ANALYZING THE INFLUENCE OF IS CAPABILITY ON SOFTWARE-AS-A-SERVICE PERFORMANCE: A RELATIONAL VIEW

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Abstract

The formation of clients’ satisfaction in software-as-a-service (SaaS) remains unclear. Building on the relational view and outsourcing literature, this study develops a theoretical model to explain the relationships between SaaS satisfaction, relational value, and IS capabilities. Relational values are characterized as task-based value and governance-based value. IS capabilities include IS integration and IS coordination. The proposed model and hypotheses are supported by the empirical data from 255 firms. The results show that clients’ satisfaction is influenced by both task-based value and governance-based value, which, in turn, are affected by IS capabilities. Finally, we discuss the implications of our findings.

Keywords: Software-as-a-service, relational value, satisfaction.
1. INTRODUCTION

Software-as-a-service (SaaS), referring to a demand-driven application services over the Internet, has become an important model of software delivery (Benlian & Hess 2011; Benlian et al. 2012). SaaS attracts users (or clients) by providing numerous benefits including IT cost reductions, flexibility in providing the needed services, and ease of implementation (Susarla et al. 2009, 2010). For service providers, SaaS creates a new opportunity for selling IT-enabled services, but challenges conventional outsourcing. While there can be great benefits associated with SaaS, these benefits are not guaranteed. The failure rate of SaaS is high and several SaaS clients are unsatisfied with their supplier’s performance (Lacity et al. 2010; Susala et al. 2003; Valente & Mitra 2007). It has been long recognized that client satisfaction plays a key role in market share, profitability, and brand equality (Anderson et al. 1994). Thus, there is significant practical and theoretical incentive to deepen our understanding about how SaaS satisfaction is formed.

Extant studies have considered various determinants to outsourcing, including strategic management (e.g. competence, resource capability), economic (e.g. relationship-specific investment, information exchange, service quality), and social perspective (e.g. satisfaction with performance, trust, interaction between the client and the supplier) (Bharadwaj et al. 2010; Goo & Huang 2008; Goo et al. 2007; 2009; Han et al. 2008; Rustagi et al. 2008). However, less attention has been paid to the influence of suppliers’ IS capabilities and relational value on outsourcing performance in an SaaS.

Drawing from literature on outsourcing, SaaS, and the relational view (Benlian et al. 2012; Dyer & Singh 1998; Lacity et al. 2010), this study develops a theoretical model and tests it empirically. Based on the relational view, the underlying premise of our model is that a client’s satisfaction relies most proximally on whether the outsourced task in SaaS is able to be performed effectively. Drawing from the relational view (Dyer & Singh 1998; Saraf et al. 2010; Rai et al. 2012), we focus on two dimensions of relational value that directly affects SaaS performance—task-based value and governance-based value. We examine whether a supplier’s IS application capabilities affect its ability to increase relational value, including IS integration and IS coordination.

We surveyed 255 firms and analyzed the data using partial least squares (PLS). The proposed hypotheses are supported by our results. Our findings deepen understanding about how SaaS capabilities can be exploited to enhance relational value and how this relational value affects the client’s satisfaction.

2. THEORETICAL FRAMEWORK

2.1 Literature review

Outsourcing research has emphasized outsourcing decisions and outsourcing outcomes (Dibbern et al. 2004; Lacity et al. 2010). Satisfaction is an important measure of IS success (outcomes) in general and
outsourcing in particular and its formation in SaaS is unclear (Delone & McLean 2003; Benlian et al. 2012; Susarla et al. 2003). Researchers have called for in-depth empirical analyses to understand SaaS performance (Lacity et al. 2010; Rai & Sambamurthy 2006). This study responds to their call by treating satisfaction as an important factor to understand outsourcing outcomes.

SaaS is based on multi-tenant architecture—software applications and IT infrastructure (i.e., servers, bandwidth) are shared across clients (Benlian & Hess 2011; Susarla et al. 2010). Thus, clients have high and different expectations on the supplier’s IS capability and service quality (e.g., responsiveness, reliability, system performance, security). Besides, multi-tenant architecture constraints customized services that only allows the customization of the main functionality and data structures of IS applications. Finally, suppliers have more control over future development if the client continues using the service (Benlian et al. 2012; Kern et al. 2002). This may lead to increased demands on the supplier for reliable upgrades, enforcing security, and IT investment.

Susarla et al. (2003) show that a client forms its satisfaction relies on the perceived performance of the supplier in outsourcing. Others emphasize the importance of relational values that are created by the supplier or the collaboration between it and the client (Han et al. 2008; Rai et al. 2012a). Still, Goo et al. (2009) report that governance plays a key role in relationship quality, and theorize the client’s governance as formal (e.g., contract) and informal control (e.g., relational governance). Finally, others focus on suppliers’ IS capability in executing the outsourced task (Bharadwaj et al. 2010; Saraf et al. 2007).

Among these antecedents, how to increase relational value has been highlighted, because managing client-supplier relationships and enhancing their value have been consistently viewed as critical to outsourcing success in general and SaaS satisfaction in particular (Bharadwaj et al. 2010; Goo et al. 2009; Benlian et al. 2012). Considering suppliers’ ability to increase relational value is particularly important in the SaaS context because of low client-specific investment, limited customization, and the share of IT infrastructure across many clients that may hamper service quality (Benlian & Hess 2011).

Outsourcing relationships have been examined from different perspectives, including strategic management, social perspective, economic perspective, control mechanisms, a resource-based view, and the information processing view of a firm (Goo et al. 2007; Han et al. 2008; Mani et al. 2010; Rustagi et al. 2008; Tiwana 2010). For example, Bharadwaj et al. (2010) considered the impact of supplier’s capability in IS management and process management on successful relationship. Sun et al. (2012) highlighted the importance of social relationship (e.g., communication, mutual trust) in affecting satisfaction. Few studies consider the influence of relational value on satisfaction in SaaS. Satisfaction refers to a client’s judgment that a service offered a pleasurable level of consumption-related fulfillment (Oliver 1996). Studies on outsourcing show that satisfaction with the supplier’s service quality plays a key role in relationship development and relationship performance (Park & Kim 2005; Susarla et al. 2003). Others view satisfaction as a measure of relational value and focus on the effect of resources embedded in the relationships on the relational value (Lacity et al. 2010; Rai et al. 2012; Sun et al.
Prior studies have recognized the importance of satisfaction in outsourcing success and drawn on different organization and economic theories to explain the formation of satisfaction. These theories include social capital theory, the resource-based theory, relational governance, and transaction cost theory (Goo et al. 2007, 2009; Mithas et al. 2008; Sun et al. 2012; Susarla et al. 2003, 2009, 2010). Together, they clearly contribute to our understanding of the key determinants of satisfaction. However, the notable features of SaaS are not fully addressed. For example, given low customization in SaaS, the supplier’s capability in meeting different expectations on performance (e.g., security, reliability) becomes critical. Moreover, due to suppliers’ control over future IS development in SaaS, how to increase the client’s perceived governance over the supplier presents a significant challenge. This study fills these gaps by considering the antecedents of SaaS satisfaction from a relationship perspective.

2.2 Research model and hypothesis Development

The relational view identifies four dimensions of relational value: relationship-specific assets, knowledge-sharing routines, complementary capabilities, and effective governance (Dyer and Singh 1998). Their framework has been adopted to explain the relationships between IS capabilities, relational value, and performance. For example, Saraf et al.’s (2007) empirical study found that IS integration and IS flexibility affected relational values (conceptualized as knowledge sharing and coordinated interfirm processes, which, in turn, influenced firm performance.

Figure 1. Research model

We propose a capability-value-satisfaction framework, in which we argue that satisfaction relies on the relational value crated by complementary capabilities. We theorize relationship-specific assets and knowledge-sharing routines as task-based value, effective governance as governance-based value, and complementary capabilities as IS integration and IS coordination. We argue that IS integration and IS
coordination serve as the underlying mechanisms from which the relational value can be enhanced through knowledge-sharing, effective governance, and better exploiting resources (capabilities). Given that SaaS clients’ satisfaction relies on the supplier’s IS capability and relational value (or perceived performance), we expect that relational value plays an intervening role on the causal chain between IS capabilities and satisfaction (Figure 1).

SaaS suppliers are responsible for meeting different client expectations on systems performance and the service provided by them are integrated into a chain of clients’ other functions (Susarla et al. 2010). In order to do so, an IS infrastructure or IS integration that provides an integrated platform to enforce integration of data and processes is necessary (Lu & Ramamurthy 2011; Saraf et al. 2007). IS coordination enables a firm’s operations to be connected with the operations of its channel partners. Besides, IS coordination also ensures better use of the firm’s market knowledge to improve business processes because the activities of functional units are tightly coordinated (Rai et al. 2012; Roberts & Grover 2012). Thus, IS integration focuses on knowledge management while IS coordination presents a firm’s ability to facilitate interfirm processes. They reflect two different but related aspects of IS capabilities that are critical to a client’s performance.

While IS capabilities offer many potential benefits, the realization of these benefits depends on how IS capabilities can be leveraged to increase performance. We define task-based value as the extent to which the supplier is able to increase relational value relies on the performance of the outsourced task. This includes knowledge sharing, IT innovation and IT investments. Knowledge sharing helps suppliers gain the client’s process domain expertise and perform the outsourced task effectively (Bharadwaj et al. 2010; Han et al. 2008). IT investments and IT innovation present relation-specific assets (or investments) that increase the client’s switching cost (Lee 2001, 2006; Lee & Kim 1999). This reasoning leads us to posit that these factors should increase relational value and plays a key role in satisfying the client.

**H1: Task-based value positively affects client’s satisfaction**

Since the multi-tenant architecture allows suppliers to have more control over future development (e.g., future upgrades of IS), this may lead to increased demands for responsiveness of support and flexibility in changing contractual or technical (e.g., interoperability of IS applications) aspects (Benliean et al. 2012). We thus define governance-based value as the supplier’s flexibility and responsiveness and the client’s trust (Mithas et al. 2008; Rustagi et al. 2008; Susarla et al. 2010). When a client feels that it has ability to govern the supplier’s behavior, the client is likely to satisfy with its performance.

**H2: Governance-based value positively affects client’s satisfaction.**

In SaaS, due to low customization and more suppliers’ control over IT development, their flexibility that accommodates new applications and functions to meet a client’s preferences, respond to market, and discover opportunities becomes critical to the success of outsourced task (Benliean et al. 2012). IS coordination reflects suppliers’ flexibility in making ongoing adjustments to processes that capture
emerging opportunities and respond to challenges and clients’ requirements (Rai & Tang 2010; Saraf et al. 2007). We thus expect that a supplier’s IS coordination helps increase the performance of SaaS tasks and the client’s perceived governance.

**H3a: IS coordination positively affects task-based value.**

**H3b: IS coordination positively affects governance-based value.**

A supplier’s IS integration in SaaS reflects its ability to allow its client to access production-related data and market-related data (e.g., future forecasts, quality) (Roberts & Grover 2012). This suggests that a supplier’s ability to increase the flow of information and provide a consistent view of data improves SaaS performance and inspires the client’s trust. Besides, IS integration also features the extent to which a supplier’s IS applications work as a functional whole in conjunction with the client’s IS applications (Patnayakuni et al. 2006; Rai & Sambamurthy 2006; Saraf et al. 2007). This, in turn, increases the information flow and collaboration between the client and the supplier, and the client’s ability to process orders and forecast sales. Given IS integration’s capability in seamlessly sharing information related to the outsourced task, we hypothesize that IS integration plays a key role in increasing the performance of SaaS tasks and a client’s perceived governance.

**H4a: IS integration positively affects task-based value.**

**H4b: IS integration positively affects governance-based value**

3. **METHOD**

3.1 **Sample and data collection**

We identify 750 firms with SaaS experience through the assistance of Market Intelligence & Consulting Department under the Institute for Information Industry in Taiwan. Senior IT managers were chosen as the key informants because of their knowledge about SaaS. Of the 750 distributed surveys, 344 responses were received. The final analysis retained 255 responses (34% response rate). Table 1 shows the salient features of the respondents. More than 50% of the respondents have more than 5 years’ experience in SaaS, and nearly half of them are from small and medium-sized firms with fewer than 300 employees and annual revenues less than NT4.5 billion. To check the non-response bias, we compared the responding and non-responding firms in terms of the number of employees and annual revenues. Based on the results of the independent sample t-test, we found no significant difference between the two groups in number of employees ($\chi^2=9.221$, n.s.) and revenue ($\chi^2=7.492$, n.s.). Thus, we conclude that non-response bias was not an issue (Johnson and Wichern 2002).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Item</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry groups</td>
<td>Construction/Building</td>
<td>13</td>
<td>5.10</td>
</tr>
<tr>
<td></td>
<td>Manufacturer</td>
<td>44</td>
<td>17.25</td>
</tr>
<tr>
<td></td>
<td>Electronics/semiconductor</td>
<td>44</td>
<td>17.25</td>
</tr>
<tr>
<td></td>
<td>Information technology</td>
<td>36</td>
<td>14.12</td>
</tr>
</tbody>
</table>
Table 1. Demographic data (N= 255)

3.2 Measurements

The items were measured using a five-point Likert scale ranging from 1 to 5, with 1 “completely disagree” and 5 “completely agree.” As shown in Table 3, the dependent variable is satisfaction (Susarla et al. 2003) and relational value variables include two second order constructs—task-based value and governance-based value (see Table 1)(Benlian and Hess 2011; Benlian et al. 2012; Han et al. 2008; Lu and Ramamurthy 2011; Mithas et al. 2008; Susarla et al. 2010). IS capability includes IS coordination and IS integration (Rai & Tang 2010; Roberts & Grover 2012; Saraf et al. 2007; Tiwana 2010). Contract duration, service level agreement, and external ties were used as control variables (Goo & Huang 2008; Goo et al. 2007, 2009; Susarla et al. 2009).

To assess common method variance (CMV) that may occur in questionnaire-based research eliciting responses of the predictor and criterion variables from the same resource, we employed the technique of counterbalancing question order and psychological separation of measurement (Podsakoff et al. 2003). According to Harman’s one-factor test, a single factor accounting for a large proportion of the variance in factor analyses increases a CMV concern. Our findings show that no such factor exists in the exploratory factor analysis and the first factor accounted for 12% of the 67% explained variance. Thus, we conclude that CMV is not a significant threat to the validity of our study. Finally, the variance inflation factor (VIF) values of indicators ranged from 1.57 to 2.88 (Johnson & Wichern 2002), which were less than 5, thus alleviating concerns about multicollinearity.

3.3 Analysis and results

We treated task-based value and governance-based value as formative because indicators form or product their associated construct. The rest of the constructs were viewed as reflective because variation in a construct leads to variation in its indicators (Chin et al. 2003).
3.3.1 Measurement Model

The reliability of individual items was assessed by their factor loading. (Johnson & Wichern 2002). The loadings of all items are greater than 0.7, indicating acceptability.

We evaluated convergent validity by testing composite reliability and average variance extracted (AVE) from the measures (Johnson & Wichern 2002). From Table 2, composite reliability values were greater than 0.8 and Cronbach’s alpha greater than 0.7. AVE ranged from 0.542 to 0.847. These results indicate that the measurement model has high internal consistency and convergent validity is confirmed (Fornell & Larcker 1981). The discriminant validity is established when (1) the square root of AVE for each construct is greater than the levels of correlation, (2) correlation between pairs of constructs is below 0.9, and (3) cross-loadings of all items have a higher value in the defined construct than in any other constructs. The results in Table 3 confirm the discriminant validity.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Composite Reliability</th>
<th>AVE</th>
<th>Cronbach’s Alpha</th>
</tr>
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<tr>
<td>Satisfaction (ST)</td>
<td>4</td>
<td>0.902</td>
<td>0.697</td>
<td>0.874</td>
</tr>
<tr>
<td>IT innovation (INO)</td>
<td>3</td>
<td>0.814</td>
<td>0.595</td>
<td>0.688</td>
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<tr>
<td>IT investments (INT)</td>
<td>3</td>
<td>0.886</td>
<td>0.722</td>
<td>0.807</td>
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<tr>
<td>Knowledge sharing (NS)</td>
<td>4</td>
<td>0.825</td>
<td>0.542</td>
<td>0.705</td>
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<tr>
<td>Responsiveness (RP)</td>
<td>3</td>
<td>0.888</td>
<td>0.726</td>
<td>0.807</td>
</tr>
<tr>
<td>Trust (TR)</td>
<td>6</td>
<td>0.900</td>
<td>0.602</td>
<td>0.864</td>
</tr>
<tr>
<td>Flexibility (FX)</td>
<td>3</td>
<td>0.831</td>
<td>0.621</td>
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<tr>
<td>IS integration (IN)</td>
<td>3</td>
<td>0.873</td>
<td>0.696</td>
<td>0.782</td>
</tr>
<tr>
<td>IS coordination (CO)</td>
<td>3</td>
<td>0.918</td>
<td>0.790</td>
<td>0.864</td>
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<tr>
<td>Contract duration (CD)</td>
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<td>1.000</td>
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<tr>
<td>Service level agreement (SLA)</td>
<td>3</td>
<td>0.917</td>
<td>0.788</td>
<td>0.895</td>
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<td>External ties (ET)</td>
<td>2</td>
<td>0.917</td>
<td>0.847</td>
<td>0.820</td>
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</table>

Table 2. Composite reliability, AVE, and Cronbach’s alpha

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<th>Cons.</th>
<th>MN</th>
<th>S.D.</th>
<th>ST</th>
<th>INO</th>
<th>INV</th>
<th>KS</th>
<th>RP</th>
<th>TR</th>
<th>FX</th>
<th>IN</th>
<th>CO</th>
<th>CD</th>
<th>SLA</th>
<th>ET</th>
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<tr>
<td>ST</td>
<td>3.72</td>
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<tr>
<td>INO</td>
<td>3.97</td>
<td>0.78</td>
<td>0.61</td>
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<td>INV</td>
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<td>KS</td>
<td>3.68</td>
<td>0.85</td>
<td>0.53</td>
<td>0.43</td>
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<tr>
<td>RP</td>
<td>3.85</td>
<td>0.78</td>
<td>0.45</td>
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<td>0.47</td>
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<td>FX</td>
<td>3.86</td>
<td>0.73</td>
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<td>0.46</td>
<td>0.36</td>
<td>0.48</td>
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<tr>
<td>IN</td>
<td>4.19</td>
<td>0.64</td>
<td>0.38</td>
<td>0.38</td>
<td>0.35</td>
<td>0.29</td>
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<td>CO</td>
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<td>CD</td>
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<td>SLA</td>
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<td>0.38</td>
<td>0.36</td>
<td>0.49</td>
<td>0.36</td>
<td>0.396</td>
<td>0.52</td>
<td>0.01</td>
<td>0.89</td>
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<tr>
<td>ET</td>
<td>3.78</td>
<td>0.76</td>
<td>0.47</td>
<td>0.40</td>
<td>0.34</td>
<td>0.28</td>
<td>0.33</td>
<td>0.55</td>
<td>0.37</td>
<td>0.355</td>
<td>0.39</td>
<td>-0.08</td>
<td>0.58</td>
<td>0.92</td>
</tr>
</tbody>
</table>

Table 3. Correlation between construct (The shaded numbers in the diagonal row are square roots of the AVE)

3.3.2 Structural Model

Hypothesis 1 and 2 predicted that the perceived relational value positively affects a client’s satisfaction.
were supported (H1, task-based value, $\beta=0.437$, p<0.001 and H2, governance-based value, $\beta=0.222$, p<0.001). As predicted by hypothesis 3, IS coordination positively related to relational value (H3a, task-based value, $\beta=0.351$, p<0.001 and H3b, governance-based value, $\beta=0.362$, p<0.001). Hypothesis 4a and 4b, which stated that IS integration positively influences relational value, were supported (H4a, task-based value, $\beta=0.236$, p<0.001 and H4b, governance-based value, $\beta=0.234$, p<0.001).

To further examine the intermediate effect of relational value, we first tested the direct relationships, including a model of IS capabilities predicting satisfaction. The $\beta$s and $R^2$ of IS coordination were 0.416(p<0.001) and 17.3% respectively, and IS integration 0.390(p<0.001) and 15.2%. We then proceeded to examine if there is a mediation effect of by adding the intervening constructs (task-based value and governance-based value). The results showed that the governance-based value partially mediated the relationships between IS coordination and satisfaction ($\beta=0.131$, p<0.05, $R^2=42.1\%$) because the indirect path was significant and the direct path was lessened. Likewise, the relationship between integration and satisfaction was partially mediated by task-based value ($\beta=0.102$, p<0.05, $R^2=48.7\%$). One of the three control variables, external ties, was significant in the model.

4. DISCUSSION AND IMPLICATIONS

Using the relational view as a theoretical lens (Dyer & Sing 1998; Rai et al. 2012; Saraf et al. 2007), this study is the first empirical test, to the best of our knowledge, to investigate the influence of a supplier’s IS capabilities on outsourcing relationships and outsourcing performance in SaaS. Our results confirm that relational values and IS capabilities play a key role in affecting outsourcing performance. Thus, while prior work on outsourcing and interfirm partnerships that have considered the importance of interfirm resources, conceptualized as IT capabilities (e.g., IT innovation, alignment between IT planning and strategic planning), and collaboration (e.g., interfirm communication, trust)(Goo et al. 2007, 2009; Han et al. 2008; Lu & Ramamurthy 2012; Rustagi et al. 2008) can yield insight into outsourcing, a complete picture of this phenomenon must account for the characteristics of relational values (resources) that are embedded in interfirm processes. Our findings imply that relational values, in terms of task-based value and governance-based value, are directly related to a client’s satisfaction. Task-based value reflects suppliers’ relationship-specific investments (e.g., IT innovation, IT investments). Governance-based value seeks to gain the client’s trust and provides service based on the client’s expectation (i.e., flexibility). Understanding the features of relational value in SaaS context where suppliers have full control over future development of IS applications and offer limited customization of the main functionality, helps suppliers retain customers.

Additional insights can be obtained from the pattern results observed for the mediating role of relational value on the relationships between IS capabilities and SaaS performance. Prior work has shown somewhat equivocal on how much performance is influenced by IS capabilities. Some studies found that IT infrastructure and IT innovation positively affect performance (Lu & Ramamurthy 2011). Others
point out that the relationships between IS capability and performance (e.g., buyer satisfaction) are positively moderated by interfirm communication (Rai et al. 2012). We extend their findings by suggesting that IS capabilities serve as important antecedents of SaaS performance through increasing relational values. Conceptualizing IS capabilities as the supplier’s ability to help its client leverage complementary resources of the client’s partners proposes clear guidelines on how to enhance SaaS performance through managing IS capabilities. Besides, our findings also indicate that SaaS suppliers’ interfirm relationship-specific assets and ability to strengthen the client’s perceived governance are directly associated with its satisfaction. This result deepens SaaS managers’ understanding on the formation of satisfaction.

Our study has some limitations. First, the composition of the sample population lacks randomness. The samples with less than one year experience in SaaS were eliminated. Future research may consider the difference in SaaS satisfaction between adopters and non-adopters. Second, this study was conducted as a snapshot without investigating the dynamic nature of the relational value created by interfirm processes or resources. Future work may use a longitudinal approach to track the change of relational value over time.

References


