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Modeling Intention to Use an Application Service Provider

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ABSTRACT

Application service providers (ASPs) offer customer organizations the option of accessing applications and databases over the Internet or leased lines instead of installing applications locally. Adoption of the ASP concept, so far, is slower than anticipated even among small and medium sized enterprises (SME) considered by forecasters ideal candidates for ASP adoption. In this work, we use qualitative methodologies to develop a model, the ASP Intention Model (AIM), of driving and inhibiting factors affecting the decision to use ASP by SMEs, where the unit of analysis is a top SME decision maker.

Keywords

Application Service Providers (ASP), Small-Medium size Enterprises (SMEs), ASP Intention Model (AIM)

INTRODUCTION

Application Service Providers (ASPs) are "third party service firms which deploy, manage and remotely host software applications through centrally-located services in a rental or lease agreement" (Currie and Seltsikas, 2001, p. 123). Analysts predicted that the ASP concept is here to stay, in a market growing to an estimated \$8 billion in 2007 (Verity, 2003; Pring, 2003). According to Kern, Lacity and Willcocks (2000) and Wainwright (2000), ASP customers, especially SMEs, are expected to gain a substantial reduction in total cost of ownership (TCO). The expectation has thus been that SMEs would embrace the ASP concept (Currie and Seltsikas, 2000; Ekanayaka, Currie and Seltsikas, 2002; Currie 2003b). Yet, SMEs have not been attracted to ASPs and only a handful of ASPs have survived (Currie, 2003a).

This study aims at modeling SME intention to adopt ASP, as a function of driving and inhibiting factors, and how such constructs as usefulness, ease of use, risk, and vendor trustworthiness affect the intention. A new model is required since existing adoption models for IT outsourcing do not reflect the additional risks involved in ASP adoption, pertain usually to the larger organizations, and do not explain why most decision makers in SMEs choose not to adopt the ASP concept (Loh and Venkatraman, 1992, among others). The unit of analysis in this research is a top SME decision maker, such as CEO, COO, CFO or CIO, whose perspective, perceptions and beliefs, are especially relevant since in SMEs, quite often, one or two executives make the final decision (Meredith, 1994). Based on a literature review (see next section) and qualitative research, the ASP Intention Model (AIM) has been formulated. The research methodology is briefly described in the third section and the results of the qualitative research are described in the fourth section, followed by the proposed AIM model and a concluding paragraph.

APPLICATION SERVICE PROVIDERS (ASPs)

The ASP concept is a special case of IT outsourcing about which a number of theories have been proposed regarding the decision to outsource, such as transaction cost economy (Williamson, 1979), resource based view (Connor and Prahalad, 1996), and core competencies theory (Quinn, 1992). Although support for these theories does exist, studies show successful outsourcing endeavors that contradict parts or all of these theories (Lacity, Willcocks and Feeny, 1996; Levina and Ross, 2003). While most of the current ASP literature looks at the vendor side, none of the existing ASP studies have established a sound theory that can explain which organizations intend to adopt the ASP option. Therefore, it is important to examine

organizational decision-making processes leading to adoption or rejection of the ASP concept, including driving and inhibiting factors. Eliciting these factors can then pave the way to theory development and a model formulation.

Table 1 summarizes driving and inhibiting factors based on the ASP, IT outsourcing and e-commerce literature. The latter two sources were scanned because the ASP decision resembles the IT outsourcing decision and the decision to do business online. As depicted in Table 1, ASPs are expected to offer value to customers, such as cost savings, IT effectiveness improvement, better support for business processes, access to new technologies, and focus on core activities (Currie 2003a,b; Heart and Pliskin, 2001;2002a,b; Lacity and Willcocks, 1998). However, long-term contracts and contract ambiguity, as well as concerns about vendor trustworthiness (Olson and Olson, 2000) and vendor opportunism (Currie, 2000), are considered in the literature as inhibiting the willingness to engage in such business relations. Moreover, Currie (2003b) points at a “mismatch between the business strategies developed by vendors and the understanding and requirements of potential customers how to evaluate ASPs” (p. 208). Since, unlike IT outsourcing, but as in e-commerce, the ASP concept involves online transactions over public networks, data security, systems availability and response time are often cited inhibitors (Kern, Lacity and Willcocks, 2002).

Factors	Source
Business performance	Currie, 2003b; Currie and Seltsikas, 2001;Loh and Venkatraman, 1992
Reduced IT cost, reduced TCO, predictable IT cost	Currie, 2003b; Currie and Seltsikas, 2000, 2001; Ekanayaka, Currie and Seltsikas., 2002; Loh and Venkatraman, 1992; Smith and Rupp, 2002; Walsh, 2003
Better IT performance	Currie, 2003b; Loh and Venkatraman, 1992; Walsh, 2003
Focus on core activities	Currie, 2003b; Currie and Seltsikas, 2001
Contract ambiguity, long-term contracts	Currie, 2003b; Currie and Seltsikas, 2000; 2001; Kern, Lacity and Willcocks, 2002; Kern, Willcocks and Lacity, 2003
System availability	Currie, 2003b; Susaria, Barua and Whinston, 2003
System response time	Susaria, et al., 2003
Data security	Currie, 2003b; Kern, et al., 2002, 2003; Susaria et al., 2003
Vendor integrity	Mayer, Davis and Schoorman, 1995; Mayer and Davis, 1999; McKnight, Choudhury and Kacmar, 2002
Vendor ability	Mayer et al., 1995; Mayer and Davis, 1999; McKnight, et al., 2002; Susaria, et al., 2003
Vendor reputation	Jarvenpaa, Tractinsky and Vitale, 2000; Susaria, et al., 2003

Table 1: Driving and inhibiting factors and literature references

METHODOLOGY

Since, as indicated above, the ASP domain is new and young, and as we still are in the early, formative, stages of theory development, descriptive and exploratory qualitative research is appropriate (Benbasat, Goldstein and Mead, 1987). A preliminary qualitative work looked into IT usage by Israeli hotels, that are mostly SMEs (Heart, Pliskin, Shechtman and Reichel, 2001) followed by a study of driving and inhibiting factors of ASP adoption by Israeli hotels and restaurants (Heart and Pliskin, 2001; Heart and Pliskin, 2002a,b)

Against this background, the current study included two parts. First, we conducted an exploratory round of semi-structured interviews with decision makers in four Israeli organizations of various sizes and from various industries to see if there is a substantial difference between perceptions due to industry affiliation and firm size. The four interviewees included two who

have considered the ASP concept and two who have not. After being presented with a short definition of ASP, these decision makers were asked to express their views for or against this concept and, whenever the free conversation would not explicitly clarify their views, they were asked questions referring to ASP drivers and inhibitors. Second, we conducted an exploratory, yet also somewhat explanatory study, using the case study methodology, that is appropriate since it “suits well our need to understand the complex and ubiquitous interactions among organizations, technologies, and people” (Dube and Pare, 2003, p. 598). The decision to adopt ASP, taken by an Israeli hotel chain has been studied and analyzed, assessing the factors affecting ASP adoption.

RESULTS OF THE QUALITATIVE STUDIES

Semi-structured interviews

Four in-depth, semi-structured interviews were conducted with decision makers in Israeli SMEs: An owner and CEO of a software development company (SoftCo), a general manager (GM) of a hotel (HotelCo), a CIO of an industrial enterprise active in the defense market (DefCo), and a CFO of a hotel chain (ChainCo). Although ChainCo employs 1,000 employees, a handful of executives (employed by ten small organizations – nine hotels and headquarters) are responsible for all major decisions in SME management style. All interviewees described themselves as top decision-makers in their organizations, whose opinion is critical for the final decision. Table 2 presents attributes of each. Note that while HotelCo opted for pure ASP mode, ChainCo used the same hospitality software vendor but opted for hybrid ASP mode whereby it acquired the software, owned the server farm, and acted as ASP vis-à-vis its member hotels while outsourcing operations to a third party (as detailed in the case study).

The interviews were openly taped, and then transcribed. Factors for and against ASP adoption were listed in chronological order of appearance in the interview, presuming that factors mentioned first are more important. For example, data security was mentioned by DefCo’s CIO as a major inhibiting factor. Table 3 lists factors mentioned by the interviewees. Numbers reflect order of appearance in the interview and those below five are in **bold**.

As depicted in Table 3, cost savings, vendor trustworthiness, and data security were mentioned by almost all interviewees, except for GM at HotelCo, who was confident that the vendor would protect HotelCo's data better than if the data were stored at the hotel. Data security was a special concern by DefCo’s CIO, who ruled out the ASP option, except for vendors authorized by the defense authority that regulates this market. Interestingly, while most interviewees mentioned cost savings as an important factor, ChainCo’s CFO counted IT effectiveness and better business performance as more important. Likewise, systems availability and response time concerns were mentioned as inhibiting factors. These drivers are aligned with those found in the ASP and IT outsourcing literature (see Table 1).

Name	Interviewee job title	Industry	Size (no. of employees)	ASP considered?	ASP adopted?
SoftCo	Owner and CEO	Software	10	N	N
HotelCo	GM	Hospitality	20	Y	Y ¹
DefCo	CIO	Defense	130	N	N
ChainCo	CFO	Hospitality	1000	Y	Y ²

1 Pure ASP mode

2 Hybrid ASP mode

Table 2: Interviewees characteristics

Factor	SoftCo	HotelCo	DefCo	ChainCo
<u>Drivers</u>				
Cost savings	3	1	3	7
Focus on core activities		4	4	
Improved business performance	7	7	6	2
IT effectiveness		2	5	1
Partnering with an IT expert		8		
Up-to-date applications	7	9		
Vendor reputation	5		7	
<u>Inhibitors</u>				
Data security	1		1	3
Response time	6	6	9	5
System availability	2	5	8	
Vendor opportunism				6
Vendor trustworthiness	4	3	2	4

Table 3: Drivers and inhibitors mentioned by the interviewees

Case study

ChainCo, an Israeli hotel chain operating nine hotels all over the country has considered the ASP option when looking to replace its legacy systems that were installed on servers whose operations were outsourced, along with the CIO position, to an external vendor. The outsourcer helped with the ASP evaluation and advised the CFO that under ASP architecture, system availability and response time can be assured. Thus, the CFO perceived the overall technological risk as relatively low. Also, as far as data security, the advice was that transacting over leased line was not too risky. This low perception of risk, along with expectations to elevate IT effectiveness and hence business performance, resulted in a favorable attitude towards ASP adoption. However, despite the ASP's reputation in the hospitality industry, servicing sixteen hotels in the pure ASP mode with satisfactory results, the CFO decided not to entrust the ASP with the organizational databases at the vendor's server farm. Instead, the CFO opted for acquiring and installing the software on a self-owned server farm, outsourcing operations to the outsourcer already employed by ChainCO for several years, and acting as an ASP toward its member hotels. It seems that the CFO perceived overall ASP usefulness and ease-of-using ASP as high and the risk of the ASP technology as low. These perceptions paved the way to the ASP adoption decision. However, opting for pure ASP mode was inhibited only by the perception that the software vendor, who offered to host the applications and the databases, was perceived by the CFO as less trustworthy than the outsourcer. In fact, ChainCo's CFO explained that while all seems well with both the software vendor and the ASP technology, the risk seemed too high to him and therefore he chose to mitigate the risk by installing the software on ChainCo's own server farm. Table 4 depicts the perceptions of ChainCo's CFO towards the main constructs. Further implications of this case study are discussed next, upon presenting AIM.

Construct	CFO's perception
Usefulness of ASP to ChainCo	HIGH
Ease of using ASP	HIGH
Risk of ASP technology	LOW
ASP vendor trustworthiness	MEDIUM
Overall risk of pure ASP	HIGH

Table 4: ChainCo CFO's perceptions

THE ASP INTENTION MODEL (AIM)

Based on the literature (Table 1) and the qualitative investigation above (Tables 3 and 4), the ASP Intention Model (AIM) has been developed (Figure 1). The unit of analysis is the principal SME decision maker whose perceptions are sought. AIM is composed of five main latent constructs considered by him/her in the ASP decision: perceived usefulness of ASP, perceived ease of using ASP, perceived risk of ASP technology, ASP vendor trustworthiness, and perceived overall risk. Seven hypothesis are associated with AIM, using constructs that affect the intention to use ASP, believed to be the major factor affecting actual ASP usage behavior, and their antecedents, which are discussed in the following sub-sections.

H1: Perceived usefulness of ASP positively affects intention to use ASP

H2: Perceived ease of using ASP positively affects intention to use ASP.

H3: Perceived ease of using ASP positively affects perceived usefulness of ASP.

H4: Perceived overall risk negatively affects intention to use ASP.

H5: Perceived risk of ASP technology positively affects perceived overall risk.

H6: ASP vendor trustworthiness negatively affects perceived overall risk.

H7: Intention to use ASP positively affects ASP usage.

Perceived usefulness of ASP

Adapted from Davis' (1989) Technology Acceptance Model (TAM), perceived usefulness of ASP is defined as the degree to which the SME decision maker perceives that ASP is useful to the SME. As is the case of IT outsourcing (Currie, 2000), ASP is assumed to be beneficial to the customer organization by reducing IT costs, improving IT effectiveness and enabling better contribution of IT to business performance (Currie 2003b).

An earlier field study of a 300-room hotel revealed that 50% of the initial investment in acquiring and installing a new application in-house can be saved by contracting an ASP, thus refraining from investing in servers, databases, software licenses, and communication infrastructure (Heart and Pliskin 2002b). Rather, the hotel only installed maintenance-free thin-clients, costing about \$400 each (compared to \$1,000 for fat-clients required for a traditional client/server installation). Apart from savings on initial investments, ASP is also believed to reduce cost of IT ownership for SMEs (Wainwright, 2000) and to turn unpredictable IT expenses to predictable ones (Currie and Seltsikas, 2000; among others, see Table 1). The interview with HotelCo's GM, who has been an ASP customer for about four years, lends support to cost reduction, claiming that IT costs have been reduced and are more predictable and more manageable. Likewise, Loh and Venkatraman (1992) have shown in their IT Governance model, that high IT cost is significantly associated with an organization's motivation to outsource their IT operations. Although savings on initial investments might be substantial (Heart and Pliskin, 2002b), high monthly usage fees shed financial doubt. This, among other reasons discussed later, drove ChainCo's CFO toward installing their own server farm and opting for hybrid ASP mode. Hence, since both the literature and the field studies show that it is important to decision makers, **reduced IT cost** is postulated to be one of the "usefulness" antecedents (Figure 1).

According to Loh and Venkatraman (1992), a significant driver affecting the decision to outsource by organizations that chose to outsource their IT operations was the expectation to improve IT effectiveness. Since SMEs have limited resources to hire skilled IT personnel, partnering with a vendor as their outsourcer or ASP might overcome this limitation (Walsh, 2003). The words of ChainCo's CFO, when he explained why they partnered with the outsourcer XOR, lend support to this driver:

"I saw that our CIO could not deliver even relatively simple tasks such as establishing an organizational e-mail system. All I got was stories about which supplier did not do what. So I got fed up with the incompetence and decided to go for a full outsourcing with XOR, including the CIO position. The change was amazing. We got e-mail up and running in weeks, along with other IT projects."

Also, HotelCo's GM mentioned that since he could not afford a full-time technician and could not find a satisfactory part-time arrangement, he turned to the ASP option as a solution to poor IT performance, among other reasons. Hence, **improved IT performance** is postulated to be one of the "usefulness" antecedents (Figure 1).

In ChainCo's decision for hybrid ASP mode, the need to improve business performance and gain competitive advantage was one of the major drivers because consolidating and centralizing the then decentralized IT infrastructure has enabled installation of other value-adding applications, such as a central reservations office and an interactive reservation web-site. Also, this factor was found significant in Loh and Venkatraman's (1992) IT Governance model, and is also cited by the ASP

literature as important (Currie, 2003b). Hence, **improved business performance** is postulated to be one of the “usefulness” antecedents (Figure 1).

Unlike TAM, according to which perceived usefulness has a direct effect on usage behavior (Davis, 1989), AIM pertains to IT usage by SME and therefore the path from perceptions of usefulness to actual usage is much more complicated than in a decision about individual IT usage. Hence no direct affect between perceived usefulness and actual usage is hypothesized in AIM.

Perceived ease of using ASP

Based on TAM (Davis, 1989), perceived ease of using ASP is defined as the degree to which the SME decision maker believes that ASP governance is free of managerial effort. Preliminary field studies (Heart and Pliskin 2001) and literature show (Currie, 2003b) that decision makers express concern regarding managerial efforts required to implement an ASP contract and, at the same time, they expect the ASP to ease the burden of managing an internal IT organization and allow focusing on core activities. Based on the literature and the above qualitative study, it is postulated in AIM that the antecedents of “ease of use” might be: **contract ambiguity** concerns and expectations of managers to **focus on core activities** following alleviation of IT management burden (Figure 1).

Both ChainCo’s CFO and HotelCo’s GM expressed concerns about efforts required from management to ensure fulfillment of the ASP service level agreement and with hammering out a detailed ASP contract, since there is not enough published experience regarding well-formulated ASP contracts. This concern is augmented by the fact that ASPs prefer a long-term contract, for at least three years, to justify their initial investments in a new customer organization. Likewise, contract ambiguity is mentioned as one of the reasons for failures in IT outsourcing deals (Currie and Seltsikas, 2000; 2001). While contract ambiguity concerns may inhibit intention to use ASP, focus on core activities is often mentioned as a driving factor of ASP and IT outsourcing adoption (Currie, 2003b; Currie and Seltsikas, 2001). Perceptions regarding ease of use are known to influence usefulness perceptions, as shown in numerous studies (e.g., Gefen and Straub 2000).

Perceived overall risk of ASP

Perceived overall risk is defined as the degree to which the decision maker believes that the ASP concept is risky to the SME. This construct reflects a barrier to ASP usage mentioned by ChainCo’s CFO who felt that ASP was too risky even though the ASP vendor could demonstrate ability, integrity and reputation and even though the ASP technology was perceived reliable. This barrier is also demonstrated in the literature discussing the inability of ASPs to acquire a critical mass of customer organizations (Currie, 2003a). This risk perception places a barrier on intention to use ASP and might reflect immaturity of the ASP option and/or the decision maker’s propensity towards risk. In AIM, perceived overall risk is affected by two perceptions elaborated upon in the next two sub-sections: risk of ASP technology and vendor trustworthiness (Figure 1).

Perceived risk of ASP technology

Perceived risk of ASP technology is defined as the degree to which the decision maker believes that ASP technology is risky to the SME. Contracting an ASP involves transacting over the Internet or leased lines (Currie and Seltsikas, 2001), an environment that is considered risky. Based on the literature and the above qualitative study, it is postulated in AIM that the antecedents of “technology risk” might be: **organizational data security**, **systems availability**, and **systems response time** (Figure 1).

Data security has been mentioned as an inhibiting factor by three out of the four interviewees. The only exception has been HotelCo’s GM who was concerned about data security when the ASP option was first evaluated, but later on was impressed by the security means taken by the ASP vendor that far exceeded those taken by his own hotel. Data security is also mentioned by the ASP literature as a major inhibiting factor (Currie, 2003b). ChainCo’s interviews show that systems availability and response time are issues of concern for decision makers, especially since the ASP concept is relatively new and the broadband only recently afforded by the SMEs. ChainCo’s CFO insisted on experimenting at one hotel first, before deciding to adopt the ASP architecture for all other eight hotels, to verify stability, systems availability, and acceptable response time. Similarly, HotelCo’s GM stated that for three months he had kept a backup file server in-house, in case of systems or communications failure. Susaria et al., (2003) mention systems availability and response time as still inhibiting ASP penetration rate.

ASP vendor trustworthiness

ASP vendor trustworthiness is defined as the degree to which the SME decision maker believes that the ASP vendor is trustworthy. Trustworthiness is a characteristics of the trustee as perceived by the trustor, while trust is an intention to act or behave (Mayer et al., 1995; Gefen, Rao and Tractinsky, 2003). Thus, since the trustor in AIM – the SME decision maker – is the unit of analysis, vendor trustworthiness is the appropriate construct for AIM. This factor is frequently mentioned as a major concern in the literature on ASPs (Susaria et al., 2003), IT outsourcing (Currie, 2000), and e-commerce (Gefen, 2002; Jarvenpaa et al., 2000). Trustworthiness concerns were among the reasons that drove ChainCo’s decision to act as ASP vis-à-vis its member hotels and were also mentioned as important by all interviewees for this study (see Table 3). Meyer et al. (1995) suggest that vendor trustworthiness is a second degree construct, composed of vendor ability, integrity and benevolence. However, while vendor ability and integrity are found significant (Gefen, 2002; McKnight et al., 2002; Meyer and Davis, 1999), vendor benevolence seems problematic and highly correlates with integrity. Based on the interviews and on our field studies, vendor reputation is an important factor. Thus, for AIM, benevolence was replaced by reputation and it is postulated that the antecedents of “trustworthiness” might be: **vendor ability**, **vendor integrity**, and **vendor reputation** (Figure 1).

Intention to use ASP

Intention to use ASP is defined as willingness of the decision maker to recommend using ASP by the SME. Actual usage is defined as contracting of an ASP by the SME for the organizational IT governance, as in the case of HotelCo. Based on TAM, intention to use positively affects actual usage behavior and therefore the seventh AIM hypothesis is H7.

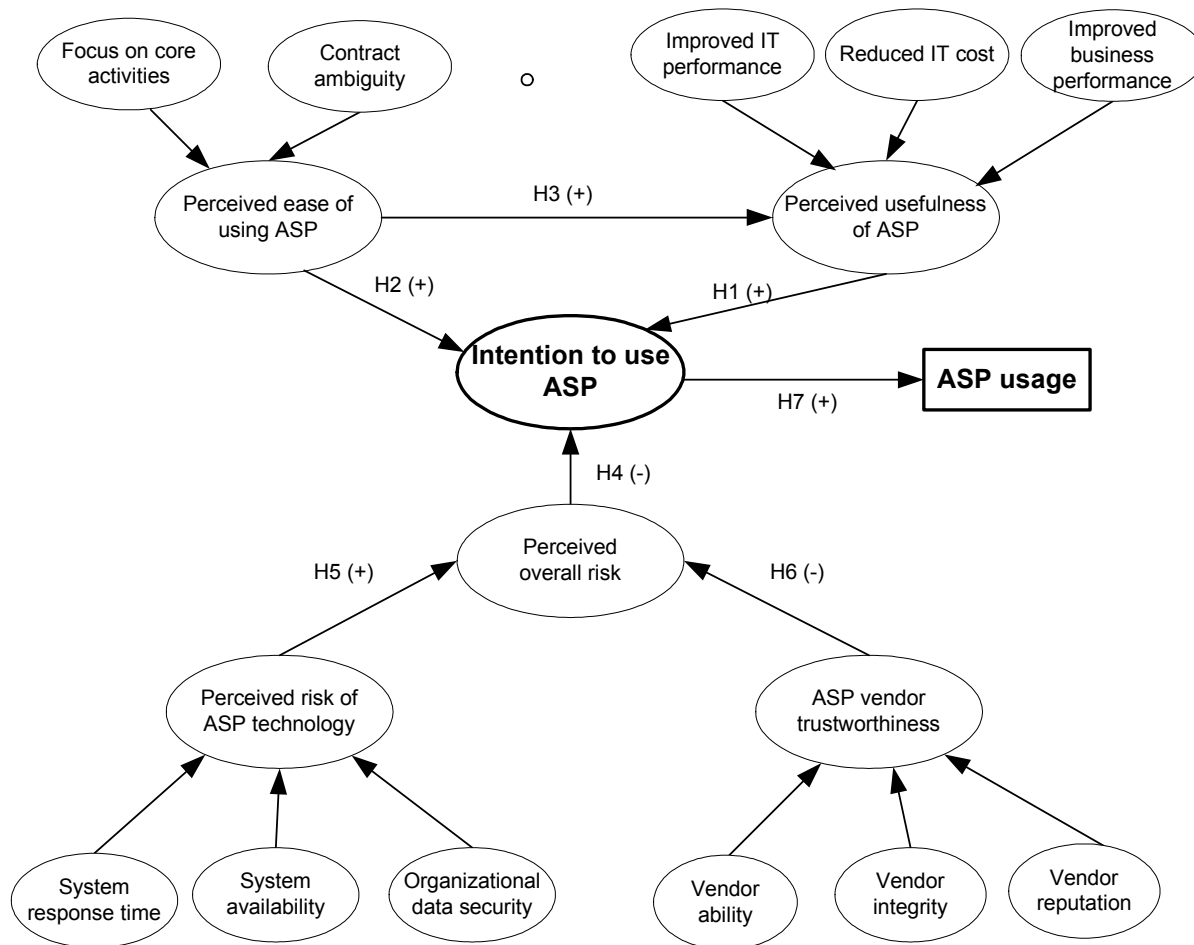


Figure 1: The ASP Intention Model (AIM)

In order to validate AIM, a questionnaire has been composed, which starts with a definition of ASP and thirteen demographic questions. Respondents indicate on a 1 to 7 scale their agreement regarding statements that reflect AIM's constructs, that were validated for phrasing clarity and content validity by a panel of three experts, all University professors. The questionnaire was pre-tested on three managers, who are decision makers in organizations, and is now being distributed to Israeli SMEs. Data collection is in process.

CONCLUSION AND FUTURE WORK

AIM seems to reflect major factors affecting the SME decision to adopt ASP, derived from the literature and preliminary qualitative studies. Validation of the model, currently under work, will help shed light on drivers and inhibitors of ASP usage by SMEs and explain the slower than anticipated adoption of ASP by these organizations. AIM, once validated, will have implications for both research and practice. In the research arena, AIM can be tested in the context of larger organizations, comparing and contrasting with the SME context. In addition, research can be conducted to test this adoption model in the context of web services and other IT innovations that are risky and involve online vendors. AIM exposes antecedents of constructs such as perceived usefulness, perceived ease of use, perceived risk and vendor trustworthiness, most of which have not been extensively researched, for practitioners to consider in actual decision making.

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