Communications of the Association for Information Systems

Volume 29 Article 1

7-2011

Determinants of Corporate Web Services Adoption: A Survey of Companies in Korea

Daekil Kim
Ming Chuan University, Taiwan, Daekil@mail.mcu.edu.tw

Lorne Olfman
Claremont Graduate University, USA

Recommended Citation
Kim, Daekil and Olfman, Lorne (2011) "Determinants of Corporate Web Services Adoption: A Survey of Companies in Korea," *Communications of the Association for Information Systems*: Vol. 29 , Article 1.
DOI: 10.17705/1CAIS.02901
Available at: https://aisel.aisnet.org/cais/vol29/iss1/1

Communications of the Association for Information Systems

CAIS

Determinants of Corporate Web Services Adoption: A Survey of Companies in Korea

Daekil Kim

Ming Chuan University, Taiwan

Daekil@mail.mcu.edu.tw

Lorne Olfman

Claremont Graduate University, USA

Abstract:

Despite growing interest and attention from Information Technology researchers and practitioners, empirical research on factors that influence an organization's likelihood of adoption of Web services has been limited. This study reports an empirical analysis of survey data to identify the influencing factors and demographic characteristics related to Web services adoption intention—based on whether to adopt and when to adopt Web services—from the perspective of 129 South Korean firms. The survey questionnaire respondents were an individual in each firm who typically advised the key person who would be making the decision to adopt Web services technology. The determining factors of Web services adoption were identified from both in-depth interviews with Web services experts and a literature review. The questionnaire was pretested with a pilot survey of seventy-four South Korean firms. Logistic regression was the main statistical analysis method, and the test showed significant correlation between some factors and whether to adopt. Important factors are business benefit driver (BBD), readiness (RD), and trust (TRUST).

Keywords: organizational behaviors, organizational unit, enterprise wide systems, IT Innovation

Volume 29, Article 1, pp. 1-24, July 2011

Communications of the Association for Information Systems

I. INTRODUCTION

Expansion of the IT services sector suggests the primary concern for many organizations is the availability of IT services throughout their organizations. This concern has been demonstrated by the proliferation of e-hub sites, e-portals and the Web services concept [Daniel and White, 2005]. The effectiveness and prospective benefits of the Web services concept [Infravio, 2003] have encouraged companies to adopt and promote Web services within their organizations. Various companies in Korea have started to develop and promote Web services as the new paradigm for achieving competitive advantage [Lee et al., 2005]. Companies and researchers in Korea should have a better understanding of Web services in order to ensure their success in realizing these perceived benefits; therefore, the purpose of this article is to provide this added knowledge.

The recent rapid growth of the market and interest in Web services, as partly evidenced by the increased volume of research, has led to expanded organizational initiatives in businesses [Zhao and Cheng, 2005]. Web services have been discussed from multiple perspectives, with mainstream research focusing on both technical and business aspects. Technical aspects have concentrated on enhancement of Web services mechanisms and architecture [Papazoglou and Georgakopoulos, 2003; W3C, 2004], while business aspects have been more concerned with organization adoption and implementation of Web services-based business applications and their economic potential [Chen et al., 2006; Hackney et al., 2006; Lawler et al., 2005; Legner, 2007; Lippert and Govindarajulu, 2006].

Assuming that the concept of Web services lives up to the hype, pressing questions remain: What are the factors that will influence its adoption in organizations? What are the importance of and relationships between these factors? What is the possibility for a firm to adopt Web services? Unfortunately, there is very little literature related to the adoption of Web services at the organizational level. Thus, the study reported here identifies factors that predict whether an organization (firm) thinks it will adopt or reject Web services.

II. THEORETICAL BACKGROUND

Prior studies have examined the influence of general readiness attributes on Web services adoption [Wu, 2004], and such research has created an evaluation framework for Web services [Hackney et al., 2006] based on technological, organizational, and external (TOE) environmental contexts [Tornatzky et al., 1990], adding the organizations' IS strategy as an emergent context. Similarly, Lippert and Govindarajulu [2006] proposed a model of Web services adoption based on the TOE framework. Lawler et al. [2005] analyzed the critical components of an effective Web services strategy using business, methodological, and technological factors. Chen et al. [2006] proposed a model to evaluate an organization's position based on its current level of IT sophistication according to three dimensions: Intranet, extranet, and Internet. Zhao and Cheng [2005] examined research in Web services and in process management by reviewing Web services articles published between 1995 and 2002 in three major digital libraries: IEEE Xplore, ACM DL, and INSPEC. Based on their examination, they suggested three research directions in a hybrid area of Web services and process management: technical foundation, architecture and application development, and strategic analysis.

Estrem [2003] reported various problems associated with Web services adoption: (a) inexperience with architecting Web services, (b) changing internal organizational culture to embrace Web services, (c) multiple standards for implementation, (d) immature technology, and (e) security concerns. Consistent with Estrem's findings, Xu et al. [2005] determined that existing theories were not sufficient to explain the phenomenon of Web services innovation and its adoption in organizations. They demonstrated that the TOE framework described by Tornatzky et al. [1990] is not capable of tracking the innovation of complex Web services because modern software practices among IS development groups might be influenced differently by the same factors in a single organizational context. For this reason, Xu et al. [2005] argued that Web services innovation does not have a fixed form or construct in the organizational context; the researchers termed this characteristic *polymorphism.* Xu et al. [2005] considered the Web services adoption phenomenon to be an amorphous matter within the infrastructure of enterprise IS.

The need to understand the unique factors that impact organizations' adoption of Web services led Xu et al. [2005] to suggest a model based on a pattern they identified for a company's adoption of Web services, though their work was not validated through an empirical test. They emphasized that a company's perception and management factors were important in determining adoption.

Our review of literature did not identify any other comprehensive studies evaluating perception factors or other important firm-level factors and their impact on organizational adoption of Web services. To address this limitation, the first author began the study by conducting interviews with eleven Korean Web services experts, including engineers, project managers, and project members involved in the development of Web services projects, with the objective of identifying additional managerial factors related to Web services adoption and research guidance.

Based on those interviews and using open coding methods, we identified the following managerial and perception factors in the adoption of Web services: (A) perceived trust, (B) perceived risk, (C) perceived maturity, (D) perceived benefit, (E) business process fit, (F) business benefit driver, (H) strategic intent, (I) regulation, management knowledge, and involvement, and (J) readiness.

Chang et al. [2008] defined open coding as "a method of analysis that names a phenomenon after careful examination" (p. 201). They drew eighteen RFID adoption factors from twenty-seven previous studies using an open coding method. Similarly, in this study, we categorized the factors of business process fit (BF), business benefit driver (BBD), strategic intent (SI), regulation (REG), management knowledge and involvement (MKI), and readiness (RD) by conducting decomposition, examination, comparison, conceptualization, and categorization. The process was based on the definitions of adoption factors, along with multiple confirming comments regarding perceived trust, perceived risk, perceived maturity, and perceived benefit. These items influence an organization's intention to adopt Web services.

The difficulty of evaluating and identifying the nature of the Web services' innovation process and the critical surrounding factors required to invest in Web services projects has been reported [Hackney et al., 2006; Xu et al., 2005]. Xu et al. [2005] argued that existing theories were not able to provide a complete explanation of the adoption of Web services at the organizational level due to Web services' unique technological characteristics, such as wide scope. Also, Hackney et al. [2006] mentioned that Internet-enabled Web services require critical and careful evaluation because Web services are not tied to any one operating system and cause ambiguities in understanding the evaluation process.

The difficulty of evaluating a Web services innovation process via existing frameworks [Hackney et al., 2006; Xu et al., 2005] led us to examine the most recent studies of Web services in terms of its adoption, evaluation, and strategy to determine their methodologies (see Table 1). From this extensive literature review, we found that there is a lack of quantitative empirical research studies on Web services adoption at the firm level. A few studies used only a limited number of case studies to support their findings [Hackney et al., 2006; Lawler et al., 2005], and some studies proposed only frameworks without testing empirically [Chen et al., 2006; Lippert and Govindarajulu, 2006; Wu, 2004]. We also found that some factors that we idenitifed in our preliminary interviews have not been considered in previous Web services adoption studies. This study addresses these limitations by identifying factors that influence the adoption of Web services at the firm level and showing how these factors determine the firm's level of intention to adopt Web services.

Pre-study Interviews

In 2007, the first author interviewed South Korean Web services experts. A series of face-to-face, semi-structured, open-ended interviews was conducted with eleven experts from various industries. These interviews were recorded and later transcribed for analysis. The interview process explored the following topical areas:

- Critical success factors of Web services adoption
- The nature of the Web services adoption process
- The role of various factors in Web services adoption.

Comments regarding the critical constructs of the intention to adopt Web services were elicited and confirmed during the interviews. Categorizing responses using open coding [Chang et al.,2008] identified a number of managerial factors: (a) business process fit (BF), (b) business benefit driver (BBD), (c) strategic intent (SI), (d) regulations (REG), (e) management knowledge and involvement (MKI), and (f) readiness (RD). These factors are believed critical to the adoption of Web services in an organizational environment. The comments from the interviews also confirmed four perception factors that we had previously found as a result of our literature search: trust, risk, IT maturity, and benefit.

Table 2 defines the constructs utilized in this study. Those cases in which definitions were adapted from other researchers from various technologies adoption areas, including Web services adoption, are noted accordingly.

Table 1: Summary of Recent Web Services Studies and Their Methodology		
Study	**About the Study**	**Methodology**
Hackey et al. [2006].	The researchers developed a specific and theoretical evaluation framework for web services.	First, the researchers developed the potential framework for web services contexts modified and expanded from Tornatzky et al.'s [1990] "Context of technology innovation." In order to develop such a potential web services framework, they used other studies not only in web services related studies but also other technology related studies such as EDI, open systems, and general IT innovation and management literature. They used three contexts: organizational, external environmental, and technological. Second, senior management executives and IS teams were interviewed using a semi-structured questionnaire based on five case sites in UK firms in various industries. Tornatzky et al.'s [1990] contextual technological innovation model with empirical and statistical data analysis in this study was customized into an evaluation framework for web services encompassing four major contexts: (1) external environment, (2) technological context, (3) organizational technological context, and (4) organizational IS strategy.
Lippert and Govindarajulu [2006]	The researchers proposed a model for Web services adoption.	The researchers proposed a model based on the modification of technology-organization-environment (TOE) model suggested by Tornatzky et al. [1990] by conducting a literature review. Based on this model, the researchers made eleven propositions. They did not test their propositions empirically.
Lawler et al. [2005].	This study analyzed key factors affecting an effective web services strategy in key financial services firms.	Stage 1: The researchers administered checklist questionnaires involving thirty-six factors categorized into three groups—business factors, methodological factors, and technological factors—at fourteen financial firms. They used a six-point rating scale (from 5-very high importance to 0-no importance). Stage 2: A sample of four financial firms was selected for detailed case studies based on on-site, semi-structured interviewing of engineers and managers
Chen et al. [2006]	The study proposed a model to evaluate a web services adoption in terms of organizations' current level of position and IT sophistication.	The researchers' model indentified critical factors affecting the successful adoption of web services along three dimensions: Intranet, extranet, and Internet. They indicated that an organization's "IT sophistication (or IT maturity)" was dependent not only on technological aspects but also on various organizational characteristics, and they applied organizational, technological, and special factors for extranet and Intranet to describe "IT sophistication." The researchers used a simulation approach using three different scenarios (in terms of different weights and diffusion levels) in Panel A, B, and C.
Wu [2004].	The study proposed a readiness model of web services adoption in three layers: the web services evolution process, web services invention process, and adoption process.	The researcher's readiness model was extended from Swanson's [1994] IS innovation typology model, which has three layers. The study defined the primary and secondary characteristics of web services from existing literature reviews and then suggested 4 research propositions. The study did not apply an empirical test.

Questionnaire Construction and Pilot Survey

Interpreting Web services as a technology process innovation allows the analysis of Web services to be embedded into the vast literature on technology adoption and innovative activities. To create the questionnaire for this study, a pool of items for each construct was extracted from the literature review of studies in contexts such as technology diffusion, strategic management, organizational behavior, and information technology (see Table 3). These measurement items were adapted from previous studies for general technology adoption areas, including Web services adoption. This approach was adapted from Churchill's [1979] widely used methodology for multi-item instrument development, which can reduce measurement error and provide a more robust measure of complex variables by combining several individual items [Stratman and Roth, 2002].

Table 2: Definitions of Constructs	
Construct	**Definition**
Perceived Benefit (PB)	Managers' perceptions within an organization regarding the overall benefits of adopting technology [Amoako-Gyampah, 2004; Banerjee and Golhar, 1994; Beatty et al., 2001; Chau and Tam, 1997; Fink, 1998; Hong and Kim, 2002; Iacovou et al., 1995; Motwani, et al., 2002; Wu and El Sawy, 2003].
Perceived Risk (RISK)	A belief regarding the potential uncertainty and negative outcomes from the intention to adopt technology [Alhakami and Slovic, 1994; Bhatnagar et al., 2000; Chau and Tam, 1997; Chaudhuri, 2002; Featherman and Pavlou, 2003; Grazioli and Jarvenpaa, 2000; Hackney et al., 2006; Jarvenpaa et al., 2000; Kim et al., 2008; Lawler et al., 2005; Mitchell, 1999; Peter and Ryan, 1976; Ramasubbu, et al., 2008; Siegrist, et al., 2000].
Perceived Trust (TRUST)	The subjective probability by which organizations believe that technology infrastructure is capable of facilitating transactions according to their confident expectations [Coetzee and Eloff, 2005; Gefen, 2002; Gefen, et al., 2003; Kim and Prabhakar, 2000; Lippert and Govindarajulu, 2006; Siegrist et al., 2000; Song and Zahedi, 2007; Xu et al., 2005]
Perceived IT Maturity (MATURITY)	A belief about a condition in which technology resources are fully developed and technology-based systems are fully integrated, including aspects of technological support, information content, functional support, and information systems management practices in terms of their evolution in planning, organization, control, and integration of those functions [Daniel and White, 2005; Gottschalk, 2008; Grant, et al., 2003; Karimi et al., 1996; Lippert and Govindarajulu, 2006; McFarlan, 1984; Nolan,1973; Raymond and Paré, 1992; Saunders and Keller, 1983; Saunders, et al., 2006].
Readiness (RD)	The state of technical, resource, architecture, and component process preparedness at which an organization adopts technology [Greer, 1988; Leonard-Barton, 1988; Lippert and Govindarajulu, 2006; McClellan, et al., 1994; Orlikowski and Hofman, 1997; Paré and Raymond, 1991; Powell and Dent-Micallef, 1997; Snyder-Halpern, 2001; Zhu et al., 2003].
Regulations (REG)	Laws and policies established by the government related to technology and fair information technology practices [Delmas, 2002; Hossain and Prybutok, 2008; Jones, et al., 2004; Kshetri and Dholakia, 2001; Lippert and Govindarajulu, 2006; Xu, et al., 2004].
Strategic Intent (SI)	An organization's set of strategic goals regarding the return on investment in technology [Chatterjee, et al., 2002; DiRomualdo and Gurbaxani, 1998; Hamel and Prahalad, 1989; Law and Ngai, 2007; Mirani and Lederer, 1998; Stratman and Roth, 2002; Thong, 1999].
Management Knowledge and Involvement (MKI)	The use of external programming support, senior management's knowledge of technology, senior management's involvement in the implementation of technology, and senior managers' responsiveness to other companies' strategic successes with technology [Biehl, 2007; Briggs and Shore, 2007; Chau, 1995; DeLone, 1988; Jiang, et al., 2001; Zhu, et al., 2003].
Business Process Fit (BF)	A subjective evaluation of how technology satisfies key needs associated with an organization's underlying intra-company business processes, including the technical and organizational fit of technology [Messner, 2007; Hong and Kim, 2002; Irani and Love, 2001; Kamhawi, 2007; Kotha and Swamidass, 2000; Law and Ngai, 2007; Scheer and Habermann, 2000; Stjernström, 2003].
Business Benefit Driver (BBD)	The extent to which anticipated benefits to the organization's business drive technology projects [Lawler et al., 2005; Tallon, et al., 2000; Chau and Tam, 1997; Hackney et al., 2006; Mahmood and Soon, 1991; Zhu et al., 2004; Beatty et al., 2001].

Table 3: Constructs and Measurement Items	
Constructs	**Measurement Items [Adapted from]**
Strategic Intent (SI)	-The business impact of introduced information systems (for instance, web services in this study) is co-aligned with strategic goals [Stratman and Roth, 2002] - Web services contribute to the globalization of firms [Zhao and Cheng, 2005; Law and Ngai, 2007] - Web services improve strategic alignment with existing partners [Zhu et al., 2004; Teo et al., 2003] - Facilitating cooperation with suppliers is important [Law and Ngai, 2007] - Web services helps to improve corporate image [Law and Ngai, 2007] - Web services creates new business opportunities (new item) - Competitive environment accelerates the speed of web services adoption for SOA [Hackney et al., 2006]
Business Benefit Drivers (BBD)	- The organization believes that an information system is a solution to interconnectivity problems due to the complex IT infrastructure [Jarvenpaa et al., 2000; Beatty et al., 2001] - A complex IT infrastructure also provides more opportunities and motivations for adoption since small-scale studies can be conducted to learn more about the technology [Chau and Tam, 1997]
Regulations (REG)	- The aid policy by government to adopt specialized standards outlined by the law affects technology adoption [Hossain et al., 2008; Lippert and Govindarajulu, 2006; Zhu et al., 2003] - Business and tax laws that are beneficial to organizations that adopt that standard are related to adopting that standard [Hossain et al., 2008; Lippert and Govindarajulu, 2006; Zhu et al., 2003] - Web services standards are outlined by the law [Hossain et al., 2008; Lippert and Govindarajulu, 2006; Zhu et al., 2003]

Table 3: continued	
Constructs	**Measurement Items [Adapted from]**
Management Knowledge and Involvement (MKI)	- Top managers need to understand about technology [Zhu et al., 2003; DeLone, 1988] - Top management support is critical in technology adoption [Zhu et al., 2003; DeLone, 1988] - The strong empowerment of IT project teams by top management is necessary to implement new technology successfully [Zhu et al., 2003; DeLone, 1988] - Rapid decisions from the top management are important in technology adoption [Teo et al., 2003]
Readiness (RD)	- Technical readiness includes not only the level of technological expertise within the organization but also assesses the level of understanding and support using IT to achieve organizational objectives [Pare and Raymond, 1991] - Organizational readiness is whether a firm has sufficient technical readiness and financial resources to undertake the adoption of EDI [Swatman et al., 1991, 1992; Iacovou et al., 1995] - Resource readiness is an organization's ability to support the IT/S innovation. This assessment requires that decision-makers be knowledgeable about the type and availability of organizational resources required for both initial IT/S innovation customization and implementation processes as well as ongoing maintenance of the IT/S innovation [Greer, 1977; 1988] - Componentization readiness is based on a new type of infrastructure, service-oriented computing to revolutionize the way software components are developed and used. Componentization refers to breaking down tasks into interchangeable pieces (new item)
Business Process Fit (BF)	- Web services process fits into the company technically [Law and Ngai,2007] - Organizational fit between the company and web services [Law and Ngai,2007] - There is more WS-process fit in some companies (or industries) than in others – bankassurance (bank+insurance) is one example of a good WS fit to the business process (new item).
Perceived IT Maturity (MTR)	- Current web services standards and development tools are mature enough to support business processes and architecture in my company (new item) - Web services is a de facto Internet integration standard instance [Austin et al., 2002; Smith, 2004] - Web services are one set of technologies and composable standards with well-defined interfaces for implementing an SOA [Austin et al., 2002; Smith, 2004]
Perceived Trust (TRUST)	- The degree and perception of reliability of an information system is one important consideration in building trust [Lippert and Govindarajulu, 2006; Wang and Head, 2007] - The degree and perception of benefit to business operation with an information system is important factor in building a trust [Wang and Head, 2007] - Reliable Information system service is an important factor for trust building [Gefen et al., 2005] - Trustworthy vendor's gurantees are important in establishing trust [Gefen et al., 2005] - The degree and perception of trustworthy consultants of information systems is an important factor in building trust (new item)
Perceived Risk (RISK)	- Inconsistency in cross-domain interoperability of multiple technological installations is a challenge for implementing new information systems, such as web services [Lawler et al., 2005] - Information system security, technical immaturity, and uncertainty are difficulties to implementing emerging technologies, such as web services [Hackney et al., 2006] - Transaction errors is one of the obstacles to be considered [Kim et al., 2008; Hackney et al., 2006] - Information systems' unique characteristics leading to openness and component/modularity of business processes may be confusing and threatening [Kim et al., 2008; Wang and Head, 2007; Hackney et al., 2006] - Implementation of new information systems is complex, e.g. variations instead of pre-built packages [Hackney et al., 2006]
Perceived Benefit (PB)	- Adopting new Information systems provides a more flexible environment that is no longer constrained by proprietary systems, offers more choices for hardware and software, better utilizes IT resources, promotes flexibility and integration, and allows transparent data access [Chau and Tam, 1997] - Using new information systems saves transaction cost and improves cash flow [Beatty et al., 2001; Kim et al., 2008] - Adopting new information systems improves operational efficiency [Fink, 1998] - Adopting new information systems provides flexible business processes and architecture (new item) - Adopting new information systems offers new business opportunities [Beatty et al., 2001] - Adopting an information system is productive to companies [Swaminathan et al., 1999; Beatty et al., 2001; Kim et al., 2008] - Adopting an information system improves the ability to manage organizational resources effectively (e.g. in decision-making) [Fink, 1998]

To improve the content validity of the survey questionnaire, manual sorting and review panels consisting of four additional Web services experts were used to create a survey questionnaire.

Yang's [2005] suggestion that demographic constructs influence the decision making process in technology adoption led to the decision to include demographic constructs in the survey. The demographic characteristics included age of the firm (measured by number of years in business), size of the firm (measured by number of employees), industry type, headquarters location, education, job role, and age of the respondent. Four important findings emerged from Yang's study of Korean firms. Also, prior IS studies focused on understanding the adoption of information and communication technologies in SMEs in Mauritius [Lai and Sharma, 2006] using a focus group approach with both size of firm and age of firm as dependent variables. Bertschek and Fryges [2002] found that both firm size and age of firm were important factors driving a firm's decision to implement B2B electronic commerce.

The size of the business has been reputed to be the most important distinctive factor in the analysis of technology adoption [Lind et al., 1989] and it has been found to apply equally well to studies of large and small business organizations [Raymond, 1985]. Davies [1979, p. 20] stated, "... the costs and risks of early adoption are more easily borne by large firms." Other studies suggest that technology adopters tend to be larger than non-adopters [Montazemi, 1989]. Montazemi speculates that this may be because larger businesses can allocate greater financial and personnel resources to the adoption and use of new technology. Grover and Teng [1992] observed the technology adoption process between larger and smaller organizations, and noted that small businesses may be able to adopt technology because they are more flexible or can adapt to changing environments more quickly than larger businesses.

The length of time (age of firm) for which the company has been in business has an influence on the way in which the business adopts technology. Earlier studies suggest that age of organizations is related to perception of systems usefulness and technology adoption [cf. Franz and Robey, 1986]. Older businesses may be better able to adopt technology as they have greater experience with assimilating new processes into their operations [Evans, 1987]. An older business may also possess greater financial resources to apply to the acquisition and maintenance of technology [Raymond, 1985]. According to Christensen and Rosenbloom [1995], new firms are more flexible and thus more likely to adopt a new technology than old firms.

A pilot survey was conducted in 2008, to ensure that questionnaire instruments are reliable and adequate for the main study [Dennis and Valacich, 2001; Dembla, et al., 2007]. Surveys were collected from a sample of seventy-four South Korea organizations that had not adopted Web services. Items in the pilot survey were measured on seven-point Likert-type scales with 1 being "strongly disagree" and 7 being "strongly agree."

The sample was selected based on a list of 100 organizations acquired from the eleven experts who had been interviewed in the pre-study. Thus, a total of 100 surveys were sent out and seventy-four responses were collected. This sample was used only for the pilot test survey rather than for the main study survey, and the construct validity was evaluated for the main survey study with a bigger sample size. An exploratory factor analysis (EFA) was performed for the pilot test sample of seventy-four participants. This analysis also used the orthogonal rotation (varimax) method in factor rotation as one tool for identifying clusters of items for the main study survey. The reason for using the orthogonal rotation (varimax) was its mathematical simplicity with respect to independent factors and the interpretation of results.

From the factor analysis and given the careful process of pre-study interviews, open coding, and review of panels, eleven factors were extracted by considering loading values, the pattern of eigenvalues and the proportion of variance explained. The result of factor analysis showed that eigenvalues for eleven factors were greater than 1 (eigenvalue > 1), the value of cumulative variance for all eleven factors was 81.9 percent, and all factor loading values exceeded or were near the suggested threshold, that is 0.60, which was considered to be an acceptable level for a newly-developed scale using items from across disciplines [Barclay et al., 1995].

III. RESEARCH METHOD AND DESIGN

In spring of 2009, the validated questionnaire in the main survey was sent to organizations that had not yet adopted Web services in South Korea. It was addressed to the employee responsible for technology adoption and implementation for his or her organization. This clearly indicated that the unit of analysis in this study was the organization, not its employees, as in other studies [Riemenschneider et al., 2003; Grandon and Pearson, 2004] which required screening in the sample to avoid duplication of respondents in each company.

The sample in the main survey was selected based on a list of organizations from the eleven experts in the pre-study interviews. A total of 200 target organizations (none the same as those in the pilot study) were contacted

through e-mail and phone in the beginning of March 2009 to determine if they were considering the adoption of Web services. If so, a further correspondence sought to identify the contact information (i.e., e-mail address) of the employee of the division responsible for technology adoption or implementation for the organization. Contact was initiated through an e-mail letter that briefly described the intended study. This enabled the cover letter to be individualized and to solicit voluntary participation and ensure that the survey questionnaire would be sent directly to the right person. This was done in order to differentiate the questionnaire from any bulk e-mails and thereby increase the return rate.

The main survey questionnaire in the main survey consisted of seven demographic questions and a list of forty-four items representing each of the eleven constructs (see Appendix 1). The survey items were measured on 7-point Likert-type scales, with 1 being "strongly disagree" and 7 being "strongly agree."

Due to limitations of time and budget, we estimated the optimal sample size [Berenson and Levine, 1996] as the minimum sample size needed to attain a desired level of precision. The following equation to estimate the optimal sample size for the dichotomous variables (adopting or rejecting) was used. It assumes simple random sampling, a limit of error (e) at 0.10, a two-tailed 95 percent confidence level ($z_{0.025}$), and an unknown prior probability of dichotomous variables (Adopting or Rejecting;$\hat{p}$) (0.5) [Mason et al., 2003; Giesbrecht and Gumpertz, 2004]:

$$n = \frac{z^2 \hat{p}(1-\hat{p})}{e^2} = \frac{1.96^2(0.5)(0.5)}{0.1^2} = 96$$

Thus, the optimal sample size was ninety-six for this study. However, in the case of unreliable responses and an estimated response rate of 50 percent, surveys were sent to 200 companies;151 surveys were returned for a 75 percent response rate. After the extraction of unreliable responses—nonresponses or poor item comprehension—a total of 129 responses were used for the analyses, which was more than the optimal sample size of ninety-six.

The collected data were analyzed using SPSS17.0. Factor analysis was used in the process of examining construct validity. Cronbach's alpha was used to determine the reliability of scales. Gamma test and t-test were used to describe and test the relationships between the research factors and to discriminate between different adopting groups.

IV. DATA ANALYSIS AND DISCUSSION

Sampling and Data Collection

Table 4 shows demographics of the respondents and their firms in terms of industry, number of employees, location of headquarters, education, number of years in business, job role of respondents, and age of respondents.

Table 4 showed demographic characteristics of participants in this study. The information technology (IT) industry made up the greatest percentage (38.0 percent), followed by machinery (13.2 percent), services (13.2 percent), and other (13.2 percent). The majority of headquarters locations (95.5 percent) were in South Korea. The majority of the respondents were in their 30s (58.1 percent) and 20s (28.7 percent). Only 13.2 percent of the respondents were 40 years of age or older. The distribution of the number of employees appeared to be well-balanced. The breakdown of job role held by the respondents was: report to the chief decision maker (40.5 percent), give advice to the chief decision maker (33.3 percent), do not directly play a role (23.0 percent), and the chief decision maker (3.2 percent). The majority education level was university graduate (72.7 percent), followed by graduate school (27.3 percent).

Validity and Reliability

Validity was assessed by factor analysis with varimax rotation, and Cronbach's alpha was estimated for reliability. Table 5 shows the results of the statistical analysis.

As seen in Table 5, the result of the factor analysis showed that eigenvalues for all ten independent factors were greater than 1 and the value of cumulative variance for all ten factors was 74.4 percent. All factor-loading values except SI1, Bf3, Trust 2, and Risk 1 for the ten factors in this study exceeded the suggested threshold of .60, which is considered to be an acceptable level for a newly-developed scale across disciplines [Barclay et al., 1995]. Also, composite scales constructed by averaging items within each factor all showed acceptable reliability levels, as Cronbach's alpha values ranged from .797 for readiness (RD) to .945 for perceived benefit (PB). The values are higher than the recommended threshold of .70 [Barclay et al., 1995; Bagozzi and Yi, 1988].

Table 4: Demographics and Descriptive Statistics			
Measure	**Item**	**Number**	**Percentage (%)**
Business type	Machine	17	13.2
	Metal	2	1.6
	Electricity/electronics	11	8.5
	Textiles	1	.8
	Food	1	.8
	Retail	2	1.6
	Non-metal	2	1.6
	Service	17	13.2
	IT	49	38.0
	Physical distribution	3	2.3
	Finance/insurance	7	5.4
	Other	17	13.2
	Total	129	100
Headquarters	Korea	123	95.5
	Foreign	6	4.7
Education	University/college graduate	93	72.7
	Graduate school	35	27.3
Age	20s	37	28.7
	30s	75	58.1
	40s	17	13.2
Number of employees	<1000	38	29.5
	1000~5000	32	24.8
	5000~10000	33	25.6
	>10000	26	20.2
Years since founding	<10	30	23.3
	10–20	30	23.3
	20–30	34	26.4
	>30	35	27.1
Role	The chief decision maker	4	3.2
	Report to the decision maker(s)	51	40.5
	Give advice to the decision maker(s)	42	33.3
	Do not directly play a role	29	23.0
Scope	[1] company wide	87	69.0
	[2] only at our headquarters	5	4.0
	[3] only for external B2B	17	13.5
	[4] only at some locations	3	2.4
	1,3	12	9.5
	1,2,3	1	0.8
	2,3	1	0.8
	Missing value	3	

Table 5: Factor Analysis of Research Constructs												
Construct	Items	Component										Cronbach's Alpha
		1	2	3	4	5	6	7	8	9	10	
Maturity (MTR)	MTR1	.740	.198	-.071	.189	.074	.108	.186	.219	-.123	.108	.835
	MTR2	.695	.115	.169	.057	.145	.132	-.064	.185	-.264	.068	
	MTR3	.783	.099	.017	.079	.059	.027	.072	.241	-.136	.270	
Strategic Intent (SI)	SI2	.085	.701	.133	.246	.044	.182	.100	.108	-.104	.295	.896
	SI3	-.015	.758	.054	.176	.235	.248	.103	-.002	-.010	.231	
	SI4	.156	.695	.130	.258	.156	.140	.241	.023	-.013	.294	
	SI5	.389	.719	.070	.252	-.041	.104	.087	.027	.036	.096	
Business process fit (BF)	BF1	.110	.094	.821	.150	.124	.148	.115	.083	.012	.188	.798
	BF2	-.030	.159	.790	.087	.122	.268	.169	-.030	.047	.142	
Business benefit Driver (BBD)	BBD1	.053	.189	.136	.830	.201	.012	.085	.048	-.051	.134	.888
	BBD2	.089	.204	.066	.800	.252	.192	.063	.125	-.098	.167	
	BBD3	.181	.333	.119	.642	-.029	.206	.264	.110	.040	.182	
	BBD4	.250	.249	-.025	.606	.165	.279	.286	.174	.016	.105	
Regulation (REG)	REG1	.050	.090	.147	.175	.744	.264	.149	.161	-.055	.219	.873
	REG2	.100	.154	.075	.205	.796	.188	.069	.099	.049	.282	
	REG3	.148	.065	.105	.140	.684	.277	.122	-.038	.142	.292	
Management Knowledge & Involvement (MKI)	MKI1	.015	.172	.155	.184	.059	.725	.274	.107	.079	.136	.888
	MKI2	.117	.187	.137	.112	.175	.803	.149	.169	-.100	.076	
	MKI3	.089	.121	.032	.075	.320	.713	.044	.072	-.002	.177	
	MKI4	.122	.111	.229	.183	.202	.684	.302	.091	-.058	.076	
Readiness (RD)	RD1	.125	.036	.048	.197	.118	-.063	.828	-.070	.080	.028	.797
	RD2	.081	.115	.071	.080	.112	.230	.758	.105	.014	.124	
	RD3	-.044	.164	.155	-.061	.076	.346	.698	.183	.070	.068	
	RD4	-.012	.119	.092	.285	-.032	.305	.628	.065	-.136	.193	
Trust	TRUST1	.202	.054	.246	.093	.132	-.049	.201	.656	.000	.246	.849
	TRUST3	.172	.025	-.016	.086	.029	.125	.009	.839	.054	.190	
	TRUST4	.095	.053	-.075	-.025	.033	.259	-.059	.804	-.058	.280	
	TRUST5	.180	.020	.011	.188	.056	.060	.150	.719	-.063	.313	
Risk	RISK2	-.011	-.318	-.002	.133	-.054	.187	.057	-.137	.729	.122	.867
	RISK3	-.075	.009	-.086	-.021	.027	.014	-.052	-.127	.834	.036	
	RISK4	-.083	.050	-.027	-.175	.168	-.160	.006	.133	.745	-.185	
	RISK5	-.283	.041	.174	-.124	-.030	-.192	-.005	.139	.715	-.106	
Perceived benefits (PB)	PB1	.070	.171	.194	.143	.013	.133	.101	.091	.009	.785	.945
	PB2	.155	.258	.067	.140	.108	.116	.043	.204	.067	.732	
	PB3	.093	.071	.055	.082	.111	.153	.117	.184	-.062	.840	
	PB4	.201	-.005	.105	.062	.105	.169	-.013	.119	.053	.832	
	PB5	.060	.063	.041	.104	.186	.179	.034	.141	-.010	.823	
	PB6	.038	.131	.053	.066	.107	-.139	.039	.145	-.049	.787	
	PB7	-.055	.209	-.038	.043	.198	.000	.199	.212	-.061	.683	
eigenvalue before rotation		13.686	8.434	7.524	7.301	7.265	7.256	6.894	5.853	5.800	4.449	
Cumulative Variance		13.686	22.121	29.645	36.946	44.211	51.467	58.361	64.214	70.014	74.463	

Multicollinearity

Some diagnostic tests also were performed to check the reliability of the model in this study. Multicollinearity was checked using the variance inflation factor (VIF) among the independent variables in each of the regression model equations. If R^2_j is the coefficient of determination resulting when the predictor variable X_j is regressed on all the remaining predictor variables, the variance inflation factor for X_j (VIF_j) is given by:

$$VIF_j = \frac{1}{(1-R_j^2)}, j = 1,2,\ldots,p$$

where p is number of independent variables. As seen in Table 6, the variance inflation factor (VIF) test did not detect any high level of multicollinearity because all VIF values were low, ranging from 1.174 to 2.283, which are well below the threshold level of 5.

Table 6: Variance Inflation Factor (VIF)

	MTR	SI	BF	BBD	REG	MKI	RD	TRUST	RISK	PB
VIF	1.812	2.283	1.609	2.139	1.854	2.112	1.558	1.828	1.174	1.774

Correlation Analysis

With the factors identified and validated, we proceeded to explore the relationships among the research constructs. Table 7 summarizes the correlation analysis among the ten independent variables. The results suggested that

Table 7: Correlations

		MTR	SI	BF	BBD	REG	MKI	RD	TRUST	RISK	PB
MTR	Pearson Correlation	1									
	Sig. (2-tailed)										
SI	Pearson Correlation	.433**	1								
	Sig. (2-tailed)	.000									
BF	Pearson Correlation	.185*	.402**	1							
	Sig. (2-tailed)	.036	.000								
BBD	Pearson Correlation	.423**	.634**	.368**	1						
	Sig. (2-tailed)	.000	.000	.000							
REG	Pearson Correlation	.329**	.430**	.414**	.492**	1					
	Sig. (2-tailed)	.000	.000	.000	.000						
MKI	Pearson Correlation	.329**	.479**	.467**	.515**	.569**	1				
	Sig. (2-tailed)	.000	.000	.000	.000	.000					
RD	Pearson Correlation	.241**	.415**	.383**	.473**	.370**	.530**	1			
	Sig. (2-tailed)	.006	.000	.000	.000	.000	.000				
TRUST	Pearson Correlation	.485**	.290**	.219*	.344**	.338**	.339**	.270**	1		
	Sig. (2-tailed)	.000	.001	.012	.000	.000	.000	.002			
RISK	Pearson Correlation	-.304**	-.048	.087	-.006	.090	.014	.083	-.040	1	
	Sig. (2-tailed)	.000	.586	.328	.946	.312	.878	.350	.649		
PB	Pearson Correlation	.369	.483	.336	.408	.497	.363	.299	.516	-.011	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.001	.000	.897	

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

maturity (MTR), business benefit drive (BBD), trust (TRUST) and perceived benefit (PB) are negatively related to risk and the other constructs are positively related to each other. All correlation coefficient values were below .8, suggesting an acceptable discriminant threshold [Anderson and Gerbing, 1988].

Relationships Between Demographic Constructs and Adopting/Rejecting WS

To explore the relationship between each of the demographic constructs and the company's plan of "adopting" or "rejecting" Web services, we performed three Gamma tests. A test was conducted to detect if there was a relationship between "number of years in business" and the company's plan of "adopting" or "rejecting" Web services. (see Table 8).

Table 8: Number of Years in Business and Plans to Adopt or Reject Web Services				
		Group with an Intention		Total
		Adopting	Rejecting	
Number of years in business	<10 years	23(76.7)	7(23.3)	30(100.0)
	10-19 years	21(75.5)	7(25.5)	28(100.0)
	20-29 years	27(93.1)	2(6.9)	29(100.0)
	>30 years	29(90.6)	3(9.4)	32(100.0)
Total		100(84.0)	19(16.0)	119(100.0)
Gamma		.363*		
** p<.01, * p<.05				

The results showed that the Gamma value was .363, and the p-value was .046, which was statistically significant at α=.05. The results suggested that companies with more years in business show greater intentions to adopt Web services than companies with fewer years in business.

Table 9: Number of Employees and Plans to Adopt or Reject Web Services				
		Group with an Intention		Total
		Adopting	Rejecting	
Number of employees	<1000	28(77.8)	8(22.2)	36(100.0)
	1000-4999	24(80.0)	6(20.0)	30(100.0)
	5000-9999	31(93.9)	2(6.1)	33(100.0)
	>10000	17(85.0)	3(15.0)	20(100.0)
Total		100(84.0)	19(16.0)	119(100.0)
Gamma		.266		
** p < .01, * p < .05				

A gamma test also was conducted to detect if there was a relationship between “number of employees” and the company’s plan of “adopting” or “rejecting” Web services. The results (see Table 9) showed that the Gamma value was .266, and the p-value was .166, which was not significant. Thus, “number of employees” was not found to be a significant factor to distinguish the “adopting” group from the “rejecting” group.

Table 10 shows that a respondent who played a direct role (the chief decision maker, reports to the decision maker, or gives advice to the decision maker) indicated an intention to adopt Web services at a rate of 75 percent, 93.5 percent, and 87.2 percent, respectively, while people who did not play a direct role showed an intended adoption rate of 63 percent.

Gamma was used to analyze the relationship between role and the two adopting groups based on the assumption of role as an ordinal scale. As seen in Table 10, Gamma was .516, indicating that respondents with a greater role in decision making are more likely to adopt Web services than those with no direct role (p = .012).

Table 10: Decision-Making Role and Plans to Adopt or Reject Web Services				
		Group with an Intention		Total
		Adopting	Rejecting	
Role	The chief decision maker	3(75.0)	1(25.0)	4(100.0)
	Report to the decision maker	43(93.5)	3(6.5)	46(100.0)
	Advice to decision maker	34(87.2)	5(12.8)	39(100.0)
	No direct role	17(63.0)	10(37.0)	27(100.0)
Total		97(83.6)	19(16.4)	116(100.0)
Gamma		.516*		
** p<.01, * p<.05				

Relationships between Adopting/Rejecting WS and Research Constructs

Logistic regression analysis (backward stepwise with Wald) was performed for two reasons: (1) it is able to test categorical independent variables such as demographic variables (age and size of firm) and (2) it is able to test binary dependent variables such as two groups (“adopting group,” and “rejecting group”) without satisfying strict assumptions such as normality and homoscedasticity that are required in using discriminant analysis [Fichman and Kemerer, 1997; Mabert et al., 2003]. One demographic variable—age of firm—needed to be tested in determining placement in one of two groups using logistic regression analysis because this factor was identified as being critical by the Gamma test.

The overall correctness of classification increased to 90.8 percent as per the results of the logistic regression analysis (see Table 11). In addition, the accuracy of the adopting group was 97.0 percent, and the accuracy of the rejecting group was 57.9 percent.

The result of logistic regression analysis in Table 12 showed a positive value for the Cox and Snell R square (R[2] = 0.299), and in Table 13 found that BBD, RD, and Trust were highly significant predictors for determining the intention of adopting groups (versus rejecting). All p-values of BBD, RD, and Trust were less than 0.025.

The result also confirmed that the factor of age of firm was identified as a critical factor in discriminating the "adopting group" from the "rejecting group." Table 13 shows the results of the equation of the logistic regression including this factor: age of firm (number of years in business), represented by Y in the equation.

Table 11: Classification Table

		Predicted Value	
		Adopting	Rejecting
Observed value	Adopting	97(97.0%)	3(3.0%)
	Rejecting	9(47.4%)	10(52.6%)
90.8% of original group cases correctly classified			

Table 12: Model Summary

-2 Log likelihood	Cox & Snell R square	Nagelkerke R square
63.226	.293	.502

Table 13: Equation Table

Variables	B	Wald	p-value
Constant	6.206	8.162	.004
BBD	-1.249	7.462	.006
RD	-1.258	6.945	.008
TRUST	-.885	5.197	.023
Y1	1.327	2.140	.144
Here Y1 is <10 vs. >30			

V. RESULTS AND IMPORTANCE OF FINDINGS

The purpose of this study was to extend the understanding of organizations' Web services adoption by identifying factors that can distinguish "adopting firms" from "rejecting firms." The study, based on a pre-study interview and prior studies, identified ten factors and then evaluated their influence on organizations' decision to adopt Web services by conducting two survey stages: a pilot and the main survey. A survey instrument was developed to measure these ten factors and the firms' demographic constructs, and then data were collected from firms in South Korea.

First and foremost, a focus of this study was to understand the differences between organizations that are expected to adopt Web services and those that are not expected to adopt Web services. The result of logistic regression analysis (Table 13) found that business benefit driver (BBD), readiness (RD), and trust (TRUST) were significant predictors for determining the intention of adopting groups (versus rejecting). In addition, it appears that business benefit driver (BBD) is the most significant factor affecting the adoption or non-adoption of Web services (p = 0.006), assuming that the smaller the p-value is, the more important that factor is in predicting the intention to adopt or reject. It is, therefore, noted that the business benefit driver (BBD) factor would be the strongest significant factor to be considered by organizations that have a plan whether to adopt Web services.

The findings also show that certain demographic constructs are important in distinguishing those firms that plan to adopt Web services. First, the age of the firm, measured by "number of years in business," is related to a firm's Web services intention to adopt. The emergence of the age of firm factor as a significant determinant, which has not been mentioned in prior IS studies except in one study investigating the adoption of information and communication technologies in SMEs in Mauritius [Lai and Sharma, 2006], is a unique finding of this study.

Second, existing studies [Min and Galle, 1999; Chwelos et al., 2001; Damanpour, 1991; Lal 2004] have suggested that a firm's size plays a critical role in the adoption of new technology. The firm size factor, as measured by number of employees, did not attain statistical significance in determining placement in the adopting versus rejecting group.

VI. DISCUSSION AND CONCLUSION

Implications

The empirical findings pertaining to the identified key factors of Web services adoption have important implications for an organization's executives in deciding on Web services adoption. This study advises firms (at least in Korea) who are contemplating the adoption of Web services to pay close attention to how a firm strategically uses these four identified factors and thus, it is hoped, increase the probability of Web services adoption.

As noted, business benefit drivers (BBD) were found to be the strongest indicator in the Web services adoption decision. Compared with other indicators, respondents' expectation of delivering Web services was perceived as higher by firms that plan to adopt Web services. Since business benefits such as improving the performance of job tasks, improving operation efficiency, solving the lack of integration in systems, and solving the high complexity in legacy systems infrastructure are said to be possible from adopting Web services, it is assumed that these firms believe in the potential benefits. Firms that market Web services should consider focusing first on the potential organizational performance benefits that can be derived from their product.

Prior studies have only suggested readiness factors without empirical verification [e.g., Wu, 2004]. In contrast, this study empirically found and confirmed that the readiness (RD) indicator was significant in determining firms' Web services adoption expectations. So, a readiness (RD) factor indicated that this factor greatly affects whether adopt or reject Web services—readiness factors was the second strongest indicator in making a plan to adopt or reject Web services (more technical, resource, architecture, and component process preparedness of an organization for adopting Web services technology). So, if a firm is considering whether to adopt or reject Web services, the firm's decision makers should consider organizational readiness (RD) for change by increasing communications between organization members and engineers regarding possible changes as a result of Web services adoption.

The trust (TRUST) indicator has also become a managerial issue in adoption of Web services [Chen et al., 2003]. It is not only a matter of how much a firm can trust the security of Web services, but also of how well customers, partners, and IT managers can trust Web services to perform as promised. Firms that are undertaking Web services initiatives and building service oriented architecture (SOA) are doing so with extreme caution. This study specifically examined the trust issue related to Web services adoption from the perspectives of employees in firms and confirmed that trust is another strong indicator in determining adoption or non-adoption of Web services.

In addition, regarding the findings of demographic variables, the result that older firms are more likely to adopt Web services and that younger firms are less likely to adopt Web services in South Korea has implications: (1) even if it is more expensive for older and larger firms to change their existing infrastructure, that is not a strong barrier to their intention to adopt new technologies, and (2) older firms are aggressive adopters of more advanced Web services. The finding that respondents with closer ties to decision makers are more likely to intend to adopt Web services implies that a person with a higher status position (role) related to the decision making of Web services adoption would be more likely to encourage the adoption of Web services aggressively and quickly.

Limitations and Future Research

While this study provided interesting insights, there are limitations, including the need for follow-up studies, which should be conducted using different methods and target different populations and respondents. First, the process of sampling the firms that participated in the study was not random. As a result, some findings may not be applicable to the general population of Korean organizations. Specifically, the sample may have been biased toward some industries and organizational sizes. Thus, we advise caution when interpreting the findings. We are hopeful that future studies will eliminate or reduce this limitation. For example, future studies can refine the sample for a specific industry (e.g., the manufacturing or financial industry) rather than include a generic sample of all industries. Another topic of interest would be to examine the phases of adoption or diffusion and identify the factors and their influence on the diffusion of Web services.

The second limitation of the study is that most research constructs and variables measured the perceptions and expectations of employees of organizations that are considering and planning the adoption of Web services rather than using objective data. Furthermore, the assumption that one respondent's perception was considered to be the perception of the whole firm constrained the survey and potentially compromised the rigor and diligence with the sampling and survey administration process. As the concept of Web services matures and its adoption becomes widespread, we hope that future studies will be conducted based on objective data rather than perception. We advise the reader to interpret some of the findings with caution due to the exploratory nature of the study. For example, we anticipated finding a statistically significant relationship between the risk factors (RISK) and a firm's Web services adoption through a simple t-test. Although the study did not provide significant empirical evidence to support these relationships, it is too easy to conclude the absence of such relationships. As we learn more about the

technology and the associated issues and factors, we will develop more elaborate and fine-tuned research frameworks and consequently clearer understandings of the inconclusive findings of this study.

Ozdemir and Abrevaya [2007] studied the adoption of technology-mediated distance education (TMDE) between 1997–1998 and 2000–2001. Their study determined that while the intention to adopt correlated significantly with actual adoption, many schools that were not interested in TDME in 1997-–998 actually had adopted it by 2000–2001. Their study provides one way to validate the research framework suggested in this article, namely by collecting a set of data some time after the initial set of data to determine whether companies in the initial survey actually have adopted Web services. Further studies may use longitudinal methods, such as those used in Ozdemir and Abrevaya's [2007] study, to explore the actual Web services adoption rate, which was not investigated in this study. However, the first author recently contacted several companies that were surveyed in the pilot and the main study. They commented that they had had to postpone all new IT implementation plans because of the shrinking budgets caused by the current financial crisis. These factors pose some difficulties in validating the current research study.

Conclusion

We expect that the findings of this study will interest academic researchers in the Web services paradigm and thus might contribute to the theoretical foundations of Web services. The future role and use of Web services depend on refined practical achievements as well as theoretical support. This mixture of approaches from both the practical and theoretical side will increase the importance of Web services as a strategic activity in organizations because Web services can create value through intense partnering and alliance activity [Currie and Parikh, 2006].

This study addressed several knowledge gaps by: (1) defining and testing a firm's perception of and decision to adopt Web services rather than an individual's perception (although one individual in each firm we studied was the respondent to our survey) as a new way to see the adoption of Web services; (2) systematically and empirically identifying relevant factors associated with Web services adoption and their relationships, including relatively new factors such as Web services maturity, in order to extend the spectrum for considering Web services adoption; (3) determining a level of the intention of Web services adoption and thus discriminating companies as a new guideline for Web services providers, consultants, and vendors; and (4) conducting an empirical test for laying the theoretical foundation for systematic research on a firm's technology adoption rather than suggesting only a theoretical model.

REFERENCES

Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web, can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. The author(s) of the Web pages, not AIS, is (are) responsible for the accuracy of their content.
4. The author(s) of this article, not AIS, is (are) responsible for the accuracy of the URL and version information.

Alhakami, A.S. and P. Slovic (1994) "A Psychological Study of the Inverse Relationship Between Perceived Risk and Perceived Benefit", *Risk Analysis* (14), pp. 1085–1096.

Anderson, J. and D. Gerbing (1988) "Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach", *Psychological Bulletin* (103)3, pp. 411–423.

Amoako-Gyampah, K. (2004) "ERP Implementation Factors: A Comparison of Managerial and End-User Perspectives", *Business Process Management Journal* (10), pp. 171–183.

Austin, D. et al., (2002) "Web Services Architecture Requirements", W3C Working Group Draft 14, http://www.w3.org/TR/wsa-req#id2604831 (current Nov. 14, 2002).

Bagozzi, R.P. and Y. Yi (1988) "On the Evaluation of Structural Equation Models", *Journal of the Academy of Marketing Science* (16)1, pp. 74–94.

Banerjee, S. and D.Y. Golhar (1994) "Electronic Data Interchange: Characteristics of Users and Nonusers", *Information and Management* (26), pp. 65–74.

Barclay, D.W., C. Higgins, and R. Thompson (1995) "The Partial Least Squares (PLS) Approach to Causal Modeling: Personal Computer Adaptation and Use as an Illustration", *Technology Studies*, (2)2, pp. 285–309.

Beatty, R.C., J.P. Shim, and M.C. Jones (2001) "Factors Influencing Corporate Web Site Adoption: A Time-Based Assessment", *Information and Management* (38), pp. 337–354.

Bertschek, I. and H. Fryges (2002) "The Adoption of Business-to-Business E-Commerce: Empirical Evidence for German Companies", *Centre for European Economic Research,* Discussion Paper No. 02–05, Mannheim.

Bhatnagar, A., S. Misra, and H.R. Rao (2000) "On Risk, Convenience, and Internet Shopping Behavior", *Communications of the ACM* (43)11, pp. 98–105.

Biehl, M. (2007) "Success Factors for Implementing Global Information Systems", *Communications of the ACM* (50)1, pp. 52–58.

Briggs, W. and B. Shore (2007) "Competitive Analysis of Enterprise Integration Strategies", *Industrial Management and Data Systems* (107), pp. 925–935.

Chau, P.Y. (1995) "Factors Used in the Selection of Packaged Software in Small Businesses: Views of Owners and Managers", *Information and Management* (29), pp. 71–78.

Chau, P.Y. and K.Y. Tam (1997) "Factors Affecting the Adoption of Open Systems: An Exploratory Study", *MIS Quarterly* (21), pp. 1–24.

Chang, S.I. et al., (2008) "The Determinants of RFID Adoption in the Logistics Industry—A Supply Chain Management Perspective", *Communications of the Association for Information Systems* (23) Article 12, pp. 197–218.

Chatterjee, D., C. Pacini, and V. Sambamurthy (2002) "The Shareholder-Wealth and Trading Volume Effects of Information Technology Infrastructure Investments", *Journal of Management Information Systems* (19)2, pp. 7–42.

Chaudhuri, A. (2002) "A Study of Emotion and Reason in Products and Services", *Journal of Consumer Behavior* (1), pp. 267–279.

Chen, A.N., S. Sen, and B.B. Shao (2006) "Strategies for Effective Web Services Adoption for Dynamic E-Businesses", *Decision Support Systems* (42), pp. 789–809.

Churchill, G.A. (1979) "A Paradigm for Developing Better Measures of Marketing Constructs", *Journal of Marketing Research* (16), pp. 64–73.

Christensen, C.M. and R.S. Rosenbloom (1995) "Explaining the Attacker's Advantage: Technological Paradigms, Organizational Dynamics, and the Value Network", *Research Policy* (24)2, pp. 233–257.

Coetzee, M. and J.H. Eloff (2005) "Autonomous Trust for Web Services", *Internet Research* (15), pp. 498–507.

Currie, W.L. and M.A. Parikh (2006) "Value Creation in Web Services: An Integrative Model", *Journal of Strategic Information Systems* (15)2, pp. 153–174.

Damanpour, F. (1991) "Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators", *Academy of Management Journal* (34)3, pp. 555–590.

Daniel, E.M. and A. White (2005) "The Future of Inter-Organizational System Linkage: Findings of an International Delphi Study", *European Journal of Information Systems* (14), pp. 188–203.

Davies, S. (1979) *The Diffusion of Process Innovations*, Cambridge, MA: Cambridge University Press.

DeLone, W.H. (1988) "Determinants of Success for Computer Usage in Small Business", *MIS Quarterly* (12), pp. 51–61.

Delmas, M.A. (2002) "The Diffusion of Environmental Management Standards in Europe and in the United States: An Institutional Perspective", *Policy Science* (35), pp. 91–119.

Dembla, P., P. Palvla , and K. Balajli (2007) "Understanding the Adoption of Web-Enabled Transaction Processing by Small Businesses", *Journal of Electronic Commerce Research* (8), pp. 1–17.

Dennis, A.R. and J.S. Valacich (2001) "Conducting Research in Information Systems", *Communications of the Association for Information Systems* (7) Article 5, pp. 1–40.

DiRomualdo, A. and V. Gurbaxani (1998) "Strategic Intent for IT Outsourcing", *Sloan Management Review* (39)4, pp. 67–80.

Estrem, W.A. (2003) "An Evaluation Framework for Deploying Web Services in the Next Generation Manufacturing Enterprise", *Robotics and Computer-Integrated Manufacturing* (19), pp. 509–519.

Evans, D.S. (1987) "The Relationship Between Firm Growth, Size, and Age: Estimates for 100 Manufacturing

Industries", *Journal of Industrial Economics* (35)4, pp. 567–581.

Featherman, M.S. and P.A. Pavlou (2003) "Predicting E-Services Adoption: A Perceived Risk Facets Perspective", *International Journal of Human-Computer Studies* (59), pp. 451–474.

Fichman, R.G. and D.F. Kemerer (1997) "The Assimilation of Software Process Innovations: An Organizational Learning Perspective", *Management Science* (43)10, pp. 1345–1363.

Fink, D. (1998) "Guidelines for the Successful Adoption of Information Technology in Small and Medium Enterprises", *International Journal of Information Management* (18), pp. 243–253.

Franz, C.R. and D. Robey (1986) "Organizational Context, User Involvement, and the Usefulness of Information Systems", *Decision Sciences* (17), pp. 329–356.

Gefen, D. (2002) "Nurturing Clients' Trust to Encourage Engagement Success During the Customization of ERP Systems", *Omega* (30), pp. 287–299.

Gefen, D., E. Karahanna, and D.W. Straub (2003) "Trust and TAM in Online Shopping: An Integrated Model", *MIS Quarterly* (27), pp. 51–90.

Gefen, D. et al. (2005) "ICIS Panel Summary: Should Institutional Trust Matter in Information Systems Research?" *Communications of the Association for Information Systems* (17) Article 9, pp. 205–222.

George, D. and P. Mallery (2003) *SPSS for Windows Step by Step: A Simple Guide and Reference 11.0 Update*, *4th edition,* Boston, MA: Allyn and Bacon.

Giesbrecht, F.G. and M.L. Gumpertz (eds.) (2004) *Planning, Construction, and Statistical Analysis of Comparative Experiments,* Hoboken, NJ: Wiley, pp. 1–11.

Gottschalk, P. (2008) "Maturity Model for Email Communication in Knowledge Organizations: The Case of Police Investigations", *International Journal of Law, Crime and Justice* (36), pp. 54–66.

Grandon, E. and J.M. Pearson (2004) "Electronic Commerce Adoption: An Empirical Study of Small and Medium US Businesses", *Information and Management* (42), pp. 197–216.

Grover, V. and J.T.C Teng (1992) "An Examination of DBMS Adoption and Success in American Organisations", *Information and Management* (23), pp. 239–248.

Grant, K.D. et al., (2003) "Beyond the Shoe Box: Foundations for Flexibly Organizing Photographs on a Computer", http://dbpubs.stanford.edu:8090/pub/2003-3 (current Mar. 22, 2003).

Grazioli, S. and S.L. Jarvenpaa (2000) "Perils of Internet Fraud: An Empirical Investigation of Deception and Trust with Experienced Internet Consumers", *IEEE Transactions on Systems, Man, and Cybernetics*, *Part A* (30), pp. 395–410.

Greer, A.L. (1977) "Advances in the Study of Diffusion of Innovation in Health Care Organizations", *Milbank Memorial Fund Quarterly: Health and Society* (55), pp. 505–532.

Greer, A.L. (1988) "The State of the Art Versus the State of the Science: The Diffusion of New Medical Technologies into Practice", *International Journal of Technology Assessment in Health Care* (4), pp. 5–26.

Hackney, R.A., H. Xu, and A. Ranchhod (2006) "Evaluating Web Services: Towards a Framework for Emergent Contexts", *European Journal of Operational Research* (173), pp. 1161–1174.

Hamel, G. and C.K. Prahalad (1989) "Strategic Intent", *Harvard Business Review* (67), pp. 63–76.

Hong, K.K. and Y.G. Kim (2002) "The Critical Success Factors for ERP Implementation: An Organizational Fit Perspective", *Information and Management* (40), pp. 25–40.

Hossain, M.M. and V.R. Prybutok. (2008) "Consumer Acceptance of RFID Technology: An Exploratory Study", *IEEE Transactions on Engineering Management* (55), pp. 316–328.

Irani, Z. and P.E. Love (2001) "The Propagation of Technology Management Taxonomies for Evaluating Investment in Information Systems", *Journal of Management Information Systems* (17)3, pp. 161–177.

Iacovou, C.L., I. Benbasat, and A.S. Dexter (1995) "Electronic Data Interchange and Small Organizations: Adoption and Impact of Technology", *MIS Quarterly* (19), pp. 465–485.

Infravio (2003) *Web Services: Next Generation Application Architecture,* White Paper.

Jarvenpaa, S.L., N. Tractinsky, and M. Vitale (2000) "Consumer Trust in an Internet Store", *Information Technology and Management* (1), pp. 45–71.

Jiang, J.J. et al. (2001) “IS Service Performance: Self-Perceptions and User Perceptions”, *Information and Management* (38), pp. 499–506.

Jones, P. et al. (2004) “Radio Frequency Identification in Retailing and Privacy and Public Policy Issues”, *Management Research News* (27), pp. 46–56.

Kamhawi, E. (2007) “Critical Factors for Implementation Success of ERP Systems: An Empirical Investigation from Bahrain”, *International Journal of Enterprise Information Systems* (3)2, pp. 34–49.

Karimi, J., Y.P. Gupta, and T.M. Somers (1996) “Impact of Competitive Strategy and Information Technology Maturity on Firms’ Strategic Response to Globalization”, *Journal of Management Information Systems* (12)4, pp. 55–88.

Kim, D.J., D.L. Ferrin, and H.R. Rao, (2008) “A Trust-Based Consumer Decision-Making Model in Electronic Commerce: The Role of Trust, Perceived Risk, and Their Antecedents”, *Decision Support Systems* (44), pp. 544–564.

Kim, K. and B. Prabhakar (2000) “Initial Trust, Perceived Risk, and the Adoption of Internet Banking”, *Proceedings of the Twenty-First International Conference on Information Systems*, Brisbane, Queensland, Australia, pp. 537–543.

Kotha, S. and P.M. Swamidass (2000) “Strategy, Advanced Manufacturing Technology and Performance: Empirical Evidence from U.S. Manufacturing Firms”, *Journal of Operations Management* (18), pp. 257–277.

Kshetri, N. and N. Dholakia (2002) “Determinants of the Global Diffusion of B2B E-Commerce”, *Electronic Markets* (12), pp. 120–129.

Lai, K. and P.A. Sharma (2006) “Small Islands, New Technologies and Globalization: A Case of ICT Adoption by SMEs in Mauritius”, *Maastricht Economic and Social Research and Training Centre on Innovation and Technology,* Netherlands.

Lal, K. (2004) “E-Business and Export Behavior: Evidence from Indian Firms”, *World Development* (32)3, pp. 505-517.

Law, C.C. and E.W. Ngai (2007) “ERP Systems Adoption: An Exploratory Study of the Organizational Factors and Impacts of ERP Success”, *Information and Management* (44), pp. 418–432.

Lawler, J.P. et al. (2005) “A Study of Web Services Strategy in the Financial Services Industry”, *Information Systems Education Journal* (3)3, pp. 66–76.

Lee, R. et al. (2005) “A Framework for Dynamically Converting Components to Web Services”, *Proceedings of the Third ACIS International Conference on Software Engineering Research, Management and Applications,* pp. 431–437.

Legner, C. (2007) “Is There a Market for Web Services? An Analysis of Web Services Directories”, *Proceedings of the 1st International Highlight Workshop on Web APIs and Services Mashups*, Vienna, Austria.

Leonard-Barton, D. (1988) “Implementation as Mutual Adaptation of Technology and Organization”, *Research Policy* (17), pp. 251–267.

Lind, M.R., R.W. Zmud, and W.A. Fischer (1989) “Microcomputer Adoption—The Impact of Organisational Size and Structure”, *Information and Management* (16), pp. 157–162.

Lippert, S.K. and C. Govindarajulu (2006) “Technological, Organizational, and Environmental Antecedents to Web Services Adoption”, *Communication of the IIMA* (6)1, pp. 146–158.

Mabert, V.A., A. Soni, and M.A. Venkataraman (2003) “Enterprise Resource Planning: Managing the Implementation Process”, *European Journal of Operational Research* (146)2, pp. 302–314.

Mahmood, M.A. and S.K. Soon (1991) “A Comprehensive Model for Measuring the Potential Impact of Information Technology on Organizational Strategic Variables”, *Decision Science* (22), pp. 869–897.

Mason, R.L., R.F. Gunst, and J.L. Hess (2003) *Fundamental Statistical Concepts, Statistical Design and Analysis of Experiments: with Applications to Engineering and Science*, *2nd edition*, Hoboken, NJ: Wiley, pp. 1–98.

McClellan, M.A. et al., (1994) “Introducing New Technology: Confusion or Order?” *Nursing Management* (25)7, pp. 38–41.

McFarlan, F.W. (1984) “Information Technology Changes the Way You Compete”, *Harvard Business Review* (62)3, pp. 98–103.

Messner, W. (2007) “Justifying Information System Value: Development of a Method for Measuring Customer

Advisory System Effectiveness", *Business Information Review* (24), pp. 126–134.

Min, H. and W.P. Galle (1999) "Electronic Commerce Usage in Business-to-Business Purchasing", *International Journal of Operations and Production Management* (19)9, pp. 909–921.

Minder, C., N.K.C. Andrew, and B.M.S. Benjamin (2003) "The Implications and Impacts of Web Services to Electronic Commerce Research and Practices", *Journal of Electronic Commerce Research* (4)4, pp. 128–139.

Mirani, R. and A.L. Lederer (1998) "An Instrument for Assessing the Organizational Benefits of IS Projects", *Decision Sciences* (29)4, pp. 803–838.

Mitchell, V.W. (1999) "Consumer Perceived Risk: Conceptualizations and Models", *European Journal of Marketing* (33), pp. 163–196.

Montazemi, A.R (1998) "Factors Affecting Information Satisfaction in the Context of the Small Business Environment", *MIS Quarterly*, pp. 238–256.

Motwani, J. et al., (2002) "Successful Implementation of ERP Projects: Evidence from Two Case Studies", *International Journal of Production Economics* (75), pp. 83–96.

Nolan, R.L. (1973) "Managing the Computer Resource: A Stage Hypothesis", *Communications of the ACM* (16), pp. 399–405.

Orlikowski, W.J. and J.D. Hofman (1997) "An Improvisational Model for Change Management: The Case of Groupware Technologies", *Sloan Management Review* (38), pp. 11–21.

Ozdemir, Z.D. and J. Abrevaya (2007) "Adoption of Technology-Mediated Distance Education: A Longitudinal Analysis", *Information and Management* (44)5, pp. 467–479.

Pare, G. and L. Raymond (1991) "Measurement of Information Technology Sophistication in SMEs", *Proceedings of Administrative Sciences Association of Canada*, pp. 90–101.

Papazoglou, M.P. and D. Georgakopoulos (2003) "Service-Oriented Computing", *Communications of the ACM* (46)10, pp. 25–28.

Peter, J.P. and M.J. Ryan (1976) "An Investigation of Perceived Risk at the Brand Level", *Journal of Marketing Research* (13), pp. 184–188.

Powell, T.C. and A. Dent-Micallef (1997) "Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources", *Strategic Management Journal* (18), pp. 375–405.

Premkumar, G. and K. Ramamurthy (1995) "The Role of Interorganizational and Organizational Systems", *Decision Science* (26)3, pp. 303–336.

Ramasubbu, N., S. Mithas, and M.S. Krishnan (2008) "High Tech, High Touch: The Effect of Employee Skills and Customer Heterogeneity on Customer Satisfaction with Enterprise System Support Services", *Decision Support Systems* (44), pp. 509–523.

Raymond, L. (1985) "Organizational Characteristics and MIS Success in Context of Small Business", *MIS Quarterly* (9)1, pp. 37–52.

Raymond, L. and G. Paré (1992) "Measurement of IT Sophistication in Small Manufacturing Business", *Information Resources Management Journal* (5)2, pp. 4–16.

Riemenschneider, C.K., D.A. Harrison, and P.P. Mykytyn (2003) "Understanding IT Adoption Decisions in Small Business: Integrating Current Theories", *Information and Management* (40)4, pp. 269–285.

Saunders, G.I. and R.T. Keller (1983) "A Study of the Maturity of the Information Systems Function, Task Characteristics and Inter-Departmental Communication: The Importance of Information Systems and Organizational Fit", *Proceedings of the International Conference on Information Systems*, Houston, TX, pp. 424–431.

Saunders, S. et al., (2006) "The Software Quality Challenges of Service Oriented Architectures in E-Commerce", *Software Quality Control* (14), pp. 65–75.

Scheer, A. and F. Habermann (2000) "Enterprise Resource Planning: Making ERP a Success", *Communications of the ACM* (43)4, pp. 57–61.

Siegrist, M., G. Cvetkovich, and C. Roth (2000) "Salient Value Similarity, Social Trust, and Risk/Benefit Perception", *Risk Analysis* (20), pp. 353–362.

Smith, D. (2004) "Web Services Enable Service-Oriented and Event-Driven Architectures", *Business Integration*

Journal, pp. 12–14.

Snyder-Halpern, R. (2001) “Indicators of Organizational Readiness for Clinical Information Technology/Systems Innovation: A Delphi Study”, *International Journal of Medical Informatics* (63), pp. 179–204.

Song, J. and F.M. Zahedi (2007) “Trust in Health Infomediaries”, *Decision Support Systems* (43), pp. 390–407.

Stjernström, L. (2003) “Chaos and Complexity in ERP Implementations: A Literature Review of Critical Success Factors Within ERP Implementation or Adoption”, *Scandinavian Academy of Management (NFF) Conference,* Reykjavik, Iceland (17), pp. 1–7.

Stratman, J.K. and A.V. Roth (2002) “Enterprise Resource Planning (ERP) Competence Constructs: Two-Stage Multi-Item Scale Development and Validation”, *Decision Sciences* (33), pp. 601–628.

Swaminathan, V., E. Lepkowska-White, and B.P. Rao (1999) "Browsers or Buyers in Cyberspace? An Investigation of Factors Influencing Electronic Exchange”, *Journal of Computer Mediated Communication* (5)2**.**

Swanson, E. (1994) “Information Systems Innovation Among Organizations”, *Management Science* (40), pp. 1069–1092.

Swatman, P.M. and P.A. Swatman (1991) “Electronic Data Interchange: Organizational Opportunity, Not Technical Problem”, *Proceedings of the 2nd Australian Conference on Database and Information Systems,* Wales, Sydney, pp. 290–307.

Swatman, P.M. and P.A. Swatman (1992) “EDI Systems Integration: A Definition and Literature Survey”, *The Information Society* (8), pp. 169–205.

Tallon, P., K.L. Kraemer, and V. Gurbaxani (2000) “Executives’ Perceptions of the Business Value of Information Technology: A Process-Oriented Approach”, *Journal of Management Information Systems* (16)4, pp. 145–173.

Teo, H.-H., K.K. Wei, and I. Benbasat (2003) “Predicting Intention to Adopt Interorganizational Linkages: An Institutional Perspective”, *MIS Quarterly* (27), pp. 19–49.

Thong, J.Y. (1999) “An Integrated Model of Information Systems Adoption in Small Businesses”, *Journal of Management Information Systems* (15)4, pp. 187–214.

Tornatzky, L.G., M. Fleischer, and A.K. Chakrabarti (1990) *The Processes of Technological Innovation,* Lexington, MA: Lexington Books.

Wang, F. and M. Head (2007) “How Can the Web Help Build Customer Relationships? An Empirical Study on E-Tailing”, *Information and Management* (44)2, pp. 115–129.

Wu, C. (2004) “A Readiness Model for Adopting Web Services”, *Journal of Enterprise Information Management* (17), pp. 361–371.

Wu, C. and O.A. El Sawy (2003) “Web Services Innovation Characteristics: A Preliminary Research Study”, *ISOneWorld Conference,* Las Vegas, NV.

W3C (2004) “Web Services Architecture”, http://www.w3.org/TR/2004/NOTE-ws-arch-20040211/ (current Feb. 11, 2004)

Xu, H., S.K. Sharma, and R.A. Hackney (2005) “Web Services Innovation Research: Towards a Dual-Core Model”, *International Journal of Information Management* (25), pp. 321–334.

Yang, K.C.C. (2005). “Exploring Factors Affecting the Adoption of Mobile Commerce in Singapore”, *Telematics and Informatics* (22)3, pp. 257–277.

Zhao, J.L. and H.K. Cheng (2005) “Web Services and Process Management: A Union of Convenience or a New Area of Research?” *Decision Support Systems* (40), pp. 1–8.

Zhu, K., K.L. Kraemer, and S. Xu (2003) “E-Business Adoption by European Firms: A Cross-Country Assessment of the Facilitators and Inhibitors”, *European Journal of Information Systems* (12), pp. 251–268.

Zhu, K. et al., (2004) “Information Technology Payoff in E-Business Environments: An International Perspective on Value Creation of E-Business in the Financial Services Industry”, *Journal of Management Information Systems* (21)1, pp. 17–54.

APPENDIX 1: MAIN SURVEY QUESTIONS

Ⅰ. The followings are general questions about you. Please check or write the number inside parentheses, or use "other" to explain your answer.

1. What is your company's type of business? ( ) Please clarify your business type if your company is in the Service industry (#10.) or an industry not specified (#14, "other").

1. Machine 2. Metal 3. Electricity/electronics 4. Textiles 5. Chemical engineering 6. Foodstuffs 7. Miscellaneous goods 8. Distribution/retail 9. Non-metal 10. Service (_____) 11. IT 12. Physical distribution 13. Finance/insurance 14. Other (_____)

2. Is your company's headquarters in Korea?

1. Yes 2. No

2.2 If "No" above, where is the headquarters? (_____).

3. What is your highest academic standing? ( )

1. High school graduate 2. Community college graduate 3. University graduate 4. Graduate school

4. What is your age? ( )

1. in twenties 2. in thirties 3. in forties 4. in fifties 5. in sixties or over

5. How many employees are in your company? ( )

1. under 100 2. over 100—under 500 3. over 500—under 1000
4. over 1000—under 5000 5. over 5000—under 10000 6. over 10000

6. When was your company formed? ( )

1. under 5 years 2. over 5 years—under 10 years 3. over 10 years—under 15years
4. over 15 years—under 20 years 5. over 20 years—under 25 years 6. over 25 years—under 30 years 7. over 30 years

7. What role do you play in making decisions like adoption of Web Services (WS)? (___)

1. I am the chief decision maker 2. I report to the chief decision maker(s) 3. I give advice to the decision maker(s) 4. I do not directly play a role 5. Other (_____)

Ⅱ. Please check V in the following number according to your direct/indirect experiences.

***** WS (Web Services)/SOA (Service Oriented Architecture)**

Maturity (MTR)	
1. **(MTR1)** 1. Current WS standards and development tools are mature enough to support business processes and architecture in my company. **( )**	1.strongly disagree 7.strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
2. **(MTR2)** WS technology is a current de facto integration standard. **( )**	1.strongly disagree 7.strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
3. **(MTR3)** WS is a de facto Internet standard instance of current SOA architecture. **( )**	1.strongly disagree 7.strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
Strategic Intent (SI)	
4. **(SI1)** WS will contribute to the globalization strategy of my company. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
5. **(SI2)** WS will improve my company's strategic alignment with our existing partners and suppliers. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
6. **(SI3)** I expect that adopting WS will improve our corporate image. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
7. **(SI4)** Adopting WS will help my company to create new business opportunities. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
8. **(SI5)** The extreme competitive business environment is accelerating the speed of WS adoption for SOA. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
9. **(SI6)** WS will not enhance my company's strategic alignment with our existing partners and suppliers. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
10. **(SI7)** Adopting WS will not help my company to improve business strategies. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
Business Process Fit (BF)	
11**. (BF1)** Considering WS-process technical fit is critical to adopting WS in my company [Technical fit is an important requisite for integrating the WS system with the old remaining systems in the organization, which refers to the degree of compatibility with these retained systems (Kamhawi, 2007)]. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
12. **(BF2)** Organizational fit (e.g., capability of organizational infrastructure to content with new technology) between my company and the WS provider is critical to adopting WS in my company. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7

13. **(BF3)** There is more WS-process fit in some companies (or industries) than in others [bankassurance (bank + insurance) is one example of a good WS fit to the business process]. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
Business Benefit Driver (BBD)	
14. **(BBD1)** The effort of solving the lack of integration in systems will encourage the adoption of WS in my company. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
15. **(BBD2**) The effort of solving the high complexity in legacy systems infrastructure will encourage the adoption of WS in my company. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
16. **(BBD3)** The innovative business process of introducing WS is expected to improve the performance of job tasks in my company. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
17. **(BBD4)** The introduction of WS associated with SOA is expected to improve the overall efficiencies and effectiveness of business operation processes. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
Regulation (REG)	
18. **(REG1)** Aid policy by the government (e.g., a grant for WS projects) positively affects the adoption of WS. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
19. **(REG2)** Aid policy by the government (e.g., tax breaks) for WS projects positively affects the adoption of WS. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
20. **(REG3)** WS standards outlined by the law will positively affect the adoption of WS in my company. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
Management Knowledge & Involvement (MKI)	
21**. (MKI1)** A high understanding (know how) of WS and SOA by top management will contribute to the wide adoption of WS. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
22. **(MKI2)** Top management support (e.g., financial support and good communication) will increase the level of WS adoption. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
23. **(MKI3)** The strong empowerment of WS project teams by top management will increase the adoption of WS. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
24. **(MKI4)** WS adoption will be higher due to managers' decisions to respond quickly to the successful adoption of WS by competitors. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
Readiness (RD)	
25. **(RD1)** The technical readiness (e.g., HW and SW support) in companies will positively affect WS adoption. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
26. **(RD2)** Trading partner readiness (e.g., technical and organizational support) will positively affect the adoption of WS. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
27. **(RD3)** Organizational readiness (e.g., IT professionals' support, change management, and financial support) for WS implementation will positively affect the adoption of WS. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
28. **(RD4)** Componentization[1] process readiness (e.g., architecture and infrastructure support) affects the adoption of WS. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
Scope	
29. The scope of WS implementation in my company will be:	**[ ]** company wide **[ ]** only at our headquarters **[ ]** only for external B2B **[ ]** only at some locations **[ ]** other—explain ( )
Trust	
30**. (TRUST1)** Current WS technology is reliable. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7

[1] **Componentization** refers to breaking down into interchangeable pieces. Today's service oriented architectures, based on Web Services, go a next step by encapsulating components in a standards-based service interface, which allows components to be reused outside their native framework. Componentization is not limited to software; through the use of subcontracting and outsourcing, it can also apply to business organizations and processes (http://looselycoupled.com/glossary/componentization).

31. **(TRUST2)** Change and improvement resulting from WS and SOA implementation will be beneficial to our business operations. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
32. **(TRUST3)** WS offered by providers will be reliable (e.g., by providing their services as needed and error-free. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
33. **(TRUST4)** Based on my experience with WS vendors in the past, I know they are trustworthy. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
34**. (TRUST5)** Consultants and vendors who introduce and support a WS implementation are generally trustworthy. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
Risk	
35. **(RISK1)** With the introduction of WS, problems would be generated, such as clashes, errors, and incompatibility with existing systems. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
36. **(RISK2)** Some risk would be involved in adopting WS in my company because of technology uncertainty such as security risk. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
37. **(RISK3)** Introduction of WS would involve more transaction errors when compared with legacy transaction-processing system. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
38. **(RISK4)** It is risky to obtain services from a WS provider. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
39. **(RISK5)** The high complexity in implementing WS associated with SOA would increase the likelihood of failure of a WS project. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
Perceived Benefit (PB)	
40. **(PB1)** Adopting WS in my company will provide the effectiveness of system integration with the existing legacy system. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
41. **(PB2)** Adopting WS associated with SOA in my company will reduce operation costs. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
42. **(PB3)** Adopting WS in my company will improve the ability to manage organizational resources effectively. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
43. **(PB4)** Adopting WS in my company will lead to flexible business process implementation and architecture. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
44. **(PB5)** Adopting WS in my company will enable new business models through the integration of systems and connectivity with other companies. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
45. **(PB6)** Adopting WS associated with SOA in my company will reduce the costs and duration of future IT projects. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
46. **(PB7)** The adoption of WS in my company will increase our competitive advantages. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
Intention (INT)	
47. **(INT4)** My company is likely to adopt WS within five years. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7
48. **(INT5)** My company is unlikely to adopt WS within the next five years. **( )**	1. strongly disagree 7. strongly agree □1.....□2.....□3.....□4.....□5.....□6.....□7

ABOUT THE AUTHORS

Daekil Kim is an Assistant Professor in the Applied Computing at The Ming Chuan University, Taiwan. His research focuses on the areas of human computer interaction, electronic commerce, technology adoption, and ERP. Dr. Kim holds a Ph.D. and Masters from Claremont Graduate University's School of Information Systems and Technology. Prior to Claremont Graduate University, he attended a Master's program in public policy and management at Carnegie Mellon University's H. John Heinz III College for one year, and began his academic career by earning a BS from the University of Arizona.

Lorne Olfman is a Professor in the School of Information Systems and Technology and Fletcher Jones Chair in Technology Management at Claremont Graduate University (CGU) and former Dean of the School. Lorne's research interests include: how software can be learned and used in organizations, the impact of computer-based systems on knowledge management, and the design and adoption of systems used for group work. Along with Terry Ryan, Lorne co-directs the Social Learning Software Lab ([SL]2). A key component of Lorne's teaching is his involvement with doctoral students; he has supervised forty-eight students to completion and has served on more than fifty other dissertation committees. As an active member of the Information Systems community, Lorne has co-authored more than 120 refereed journal articles, book chapters and conference papers. He is always proud to publish a paper with one of his (former) students, as is the case here.

Communications of the Association for Information Systems

ISSN: 1529-3181