SaaS Ecommerce

Nurtugan Nuraly, Zheten Fazylzhan

**Type of research:** Predictive

**Our research approach:** Qualitative/Applied/Deductive/

**Research philosophy:** Positivic

**Phenomenological case study:** Explanatory

ACTION RESEARCH

The researcher enters into the situation, e.g. by introducing new techniques, and monitors the results.

PHENOMENOLOGICAL

|  |  |
| --- | --- |
| Advantages/Positives | Disadvantages/Points of Criticism |
| There are could be already tested practices | Bad practices, bad results |

**Abstract**

Software as a Service (SaaS) is increasingly used by firms for sourcing business application software. SaaS can enable a cost reduction and quality improvement of existing operations and provide rapid and low-cost innovation. However, decision makers are unclear about how they can benefit from SaaS. This study contributes to filling this knowledge gap by investigating factors that determine the magnitudes of operational and innovational benefits and firm performance. These research hypotheses were tested using data collected through a survey of 102 Dutch firms that use sophisticated financial SaaS services. The results show that a firm's adaptation to the SaaS model as well as its ACAP positively affects operational and innovation benefits, whereas contractual governance positively affects only the innovational benefits, and relational governance does not affect any of these two types of benefits. Although both operational and innovational benefits positively impact a firm's performance, the former have a stronger impact than the latter. The insights gained from our survey can support firms' decision-making concerning the maximization of the business benefits and firm performance.

Recommender systems1 are used by E-commerce sites to suggest products to their cus- tomers and to provide consumers with information to help them decide which products to purchase. The products can be recommended based on the top overall sellers on a site, on the demographics of the consumer, or on an analysis of the past buying behavior of the consumer as a prediction for future buying behavior. The forms of recommendation include suggest- ing products to the consumer, providing personalized product information, summarizing community opinion, and providing community critiques. Broadly, these recommendation techniques are part of personalization on a site because they help the site adapt itself to each customer. Personalization, to this extent, is one way to realize Pine’s ideas on the Web. Mass customization originally referred to the physical modification of products and services to make them fit each consumer’s needs

Contractual and relational governance are the two main mechanisms for the governance of inter-organizational relationships. ICT outsourcing research has found that both the contractual and the relational governance have a positive impact on outsourcing benefits. Since the use of SaaS services by firms can be viewed as a specific form of outsourcing, having peculiarities like standardized services with limited customization, rapidly provisioned and released with minimal client–provider interaction, the degree of contractual and relational governance of the relationships with SaaS service providers might affect the magnitude of the operational and innovational benefits obtained from SaaS.

Contractual governance is based on comprehensive and detailed formal contracts that are designed to guide the behaviour of the contracting parties towards desired objectives and to minimize opportunistic behaviours. Contracts usually specify the quantities of the products/services to be delivered by the supplier, as well as their quality levels, the way/how they are measured, and the prices to be paid for them by the client. They also include specific penalties if the required quantity/quality levels are not met, contain descriptions of forms and procedures of communication between client and supplier, procedures for handling problems and contingencies that might arise, and procedures for the resolution of disputes between the parties.

Contractual governance increases the motivation of and pressure on SaaS providers to provide all the agreed SaaS services and void opportunistic behaviours, which might lead to lower quality or/and higher costs of SaaS services. A higher degree of contractual governance is expected to enable SaaS services to be delivered rapidly and effectively, and to minimize the resulting reductions in their quality as well as cost overruns. For all the above reasons, we expect that a higher degree of contractual governance leads to higher levels of SaaS operational benefits. So, our first research hypothesis is:

H1

The degree of contractual governance of a firm's relationships with its SaaS service providers has a positive effect on the magnitude of the SaaS operational benefits.

Furthermore, the adoption of a high degree of contractual governance of a firm's relationships with its SaaS service providers can lead to contracts covering innovation aspects. Contracts may include procedures for covering the additional needs of the firm that might appear in the future, such as for new services and new technologies. These contract provisions allow the firm to access rapidly and at low cost appropriate SaaS services and technologies for the electronic enablement of its planned innovations. Furthermore, they will allow access to new services and technologies, which are required in order to make smaller adaptations/responses to various changes/challenges in its external environment, like the introduction of new products, changes in services and pricing policies by competitors, changes in market demand for a firm's products and service, changes in customers' needs and preferences, and opportunities for expansion into new markets. Such contracts enable firms to better exploit SaaS [25]. For all the above reasons, we expect that a higher degree of contractual governance of a firm's relationships with its SaaS service providers also leads to higher levels of SaaS innovational benefits. So, our second research hypothesis is:

H2

The degree of contractual governance of a firm's relationships with its SaaS service providers has a positive effect on the magnitude of the SaaS innovational benefits.

Relational governance is based on the development of informal and unwritten norms, social processes and positive attitudes between supplier and client, which promote information exchange among the contracting parties, collaborative problem solving, mutual adaptation and flexibility, and commitment and trust. Relational governance aims at achieving better and smoother cooperation, higher levels of satisfaction for both parties and a long-term business relationship. An important element of the relational governance is the free and extensive bidirectional information exchange between client and supplier. The client provides the supplier with extensive information concerning its needs, activities, business processes, strategic goals etc., while the supplier provides the client with extensive information concerning its range of products and services, its technological capabilities, ways the client can better exploit them, solve its specific problems, etc. These enable the development of a shared deeper understanding of the objectives and the context of the contract, and therefore better alignment and coordination between the supplier and the client. Another important element of relational governance is the development of a positive and constructive attitude in both parties for solving problems and resolving disputes in close cooperation resulting in higher mutual adaptation and flexibility.

In particular, the development of a high degree of relational governance is expected to increase the SaaS service providers' understanding of the operations and the relevant needs of the firm, and the firm's understanding of the current offerings of its SaaS service providers, as well as future offerings. This is expected to enable the firm to better utilize the SaaS services of its providers to meet its needs. Furthermore, a higher degree of relational governance is expected to create a positive attitude for solving problems and resolving disputes between the firm and its SaaS service providers, with mutual adaptation and flexibility, avoiding opportunistic behaviours, and aiming at mutual benefit and satisfaction. Therefore, we expect that a higher degree of relational governance of a firm's relationships with its SaaS service providers leads to higher levels of operational benefits. So, our third research hypothesis is:

H3

The degree of relational governance of a firm's relationships with its SaaS service providers has a positive effect on the magnitude of the SaaS operational benefits.

Previous ICT outsourcing research has found that the relational governance of a firm's relationships with its ICT outsourcing service providers is quite important for achieving innovational benefits from ICT outsourcing, through the collaborative development of innovations. The development of a high degree of relational governance is likely to result in a better exchange of information between a firm and its SaaS service providers about planned future innovations in the firm's processes, products and services, as well as smaller adaptations/responses by the firm to changes/challenges in its external environment, and also increase information exchange concerning specific SaaS services (existing and future ones) of the providers that might cost-effectively enable and support these innovations and smaller adaptations. These can gradually create a high level of shared understanding of a firm's planned innovations. Therefore, we expect that a higher degree of relational governance of a firm's relationships with its SaaS service providers also leads to higher levels of SaaS innovational benefits. So, our fourth research hypothesis is:

H4

The degree of relational governance of a firm's relationships with its SaaS service providers has a positive effect on the magnitude of SaaS innovational benefits.

Adaptation to Software as a Service

The SaaS model requires different ICT skills and organization at the client/user firm level. Qualitative research has revealed that firms adopting these types of ICT services sourcing models have to adapt their ICT skills and their ICT-related organization [18,33]. In particular, the above research has found that the ICT personnel should enrich their knowledge/skills concerning the SaaS technologies, the capabilities they provide, their interconnection/integration with on-premises ICT infrastructures, as well as the management of the contracts and business relationships with the providers of these services. In SaaS role of the ICT personnel gradually becomes less technological and more business oriented. It includes less systems development, administration and support, and the focus shifts to more cooperation with a firm's non-ICT personnel for the exploration and exploitation of the continuously evolving SaaS services offered by multiple providers, the selection of the most appropriate providers and services for fulfilling a firm's needs, and the monitoring of the provision and the quality levels of these services. This necessitates an increase in the business knowledge/skills of the ICT personnel, and an enhancement of their understanding of the operations, processes and goals of the firm. This requires a change in their mentality and attitude, including the development of a stronger business orientation, towards the achievement of not only technical but also business goals.

In general, the SaaS model requires less technical work at user firm level in comparison with the traditional on-premises model, and more business-oriented work. Ragowsky et al. [33] and Schneider and Sunyaev [18] have found that this results in the expectation that the non-ICT personnel of a firm's business units have to assume a stronger role in ICT-related decision making. It is also strongly expected that the use of SaaS will be combined with a decentralization of business applications-related decision making from the ICT unit to the business units. The ICT unit now has a critical role in coordinating the procurement of SaaS services, as well as in interconnecting/integrating them with a firm's on-premises ICT infrastructure.

There has been considerable research on the association between the contractual and the relational governance of inter-organizational relationships in outsourcing. In this literature there are two opposing arguments, namely the complementarity and the substitution argument. The former suggests that the higher use of one governance mechanisms also leads to an increase in the other mechanism, whereas the substitution argument suggests that the higher use of one of them leads to a decrease in the other. There has been much more empirical evidence for the complementarity than for the substitution argument (see literature reviews by Cao and Lumineau [27] and Liang et al. [22]). Comprehensive ICT outsourcing contracts have been found to promote the development of constructive and mutually beneficial relations between the two parties [[12], [13], [14],22]. With respect to the use of SaaS, we expect that the degree of contractual governance has a positive effect on the degree of relational governance of a firm's relationships with its SaaS service providers. A high degree of contractual governance leads to comprehensive and detailed contracts, which clearly define the rights and obligations of both the firm and its SaaS service providers, and create structure, direction and rules for the cooperation between them. In turn, this promotes the development of a meaningful and constructive relationship, with lower levels of uncertainty and risk for all contracting parties. The detailed description in the contracts of the objectives of the cooperation provide ground for a focused and effective information exchange between the two parties, directed towards the achievement of these objectives. This contributes to the development of positive attitudes among the involved personnel of the contracting parties towards these tasks. For the above reasons, our fifth research hypothesis is:

H5

The degree of contractual governance has a positive effect on the degree of relational governance of a firm's relationships with its SaaS service providers.

Finally, due to these changes it is necessary to develop new governance processes for all aspects of the management of SaaS utilization by the firm. In particular, it is necessary to develop new processes for the SaaS-related cooperation and coordination between the ICT unit and the business units, for the quality control of the SaaS services and for the cooperation with SaaS providers. Furthermore, in order to maximize the business benefits, it is important to develop a strategy for the use of various types of SaaS services by the firm.

Although research [18,33] has identified some of the changes/adaptations that should be made, there is a lack of empirical investigation into the effects of these changes/adaptations to the needs of SaaS on the benefits realized by firms. Our study contributes to filling this research gap by investigating empirically the effects of adapting a firm's ICT skills and organization to the SaaS model.

In particular, we expect that adapting a firm's ICT-related skills, structure, processes and strategy to the SaaS model will increase the operational benefits derived from SaaS. The enrichment of the technological knowledge/skills of the ICT personnel about SaaS and of their business knowledge of/skills related to a firm's operations and processes is expected to increase their ability to contribute to the selection and use of the most appropriate SaaS services, from both technological and business perspectives, for providing high-quality and low-cost support of a firm's operations. Adaptations of a firm's ICT-related structure to the SaaS model are needed due to the decentralization of decision making about business application software from the ICT unit towards the business units. This is expected to lead to a better exploitation of the extensive and deep knowledge of a firm's business units about their operations and processes, as well as their problems and challenges, for the selection of the most appropriate and cost-effective SaaS services for supporting them. There is a need for the development of new processes, both for the SaaS-related cooperation and coordination between the ICT unit and the business units, and also for the quality control of the SaaS services, and for the cooperation with their providers. This will contribute to the selection of the most cost-effective SaaS services to support a firm's operations, and to enable the early identification and resolution of problems that might lead to a reduction in SaaS services quality and cost overruns. For all these reasons, we expect that a high degree of these adaptations to the SaaS model leads to more SaaS operational benefits. So, out eighth research hypothesis is:

H8

The degree of a firm's adaptation to the SaaS model has a positive effect on the magnitude of the SaaS operational benefits.

Furthermore, we expect that the adaptations of a firm's ICT-related skills, structure, processes and strategy to the SaaS model identified by Ragowsky et al. [33] and Schneider and Sunyaev [18] also increases the innovational benefits derived from SaaS. The enrichment of the business knowledge/skills of the ICT personnel concerning a firm's operations and processes, as well as strategic goals and directions, and in general the enhancement of their business orientation, will allow them to understand better and in more depth a firm's planned innovations as well as smaller adaptations to environmental changes/challenges. This will enable ICT personnel to have a better and more effective cooperation with business units' personnel for the selection and utilization of the most appropriate and cost-effective SaaS services for the enablement of these innovations. Quite important for this is also the decentralization of decision making concerning business application software from the ICT unit to the business units, which will increase the involvement and the contribution of the latter (and therefore the exploitation of their business knowledge/skills) in the electronic support of a firm's innovations/adaptations. The abovementioned change of the role of the ICT unit will allow them to put more effort into this necessary cooperation with the business units concerning the utilization of SaaS services for the enablement of these innovations/adaptations, and also into the interconnection/integration of the specific SaaS services to be selected for this purpose with a firm's on-premises ICT infrastructure. Moreover, the development of processes for the cooperation between the ICT unit and the business units concerning SaaS use, as well as with a firm's SaaS providers, will lead to a better organization of the search for appropriate SaaS services for the enablement of a firm's planned innovations/adaptations, and a more rational selection and utilization of the most cost-effective ones. Finally, the development of a strategy concerning the use of SaaS by the firm will lead to a more coherent and coordinated utilization of SaaS services for the enablement of innovations/adaptations as well, having a stronger connection with the firm's overall strategy, leading to an increase in SaaS innovational benefits. Thus, our ninth research hypothesis is:

H9

The degree of a firm's adaptation to the SaaS model has a positive effect on the magnitude of the SaaS innovational benefits.

Operational – innovational SaaS benefits and firm performance

The last two research hypotheses (H10, H11) concern the effects on firm performance of the operational and innovational benefits obtained from SaaS [1,2,4,7,8]. A higher magnitude of operational benefits gained from SaaS leads to higher quality and lower cost to support a firm's operations, both of which reduce firm's operating costs, resulting in higher firm performance. Also, a higher magnitude of innovational benefits derived from SaaS results in higher quality and lower cost electronic enablement of innovations in a firm's processes that reduce a firm's operating costs, and also of innovations in a firm's products and services, as well as smaller adaptations/responses to various changes/challenges in the external environment, which increase firm's sales revenue. These are expected to result in higher firm performance. Therefore, our final research hypotheses are:

H10

A higher magnitude of operational benefits derived from SaaS has a positive effect on firm performance.

H11

A higher magnitude of innovational benefits derived from SaaS has a positive effect on firm performance.

**Research methodology**

Data collection

The data used in this study were collected through a survey of Dutch firms from various sectors that use financial SaaS services. The questionnaire developed for the survey was pre-tested by three colleagues who are experienced in surveys and quantitative research. Their remarks and suggestions were used to make improvements and to clarify some questions, which led to the final version of the questionnaire. We then contacted two large Dutch SaaS providers that offer mainly financial SaaS. These organizations agreed to email the questionnaire to their customers and ask them to fill it in and return it to us by email. In total, the questionnaire was sent to the CEOs of 600 firms. Since our research concerns the business aspects of SaaS, including contracts and organizational adaptation, operational and innovational benefits, and firm performance, there was often only one person per company who would be able to fill in the survey. This resulted in the limitation that there was only one respondent per company. After one month, a reminder email was sent to the firms. We finally managed to collect completed questionnaires from 102 firms.

The composition of our sample by size, sector and age is shown in Table 1. In our sample 70.6% of the firms are small, having fewer than 50 employees, while the remaining 29.4% are medium-sized or large, with >50 employees. The majority of the firms are in services sectors. There is an even distribution of our sample firms in the three age classes (<5 years, 5–15 years, >15 years).

Recommender systems include processes that are conducted largely by hand, such as

manually creating cross-sell lists, and actions that are performed largely by computer, such

as collaborative filtering. We will refer to the latter as automatic recommender systems.

Automatic recommender systems are specialized data mining systems that have been opti-

mized for interaction with consumers rather than marketers. They have been explicitly

designed to take advantage of the real-time personalization opportunities of interactive

e-commerce. Accordingly, the algorithms focus more on real-time and just-in-time learning

than on model-building and execution.

As merchandisers gained the ability to record transaction data, they started collecting and

analyzing data about consumer behavior. The term data mining is used to describe the

collection of analysis techniques used to infer rules from or build models from large data

sets. One of the best-known examples of data mining in commerce is the discovery of

association rules—relationships between items that indicate a relationship between the

purchase of one item and the purchase of another. These rules can help a merchandiser

arrange products so that, for example, a consumer purchasing ketchup sees relish nearby.

More sophisticated temporal data mining may suggest that a consumer who buys a new

charcoal grill today is likely to buy a fire extinguisher in the next month.

Many different approaches have been applied to the basic problem of making accurate and

efficient recommender and data mining systems. Many of the technologies used in the actual

recommender systems studied are fairly simple database queries. Automatic recommender

systems, however, use a wide range of techniques, ranging from nearest neighbor algorithms

to Bayesian analysis. The worst-case performance of many of these algorithms is known

to be poor. However, many of the algorithms have been tuned to use heuristics that are

particularly efficient on the types of data that occur in practice.

Recommender applications address a variety of E-commerce business needs. They allow

businesses to practice mass customization (Pine, 1993) by creating a customized experience

through a set of standard products and by allowing product components to be assembled

into customized products. As businesses focus on long-term customer value (Peppers and

Rogers, 1997), they need advantages that help them retain customers. In E-commerce, the

advantage of location is gone, and businesses must depend more heavily on information

advantages. Recommender systems allow businesses to leverage their customer history to

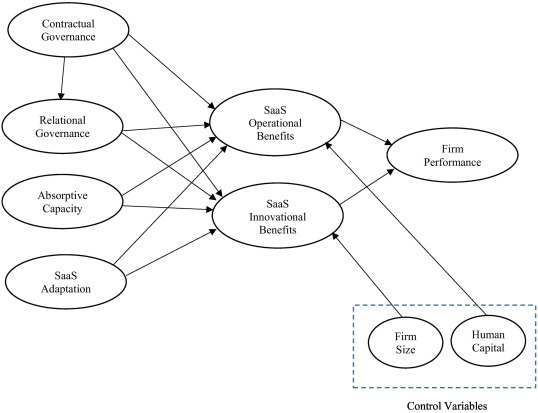
create more personalized experiences for their customers. Those customers will quickly

discover that the business that “knows them best” is the one that can serve them most

effectively, recommending the right products rather than treating them like strangers.

**Measurement**

All our variables were measured using multi-item scales, which were based on previous literature, and are shown in the Appendix A. The degrees of contractual and relational governance of the relationships with a firm's SaaS service providers were measured through two five-item scales (CG1–CG5 and RG1–RG5, respectively), which were based on Goo et al. [13] and Oshri et al. [23]. The ACAP was measured through a seven-item scale (AC1–AC7) adapted from Roberts [36]. The adaptation to the SaaS was measured through a six-item scale (AD1–AD6), which was developed based on the recent relevant literature reviewed in Section 2.4, concerning the adaptations to a firm's ICT personnel skills/knowledge, as well as ICT-related structure, processes and strategy, that the adoption of the SaaS model necessitates [18,33]. The SaaS operational and innovational benefits were measured though three-item scales (BEN1–BEN3 and BEN4–BEN6), which were based on previous literature on the benefits derived from SaaS [1,2]. Finally, the firm performance was measured using a four-item scale (FP1–FP4) adapted from Chen et al. [37]. The control variables firm size and human capital were measured through the number of employees of the firm and the share of employees having a higher education degree, respectively.



**Results**

In order to test research hypotheses, we used the above data to estimate the model shown in Fig. 1, through partial least squares structural equation modelling, which is the most appropriate technique if the sample size is small [38,39]. According to Hair et al. [38], the minimum sample required is: a) ten times the largest number of formative indicators used for measuring one of the constructs of the model; and b) ten times the largest number of structural paths directed towards one of the constructs of the model. In our case, as we did not have formative constructs/indicators and the maximum number of structural paths directed to a construct was four (for the SaaS operational and innovational benefits constructs), the minimum sample required was equal to 4 × 10 = 40, which our sample (102 firms) exceeds. For our estimation, we used SmartPLS software.

**Measurement model**

We initially examined the measurement part of the estimated model, in order to assess the convergent validity, the reliability and the discriminant validity of our constructs. For this purpose, we used the procedures proposed by Wong [39].

In particular, for a construct to have acceptable convergent validity, it must have an average variance extracted (AVE) higher than 0.5, and the loadings of all its items must be higher than 0.5, and preferably exceed 0.7. We can see for each of our seven constructs the AVE and the loadings of its items, respectively. We can see that for all constructs the AVE is higher than 0.5, and that all items' loadings are higher than 0.5, with most of them exceeding 0.7, while the remaining ones are only slightly lower than 0.7. So, we can conclude that all constructs exhibit acceptable convergent validity.

