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Full Length Research Paper

Why firms do not adopt SaaS

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The development of cloud computing has promoted Software as a Service (SaaS) as another option for firms to adopt IT services. Many studies have confirmed the advantages of SaaS, while seldom conducted case studies on the implementation of SaaS. This research investigated the Top 2000 firms of Taiwan and constructed a research structure based on task/technology fit (TTF), joint benefit, and relationship viewpoints for analysis with PLS. The results show that although firms consider SaaS as a good solution for IT, they have no intention of adoption. The findings can help SaaS vendors to develop business strategies when designing future service models.

Key words: Cloud computing, SaaS, task/technology fit (TTF), intention of adoption.

INTRODUCTION

Providing software as a service (SaaS) is not a new computing practice (Sultan, 2010). The basic concept of SaaS is centred on separating software possession from its use, and is seen as a replacement for traditional software ownership, where a business purchases a software license for application software, such as ERP, and installs this application software on individual machines. However, with SaaS, a business contracts the use of application software, rather than buying a software license; and the software is hosted by a software vendor. Just as consumers can check e-mail or use mapping programs with their Web browsers, enterprise customers can access business applications over the Internet (Dubey and Wagle, 2007).

"Traditional software is already dead". The market for SaaS is growing by 50% each year (The Economist, 2006). According to research and analyst firm IDC (IDC, 2010), the SaaS market to reach $40.5 billion by 2014, representing a compound annual growth rate of 25.3%. By 2014, approximately 34% of all new business software purchases will be procured via SaaS and SaaS delivery will constitute about 14.5% of worldwide software spending across all primary markets. Moreover, there are many situations where agents and services on the Web would benefit if aggregations are unambiguously enumerated and described (Lagoze, 2010). Many such articles describe SaaS as a new and easy solution of IT adoption; however, only few enterprises have applied it. Therefore, this research aims to understand the key problem of firms opting to not adopt SaaS.

This research intends to build a model structure using TTF; the main concern is whether it will reduce users' operating efficiency in cases of new technology unable to fit organizational tasks and personal capabilities. Such results can also explain reasons for firms choosing not to adopt SaaS. Moreover, this research further explores the reasons that firms choose not to adopt Saas even if it fit tasks and personal capabilities.

SaaS with task/technology fit model

The majority of conceptualizations of IT adoption are drawn on the robust theories of MIS literature, in particular, the technology acceptance model (TAM), diffusion of innovation (DOI), and task/technology fit (TTF). TAM was developed to explain and predict work place technology adoption. Although it has been empirically tested and proven as contributing to the explanatory power of IT adoption models, it has been criticized for its parsimonious structure (Chen et al., 2002). However, a major weakness of TAM for studying IT adoption is the lack of task focus (Dishaw and Strong, 1999), as its inclusion

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in investigative consideration in IT usage, and its performance, leads to controversial results in IT evaluation (Goodhue and Thompson, 1995). On the other hand, empirical studies of DOI in the discipline of MIS have largely supported the predictive power of the theory (Chircu, and Kauffman, 2000; Fichman, 2001; Fichman and Kemerer, 1999). As DOI explains the formation of a favorable attitude toward a particular innovation; however it does not provide further analysis of the attitude required for evolving into adoption behaviour (Chen et al., 2002).

TTF is defined as the correspondence between task requirements, individual abilities, and the functionality of technology (Goodhue and Thompson, 1995), meaning that a technology will be adopted if it provides a good fit with tasks that it supports. This fit concept has been utilized in MIS research, such as system implementation (Palvia and Chervany, 1995), and system maintenance (Dishaw and Strong, 1999). TTF provides greater insight into the topic of repeated technology usage, in that an experienced user will choose tools or methods that can help them to complete a task with the maximum benefits. Given the descriptions of TTF, it is necessary to identify the TTF elements: technology characteristics, task characteristics, and individual abilities used in this research.

Technology characteristics are defined as system features employed by users in carrying out their intended tasks (Goodhue and Thompson, 1995). In SaaS, a technology characteristic is a software delivery model that provides customers remote access to business functionality as a service. One example is a web office, which is defined by the extent to which the information on the web is well-integrated. Integrated information is very useful when there is a working requirement for a quick response regarding multiple inputs; but is less useful if the need is for single product information. Therefore, this research proposes the following hypothesis:

H_1: Technology characteristics can influence the degree of technology and task fit positively.

Task is broadly defined as action or behaviour requirements carried out by system users in processing inputs to outputs (Goodhue and Thompson, 1995; Zigurs and Buckland, 1998), and as required behaviours can vary from one task to another, it is argued that behaviour requirements can be reasonably viewed as characteristics of tasks (Hackman, 1969). According to the description proposed by Goodhue and Thompson (1995), "task characteristics of interest include those that may cause a user to rely more heavily on certain aspects of the information system." Based on such reviews, this research proposes the following hypothesis:

H_2: Task characteristics can influence the degree of technology and task fit positively.

Individuals may adopt technologies to assist them in the performance of their intended tasks; however, before they actually use the system, some preliminary abilities are required. In the test of TTF, individual abilities have been operationalized as computer knowledge or experience with particular IT abilities (Goodhue, 1995). These abilities could affect how easily and well users will adopt a system (Dishaw and Strong, 1999), thus, this research proposes the following hypothesis:

H_3: Individual abilities can influence the degree of technology and task fit positively.

TTF is a key, albeit underestimated concept in understanding the impact of technology on user behaviour. The fit between task requirements and technology characteristics is an important prerequisite that determines subsequent performance; in other words, a technology will be adopted if it provides a good fit with the tasks that it supports. This research proposes the following hypothesis:

H_4: The higher the degree of TTF, the higher the intention to adopt SaaS.

SaaS in benefit consideration

SaaS does not require a large upfront investment, and thus, there is little impact on the finances of an adopter (Hall, 2008). Huang and Sundararajan (2005) examined pricing strategies in a pay-per-use on-demand computing environment, and identified four benefits in the adoption of SaaS, namely lower cost compared with deploying IT in-house, business value of new IT, scale economic of the software vendor's infrastructure, and ease of use in software services. Therefore, this research proposes the following hypothesis:

H_5: Benefit consideration moderates positively the relationship between TTF and adoption intention.

SaaS in relationship consideration

SaaS requires tight synchronization of the technology skills required and the business model applied. As even the largest of firms are not assumed to be able to provide all of the components required in SaaS solutions; partnering is seen as the only realistic solution in order to offer software as a service.

The ability to manage partnerships will therefore be important among a new set of skills required by the companies offering SaaS (Sääksjärvi et al., 2005). On the other hand, the adoption of SaaS is frequently justified by both a lower cost and a promise to deliver better service than licensed software under a maintenance contract. Based on the preceding discussion, this research posits that relationship considerations moderate the effect of SaaS adoption intention (Figure 1) and proposes the following hypothesis:

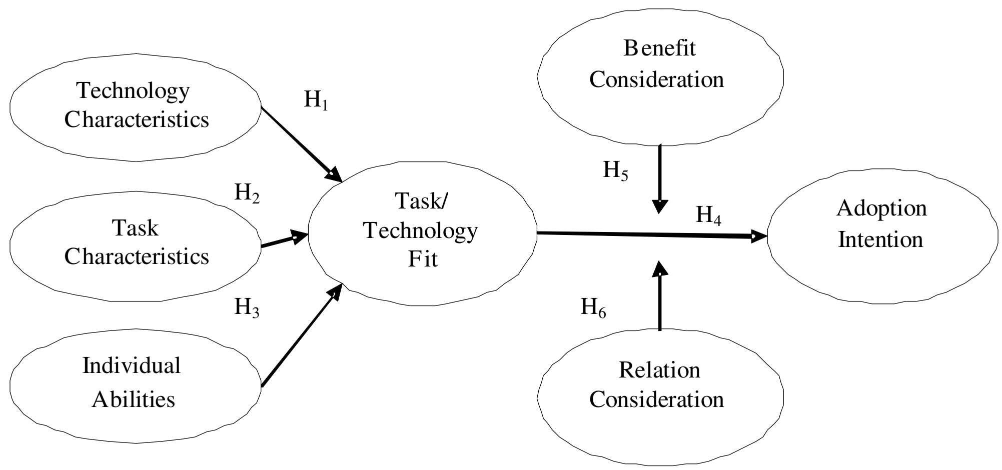

Figure 1. The Moderate model.

Table 1. Profile of respondents.

Measure	Item	Frequency
Title	CEO	4
	President	13
	Plant manager	11
	Manager	47
	Director	33
Scale of company (Number of employees)	Under 50	52
	Under 100	33
	Under 500	19
	Under 1000	0
	Under 2000	1
	Over 2000	3
Revenue (NT$ billion)	Under 1	30
	Under 2	32
	Under 3	19
	Under 4	9
	Under 5	2
	Under 10	6
	Under 20	2
	Under 30	3
	Over 30	5

H_6: Relation consideration moderates positively the relationship between TTF and adoption intention.

METHODOLOGY

Data collection

Based on a questionnaire survey, this research sent to the examined the Top 2000 Corporations in Taiwan, 2000 copies were sent through mail, fax, and E-mail. The survey yielded 108 usable responses, with a response rate of 0.54% (Table 1).

Measurement development

The questionnaires were developed using test statements taken from literature. This research measured a direct model, adapted from Goodhue and Thompson (1995), Dishaw and Strong (1999), Hackman (1969) and Zigurs and Buckland (1998). A moderate model, adapted from Huang and Sundararajan (2005), Ma and Seidmann (2004), Foley (2004) and Sääksjärvi et al. (2005) was

Table 2. Measure factor loading.

Item	Value
Technology characteristic	
composite reliability = 0.91	
SaaS can be easily used	0.77
SaaS can be used in anywhere	0.81
SaaS can be used in anytime	0.79
Task characteristic	
composite reliability = 0.89	
I usually work with teams	0.78
I have to respond my task quickly	0.88
I need the help of IT to do my job	0.87
Individual abilities	
composite reliability = 0.90	
I have a similar experience in the use of SaaS (EX. Web storage, web album, blog)	0.79
Using those services above is easy for me	0.94
Task/ Technology Fit	
composite reliability = 0.88	
SaaS can promote the cooperation between team and I	0.83
SaaS can make me quickly respond the task's need	0.81
SaaS can make my task become more convenient	0.84
Benefit consideration	
composite reliability = 0.86	
I don't have to purchase host by adopting SaaS	0.82
I don't have to purchase application software by adopting SaaS	0.88
I don't have to maintain and upgrade system by adopting SaaS	0.81
Relation consideration	
composite reliability = 0.84	
Adopting SaaS makes me have a better relationship with SaaS vendor	0.94
Adopting SaaS makes me have a better interaction with SaaS vendor	0.91
Adopting SaaS makes me exchange information with SaaS vendor	0.83
Adoption intention	
composite reliability = 0.89	
I want to use SaaS	0.92
I want to recommend others to use SaaS	0.90

then measured. Respondents were asked to rate each item on a seven-point Likert scale, where 1 denotes 'strongly disagree' and 7 denotes 'strongly agree'. In the pilot test, this research invited 30 on-the-job graduate students to participate as respondents. The actual items used to measure each construct are listed in Table 2.

Method

Analysis of the data was conducted in a holistic manner using partial least squares (PLS), which procedure (Wold, 1989) allows researchers to both specify the relationships among the conceptual factors of interest and the measures underlying each construct. When testing the interaction effect, this research followed a hierarchical process similar to multiple regressions, proposed by Chin et al. (2003), in which the results of two models (one with and one without the interaction construct) are compared. The significance of moderating effects was tested and interpreted according to the formula proposed by Carte and Russell (2003), which monitors the differences between squared multiple correlations (R^2).

Cohen (1988) suggested that the overall effect size (ΔR^2) for the degree of interaction could be small (0.02), moderate (0.15), or

Table 3. The latent construct correlation matrix.

Tec.	Tas.	I.A.	TTF	B.C.	R.C.	A.I.
0.85						
0.18	0.87					
0.32	0.36	0.87				
0.31	0.34	0.29	0.84			
0.17	0.26	0.21	0.35	0.82		
0.12	0.19	0.13	0.31	0.24	0.86	
0.02	0.07	0.06	0.04	0.03	0.06	0.81

Diagonal elements represent square root of average variances extracted (AVE), while off-diagonal entries represent correlation coefficients.
Tec.=Technology Characteristics, Tas.=Task Characteristics, I.A.=Individual Abilities, B.C.=Benefit Consideration, R.C.=Relation Consideration and A.I.=Adoption Intention

Table 4. Results of path analysis.

Coefficient	Direct model	Moderate model
Tec. → TTF	0.71**	0.76**
Task → TTF	0.82**	0.79**
I.A. → TTF	0.69**	0.66**
TTF → A.I.	0.51**	0.79**
B.C. → A.I.	-	0.53**
R.C. → A.I.	-	0.37**
TTF×B.C. → A.I.	-	-0.43**
TTF×R.C. → A.I.	-	-0.61**
R^2 in A.I.	0.43	0.55
Change in R^2	-	0.12
Effect size	-	0.27

Coefficients are presented with t-values in parentheses.
Effect size can be calculated by the formula $[(R^2_{conceptual} - R^2_{basic}) / (1 - R^2_{basic})]$ * P < 0.05; ** P < 0.01

large (0.35).

DATA ANALYSES AND RESULTS

Measurement model validation

The measurement model in PLS was investigated in terms of factor loadings, composite reliability, and discriminate validity. Hair et al. (2006) recommended an acceptance level of 0.7 for both factor loadings and composite reliability. All constructs in our model meet this criterion (Table 2).

It is noted that for all constructs, the extracted variance exceeds the expected variance (0.5) due to measurement errors alone. These results demonstrate the convergent validity of our measurement items. As a standard of discriminate validity, Hair et al. (2006) suggested that the average variance extracted for each construct should be greater than the shared correlation between itself and any other construct. The results indicated that the shared correlation between each pair of constructs is less than the square root of the average variances validity (Table 3).

Estimation of the structural model

Hypotheses and moderating effects are tested by examining the standardized beta coefficients (std. β). In addition to path analysis, explained variance (R^2) in the dependent constructs is assessed as an implication of the overall predictive power of the proposed model. Table 4 shows the results of the PLS analysis of two models.

The standardized beta coefficients are given along with their t-values. The basic model shows that all paths are significant, indicating support for all proposed hypotheses. Technology characteristics ($\beta = 0.71$, $P < 0.01$), task characteristics ($\beta = 0.82$, $P < 0.01$) and individual abilities ($\beta = 0.69$, $P < 0.01$) have significant positive effects on task/ technology fit. Thus, H_1, H_2, and H_3 are supported. As anticipated by this research, task/ technology fit has a significant positive effect on adoption intention ($\beta = 0.51$, $P < 0.01$), confirming H_4.

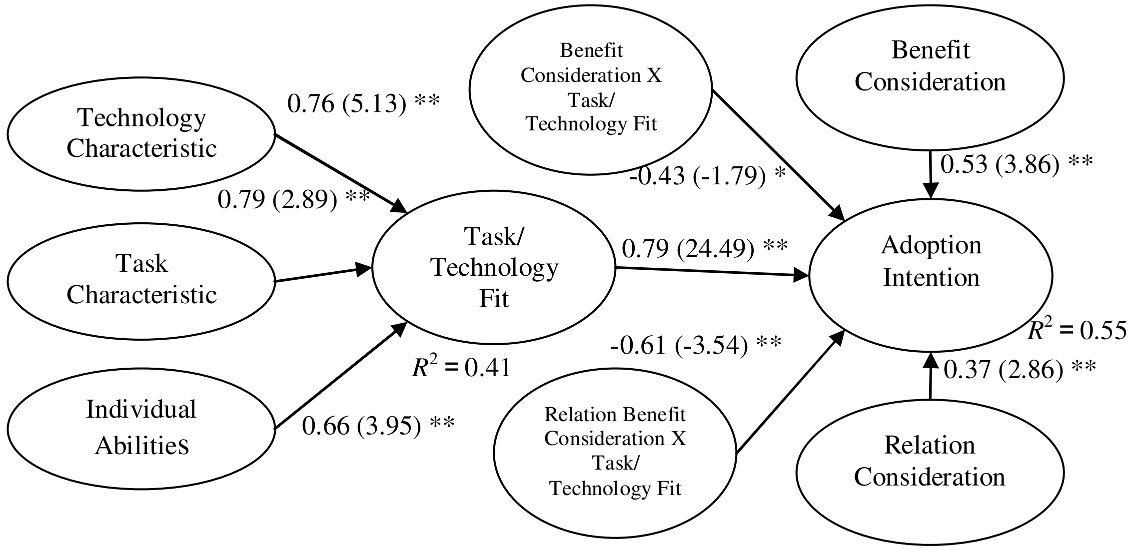

Figure 2. Results of path analysis.

Table 5. Hypothesis results.

Hypothesis		Support
H_1:	Technology characteristics can influence the degree of technology and task fit positively.	Yes
H_2:	Task characteristics can influence the degree of technology and task fit positively.	Yes
H_3:	Individual abilities can influence the degree of technology and task fit positively.	Yes
H_4:	The Higher degree of TTF, the higher intention to adopt SaaS.	Yes
H_5:	Benefit consideration moderates positively the relationship between TTF and adoption intention.	No
H_6:	Relation consideration moderates positively the relationship between TTF and adoption intention.	No

Moderating effect

The results of the moderate model in Figure 2 are a standardized beta coefficient of 0.76 for technology characteristics to task/technology fit, 0.79 for task characteristics to task/technology fit, 0.66 for individual abilities to task/technology fit, 0.79 for task/ technology fit to adoption intention. The main effect is 0.53 for benefit considerations to adoption intention, the main effect is 0.37 for relation considerations to adoption intention, and interaction effects are -0.43 and -0.61, respectively. As hypothesized by this research, the moderating effects of benefit and relation consideration (effect size = 0.27) have a significant change in ΔR^2 ($F=6.07$, $P < 0.05$); however, the moderating effects are negative, thus, H_5 and H_6 are rejected (Table 5).

DISCUSSION AND IMPLICATION

Benlian and Buxmann (2009) explained why the adoption of SaaS from three theoretical perspectives (transaction-cost theory, resource-base view and the theory of planned behavior), but there are few can explain why only part of firm adopt SaaS.

The contribution of this research is to point out the key problems from the users' viewpoints: cloud issues become more urgent as large firms have built large-scale cloud computing centers, yet only a few cases are actually implemented. Moreover, these firms implement only part of the service instead of a complete commercial service. Why do users refuse to adopt such a seemingly good service?

This research summarizes the findings into four points:

(1) when considering the adoption of SaaS, task/ technology fit plays a critical role; (2) the characteristics of SaaS as low expense for IT investment and great focus on the core task may influence the management's decision on adopting SaaS; (3) although past studies have suggested that the benefits of SaaS could attract firms to adopt SaaS, this research found that the benefits

brought by SaaS will reduce the intention of adoption; (4) this research also found that a closer relationship with vendors will reduce the intention of adoption.

During the interviews on the reason of high benefits and relationship reducing the intention of adoption, the other equipments. Therefore, firms are unlike to replace the existing equipment with SaaS. On the other hand, firms also intend to use their existing equipment to build a

private cloud, as a private cloud can provide the benefits of SaaS, and also solve the problem of privacy. Second, the information involved during communication with SaaS service providers may concern business secrets, thus, firms may be reluctant to adopt SaaS.

Based on the above, although SaaS is becoming mature, firms are reluctant to adopt SaaS. Therefore, SaaS vendors should identify the key factors that affect the adoption of SaaS. The findings can help SaaS vendors to develop business strategies when designing future service models. For example, this research has pointed out that firms tend to build a private cloud, however, it requires many professional technical assistances and integration of data formats. Therefore, SaaS vendor can charge through providing professional advises and assistances, this way can also solve the problems of security and privacy concerning of the firms.

LIMITATIONS

In the processes of this research, the most difficulty was to collect research samples. This research sent 2000 copies of electronic questionnaires by fax and E-mail; however, the reply included only 113 copies, with 5 invalid questionnaires, which caused the sample of this research to be very small.

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