Coordinating Cross-Agency Business Processes

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INTRODUCTION

A big challenge for governments from all over the world is to improve the service provisioning to their clients, citizens, and businesses. This is partly motivated by the aim to reduce the administrative burdens for citizens and businesses (e.g., Dutch Government, 2003, 2004), but also demanded by its clients, who expect the public sector to increase its attention on customer service just as businesses have done as a result of the rise of Internet technologies (Donnelly, Wisniewski, Dalrymple, & Curry, 1995; McIvor, McHugh, & Cadden, 2002).

Due to the fragmented nature of governments (Wimmer, 2002), the activities that make up the service-delivery processes of many governmental services are often performed by different governmental agencies (Castellano, Pastore, Arcieri, & Summo, 2004; Contenti, Termini, Mecella, & Baldoni, 2003; Gortmaker & Janssen, 2004). Managing these service-delivery processes that span multiple agencies requires adequate coordination between the different subprocesses and different agencies.

The trend of moving toward electronic service delivery makes the need of coordinating cross-agency service-delivery processes even more apparent, as citizens and business expect fast responses and customer-centric service provisioning. A complication is that information systems are also largely fragmented, which gives rise to a whole new range of coordination issues that need to be solved.

A promising technology that offers many advantages to the problem of automating cross-agency processes is Web service orchestration (Gortmaker, Janssen, & Wagenaar, 2004). However, there is a lack of experience reports, literature, and case studies concerning the potential of Web service orchestration (van Hillegersberg, Boeke, & van den Heuvel, 2004). Moreover, orchestration should be viewed on at least two different levels: on a technical, and an organizational level (Gortmaker & Janssen, 2004). On a technical level, Web-service orchestration makes use of the potential of Web-service technology to orchestrate different Web services into one overall service-delivery process. On an organizational level, orchestration can be viewed as performing process orchestrator roles aimed at managing the interdependencies between various subprocesses performed by multiple agencies.

This article investigates research issues concerning the application of Web-service orchestration technology and process orchestrator roles for coordinating cross-agency business processes. These research issues need to be resolved in order to be able to use process orchestrators in an efficient and effective way to coordinate governmental cross-agency service-delivery processes. First, we present the background of both Web-service orchestration and process orchestrators. Thereafter, we investigate a case study and use this case study to demonstrate the research issues that should be addressed for automating cross-agency processes using Web-service orchestration and process orchestrators. Finally, further trends are presented and conclusions are drawn.

BACKGROUND

Web-Service Orchestration

Web-service orchestration is based upon the notion of a service-oriented architecture (SOA). Due to its loosely coupled nature, SOA seems very suitable for orchestrating service-delivery processes that run across relatively autonomous agencies (Stojanovic & Dahanayake, 2005). In a SOA, application functionality is not provided by one large monolithic application, but is provided by relatively

small-grained services that are offered by different independent providers. These services can be invoked by service requesters who found the service in a service directory. A SOA makes it possible to quickly assemble new compound services out of existing subservices.

Although various middleware technologies can be used to achieve SOA, Web-service standards satisfy the universal interoperability needs better (Pasley, 2005). Web services are an important technology for realizing a SOA. Web services enable the provisioning of functionality, both on application and business level, by means of a standardized interface in a way that they is easily invoked via Internet protocols. Web services are modular, accessible, well described, implementation independent, and interoperable (Fremantle, Weerawarana, & Khalaf, 2002). Using Web services, existing legacy applications can be reused by encapsulating them using a Web-service interface.

Web-service orchestration coordinates different Web services using an executable business process. As such it builds upon Web-service technology and the concept of a SOA. Wohed, Van der Aalst, Dumas, and Hofstede (2003) define an executable business process as "[specifying] the execution order between a number of constituent activities, the partners involved, the messages exchanged between these partners, and the fault and exception handling mechanisms" (p. 202). In Web-service orchestration, these activities are typically performed by Web services that are invoked from a process by means of their standardized Web-service interface.

The standard language for orchestration is the Business Process Execution Language for Web Services, BPEL4WS, or BPEL for short. A process that is specified in BPEL consists of two types of activities: basic activities, such as receive, reply, wait, and structured activities as switch, while, and sequence. The structured activities determine the structure, or the sequencing of the process, and the basic activities determine what happens in the process, for example, the invocation of a Web service, receiving a message from a Web service, and so forth.

Process Orchestrator

The process orchestrator aims at coordinating the different subprocesses making up an overall service-delivery process. The process orchestrator is responsible for maintaining an overview about the entire service-delivery process. For this reason, it is obvious to appoint the process orchestrator role to a governmental organization or department, in this way freeing the customers from doing all the coordination themselves.

Although many process orchestrators will make use of information technologies and communication technologies, it should be noted that most process-orchestrator roles are technology independent. A process orchestrator can be compared with other types of intermediaries including information brokers and supply chain managers (e.g., Janssen, 2004). Governmental service-delivery processes that involve other governmental agencies can be viewed as the governmental supply chain.

Tasks that are typically performed by a process orchestrator are the splitting up of a request into several requests for multiple agencies, coordination of various subactivities, guarding lead times of service-delivery processes, facilitating information sharing among agencies, and ensuring accountability of the process, for example, by means of providing, and updating details about the status of the process.

Another major task is providing transaction capabilities. Transaction capabilities are needed when multiple related services are requested in parallel. The use of transactions must ensure that requested services are finalized, or "committed," only when all other services have successfully been delivered. When someone wants to open a new business, he or she needs several permits, such as an environmental permit and a building permit. These permits all require a certain fee to be paid. As there is no use of having an environmental permit for something that cannot be built, these permits should be delivered on an "all or nothing" basis.

A process orchestrator that coordinates cross-agency service-delivery processes can also be viewed as fulfilling certain intermediary roles. Much is written about intermediaries and especially about electronic intermediaries (Bailey & Bakos, 1997; Janssen & Sol, 2000). Bailey and Bakos (1997) make a classification of electronic intermediary roles based on 13 case studies. These roles are (1) information aggregating, (2) being a trusted agent, (3) facilitating the market, and (4) matching buyers and sellers. Although these roles are derived from case studies in the e-commerce domain we also found them useful to analyze the roles performed by a process orchestrator. In the next section, we will investigate these four roles for a case study at a business counter and derive research issues.

PROCESS ORCHESTRATORS IN PRACTICE

In this section we present a case study of a cross-agency service-delivery process to evaluate the application of BPEL4WS and derive research issues. The business counter is a one-stop shop for different kinds of businesses at a medium-sized municipality in the Netherlands. Throughout the country, this business counter is viewed