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Xiaoni Zhang

Northern Kentucky University, zhangx@nku.edu

Albert Huang

University of the Pacific, ahuang@pacific.edu

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Develop a Tool to Measure Web Service Impact

Xiaoni Zhang

Department of Information Systems
Northern Kentucky University
zhangx@nku.edu

Albert Huang

Eberhardt School of Business
University of the Pacific
ahuang@pacific.edu

ABSTRACT

Web services represent the next generation of applications with a focus on integration. As companies continue to search for better methods to be cost effective and simplify business and IT operations process, it is critical to identify the factors that impact business operations. In this work, we explore how Web services affect businesses and people. A tool was developed to assess the impact of Web services from security, integrity and task perspectives.

Keywords

Web services, task innovation, integration, task technology fit.

INTRODUCTION

With the proliferation of distributed computing, more and more companies have started to move their applications to the Internet and the latest trend in technology is to view software programs as Web services. Web services implementations are growing as users migrate to the middleware that enables and simplifies Web application-to-application connectivity. Currently, companies are experimenting service-oriented architecture (SOA) to connect applications across a network for code sharing and reuse.

Gartner predicts that by 2007, 40% of software purchase will be Web service enabled (Havenstein 2005). Web services hold the promise to resolve corporate integration problems. The current products and services relating to Web services are transitional. Companies continue to search for better methods to be cost effective and simplify business and IT operations process. With Web services, integration may be solved but security is the inhibitor. Migrating to Web services and SOA requires long-range thinking about how to build useful services. New technologies always produce great impact on businesses and people. Web services represent the next generation of applications with a focus on integration.

Research Purpose

Currently, Web services standards are still evolving and research related to Web services are largely focused on technical aspect. In general, research on business impact of Web services is very limited. Although many benefits are proposed by Web services vendors, it is important to validate such benefits in business context. In this work, we develop an instrument to evaluate Web service impact and this work contributes to understanding the emerging issues related to Web services adoption. Particularly, we examine factors related to Web services impact such as task, productivity, satisfaction, security and integration.

Definition of Web Services

The W3C Web Services Architecture Working Group defines Web services as a software application identified by a URI, whose interfaces and bindings are capable of being defined, described, and discovered as XML artifacts. Web services are self-contained business applications that can be published, located and invoked by other applications over the Internet.

PRIOR RESEARCH

Both practitioners and academicians suggest that the biggest benefit of using Web services is integration (Little 2003). However, security is the major hurdle in Web service deployment. Business needs trigger technology implementation. In other words, technology should fit the underlying business activities. The impact of information technology is multi-dimensional. The relevant literature relating to this work includes Web services, task technology fit, technology impact, security and integration.

Web Services

Web Services is an emerging technology driven by the will to securely expose business logic beyond the firewall. Through Web services, companies can encapsulate existing business processes, publish them as services, search for and subscribe to other services, and exchange information throughout and beyond the enterprise. Web services enable application-to-application e-marketplace interaction, removing the inefficiencies of human intervention. But research in Web services is scarce. Most of the papers focus on technical issues of Web services (Estrem 2003; Yang and Papazoglou 2004). As with any other technologies, Web services has its drawbacks. Currently, standards and security are the two major challenges (Lim and Wen 2003). Security, reliability, and service composition are the areas that need to be addressed to successfully support the idea of service oriented computing.

Various industries are experimenting with Web services such as insurance, financial, banking, manufacturing, online retail, automobile etc. Manufacturing enterprises use Web services to support the complex business processes and effectively collaborate with suppliers, customers, and other stakeholders in virtual enterprise environments (Estrem 2003).

In summary, prior studies have addressed the evolution of Web services, design, development and programming services approaches, as well as the supporting technologies and infrastructures. However, the adoption process and factors are not explored.

Technology Impact

Technology has a profound impact on businesses and has changed our way of doing business (Quan et al 2003): delivering education or shopping (McKnight et al 2002), making decisions for managers (Ferratt and Vlahos 1998), maintaining software (Dishar and Strong 1998) and supporting group decisions (Shirani et al 1999). The selection of a particular technology is dependent on tasks at hand and on the purpose one wants to achieve (Goodhue 1995).

As Information systems become pervasive, firms depend on information systems to improve productivity. Technology has a dramatic and complex role in developing competencies for a firm (Sampler et al 1994). Numerous studies have examined technology impact (Kraemer and Danziger 1990). Based on these prior studies, Torkzadeh and Doll (1999) identified four impact dimensions: productivity, task innovation, customer satisfaction and management control. In the Ecommerce environment, security and integration are the major challenges for companies (Udo 2001). Due to the practical significant problem with integration, we added security and integration to the technology impact categories. The justification for including these two dimensions is described below.

Security

Computer security institute/FBI reported that Fortune 1000 organizations have suffered frequently attacks responding by 91% deploying firewalls and 61% installing intrusion detection systems. Although corporations develop security policies and install security tools to safeguards their systems, their efforts are reactive and several steps behind the latest exploits. Security is the major barrier for Ecommerce (Udo 2001). Corporations need to be agile in adapting their security systems to meet the ever-changing environment (Hofmeyr, 2003). Focusing on prevention rather than detection is a proactive approach in security management.

Web Services has the potential to blur the lines between intranets, extranets and the public domain thereby exposing interfaces that have not been previously exposed. More interfaces mean more potential security vulnerabilities. It is possible to have denial of service attacks on Web Services (Rabkin 2002). Web services represent a challenge to the security of business environments. Until the issue of authentication can be resolved, the security issue will remain one of the primary roadblocks to web services adoption going beyond use with previously known and trusted partners (Weiss 2001). Web Services expose business systems and make them more accessible within organizations and externally, to customers and partners. Technically, the Web Services technologies were specifically designed to flow through firewalls, tunneling through existing ports and protocols which create security challenges at the network level.

Integration

Technology is useful glue for making business data and processes as flexible as possible. Large companies currently spend more than 30 percent of their IT budgets integrating their business applications (Baker et al 2002). Integration allows different components and systems to communicate and work with each other to accomplish common goals. Integration is a cross-platform, cross-departmental thing, and centering on business processes. For some large companies, the need to tie together incompatible systems becomes a necessity (Meehan 2002). Integration is the top spending priority and key focus for

businesses. Integration has the following categories: business rules integration, information integration, process integration, and collaboration. The benefits of application integration include a greater reduction of time and resources (Walecka, 1998).

Integration is viewed as a technical issue that can be addressed with technical solutions. However, the root cause of the integration challenge is due to the lack of integration within the business infrastructures that IT supports (Ulrich 2000). In most of the cases, vendors build complexity into their tools but customers demand for more simplicity, more accessibility, and more security. Application integration is the major concern for customers (Evans 2004). It is important that application integration is treated as a business issues just as much as a technical issue. In essence, integration is largely a business and cultural problem (Flood 2002).

RESEARCH METHODS

Web services are rapidly emerging as important building blocks for business integration. However, security is a concern for the fast deployment of Web services (Curbera et al. 2003). To understand the impact of Web services, we followed the guideline suggested by Straub (1989) and develop an instrument based on Torkzadeh and Doll's instrument (1999; 2002) on technology impact to evaluate the impact of Web services.

Instrument Development

To develop an instrument to measure the impact of Web services, content validity must be ensured. Extensive literature review was conducted in Web services, security, software integration, and task technology fit research. As a result of this extensive literature review, key constructs were extracted to measure the impact of Web services. Seven-point Likert scale is used with anchors being strongly agree and strongly disagree. The description about the items for each construct in our instrument is as follows.

Integration

Integration measures the extent that businesses activities and applications communicate with each other seamlessly. Our items used to measure integration are pulled from practitioners' journals (Walecka, 1998; Meehan 2002; Evans 2004). The items are a summary of the main concerns of integration from practitioners' point of view. Six items are used to measure integration and these items measure data processing, application, applications integration, workflow integrations, data transformation, communication integration, and data access.

Task productivity

Productivity indicates that the amount of output produced with certain input. Three items are identified from the literature to measure task productivity. Items used by Torkzadeh and Doll (1999) are modified to measure task productivity in the Web service context. Three items were used to measure task productivity: time saving, increasing productivity, and accomplishing more work.

Task Innovation

Innovation is defined as new ideas which are generated and applied to work tasks. Three items were used by Torkzadeh and Doll (1999) and were modified to measure task innovation in Web service context. The items intend to capture the following dimensions: being more creative, trying out innovative ideas, and generating new ideas.

Management control

Management control is defined as managers' improvement on their regulatory and supervisory performances. Three items used by Torkzadeh and Doll (1999) were modified to measure management control in the Web service context: controlling the work process, improving management control, and monitoring performance.

Security

Security is a collection of objectives to protect data and systems. The measures for security are designed to assess the following dimensions which are extracted from prior research (Hofmeyr 2003; Rohrig and Knorr 2004). Fifteen items are used to measure security: security policy, firewall configuration rules, confidentiality, integrity, accountability, availability, identification/authentication, non-repudiation, authorization, authentication, data privacy, data integrity, standards, malicious attack protection, and policies.

Table 1 below shows the definition of the constructs and prior research support.

Constructs	Definition	Prior studies
Integration	The extent that businesses activities and applications communicate with each other seamlessly	Meehan 2002; Evans 2004
Task productivity	With the given input, the amount of output produce by users	Kraemer and Danziger 1990;Torkzadeh and Doll 1999; Sulek and Maruchek 1992;
Task innovation	The extent that users generate new ideas and apply these new ideas in work	Curley and Pyburn 1982; Davis et al 1989
Security	A collection of objectives to protect data and systems.	Udo(2001); Hofmeyr (2003); Chen et al. 2001).
Management control	Managers improves their regulatory and supervisory performances	Kraemer and Danziger 1990;

Table 1 Research Constructs

CONCLUSION

The goal of this study was to develop a tool to measure the impact of Web services. The paper began by conceptualizing what Web services is, providing definitions of Web services and related prior works in Web services. The literature review covers technology impact, security and integration issues. Based on the extensive literature review, key dimensions of each research constructs were identified. In the future, we plan to validate the tool developed in this study. We will survey companies that use web services in their business operations. The tool developed in this paper helps companies to better understand the impact of Web services. Accordingly, companies develop strategies to cope with technology development to meet business goals.

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