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Strategies for effective Web services adoption for dynamic e-businesses

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Abstract

Web services hold the promise for the so-called *dynamic e-business* movement. Currently, many organizations are either in the process of adopting Web services technology or seriously evaluating this option. One of the major concerns of senior management in this endeavor is the cost of adopting Web services. In this paper, a model is proposed to evaluate an organization's position in a technology adoption space by evaluating its current level of information technology (IT) sophistication. The model identifies critical factors necessary for the successful adoption of Web services technology along three dimensions—intranet, extranet, and Internet. A simulation experiment is conducted to find the most cost-effective strategy for allocating resources to pursue Web services adoption. Alternative strategies are evaluated under three scenarios with different combinations of significance levels (weights) and diffusion levels of the critical factors. Our results suggest that different strategies should be employed, while organizations consider their existing organizational IT status and focus area. This study provides useful guidelines for management to utilize available resources effectively in the process of adopting Web services technology.

1. Introduction

E-business applications are now commonplace in business-to-consumer (B2C) and business-to-business (B2B) environments. Lately, a movement towards the so-called *dynamic e-business* has been gathering momentum and it has been claimed to be the next stage of e-business. Dynamic e-business is concerned with how organizations can integrate systems across intranets, extranets, and the Internet in a dynamic fashion, permitting them to modify the existing systems quickly and easily when the business process requires some changes. Dynamic e-business is defined as the next generation of e-business that focuses on the integration and infrastructure complexities of B2B by leveraging the benefits of Internet standards and common infrastructure to produce optimal efficiencies for intra- and inter-enterprise computing [29]. Maruyama [44]

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referred to dynamic e-business as the third wave of e-business evolution after B2C and B2B. Equipped with advanced Internet technologies and standards, participants in dynamic e-business are able to externalize a company's business processes in a standard way and utilize business processes provided by other parties to create new applications or business flows by integrating such internal and external processes dynamically.

Web services hold the promise for this dynamic e-business movement. The Web services paradigm has emerged as an important mechanism for interoperation among separately developed and geographically distributed applications [46]. Web services describe a family of standards that allow participants of e-business to discover each other (e.g., using Universal Description, Discovery, and Integration—UDDI), describe their applications/services (e.g., using Web Services Description Language—WSDL), establish communication based on familiar protocols (e.g., using Hypertext Transfer Protocol—HTTP), issue requests and responses (e.g., using Simple Object Access Protocol—SOAP), and exchange data and information (e.g., using eXtensible Markup Language—XML). Web services enable individuals and organizations to design, implement, deploy, and use the so-called plug-and-play applications, both internally and externally, in a ubiquitous fashion. In a similar vein, companies can use standard platform-independent Internet technologies offered by Web services for three types of integration—internal, external, and multi-channel [1,2]. For internal implementation (or application-to-application interaction), integration of heterogeneous systems can be achieved at lower cost and enterprise systems can be exposed as a set of reusable Web services that can be consumed by composite business applications. For external implementation (or inter-enterprise connectivity), business partners can integrate transactions based on agreed Web services standards for each step in a business process so as to reduce custom business processes. For multi-channel implementation (or global access by extended users over the Web), extended integration across parties of value and supply chains can re-tool their existing applications across different channels to adapt to business innovations and extend the reach of systems.

Both the academic and practitioner literature has recognized the immense potential of Web services in providing interoperability among heterogeneous information systems. While there is no lack of articles in popular press and academic journals on Web services technology, architecture, and standards, there has been little research effort to address the specific issue of Web services adoption in an organization. Adoption-related issues from a business information technology perspective–such as the most cost-effective strategy to implement this technology within an organization and the driving factors for successful implementation–have been under-addressed so far. Implementation of any new technology requires a careful assessment of the needs and capabilities of the organization as well as the formulation of cost-effective adoption strategies. Research efforts are thus needed to investigate the adoption decision process in the Web services context. We argue that the first step in the adoption of a new technology such as Web services involves a proper assessment of the status of information technology (IT) within the organization. Based on the current IT level and resource availability, appropriate strategies can be formulated. Hence, in this paper, we first attempt to formalize a way to locate the position of a company in an IT adoption space based on the "sophistication level" of its current IT infrastructure, factors, and applications. We extend the adoption space model proposed by Chen et al. [17] to measure the resources that a company would need in order to adopt Web services applications with consideration of the company's current IT status along three dimensions of Web-based applications—intranet, extranet, and Internet. Our research aims to help businesses in the adoption decision of Web services, and our simulation results provide guidelines for businesses with limited resources to pursue the adoption of Web services in a cost-effective manner by strengthening appropriate factors.

The contribution of this study is two-fold. First, we identify the factors relevant to the adoption of Web services by an organization and provide an estimate of the potential resources that would be needed by the adoption. In introducing any new technology, one of the major concerns of senior management is the resources associated with the change. The success of such an endeavor depends on various factors. We argue that the higher the level of IT sophistication of a company, the less the resources needed to adopt Web services technology. Hence, we first identify