

Determinants of Application Service Provider (ASP) Adoption as an Innovation

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Abstract

The trend toward external procurement of software and services has led to the emergence of application service providers (ASPs). While prior research has investigated the use of ASPs as a form of outsourcing, this study considers ASP from multiple perspectives, both as a genre of outsourcing and as an IT innovation. Employing Tornatzky and Fleischer's (1990) theoretical framework, this study identifies the most important determinants of ASP adoption. A model that explains ASP diffusion and infusion is specified and tested using PLS. Some of the most important factors of ASP adoption identified in the study include: top management orientation, integration capability, internal IS expertise and competitive pressure. Other factors such as relationship management, service quality, relative advantage and cost were found to be less important. With the phenomenon of ASP at a very early stage, this study provides an opportunity to understand the immediate and practical implications of its adoption.

1. Introduction

The growth of the Internet and related technologies, along with the expansion of networked infrastructure that facilitates the delivery of software over networks, has led to the emergence of a new model for the acquisition of software and services, the Application Service Provider or ASP (Kern et al 2002a).

The roots of ASP can be traced to three developments: 1) outsourcing, 2) packaged enterprise applications, and 3) Internet computing. During the 1990s, some companies signed large outsourcing deals, while others—some of whom adhered to selective outsourcing (Lacity et al 1996; Currie 2000)—spent billions of dollars on ERP applications. Concurrently, Internet technologies expanded to provide the infrastructure for the electronic commerce revolution

(Rose et al 1999). For ASP to have become the option it is, the convergence of all three developments was necessary.

The trend toward external procurement of software and services (i.e., software development and deployment) has been a matter of debate in the information systems (IS) community for a long time (Kern et al 2002a). The Gartner Group has predicted that in about ten years most enterprises will not purchase software (and implement it in-house), but rather rent software or use software services (Terdiman et al 2000).

Prior research considers ASP a genre of outsourcing commonly referred to as selective outsourcing. While outsourcing has a longer history and provides one natural ontological and epistemological lens through which to view the ASP phenomenon, ASP is a relatively new phenomenon that can be viewed as an emerging innovation. The innovation perspective can serve as another important lens for understanding ASP.

Why is it important to see ASPs from an innovation perspective? Daft (1978, p. 197) defines organizational innovation as the adoption of an idea or behavior that is new to the organization adopting it. Swanson (1994, p. 1072) basically defines IS innovation as the innovation in the organizational application of information technology. The “newness” in ASP (vis-à-vis the traditional enterprise system acquisition) is in the administrative oversight of a system's implementation, maintenance, and ownership. The adoption of ASP changes organizational structure, administrative processes, and human resources requirements associated with IS organizations, among other things.

The network-centricity of the ASP delivery model introduces yet another concept into this debate, that of Internet computing, which has a broad and evolving set of models of distributed computing and related solutions (Lyytinen and Rose 2003). In their new IT innovation model, Lyytinen and Rose (2003) characterize Internet computing as a disruptive IT innovation. Since ASP

certainly falls into the broad sphere of Internet computing, it qualifies as an IS innovation.

Fichman and Kemerer (1997, p. 1359) argue that one of the limitations of innovation research has been its focus on technologies for which diffusion has already run its course. Since ASP is at its infancy—an early adopters stage—a study of the determinants of ASP innovation adoption will provide ASP vendors and potential adopters with the necessary information needed to make future ASP related decisions.

2. ASP: an overview

As a new and emerging IS practice, currently there is a wide variety of definitions of ASP amongst IS researchers (Currie et al 2003). However, there is a common thread in all definitions: ASPs provide the rental delivery of commercially available application services, from shared facilities over a network, to multiple customers.

Industry analysts view the benefits of ASP as including the ability to access a broader range of applications and to achieve on-demand scalability while keeping implementation short and total cost of ownership low and predictable (Sovie and Hanson 2000). Other benefits may include the ability to focus on a company's core competency while it acquires up-to-date application solutions and maintains scalability and flexibility. Many companies believe that the ultimate value of ASPs is to achieve all of these benefits faster, on a global scale, in a market characterized by shortages of IT resources.

Although the ASP model is still evolving (Desai et al 2003) and its market is in a state of shakeout, the Gartner Group and International Data Corporation (IDC) predict that ASPs are here to stay (Terdiman et al 2000). Early predictions of ASP market growth (dating back to 1999-2000) varied wildly, from a low of \$7 billion to a high of \$132 billion by 2006. Based on the latest report from IDC, however, the ASP market (worldwide spending on software as a service and associated software licensing) has reached nearly \$5 billion (\$4,816 million) in 2003, and is estimated to grow to \$13.4 billion by 2007 (Konary 2004)—much lower than earlier predictions but substantial nonetheless.

3. Theoretical framework

Research on diffusion-of-innovation is vast and encompasses a wide range of variables, which have been applied in different contexts and in a broad range of disciplines (Rogers 1995). There is no general theory of innovation (Fichman 2000); current innovation theories also explain little about IS innovations (Swanson 1994;

Chau and Tam 1997). This lack of a general theory leads to any comprehensive model for innovation adoption being very large (Premkumar and Potter 1995). IS researchers must limit the variables they study to those that are relevant to the specific innovation under investigation, along with any contextual framework that guides the research (Chau and Tam 1997).

This research study employs Tornatzky and Fleischer's (1990) theoretical framework, "The Context of Technological Innovation" (p. 153). This framework postulates three contextual elements that influence the adoption of innovation: 1) organizational context, 2) technological context, and 3) environmental context. Each context is populated with variables considered to influence adoption of innovation.

A review of Tornatzky and Fleischer's discourse (p. 151-173) on the contextual elements of technological innovation makes it clear that the framework must be adapted for use in studying any particular innovation. As Chau and Tam (1997) point out, the theoretical framework suggested by Tornatzky and Fleischer provides "a useful starting point" (p. 4).

3.1. Perspectives on adoption of innovation

Innovation research literature reflects a variety of different measures that researchers have used as dependent variables for organizational innovation: (earliness of) adoption, diffusion, infusion, routinization, and (stages of) assimilation (Fichman 2001). Each of these measures has been operationalized in different ways by different researchers.

Overall, researchers have employed one of the following three approaches to measure adoption of innovation: 1) stages of assimilation (Fichman and Kemerer 1997); 2) diffusion and assimilation (Agarwal et al 1997); and 3) diffusion and infusion (Eder and Igbaria 2001).

Researchers who have combined diffusion and infusion as dependent variables (Eder and Igbaria 2001) are cognizant of the fact that innovations may be widely diffused (acquired), but sparsely infused (deployed), which results in what has been termed an "assimilation gap" (Fichman and Kemerer 1999). Researchers who are interested in the successful implementation of IS innovations consider diffusion and infusion as two dimensions of successful adoption of IS innovations (Kishore and McLean 1998).

Diffusion generally measures how extensively an innovation is deployed in an organization. Infusion, on the other hand, generally measures how well a deployed innovation is being implemented and integrated with other business processes—how fully an innovation is being used.

4. Research model

An adoption model based on Tornatzky and Fleischer's (1990) theoretical framework ties determinants of ASP adoption in three contexts: 1) organizational; 2) technological; and 3) environmental. These variables were selected from a pool of possible variables that have been suggested by either outsourcing or innovation researchers to have the most influence on the ASP adoption process. Figure 1 presents the research framework used in the study.

4.1. Organizational context

Organizational context embodies a set of measures or characteristics of an adopting organization that define the structures and processes that either constrain or facilitate diffusion and infusion of a particular innovation. Tornatzky and Fleischer point out that the firm itself is a "rich source" of formal and informal structures, processes, attitudes and cultural traits that influence the adoption process. Under the organizational context three factors are considered: 1) top management orientation, 2) internal IS expertise, and 3) relationship management.

Top management orientation. There is a large body of evidence that top management support and managerial attitudes toward change positively affect innovation adoption (Premkumar and Potter 1995; Eder and Igbaria 2001). ASP adoption requires drastic changes in top management orientation toward IT acquisition. As Kern et al (2002b) point out, adopting an ASP model is a strategic decision on the part of top management that enables an organization to overcome its internal constraints (such as potential gaps in its IS resources and capabilities) so that it can carry out its business strategies. Many researchers, therefore, believe that top management orientation—or their strategic thinking toward IT acquisition—has a major influence on ASP adoption.

Internal IS expertise. Organizations' adoption of innovations often results in reallocations of resources and changes in required task behaviors (Zmud 1982). Internal IS Expertise is a construct that refers to an organization's skill-set in developing, implementing, and maintaining software applications. Using an ASP is a strategic decision that enables an organization to overcome internal resources or time constraints to carry out its business strategy, and to fill any potential gaps in its IS resources and capabilities (Kern et al 2002b). Many researchers of ASP and outsourcing believe that a quantitative and qualitative shortage of internal IS expertise encourages ASP adoption.

Relationship management. The importance of relationship management in outsourcing is widely documented (Fitzgerald and Willcocks 1994; Kern 1997). How a firm manages its relationship with ASPs also plays an important role in ASP adoption. Kern (1997) describes an outsourcing relationship as a certain "gestalt" that, when formalized, consists of two parts: the contract and its operationalization. Drawing support from exchange theory and contract law, Kern (1997) concludes that a solid outsourcing relationship is a must because "the contract on its own is neither self-enforcing nor self-adjusting" (p. 52). Relationship management represents an organization's ability to develop and manage an ASP relationship. An organization's ability to adopt ASP depends upon its ability to develop and manage an ASP relationship.

4.2. Technological context

Technological context is the domain that defines the characteristics of an innovation artifact itself and its fit to an organization's internal landscape (Tornatzky and Fleischer 1990). The influence of innovation characteristics on the diffusion process also has been documented. An organization's decision to adopt (or not adopt) an innovation (e.g., ASP) to a large extent depends on what the innovation can provide and how it will fit into the existing IS landscape. To represent ASP innovation characteristics, five contextual factors of ASP technology adoption are considered: 1) integration capability; 2) service quality; 3) cost factor; 4) relative advantage; and 5) perceived barriers.

Integration capability. According to Seltsikas and Currie (2002), the challenge of integrating ASP services with existing applications influences ASP adoption. Although some applications (e.g., emails) are "stand alones" and require little or no integration, other applications (e.g., inventory management) require a high degree of integration with other enterprise applications. As organizations consider ASPs, they also face a decision of whether to invest in expensive software integration or maintain the status quo (Seltsikas and Currie 2002). Hence, integration proves to be a challenge for ASP adoption. Integration capability represents a firm's capacity to integrate ASP offerings with their existing IS systems. It is a reflection of a firm's current and prior experience dealing with integration technologies.

Service quality. The influence that an innovation's attributes exert on its diffusion is very well documented (Premkumar and Potter 1995; Rogers 1995). As stated previously, the ASP phenomenon is an applications-as-service model; therefore, service quality is an attribute

of the delivered service. After an IS department deploys ASP, its end-users interface experience with ASP services defines ASP service quality. Service quality pertains to ASP service attributes and reflects the quality of ASP end-user experiences. For example, service attributes, such as ASP functional and technical capability, are deemed to influence perceived provider performance (Susarla et al 2003), and hence, impact ASP adoption.

Cost factor. In economic analysis of outsourcing, cost savings is considered the foremost predictor (Lacity and Hirschheim 1993). In this study, cost factor captures the monetary advantages of ASPs. Lower and predictable costs, or lower total cost of ownership, have been at the top of all literature lists of ASP drivers (Kern et al 2002a).

Relative advantage. An important factor that affects the adoption of ASP is its value proposition or relative advantage to an organization. Relative advantage has been widely and consistently reported to have a positive impact on the adoption process (Tornatzky and Klein 1982; Rogers 1995). Generally, relative advantage is a catchall phrase that includes the benefits and costs resulting from the adoption of an innovation (Rogers 1995). In this study, relative advantage captures the non-monetary benefits of ASP adoption. A focus on core competencies, scalability, flexibility, risk reduction, and faster implementation are among the widely reported value propositions of ASPs (Kern et al 2002a); these are included in the factor, relative advantage.

Perceived barriers. Obstacles to ASP adoption are numerous: outsourcing risks, security and reliability issues, ASPs' dependency on other partners, and integration with existing systems are but a few examples. Outsourcing risks (e.g., loss of control and dependency) have been very well documented in the literature (Lacity and Hirschheim 1995; Lacity and Willcocks 1998). However, on top of outsourcing risks, ASP presents a set of risks that are an integral part to moving data over public networks (Columbus 2000). Data confidentiality, access security, and general network security risks are of primary concern to customers (Kern et al 2002a). Security and reliability are two of the top five concerns of current and potential ASP customers; ASPs' service stability, longevity and survival, and dependence on other parties are the other three concerns (Kern et al. 2002a, p. 307). The perceived barriers factor captures the most important deterrents of ASP adoption.

4.3. Environmental context

Environmental context is defined as the arena where a firm operates: its industry, suppliers, customers, and the government (Tornatzky and Fleischer 1990). Tornatzky and Fleischer (1990) argue that all of these factors can influence innovation adoption. They also report (p. 167) that competitive characteristics of the industry and the existence of a relevant technology support infrastructure are two environmental aspects that are key determinants to innovation adoption.

While certain environmental factors, such as market uncertainty (Chau and Tam 1997), have been tested in IS innovation research, the existence of a relevant environmental context for the ASP phenomenon has not been integrated in an empirical research study. ASP is an Internet-induced innovation that is currently vendor-driven (Seltsikas and Currie 2002), although ASPs depend heavily on infrastructures provided by ASP partners. Within this context two factors are examined: 1) ASP industry characteristics, and 2) competitive pressure.

ASP industry characteristics. Environmental conditions of the ASP marketplace and the increased number and diversity of viable ASPs are important factors for potential ASP adopters (Kern et al 2002a). Field research shows that the ASP ecosystem is complex and dynamic (Currie 2000; Seltsikas and Currie 2002). However, the ASP industry is still in an early stage, so changing alliances and consolidations, as well as bankruptcies, are likely (Mears 2001). Kern et al (2002b) argue that as the number and diversity of ASPs increase, these factors will create a favorable environmental condition for the acceptance of the ASP model. ASP industry characteristics reflect the maturity, or lack thereof, of the ASP industry.

Competitive pressure. Outsourcing literature strongly suggests that the need for efficiency has prompted many organizations to outsource their IT activities (Willcocks and Lacity 1998). Innovation studies present strong evidence that market competition appears to stimulate innovation adoption (Tornatzky and Fleischer 1990; Grover and Goslar 1993; Chau and Tam 1997). Grover and Goslar (1993), for example, found that environmental uncertainty has a significant relationship with the adoption of telecommunication technologies. Competitive pressure to establish e-business services pushed a lot of companies toward using ASPs (Columbus 2000).

4.4. Diffusion as an Independent Variable

IS researchers have studied the relationship between diffusion and infusion for quite some time, but with inconclusive results (Cooper and Zmud 1990; Zmud and Apple 1992; Eder and Igbaria 2001). Zmud and Apple

(1992), for example, report that a high degree of diffusion of an innovation positively affects infusion, but that there is little support for the effect of a low degree of diffusion on infusion. According to Zmud and Apple, infusion requires deep, comprehensive embedding of innovation within an organization's work system.

5. Research method

With the penetration of the Internet, Web-based surveys are now increasingly common. In such surveys, participants are invited to access a Website and fill out a questionnaire. Participants of Internet surveys are recruited in one of two ways by way of an invitation that is sent via regular mail, fax, or email; or through advertising in newsgroups and/or on Websites (Crawford et al 2001; Schonlau et al 2002).

To solicit survey participation for this study, the following actions were taken: First, the survey was posted on both the ITAA¹ and CompTIA² websites. Second, a letter of invitation to a mailing list of IT executives from Applied Computer Research (ACR) invited qualified recipients—those who are using an ASP or have used an ASP before—to participate in the survey and urged them to ask their qualified colleagues to take the survey. Third, a follow-up fax letter was sent to the same mailing list. Fourth, to expedite the process, a new, smaller, fax-only campaign was conducted using a similarly selected, mailing list from ACR.

Participants in this study are IS executives, managers or staff with current or prior work experience with ASP or knowledge of ASP configuration and infrastructure. Specifically, participants were encouraged to take the survey only if they were familiar with their organization's ASP infrastructure or if they had previously worked in an ASP environment and had intimate knowledge of ASP technology.

According to guidelines specified by Chin (1998), given the size of the model to be analyzed and tested in this research, a sample size of 100 would be sufficient (conservatively). The size of sample achieved in the study was 118.

5.1. Questionnaire

A Web-based questionnaire was created to capture respondents' beliefs about independent, dependent, and contextual variables. Pilot testing was conducted to assess and refine the questionnaire. The final version of

the questionnaire included ten scales to measure independent variables. One of these scales (cost factors) included two items. Three scales (relationship management, relative advantage, and competitive pressure) included three items each. The remaining scales included four items each. Two scales, each comprising three items, were included to capture dependent variables. Other items were included to capture information about the organization (industry type, size, length of time in business, length of time using ASP) and the respondent (length of time with the organization and position).³

6. Data analysis and results

PLS Graph⁴ was used to analyze the data and test the research model. PLS estimates the parameters for both links between measures and constructs, and the relationships between different constructs at the same time. For practical reasons, a PLS model is usually analyzed and interpreted sequentially in two stages (Barclay et al 1995; Hulland 1999). The reliability and validity of the measurement model is assessed first, followed by an assessment of the structural model. This approach ensures that the measures are reliable and valid before any conclusions can be drawn in regard to any relationships among constructs (Barclay et al 1995).

6.1. Evaluation of the measurement model

To assure that the manifest variables adequately and reliably measure the unobserved variables, the measurement model must be evaluated. The evaluation process includes three activities: 1) examining individual item reliabilities, 2) reviewing internal consistency or convergent validity of the measures, and 3) assessing discriminant validity (Barclay et al 1995; Hulland 1999).

Individual item reliability. Items with loadings of 0.70 or above demonstrate acceptable reliability, which means that there is more shared variance between the measure and its construct than there is error variance (Barclay et al 1995). A lower bound of 0.60 is acceptable for newly developed scales, and items below 0.50 should certainly be dropped (Hulland 1999). All items, except one, which had a loading of 0.58, displayed loadings above 0.60.

Internal consistency. Internal consistency indicates the reliability of each group of manifest variables used to measure a specific construct. Internal consistency is also known as composite reliability or convergent

¹ Information Technology Association of America (www.ita.org) is a nonprofit advocacy organization.

² Formerly known as the ASP Industry Consortium (ASPIC), CompTIA Software Services Group is an organization that advocates and promotes the use of ASPs on a global basis.

³ Copies of the survey instrument are available from the authors.

⁴ Version 03.00, Build 1060

validity. A composite reliability calculation is a measure of internal consistency for a block of manifest variables. (Fornell and Larcker 1981; Chin 1998) A composite reliability score of 0.70 or higher is considered to be acceptable (Barclay et al 1995). In this study, the composite reliability score for all items was above 0.70.

Discriminant validity. Discriminant validity is the measure of how a particular construct is different from other constructs. Discriminant validity is evaluated by assessing the average variance extracted (AVE) for each construct. AVE, a measure developed by Fornell and Larcker (1981), is the average variance shared between a construct and its manifest variables. It is a measure of variance captured by the construct in relation to the amount of variance due to measurement error. The AVE should be greater than 0.50, which indicates that more than 50 percent of the items' variance is captured by the construct (Chin 1998). All items had an AVE score above 0.50.

6.2. Evaluating the structural model

In PLS an assessment of the structural model means examining the path coefficients and R^2 's produced by PLS. Figure 1 displays the estimates produced by PLS for path coefficients and R^2 's. The interpretation of the R^2 for each dependent variable is similar to regression analysis, in which the R^2 values indicate the amount of the construct's variance that is explained by the model (Barclay et al 1995). As a result, R^2 values are used to determine the strength of independent variables in predicting the dependent variables that is the predictor power of the model.

While path coefficients and R^2 's are measures of a model's predictive capability, resampling procedures (such as jackknifing and bootstrapping) are used to examine the stability of the estimates, or the significance (t-values) of the path coefficients (Chin 1998; Gefen et al 2000). To test the hypotheses a bootstrapping procedure with resampling set at 200 was used to determine the path coefficients and to assess their significance. Statistical significance of each hypothesized path was evaluated with t-values.

7. Discussion of research findings

The main objective of this study is to identify and to study the underlying drivers for ASP innovation adoption. The notion that ASP is indeed an innovation was the starting point of this study. While currently most IT studies regard ASP as merely a genre of outsourcing, this study sets out to investigate ASP as an innovation. In other words, this study considers ASP from multiple perspectives, both as a genre of

outsourcing and as an IT innovation. As Tornatzky and Klein (1982) point out, the ontological and epistemological implications of multiple perspectives of phenomenon under investigation make the research study findings especially unique and interesting.

As an exploratory research, this research study upholds several widely held beliefs about ASPs diffusion and infusion, though it does not find support for some others.

7.1. Top management orientation

Top management orientation has a strong influence on ASP diffusion but not infusion.

The Top Management Orientation construct reflects top management as having considered ASP in its IT strategic planning, was convinced of its significant business benefits, and was supportive of its adoption. Intuitively, one could argue that at this stage of ASPs' adoption by organizations, top management has a great deal of influence on ASP diffusion, but not a whole lot of influence on its infusion. As is discussed later in this paper, the greatest influence on ASPs' infusion comes from diffusion itself.

This finding is consistent with prior IS literature, which reports a strong relationship between top management support and championship, and IT adoption and/or implementation success (Premkumar and Potter 1995; Eder and Igarria 2001; Chatterjee et al 2002).

The question of why top management orientation is a predictor of diffusion, but not infusion, is an intriguing one. Two explanations seem plausible: First, with the strong relationship between diffusion and infusion, it is obvious that top management influence on infusion is indirect, by way of diffusion. In other words, top management puts a self-sustaining process in place by providing the necessary resources, which, if successful (i.e., diffused) leads to infusion. Second, the way in which diffusion and infusion are measured in this research study may have led to this dichotomy. Top management has much more input in providing resources than deciding what services are procured from ASPs and, more importantly, how much work is performed using ASP services.

7.2. Internal IS expertise

Internal IS expertise shows a significant negative relationship with ASP diffusion and infusion.

The Internal IS Expertise construct is a measure of an organization's IT adequacy (or lack thereof). Shortage of internal IS expertise has several aspects. First, even at the best of times, due to the rapid changes in information technology, there is a shortage of IS skills in certain segments of the IT market that fuels IT

outsourcing. In a survey done by Cutter Consortium, 49% of respondents identified difficulty in hiring skilled IT professionals and a lack of in-house skills as the main reasons for their outsourcing decision. Second, at the end of the 1990's and in the early 2000's, there has been a prevalence of acute shortages of IT skills in most areas of the IT landscape. In these circumstances, it is natural for firms to look for ways to outsource.

7.3. Relationship management

Relationship management has no significant relationship with either diffusion or infusion.

The Relationship Management construct reflects different dimensions of good ASP relationship management (i.e., good contracts and service level agreements; tools, policies and procedures to monitor SLAs; and skills and experience to manage the process).

Most IS researchers anchor ASP in outsourcing and tend to posit strong relationships between relationship management and ASP adoption. An outsourcing relationship is defined as a "partnership", (Kern 1997) whereas an ASP adoption relationship, in all its aspects, is considered to be more similar to a firm's relationship with a utility company. It seems that the gestalt of an IT outsourcing partnership is on a much different level than a service provider utility model relationship.

7.4. Integration capability

Integration capability shows a significant relationship with ASP diffusion but not infusion.

The Integration Capability construct measures different aspects of a firm's integration capabilities: internal, external and use of integration technologies. ASP literature notes that integration issues are a major hurdle and/or risk for ASP adoption, and some researchers suggest that the ASP industry needs to augment their integration capabilities (Susarla et al 2003).

Data and application integration have been long-standing challenges in the IS field. There is no evidence to think that integration using ASPs pose more of a challenge than traditional software procurement or in-house development. From Kern et al (2002a) who list integration as a concern for existing ASP customers, one cannot discern whether the ASP integration concern is any different or if it is more challenging or intractable than organizations' concern of integration in general.

Whereas one CIO, whose view reflects most literature, commented that integration of ASP systems with existing databases poses a big problem, another respondent wrote that although ASP applications are easy to integrate, they have experienced big integration challenges unrelated to ASPs. Overall, based on these statements, and the results derived from this research

study, one can infer that integration capabilities significantly influence ASP diffusion.

7.5. Service quality

Service quality does not have any significant relationship with either diffusion or infusion.

The Service Quality construct is an overall measure of ASP satisfaction. The service quality construct loads significantly high on all four indicators and shows relatively high "satisfaction scores." However, this strength does not translate into strong relationships with diffusion or infusion and therefore may indicate that satisfaction is considered a necessary condition in order to sustain the ASP service relationship.

Service quality as a predictor of innovation adoption has not been studied before. Susarla et al (2003) studied predictors of "satisfaction with ASP." Intuitively, one can argue that a higher level of satisfaction with ASPs must eventually lead to widespread diffusion and deeper infusion. Kern et al (2002a, p. 248) also report that 85% of potential customers rate quality of service as being very important. Service quality, however, does not show any significant relationship with ASP adoption.

7.6. Relative advantage

Relative advantage does not have any significant relationship with either diffusion or infusion.

The Relative Advantage construct reflects organizations' perceived non-monetary benefits of ASP, scalability and flexibility of services, and faster implementation of software packages. In their totality, the non-monetary benefits afford an organization the opportunity to focus on its core competency.

A positive relationship between relative advantage and ASP adoption is widely reported in IT innovation research literature (Tornatzky and Klein 1982). ASP literature also portrays three dimensions of relative advantage as major components of its value proposition. (Kern et al 2002a) Kern et al (2002a, p. 248) also report that the majority of potential customers rate scalability and flexibility as being very important. This study finding is also inconsistent with prior innovation diffusion literature, which reports a significant relationship between relative advantage and innovation adoption (Tornatzky and Klein 1982) as well as ASP/outsourcing literature, which report several measures of relative advantage as being significant drivers of ASP adoption (Kern et al 2002a).

7.7. Cost factor

Cost factor does not have any significant relationship with either diffusion or infusion.

The Cost Factor construct, for this study's sample of mostly large companies, is not a significant predictor of ASP adoption. Outsourcing literature (e.g., Ang and Straub 1998), which considers production cost advantage to be the primary motive for outsourcing, reports very strong correlation between cost and outsourcing. ASP literature similarly reports lower and predictable total cost of ownership as the primary driver for ASP adoption.

On the contrary, one respondent reports that in order to reduce cost, the firm insourced one application that previously was provided by an ASP. A CIO also reports that because of cost, they similarly stopped using an ASP and instead insourced their supply chain applications.

This study finding is also consistent with A. Williams (2003), who reports that there are considerable variations among ASP users, especially in the value they attach to cost savings. For many organizations, other factors (such as risk reduction and competitive advantage) are more important.

Lastly, earlier diffusion of innovation research literature (Tornatzky and Klein 1982) could not establish a significant relationship between cost and the adoption and implementation of innovations either.

7.8. Perceived barriers

The perceived barriers construct does not have any significant relationship with either ASP diffusion or infusion.

The Perceived Barriers construct reflects concern about a loss of control and issues that surround ASP security and reliability. Respondents were not very concerned about "ASP risk" compared to some in the media, or even some in the IS research community, who appear to want to instill a risk factor feeling of concern in the user community. On the contrary, there have been reports that organizations have specifically opted for ASPs to reduce risk (Williams 2003). Some ASP customers believe that their providers can do a better job than their in-house IT can on measures of improved availability, reliable backup and recovery, and network connectivity.

A CIO of a 16-billion dollar public pension fund that supports members' access on the Internet reports that his organization is dependent on ASPs for their technical security infrastructure, firewalls, and analysis of firewall data. He acknowledges that these are not "applications" per se, but these services are the foundation for all their other business functions. If anything, this view indicates that CIO's who use ASP services are not very concerned about a lack of security, reliability, or loss of control.

7.9. ASP industry characteristics

ASP industry characteristics have a significant relationship with ASP diffusion but not with infusion.

The ASP Industry Characteristics construct involves an assessment of ASPs' technological and business model maturity. This study has posited that a higher level of ASP maturity has a positive effect on ASP diffusion and infusion.

IS executives are constantly confronted with new technologies that promise a lot and don't deliver or that are being superseded with new technologies before having widespread acceptance. Therefore, it is not surprising that IS executives are concerned about ASPs technological and business model maturity. At the height of the dot.com era in the late 1990s, the hype factor was reported to have had an impact on ASP adopters (Pring 2003). Hype supposedly camouflaged ASPs' immaturity on both of its technological and business models, which may explain significant relationship with ASP diffusion.

7.10. Competitive pressure

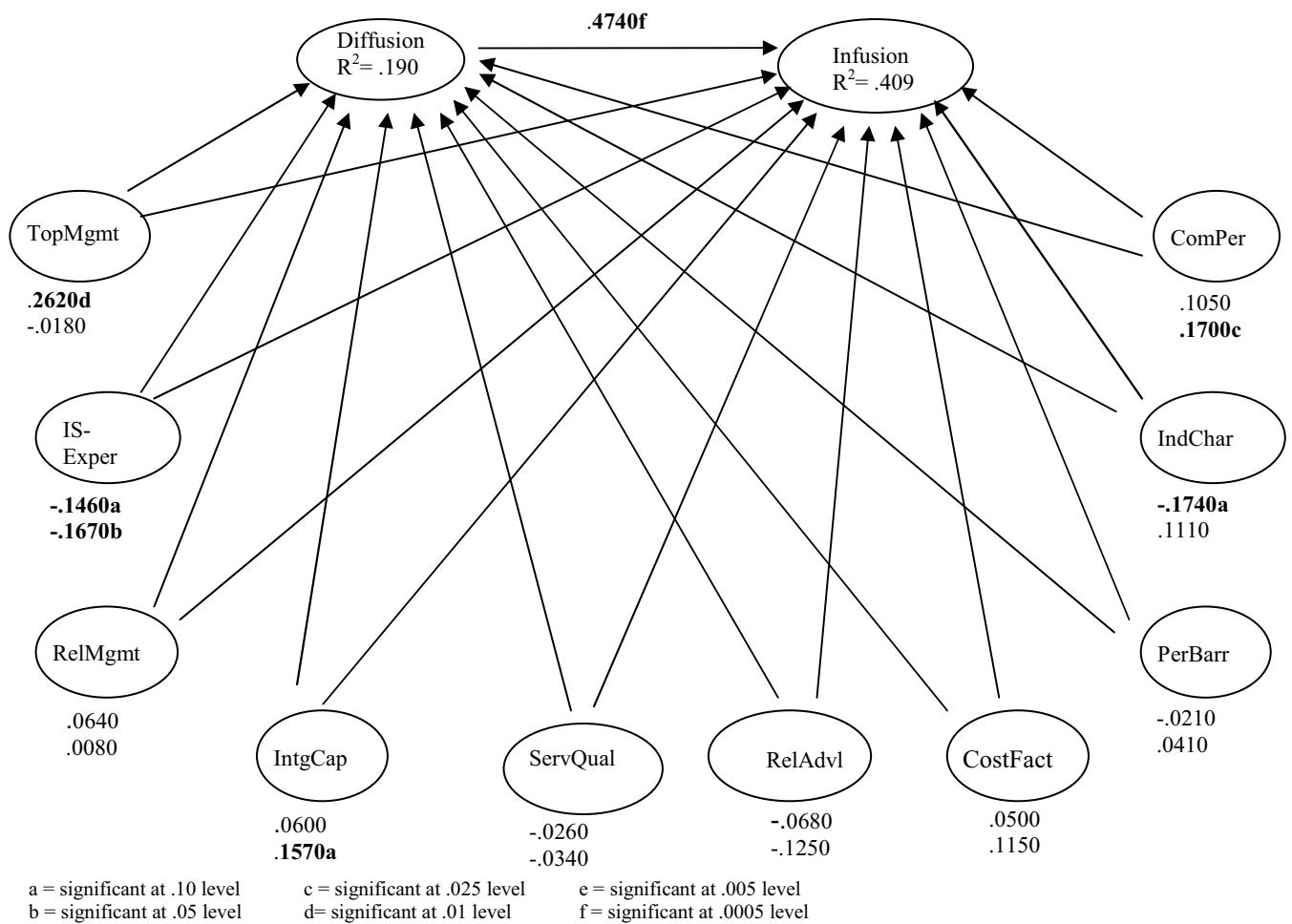
Competitive pressure has a significant relationship with ASP infusion but not diffusion.

The Competitive Pressure construct reflects an organization's sense of immediacy in responding to environmental pressures, as well as the need to provide Internet-based services. This finding is consistent with prior IS literature, which reports (although with some variation) a strong relationship between external environmental pressures and IT innovation adoption and/or implementation. It is also consistent with comments from CIO's, who repeatedly report that they use ASPs to provide access to their members and/or customers.

The question of why competitive or environmental pressure is a predictor of infusion but not diffusion is also an intriguing one. Several explanations seem plausible. First, competitive pressure certainly influences diffusion as well infusion. However, one can argue that competitive pressure's influence on diffusion is through top management orientation, which in this research study shows a strong relationship with diffusion. Second, since providing access to customers via the Internet is one of the main indicators of infusion in this research study, it is therefore not surprising that environmental pressure has a strong relationship with infusion. Third, the type of application services company needs, which is another measure of infusion in this research study, is to some extent a reflection of environmental influence.

7.11. Diffusion

Lastly, this study's data shows a very strong relationship between diffusion and infusion (with a path coefficient of 0.474). This finding is also consistent with prior research (Zmud and Apple 1992; Eder and Igbaria 2001). In addition the strength of this relationship is in the same range as reported by Eder and Igbaria (2001), which is finally another confirmation that widely used (diffused) information technology is more likely to be imbedded (infused) in the fabric of adopting organizations.



Note: For each variable the top number is the path coefficient for diffusion and the lower number is the path coefficient for infusion

Figure 1. Structural Model Results

8. References

- Agarwal, R., M. Tanniru and D. Wilemon (1997). "Assimilating Information Technology Innovations: Strategies and Moderating Influences." IEEE Transactions on Engineering Management 44(4): 347-358.
- Barclay, D., C. Higgins and R. Thomson (1995). "The Partial Least Squares Approach to Causal Modeling: Personal Computer Adoption and Use as an Illustration." Technology Studies 2(2): 285-309.
- Chatterjee, D., R. Grewal and V. Sambamurthy (2002). "Shaping up for E-Commerce: Institutional Enabler of the Organizational Assimilation of Web Technologies." MISQ 26(2): 65-89.
- Chau, P. Y. K. and K. Y. Tam (1997). "Factors Affecting the Adoption of Open Systems: An Exploratory Study." MISQ 21(1): 1-24.
- Chin, W. W. (1998). The Partial Least Square Approach to Structural Equation Modeling. Modern Methods for Business Research. G. A. Marcoulides, editor. London, Lawrence Erlbaum Associates: 295-336.
- Columbus, L. (2000). Realizing e-Business with Application Service Providers. Indianapolis, Sams Publishing.
- Cooper, R. B. and R. W. Zmud (1990). "Information Technology Implementation Research: A Technological Diffusion Approach." Management Science 36(2): 123-137.
- Crawford, S. D., M. P. Couper and M. J. Lamias (2001). "Web Surveys: Perceptions of Burden." Social Science Computer Review 19(2): 146-162.
- Currie, W. (2000). "The Supply-Side of IT Outsourcing: The Trend Towards Mergers, Acquisitions and Joint Ventures." International Journal of Physical Distribution & Logistics Management 30(3/4): 238-.
- Currie, W., B. Desai, N. Khan, X. Wang and V. Weerakkody (2003). Vendor Strategies for Business Process and Applications Outsourcing: Recent Findings from Field Research. HICSS 36.
- Desai, B., V. Weerakkody and W. Currie (2003). "Market Entry Strategies of Application Service Providers: Identifying Strategic Differentiation." HICSS 36.
- Eder, L. B. and M. Igarria (2001). "Determinants of Intranet Diffusion and Infusion." Omega 29: 233-242.
- Fichman, R. (2000). The Diffusion and Assimilation of Information Technology Innovations. Framing the Domains of IT Management: Projecting the Future Through the Past. B. W. Zmud. Cincinnati, Pinnaflex Educational Resources: 105 - 127.
- Fichman, R. G. (2001). "The Role of Aggregation in the Measurement of IT-Related Organizational Innovation." MISQ 25(4): 427-453.
- Fichman, R. G. and C. F. Kemerer (1997). "The Assimilation of Software Process Innovations: An Organizational Learning Perspective." Management Science 43(10): 1345-1363.
- Fichman, R. G. and C. F. Kemerer (1999). "The Illusionary Diffusion of Innovation: An Examination Of Assimilation Gaps." I.S. Research 10(3): 255-275.
- Fitzgerald, G. and L. Willcocks (1994). "Contracts and Partnerships in the Outsourcing of IT." ICIS, Vancouver, British Columbia, Canada.
- Fornell, C. and D. F. Larcker (1981). "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error." Journal of Marketing Research 18(1): 39-50.
- Gefen, D., D. W. Straub and M.-C. Boudreau (2000). "Structural Equation Modeling and Regression: Guidelines for Research Practice." CAIS 4(7): 77.
- Grover, V. and M. D. Goslar (1993). "The Initiation, Adoption, and Implementation of Telecommunications Technologies in U.S. Organizations." JMIS 10(1): Start page 141.
- Hulland, J. (1999). "Use of partial least squares (PLS) in strategic management research: a review of four recent studies." Strategic Management Journal 20(2): 195-204.
- Kern, T. (1997). "The Gestalt of an Information Technology Outsourcing Relationship: An Exploratory Analysis." ICIS, Atlanta, Georgia.
- Kern, T., J. Kreijger and L. Willcocks (2002b). "Exploring ASP as sourcing strategy: theoretical perspectives, propositions for practice." Journal of Strategic Information Systems.
- Kern, T., M. C. Lacity and L. P. Willcocks (2002a). NetSourcing: Renting Business Applications and Services Over a Network, New York, Prentice Hall.
- Kishore, R. and E. McLean (1998). "Diffusion and Infusion: Two Dimensions of 'Success of Adoption' of IS Innovations." AMCIS, Baltimore.
- Konary, A. M. (2004). Presentation to the ITAA, IDC.
- Lacity, M. C. and R. Hirschheim (1993). Theoretical Foundations of Outsourcing Decisions. Information Systems Outsourcing: Myths, Metaphors, and Realities, John Wiley & Sons: 24-48.
- Lacity, M. C. and R. Hirschheim (1995). Beyond the Information Systems Outsourcing Bandwagon: The Insourcing Response, John Wiley & Sons.
- Lacity, M. C. and L. P. Willcocks (1998). "An Empirical Investigation of Information Technology Sourcing Practices: Lessons From Experience." MISQ 22(3): 633-405.
- Lacity, M. C., L. P. Willcocks and D. F. Feeny (1996). "The Value of Selective IT Sourcing." SMR: 13-25.
- Lyytinen, K. and G. Rose (2003). "Disruptive Information System Innovation: The Case of Internet Computing." MISQ 27(4): 557-595.
- Mears, J. (2001). What went wrong with ASPs? Computerworld: 7.
- Premkumar, G. and M. Potter (1995). "Adoption of Computer Aided Software Engineering (CASE) Technology: An Innovation Adoption Perspective." DATA BASE Advances 26(2 & 3): 105-124.
- Pring, B. (2003). ASP Hype Cycle: Hype? What Hype? Gartner Group: ITSV-WW-DP-0501.
- Rogers, E. M. (1995). Diffusion of Innovations. New York, The Free Press.

Rose, G., H. Khoo and D. W. Straub (1999). "Current Technological Impediments to Business-To-Consumer Electronic Commerce." CAIS 1(16).

Schonlau, M., R. D. Fricker and M. N. Elliott (2002). Conducting Research Surveys via E-Mail and the Web. RAND.

Seltsikas, P. and W. Currie (2002). "Evaluating the Application Service Provider (ASP) Business Model: The Challenge of Integration." HICSS 35.

Sovic, D. and J. Hanson (2000). "Application Service Providers: Where are the Real Profit Zones?" Mercer Management Consulting.

Susarla, A., A. Barua and A. B. Whinston (2003). "Understanding the Service Component of Application Service Provision: An Empirical Analysis of Satisfaction with ASP Services." MISQ 27(1): 91-123.

Swanson, E. B. (1994). "Information Systems Innovation among Organizations." Management Science 40(9): 1069-1092.

Terdiman, R., A. Apfel, E. Paulak and T. Berg (2000). How Hard Will the ASPs Bite the IT Industry? Gartner Group: 22 pages.

Tornatzky, L. G. and M. Fleischer (1990). The Processes of Technological Innovation. Lexington Books.

Tornatzky, L. G. and K. J. Klein (1982). "Innovation Characteristics and Innovation Implementation: A meta-analysis of findings." IEEE Transactions on Engineering Management 29(1): 28-45.

Willcocks, L. P. and M. C. Lacity (1998). Strategic Outsourcing of Information Systems: Perspectives and Practices, John Wiley & Sons Ltd.

Williams, A. (2003). ASP Outsourcing: The Customer Experience, ITAA.

Zmud, R. and L. Apple (1992). "Measuring Technology Incorporation/ Infusion." Journal of Product Innovation Management 9(2): 148-155.

Zmud, R. W. (1982). "Diffusion of Modern Software Practices: Influence of Centralization and Formalization." Management Science 28(12): 1421-1431.