new architectures. IEEE defines an architecture as: "*The fundamental organization of a system embodied in its components, their relationships to each other and to the environment and the principles guiding its design and evolution*" (Architecture_Working_Group, 2000). In this paper we will explore the architecture of process management systems by looking at the components and the relationships