Chapter 4.14

# Adoption of Web Services in Digital Libraries:
## An Exploratory Study

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## ABSTRACT

This chapter describes a research study with an objective to explore and describe decision factors related to technology adoption. The study utilized theories of diffusion of innovations and communities of practice as frameworks and a case study of Web services (WS) technology in the digital library (DL) environment to develop an understanding of the decision-making process. A qualitative case study approach was used to investigate the research problems and data was collected through semistructured interviews, documentary evidence (e.g., meeting minutes), and a comprehensive member check. Face-to-face and phone interviews were conducted with respondents from five different DL programs in the U.S., selected based on distinctive characteristics (e.g., size of the DL program). Findings of the research suggest that the decision-making process is a complex procedure in which a number of factors are considered when making WS adoption decisions. These factors are categorized as organizational, individual, and technology-specific factors.

## INTRODUCTION

With the advent of the Internet and specifically the World Wide Web (WWW) application, means of accessing data and information have changed forever. The Internet brought great opportunities for libraries as well as dilemmas and problems, such as technology choice and readiness.

Digital libraries (DL) were envisioned as network-accessible repositories in the 1990s. Now, DLs extend the classical brick-and-mortar library concept, bring value to society, and transform information landscape by improving and changing the means of knowledge access, creation, use, and discovery across disciplines, regardless of temporal and geographical barriers (Larsen & Watctlar, 2003; Reddy & Wladawsky-Berger, 2001).

The speed of technological advances in information technologies (IT) in the last 10 years has enabled DLs to provide innovative resources and services to people. The information landscape is changing as a result of the revolutionary developments in IT, incompleteness of content on Internet, ever increasing digital content along with the evolution of networked technologies and applications, lack of standards, ineffective information

retrieval mechanisms, and minimal cataloging. These factors present challenges to the future of DL development efforts (Borgman, 1999; Reddy & Wladawsky-Berger, 2001).

The concept of Web services (WS) has emerged as the next generation of Web-based technology for exchanging information. This effort began with the submission of the SOAP 1.1 to the World Wide Web Consortium (W3C) (Barefoot, 2002). WS are self-contained applications that can be described, published, invoked, and located over the Internet (or any network). Once a Web service is deployed, other applications can discover and invoke the service. WS provide a programmable interface for other applications without requiring custom programming and proprietary solutions regardless of the operating systems and programming languages to share information as opposed to providing users with a graphical user interface (Boss, 2004).

According to the W3C, a Web service is defined as a software system designed to support interoperable machine-to-machine interaction over a network by using XML for sending and receiving messages (Booth, Haas, McCabe, Newcomer, Champion, Ferris, et al., 2004). Simplicity and flexibility of XML made it a definitive standard for data transmission and storage. XML is an open standard and can be accessed and processed by any tool capable of reading and writing American standard code for information interchange (ASCII) text. By definition, the only requirement for a Web service is to use XML.

The basic WS platform is composed of XML and a transport protocol. HTTP is the commonly used transport protocol on the Internet (Hickey, 2003). XML, simple object access protocol (SOAP), and Web services description language (WSDL) are tools to create WS. A Web service provides the framework for creating the next generation of distributed systems by which organizations can encapsulate existing business processes, publish them as services, search for and subscribe to other services, and exchange information throughout and beyond the enterprise (Adams, Gisolfi, Snell, & Varadan, 2002). Besides recognizing heterogeneity of networked resources and applications as a fundamental ingredient, WS are independent of platform and the development environment can be packaged and published on the Internet. Also, WS enable just-in-time integration and interoperability with legacy applications (Oguz & Moen, 2006).

The development and widespread deployment of more intelligent knowledge environments that not only support scholarly inquiry and communication but also that are open, accessible to all, and transparent in their operation remains as a fundamental challenge for DL practitioners and researchers.

DL applications need to have some room to accommodate future technological innovations regardless how they are built, using off-the-shelf software vs. custom-built, and thus decision makers who include managers, coordinators, designers, and developers need to make important decisions at some point in time to adopt or reject an innovation, including a specific technology, application, framework or idea related with DLs. Decision makers who need information about an innovation may seek this information through both informal and formal communication channels while making such critical decisions.

In the context of DLs, roles and influence of informal communication channels on the decision-making process to adopt or reject WS technology has not been investigated before. The adoption of a new technology, WS, which is its early stages of adoption in the DL environment, may provide a significant opportunity to investigate decision factors. The goal of this study is to shed a light on the decision-making process to adopt or reject a new technology, WS, in the context of DLs.

As technologies rapidly change and the information landscape is transformed, DLs find themselves dealing with the issues of technology adoption decisions to exploit this dynamically changing technology environment to meet their

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