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Identifying and Evaluating the Demand Side Factors Influencing the Choice of Software-As A Service: An Integrative Framework

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IDENTIFYING AND EVALUATING THE DEMAND SIDE FACTORS INFLUENCING THE CHOICE OF SOFTWARE-AS A SERVICE: AN INTEGRATIVE FRAMEWORK

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Abstract: *The ever increasing internet bandwidth and the fast changing needs of businesses for effectiveness and integration within and with the partners and the distributed /mobile employee force is leading organizations to adopt information systems infrastructures that are cost effective as well as flexible. The question seems to be: what is driving organizations to go in for SAAS rather than the SWS model of software provisioning? Some of the major drawbacks of SWS model of software provisioning are the high upfront and implementation costs. Also the software is difficult and costly to maintain and upgrade. Long lead times, high costs, complex planning sessions and deployment delays inherent to SWS,* make *SAAS a viable may to overcome these challenges and provide easy-to-use and cost-effective tools for system integration. Whereas there have been studies reporting technology, cost, quality ,network externalities and process as the main variables in the utility function of the user , but most of the studies have modeled either one or two in the their models . The study is an attempt to create an integrative framework with a comprehensive list of factors which affect choice of SAAS .The proposed framework is also tested on an initial sample of 15 respondents and the relative importance and the weights of the factors identified.*

Keywords: software as a service, SAAS, determinants of choice, factors effecting choice of software as a service, cloud computing, application service provider, ASP, information systems outsourcing, outsourcing

1. Introduction:

The ever increasing internet bandwidth and the fast changing needs of businesses for effectiveness and integration within and with the partners and the distributed /mobile employee force is leading organizations to adopt information systems infrastructures that are cost effective as well as flexible (Dubey et al. 2007) . In software as a service (SaaS) business model of software provisioning, the consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings (Mell et al. 2011) . SaaS takes advantage of the thin client technology and provisions software as a service based upon the internet and semantic technologies, where all the software and the data reside on the server and the client side needs an interface application like the browser, as against the packaged software provisioning model where the software is sold as a product. Some of the successful examples of SaaS are Salesforce.com and NetSuite. According to a Gartner survey, SaaS sales in 2010 reached $10b, and are projected to increase to $12.1b in 2011, up 20.7% from 2010. Gartner Group estimates that SaaS revenue will be more than double by 2015 and reach a projected $21.3b. Customer relationship management (CRM) continues to be the largest market for SaaS. SaaS revenue within the CRM market was forecast to reach $3.8b in 2011, up from $3.2b in 2010 (McHall 2011) .Although there are pure SaaS vendors, i.e. only provide SaaS , such as Salesforce and NetSuite, but some traditional packaged vendors such as Oracle, Microsoft, SAP and IBM are fast adopting hybrid SaaS i.e. Provide SaaS as well as packaged software to accommodate customer expectations and preferences (Barett 2010) . According to the Sand Hill Group and McKinsey & Company report (Dubey et al. 2008) , The SME organizations are the biggest adopters of the SaaS model.

The question seems to be: what is driving organizations to go in for SaaS rather than the packaged model of software provisioning? Some of the major drawbacks of packaged model of software provisioning are the high upfront and implementation costs (Choudhary 2007; Ekanayaka et al. 2003; Fan et al. 2009; Susarla et al. 2009; Zhang et al. 2010) . Also the software is difficult and costly to maintain and upgrade (Dubey et al. 2007; Susarla et al. 2003) . Long lead times, high costs, complex planning sessions and deployment delays inherent to packaged, make SaaS a viable may to overcome these challenges and provide easy-to-use and cost-effective tools for system integration.

Although the literature on Software as a service and IS outsourcing identify the determinants of choice of software as a service, but the main contribution of the study is to create an integrative framework, which classifies the various reasons into six broad classifications i.e. cost, quality, process, resources , technology and network externalities. The framework will help clients of SaaS to be able to judge the service provider offerings and their internal capabilities on the basis of the concise framework. For the vendor, the framework will help determine the response/adoption of their offering and the client satisfaction with their service.

2. Literature review

2.1.Perceived Technology benefits of SAAS:

The software as a service model is based upon the thin client technology where the users access the software housed on a web server on a pay-per use basis (Armbrust et al. 2010) . The main advantage of this type of software provisioning is that the organizations are able to avoid upfront procurement costs and operating costs involved in maintaining the hardware and software resources and also manpower costs for expertise, thereby converting capital expenses to operating expenses and redirecting capital to core business investment (Susarla et al. 2009) . One of the other main advantages of this type of software provisioning is that organizations can access the latest version of the software at a minimal cost and thus achieve IS infrastructure flexibility (Choudhary 2007) . So even if the prices are higher under SaaS than under packaged , but that is outweighed by the economic benefits of flexibility and transference of risk which accrues out of over-provisioning and under-provisioning (Armbrust et al. 2010) . Then there is also the flexibility to switch vendors which is not possible in the case of buying/leasing model of software provisioning (Altaf et al. 2010) .

2.2.Perceived Cost benefits of SAAS:

The economic make-or- buy decision is based on the comparison between the production costs of internal operations versus the price offered in the marketplace (Ang et al. 1998; Barthélemy et al. 2006; Benlian et al. 2009; Berg et al. 2009; Blaskovich et al. 2011; Jurison 1995; Lane 2007; Liang et al. 1998; McIvor 2009; Saarinen et al. 1994; Susarla et al. 2003; Susarla et al. 2009; Wang 2008).The rising investment in IT and it being treated as a capital investment rather than as an overhead is making organizations to adopt Information systems infrastructures which help them trim the costs of Information systems investments and relying more on outsourcing the Information systems applications (Ellram 1995; Loh et al. 1992; Smith et al. 1998) . Software maintenance and upgrades represent a significant cost for organizations (Banker et al. 1997) . The software as a service model is especially suitable to enterprise and SME customers, who can choose to get out of the traditional process of buying a software license, paying for the maintenance contracts and then going through time-consuming and expensive upgrades (Choudhary 2007; Dubey et al. 2007; Fan et al. 2009; Walsh 2003) . SaaS provider delivers software over the Internet and can potentially eliminate the need for companies and individuals to implement, and maintain complex software applications. When slack resources are low, firms are likely to resist internalizing and choose outsourcing (Sutton et al. 1989) . Thus, the SME customers who might be low in slack resources would get greater benefits out of adopting the SaaS model of software provisioning rather than buying /leasing software and hardware. Smaller organizations have more difficulty generating economies of scale in their IT operations that allows them to justify internal operations (Bakos et al. 1993; Grover et al. 1994; Lacity et al. 1993) . The study conducted by Fan et al. (2009) builds a pricing model for competition between SaaS and packaged. In their model, customer choice between packaged and SaaS depends upon price, implementation costs and the customers' sensitivity to implementation cost.

2.3.Perceived Quality in SAAS:

Since standards and licensing arrangements are important considerations in an organizations' decision to adopt a software, these factors fall under the rubric of "quality" (Raghunathan et al. 2005) . Reliability, scalability, Security, Availability, Maintainability i.e. update rate, Time-to-market were identified software quality attributes by Offutt (2002) . According toPrahalad et al. (1999) , quality means: the promise of upgrades; high performance and reliability; ease of installation, use, and maintenance. Their study also identified adaptability; flexibility and

innovation are the emerging software quality issues. Software quality such as functionality and performance are important factors affecting the competition between SaaS and packaged providers. The quality of software usually includes functionality, reliability, and usability (Khoshgoftaar et al. 2001) .

Provision and accessibility of upgrades is an important quality issue (Offutt 2002; Prahalad et al. 1999) .Software can be produced at zero marginal cost, but that consumers incur setup costs with each successive version of the product. Since the upgrades are backward and not forward compatible they force old users to buy upgrades or be left with incompatible and obsolete and lower quality systems (Ellison et al. 2000) . We argue that in the case of monolithic applications the user who upgrades does not stand to lose anything as he gets the full benefit of the network effect even after he implements the upgrade because of the presence of backward compatibility. But in the case of network applications like the ERP, SCM and CRM, even if one partner upgrades, the flow of information along the whole chain and the chain will lose its efficiency and increase the co-ordination costs. Thus there will be negative externalities arising from some of the partners in the chain upgrading while the others choose not to upgrade. In the case of SaaS this is an advantage as SaaS would provide a standardized solution to all and also lower the upgrade implementation costs and increase the co-ordination benefits. More the number of partners in the chain more are the chain sensitive to co-ordination costs.

Users complain that upgrades that are costly to buy learn, and install and that provide little benefit, but which consumers feel they must buy in order to maintain compatibility with the rest of the world (Ellison et al. 2000) .The vendor can offer upgrades and exploit either a lack of compatibility between product versions or a lack of interoperability with applications from other firms to gain market power (Anton et al. 2009) . Upgrades are welfare reducing, but still monopoly provider releases upgrades (Fudenberg et al. 1998) . The Zhang et al. (2010) study, discusses the optimal way to license software: the selling model, the leasing model, or a hybrid approach that involves both. The study addresses some of the specific issues in the packaged software market, including network externalities; upgrade compatibility, and commitment on pricing in a dynamic environment. The Choudhary (2007) research models software quality decisions by the vendor and their impact on the R&D decisions by the vendor under SaaS and packaged model of software provisioning. According to Choudhary (2007) , there exists a substantive difference in the vendors decision to invest in software development in SaaS than under packaged .This increased investment leads to higher software quality, higher profits and social welfare. They also state that one of the main advantages of SaaS is that it shifts the burden of maintaining and upgrading software to the service provider.

2.4.Perceived Network Effect benefits in SAAS:

Zhang et al. (2010) study the difference between perpetual and subscription licencensing under quality uncertainty and network externality effects. Bundling/aggregating information goods across consumers is an effective strategy that maximizes welfare and the sellers' profits. Bundling/aggregation can directly increase the value available from a set of goods, because of technological complementarities in production, distribution, or consumption. Also it provides the seller with the opportunity of price discrimination (Bakos et al. 1993; Varian 1995) .According to Bhargava et al. (2004) , Intermediaries like the SaaS providers, provide aggregation benefits i.e. , Providing buyers with access to more sellers, and, sellers' access to more buyers. They also find that an intermediary has stronger incentives to provide quality-differentiated versions of its service relative to other information goods sellers. Bundling complementary products can serve as a product differentiation device in a competitive market and help firms avoid direct price competition (Chen 1997) . Because of standardization and compatibility between the bundled products, the network size will increase for SaaS. In the case of the software as a service model of software provisioning a standardized interface will also lower the implementation and coordination costs and thus increase consumer surplus (Fan et al. 2009) .

2.5.Perceived Process benefits of SAAS:

The SaaS model is not just a way to outsource the application buying and installation from user organizations but rather as a radically new networked process innovation where a certain set of networked (partnering) players collectively enable time and location independent online application access to a continuous flow of new software applications (Sääksjärvi et al. 2005) . There is a need for interaction and co-ordination between the chain

members in network applications like E-procurement, ERP, CRM and SCM. Because these interactions are enabled through information systems, the integrated IS capability of the integrated chain will play an important role in the effectiveness of the chain. Lack of co-ordination among the chain members can lead to a mismatch in demand and supply and thus process inefficiency. There has been found to be a link between strategic agility and high IS infrastructure capability (Weill et al. 2002) . Thus integration and co-ordination are key issues in reaching optimal performance of the chain.

Some firms need to exchange information with many heterogeneous trading partners. For them, a uniform data-sharing interface based on industry-wide standards is important (Zhao et al. 2011) . Also, in dynamic network organizations quick build-up and dismantling of inter-organizational relationships is a pre-condition for success. Where a capital intensive coming together of partners introduces high entry/exit barriers, the SaaS business model allows for firms to engage in more profitable and competitive alliances. Van Hoek et al. (2001) identified, integration and standardization, as important dimensions of agile supply chain practices. The SaaS business model of software provisioning was a low cost alternative which can provide a standardised solution to all the partners. The increasing use of electronic means to integrate different players in the value chain creates the need for implementation of standardized architectures (Nolan 1973) . A high capability in IT architecture and standards is needed for strategic agility and executives consistently reported that IT architecture and standards was the hardest infrastructure capability to build. Organizations are struggling with the complexity of silo architectures and monolithic applications, which they are unable to integrate into and adapt to new business requirements. Thus standardization is another key issue in the choice of SaaS for network applications.

3. Methodology:

In the study, the researcher's design an integrative framework for evaluation of software as a service. Since the concept of software as a service is a recent concept in the application outsourcing domain, so, to the best of our knowledge there are few works in the area of software as a service, but they do not completely address our intention to find out a comprehensive list of factors which determine the choice of SaaS. So, the literature search was conducted using other keywords like application service providers, IS outsourcing, subscription licensing in addition to software as a service to define the framework. The literature search was done on research databases EBSCO, PROQUEST, and JSTOR. From out of 200 research papers that we selected on the basis of keywords, only around 60 we could use in defining our framework on factors determining choice of SaaS, and which are part of the reference section. Out of the 60, there were approximately only 18 to 20% empirical studies, around 10% were conceptual mathematical papers with an economics focus, around 40% were defining the business models , literature reviews and frameworks for ASP, SaaS and IS outsourcing and the rest were talking only of technology issues. Most of the studies talked about either two or three factors and there was no integrative framework for evaluation of SaaS model of software provisioning.

4. Integrative Framework and Results:

After a literature review, the researchers propose a model of consumer choice for SAAS (Fig. 1). Consumer choice for SAAS is dependent upon six factors: Technology, Process, Cost, and Quality of software, Network externalities and Resources .The framework was tested on an initial sample of 15 respondents and the results analyzed using extended AHP suggested by (Liberatore 1987) (Fig. 2).

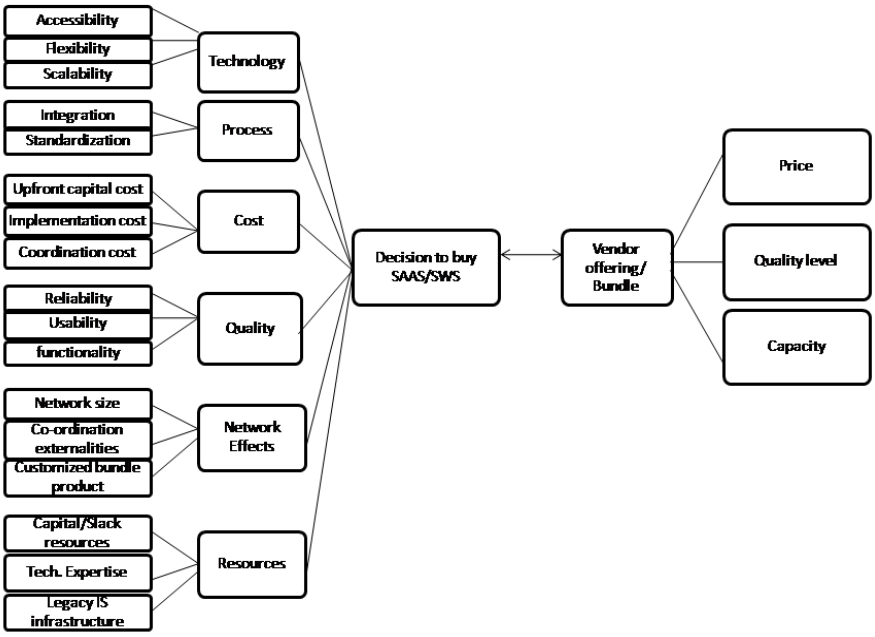

Fig. 1: Integrative Framework for SAAS

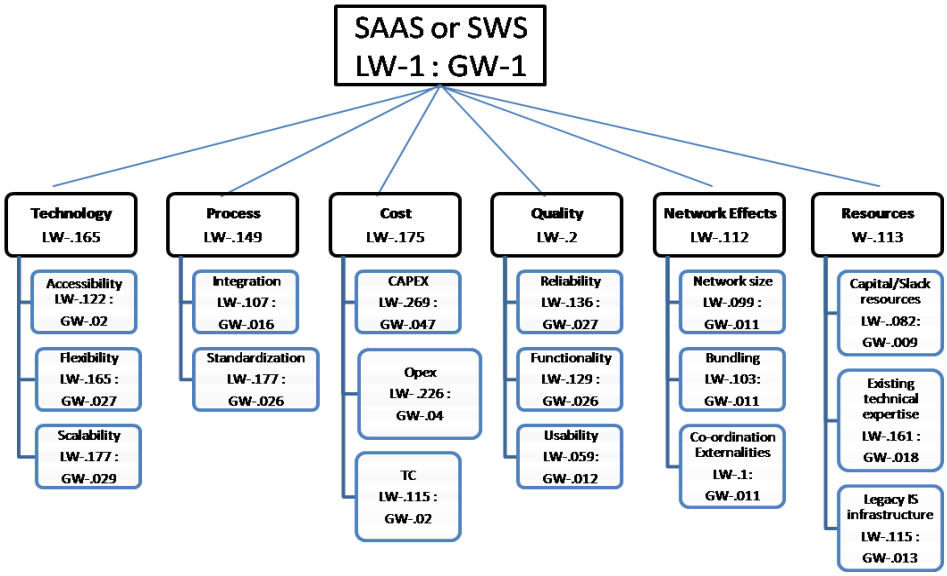

Fig. 2: Weights for the criteria and Local (LW) and Global(GW) weights for the sub-citeria

5. Conclusion:

Although the analysis on a initial sample showed cost and quality as the two most important determinants of choice, but the other four factors were not small enough to be ignored. The study was an attempt to create a

comprehensive concise framework for determining choice of SaaS. The study needs to be further extended to fully test the framework empirically and find out the impact of the various factors on final choice of SaaS or SWS

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