Chapter VII
Trends of Web Services Adoption:
A Synthesis

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ABSTRACT

The technology of Web services (WS) has been a hot area in the software industry for many years. Many organizations in the past 5 years have conducted surveys designed to get a profile of the state of Web services adoption in various subject areas. Some of those survey results are available free from the Internet. Since conducting a large scale Web services survey takes time and significant financial commitment, the research conducted in this chapter is a synthesis from published free survey results. All sources of surveys indicate Web services are being adopted more or less in all mid-size to large organizations because of realized benefits, and are anticipated to become a viable component of information systems infrastructure. Some of the current issues in Web services adoption and implementation are standards, training, and security.

INTRODUCTION

For software components to be reusable across different architectural environments new standards of integration and interoperability have been proposed and developed. The maturation of the Internet and the World Wide Web accelerates the idea for the global distributed computing. In order to make a large number of heterogeneous application systems on the Internet interoperable, many standards have been produced and practiced, for example, CORBA, COM, DCOM, and Java/RMI initiatives. *Common object request broker architecture* (CORBA) is a specification defined by the Object Management Group, DCOM is an extended version of COM of Microsoft's distributed common object model, and Java/RMI is the remote method invocation mechanism. However, these

technologies are not compatible and are difficult to use. The success of these standards is rated as marginal (Chung, Lin, & Mathieu, 2003).

A recent approach to tackle the interoperability problem is XML-based Web services, or simply Web services (WS) (Alonso, Casati, Kuno, & Machiraju, 2004). The definition of Web services as offered by W3C (w3.org) is: "A Web service is a software application identified by a URI, whose interfaces and binding are capable of being defined, described and discovered by XML artifacts and supports direct interactions with other software applications using XML based messages via internet-based protocols." This approach uses Web standards of HTTP, URLs, and XML as the lingua franca for information and data encoding for platform independence. Three XML-based protocols, one for communication, one for service description, and one for service discovery have become de facto standards. They are:

- The simple object access protocol (SOAP) provides a message format for communication among Web services.
- The Web services description language (WSDL) describes how to access Web services.
- The universal description, discovery, and integration (UDDI) provides a registry of Web services descriptions.

Additional standards that are essential for applications of Web services have been developed. Two major standards under the category of "Web services composition" are

the business process execution language for Web services (BPEL4WS) (Fischer, 2002), later called business process execution language (BPEL), and another competing standard called the business process modeling language (BPML) developed by the Business Process Management Initiative (BPMI, www.bpmi.org). Programming tools are now available for creating and composing Web services. For example, BPEL4WS has been incorporated in Microsoft's ASP.Net and BPML has been incorporated in Java.

Solid Foundations in Web Services

It is obvious that Web services technology could be the catalyst for a potential revolution in providing "services" within a company and on the Internet, and its impact might be paramount. Web services are not only a key development area of the software industry in languages, tools, and standards, but also are very active in research both in industry and academic institutions (Zhao & Cheng, 2005). Because the platform of Web services is designed to allow complex composition of a new service from arbitrary (at least in theory) number of services, thus an important challenge is how to correctly describe, compose, and verify them. Many popular modeling languages for Web services such as BPEL4WS and BPML have theoretical underpinnings using Petri Nets (Petri, 1962) and Pi calculus (Milner, 1999). For example, Smith and Fingar (2003) claim that the conceptual representation and execution of business processes of BPML is based on Pi calculus.

Web Services and SOA

The concept and framework of Web services bring about a new level of abstraction over object- and component-oriented software development. This new level of abstraction is referred to as service oriented architecture (SOA) which is not tied to a specific technology. The Organization for the Advancement of Structured Information Standards (OASIS, www.oasis-open.org) defines SOA as "a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations." A simpler definition of SOA is: "A