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Determinants of software-as-a-service benefits and impact on firm performance

Euripidis Loukis[a], Marijn Janssen[b,*], Ianislav Mintchev[c]

[a] University of the Aegean, Karlovassi 83200, Greece
[b] Delft University of Technology, Jaffalaan 5, 2628BX Delft, the Netherlands
[c] Bosch Security Systems BV, Hertogstraat 15, 5611 PA Eindhoven, the Netherlands

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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.

1. Introduction

Software as a Service (SaaS) is being increasingly adopted by firms for sourcing business application software. This model differs from the traditional 'on-premises' model, in that business software is traditionally owned, hosted and managed by the firm, while in SaaS it is owned, hosted and managed by external providers and delivered to the firm through the Internet as a service [1–5]. SaaS has been defined as 'an application or service that is deployed from a centralized data centre across a network, providing access and use on a recurring fee basis, where users normally rent the applications/services from a central provider' [6], p. 476. The SaaS model can be viewed as an evolution of the application services provision (ASP) model. SaaS goes one step further than ASP and is based on the use of multi-tenant architectures, enabling the sharing of infrastructures and thus creating economies of scale [1]. SaaS constitutes the highest level of Cloud Computing (CC) services, which allow the remote use of business applications [2]. SaaS ranges from simple office automation to more complex enterprise resource planning (ERP) and customer relationship management (CRM) applications. The SaaS revenue model is usually based on annual payments that are determined by the number of users and the specific modules/functionalities used.

Literature on SaaS firm performance is often related to CC literature. Previous literature has discussed extensively its great potential to offer benefits to firms and its risks [1,2,4,7]. These benefits can be broadly divided into two main categories, namely operational and innovational benefits. The former refer to a reduction of costs and the improvement of the quality of the support of a company's operations and business processes. Innovational benefits refers to the rapid and low-cost electronic enablement of innovations in a firm's processes, products and services. However, there has been limited empirical research concerning:

a) the factors that determine the magnitudes of operational and innovational benefits; and.

b) the contribution of these benefits to firm performance.

Since for firms SaaS is a relatively new model of sourcing information and communication technology (ICT) services, they are struggling in their SaaS related decision-making concerning whether they should adopt SaaS and, if so, how they can gain from it more benefits and a positive impact on firm performance.

This paper addresses this void in the literature by developing a set of hypotheses concerning the effects of the contractual and relational governance of a firm's relationships with its SaaS service providers, the absorptive capacity (ACAP) of the firm and its adaptation to the SaaS

* Corresponding author.
E-mail addresses: eloukis@aegean.gr (E. Loukis), m.f.w.h.a.janssen@tudelft.nl (M. Janssen), ianislav.mintchev@nl.bosch.com (I. Mintchev).

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model, on the operational and innovational benefits obtained from SaaS. Furthermore, we investigate to what extent these two types of SaaS benefits influence firm performance. These research hypotheses were tested using data collected through a survey of 102 Dutch firms that use financial SaaS services. A structural equation model (SEM) was used for the testing.

This paper consists of six sections. In the following section, the background to our study is outlined and the research hypotheses are formulated. In Section 3, the research methodology is described. The results are presented in Section 4 and discussed in Section 5. Conclusions are drawn and suggestions for future research directions are made in Section 6.

2. Background – research hypotheses

2.1. Cloud Computing (CC) and Software as a Service (SaaS) factors

Whereas there is extensive literature on CC in general and on SaaS in particular discussing the possible business benefits for firms [1,2,4,7,8], there is limited work about factors influencing the actual benefits gained by firms from the use of CC in general and SaaS in particular, although there are some exceptions. Malladi and Krishnan [9] used survey data collected from 243 firms in the USA to investigate empirically the impact of SaaS on firms' ICT-enabled innovation and the role of organizational complementarities in increasing the impact. They conclude that the use of SaaS has a positive impact on a firm's ICT-enabled innovation in products, services or processes. Furthermore, this impact increases if there is flexibility in the firm's ICT infrastructure, maturity of process management and previous experience in ICT outsourcing (organizational learning). Garrison et al. [10] used survey data collected from 302 Korean firms to investigate empirically the effects of a firm's ICT technical, managerial and relational capabilities on CC success, and the effect of the latter on firm performance. They conclude that these three ICT capabilities positively affect the level of CC success, which impacts positively on the contribution of CC to firm performance. Schniederjans and Hales [11] used survey data collected from 247 ICT and supply chain professionals in the USA to investigate empirically the effects of CC use by firms on their economic and environmental performance, and also the mediation role of supply chain (SC) collaboration in these two effects. They conclude that the use of CC positively affects both economic and environmental performance. Furthermore, CC use positively affects collaboration, which impacts positively on economic performance, but it does not impact on environmental performance. Hence, only the positive effect of CC use on economic performance is partially mediated by the SC collaboration enabled by CC.

Factors influencing operational and innovational benefits are likely to be different [1,4,7]. The former are related to a firm's existing operations/processes, and concern the reduction of the cost and the improvement of the quality of their electronic support, whereas the latter are related to innovations in a firm's processes, products and services, and concerns their rapid and low-cost electronic enablement. Furthermore, factors affecting a firm's performance are likely to be related to governance, absorptive capacity, and SaaS adaptation. Contractual and relational governance are the two main mechanisms for the governance between a firm and a SaaS provider [12–14]. As SaaS is a new type of model knowledge is needed. Absorptive capacity (ACAP) is a company's ability to recognize and acquire useful new knowledge from its external environment [15–17]. Firms have to continuously acquire knowledge assimilate that knowledge, combine it with existing internal knowledge of efficiently select and utilize the most appropriate SaaS services. Finally, firms need to adapt their ICT-related skill, governance structure, processes and strategy to gain the potential benefits from SaaS [18]. These factors and the resulting hypothesis will be discussed next.

2.2. Contractual and relational governance

Contractual and relational governance are the two main mechanisms for the governance of inter-organizational relationships [12–14,19,20]. ICT outsourcing research has found that both the contractual and the relational governance have a positive impact on outsourcing benefits [21–24]. 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 [1,18], 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 [12–14,19,20]. 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 [12–14,19,20]. 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 [23,26]. 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.

There has been considerable research on the association between the contractual and the relational governance of inter-organizational relationships in outsourcing [12–14,24,27]. 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 [12–14,22]. 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.

2.3. Absorptive capacity

A firm's absorptive capacity (ACAP) has become increasingly important for a firm's success in the modern knowledge-intensive economy [17]. ACAP is a firm's ability to recognize and acquire useful new knowledge from its external environment, assimilate it, combine it with its existing internal knowledge, and then exploit it to make valuable innovations in its processes, products and services [15–17,28,29]. Firms have to continuously acquire knowledge of SaaS providers, assimilate that knowledge, combine it with existing internal knowledge of efficiently select and in this way utilize the most appropriate SaaS services. Therefore, a firm's ACAP might affect the magnitude of the operational and innovational benefits obtained from SaaS.

While the ‘closed innovation’ model, based on the internal production of knowledge within a firm's boundaries, used to be dominant, in the last 15 years the ‘open innovation’ model has emerged [30]. Open innovation takes advantage of external knowledge, and this makes ACAP an important determinant of a firm's innovation performance [16,28,29,31,32]. Since the use of SaaS is an ICT-related innovation, we expect that ACAP has positive impact on its adoption, as well as on the generation of benefits.

A firm that has a high level of ACAP is able: a) to recognize and identify in its external environment potentially useful knowledge of SaaS services that can provide cost-effective electronic support of its operations; b) to disseminate it inside the firm (to all interested business units, as well to the ICT unit); c) to analyse and combine/integrate it with a firm's pre-existing relevant knowledge (e.g. concerning a firm's operations, their problems and challenges, as well as their previous electronic support); and d) to exploit this combined/integrated knowledge to select the most appropriate SaaS services, namely those that will provide high-quality and low-cost electronic support of the firm's operations, and to utilize them efficiently, resulting in more operational benefits. For the above reasons, we expect that higher levels of a firm's ACAP lead to higher levels of SaaS operational benefits. So, our sixth research hypothesis is:

H6. The absorptive capacity of a firm has a positive effect on the magnitude of the SaaS operational benefits.

Furthermore, we expect ACAP to have similar positive effects on the SaaS innovational benefits. A firm with a high level of ACAP is able to recognize and identify in its external environment useful knowledge of SaaS services. This knowledge might be useful for the cost-effective electronic enablement of a firm's planned innovations, as well as for adapting to environmental changes. This knowledge is disseminated inside the firm to innovations and/or adapt. For the above reasons, we

expect that higher levels of a firm's ACAP also lead to higher levels of SaaS innovational benefits. Thus, our seventh research hypothesis is:

H7. The absorptive capacity of a firm has a positive effect on the magnitude of the SaaS innovational benefits.

2.4. 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.

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.

2.5. Operational – innovational SaaS benefits and firm performance

The last two research hypotheses (H10 and 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.

3. Research methodology

3.1. 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).

In order to assess the existence of non-response bias we used the method proposed by Rogelberg and Stanton [34]. The early respondent firms, the late respondent firms (i.e. those that responded after the reminder email) and a random sample of non-respondent firms were compared with respect to sales, number of employees and age. There were no statistically significant differences at the significance level of 5%. This suggests that there is no substantial non-response bias. We also assessed the existence of common method bias using Harman's single-factor test [35]. In particular, we conducted principal component analysis for all the items of the seven constructs of this study (see Section 3.2), constraining the number of factors to be equal to one. The largest unrotated factor explained the 22% of the total variance, which is much lower than the 50% threshold specified by the above test, indicating the absence of substantial common method bias.

Table 1
Sample composition by size, sector and age.

Size	
< 50 employees	70.6%
50–150 employees	11.8%
> 150 employees	17.6%
Sector	
Information technologies	25.7%
Healthcare	15.8%
Consulting	13.5%
Energy/water	12.5%
Manufacturing	6.3%
Financial services	5.8%
Chemicals	5.7%
Consumer goods	5.5%
New media	3.8%
Real estate	2.2%
Transport	1.7%
Education	1.5%
Age	
< 5 years	33.3%
5–15 years	37.3%
> 15 years	29.4%

3.2. Measurement

All our variables (see Fig. 1) 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.

4. Results

In order to test research hypotheses H1–H11, 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 $4 \times 10 = 40$, which our sample (102 firms) exceeds. For our estimation, we used SmartPLS software.

4.1. 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. In the fourth and the fifth column of Table 2, 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.

The assessment of the reliability of our constructs was based on their Cronbach's alphas and composite reliability values; for a construct to

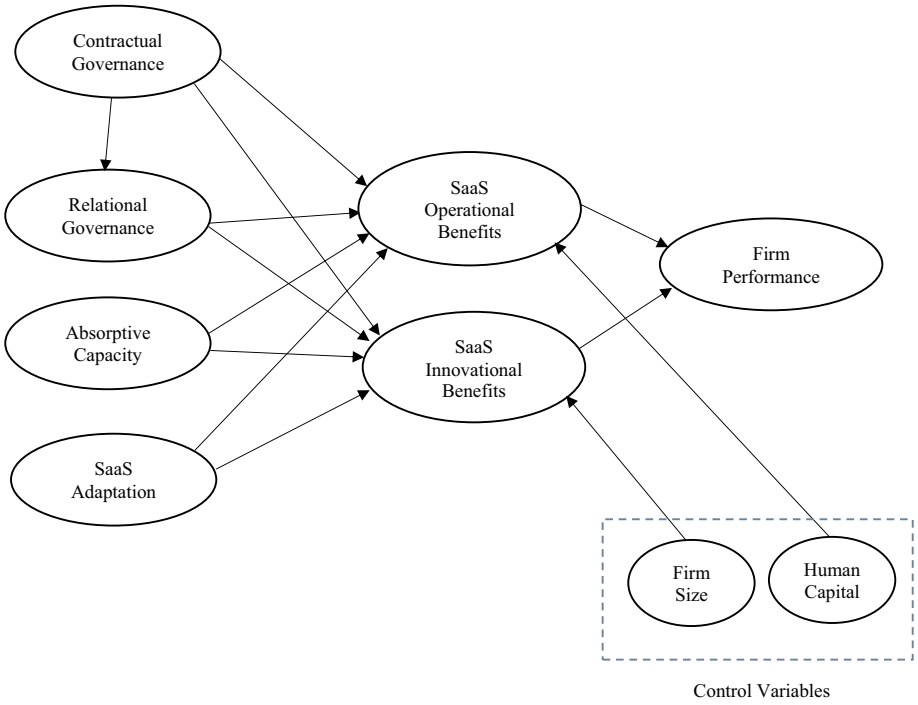


Fig. 1. Research model.

Table 2
Cronbach's alpha, composite reliability, AVE, items' loadings.

	Cronbach's alpha	Composite reliability	AVE	Items' loadings
Contractual Governance	0.867	0.904	0.654	0.798;0.820;0.739;0.853;0.829
Relational governance	0.755	0.837	0.508	0.669;0.772;0.823;0.683;0.703
Absorptive capacity	0.843	0.881	0.552	0.703;0.772;0.770;0.795;0.739;0.672
SaaS adaptation	0.873	0.902	0.569	0.804;0.765;0.660;0.759;0.831;0.811
SaaS operat. benefits	0.733	0.847	0.651	0.674;0.891;0.839
SaaS innov. benefits	0.836	0.900	0.751	0.856;0.869;0.874
Firm performance	0.807	0.871	0.629	0.818;0.734;0847;0.769

have an acceptable reliability, both these values should be higher than 0.7. In the second and the third column of Table 2, we can see that the Cronbach's alphas and the composite reliability values of all seven constructs are above the 0.7 threshold, so we can conclude that all our constructs have acceptable reliability.

Finally, the assessment of the discriminant validity of our seven constructs was based on the criterion proposed by Fornell and Larcker [40]. According to this criterion, to have acceptable discriminant validity the square root of the AVE of each construct should be larger than the correlations of it with all other constructs. In Table 3, the square roots of the AVE values of constructs are shown in bold in the diagonal cells, while the correlations between the constructs are shown in the lower off-diagonal cells. We can see that this criterion is fulfilled for all constructs, so they exhibit acceptable discriminant validity.

Table 3
Constructs' AVE and correlations.

	CG	RG	ACAP	AD	OP_BEN	INN_BEN	FP
CG	**0.809**						
RG	0.696	**0.713**					
ACAP	0.288	0.282	**0.743**				
AD	0.476	0.376	0.012	**0.754**			
OP_BEN	0.262	0.271	0.348	0.231	**0.807**		
INN_BEN	0.446	0.219	0.307	0.479	0.332	**0.867**	
FP	0.430	0.514	0.561	0.203	0.471	0.301	**0.793**

The square roots of the AVE values of constructs are shown in bold in the diagonal cells.

4.2. Structural model

The structural part of the estimated model is shown in Fig. 2; in this figure the standardized path coefficients are shown for the statistically significant paths. A firm's ACAP and adaptation to the SaaS model have statistically significant and positive effects on the operational benefits gained from SaaS (standardized path coefficients 0.297 and 0.206, respectively). However, the effects of the contractual and relational governance of a firm's relationships with its SaaS service providers are not statistically significant. Therefore, research hypotheses H6 and H8 are supported, while on the contrary research hypotheses H1 and H3 are not supported. Also, a firm's human capital has statistically significant and positive effects on the operational SaaS benefits. Furthermore, the contractual governance, the ACAP and the adaptation to the SaaS model have statistically significant and positive effects on the innovational benefits gained from SaaS (standardized path coefficients 0.375, 0.248 and 0.418, respectively); the effect of the relational governance is not statistically significant. Thus, research hypotheses H2, H7 and H9 are supported, while H4 is not supported. The contractual governance has a statistically significant and positive impact on the relational governance (standardized path coefficient 0.696), so H5 is supported. Finally, both operational and innovational benefits gained from SaaS have a statistically significant and positive impact on firm

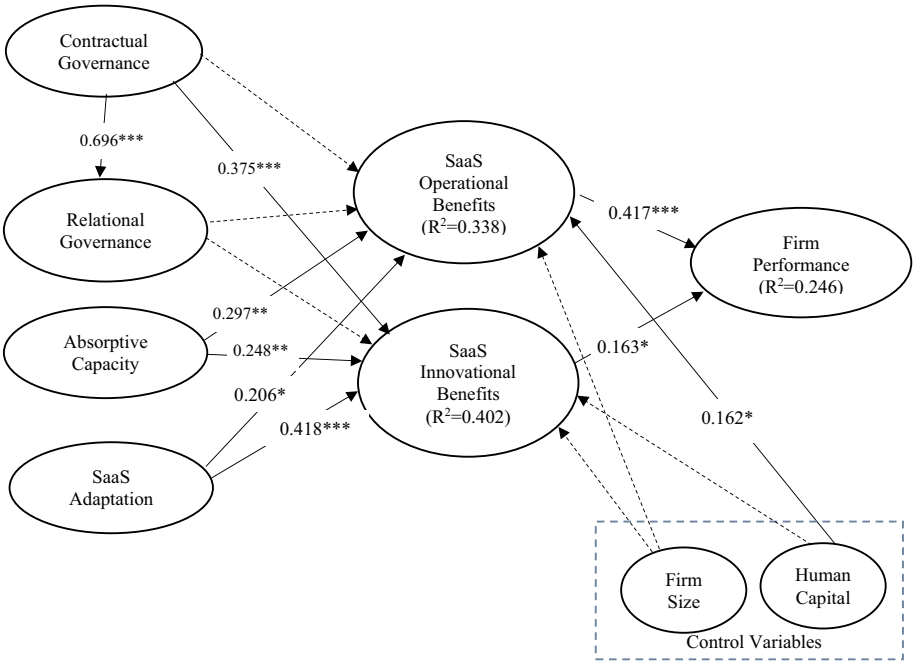


Fig. 2. Estimated structural model.

performance (standardized path coefficients 0.417 and 0.163, respectively). Thus, research hypotheses H10 and H11 are supported. We also note that the contractual and the relational governance, the ACAP and the adaptation to the SaaS model, together with a firm's size and human capital, explain substantial parts of the variance of the operational and the innovational benefits gained from SaaS (33.8% and 40.2%, respectively); the part of the variance of firm performance (24.6%) that is explained by the operational and innovational benefits derived from SaaS is smaller (but this is understandable, as firm performance is shaped by a wide range of other factors).

5. Discussion

The results of this study provide evidence that a firm's ACAP and adaptation to the SaaS model positively affect both the operational and the innovational benefits gained from the use of SaaS. According to Wong [39], a standardized path coefficient of 0.15 indicates a moderate effect, while one of 0.35 indicates a strong effect. Hence, from the estimated model shown in Fig. 2 we can conclude that a firm's adaptation to the SaaS model has a strong positive effect on SaaS innovational benefits, and a moderate to strong positive effect on SaaS operational benefits. Therefore, decision makers should be aware of the need for changes in order to fully benefit from the SaaS model. The existing ICT skills of firms, as well as their existing ICT organization (including ICT-related structure, processes and strategy), are based on and aligned to the needs of the traditional on-premises model of internal sourcing of ICT services, which are however quite different from the needs of the SaaS model [18,33]: the latter includes less internal applications' development, administration and support, and more exploration and selection of external SaaS services. SaaS also needs capabilities for the effective utilization and integration/interconnection of these services, as well as the monitoring/management of relevant contracts and business relationships with SaaS providers. Therefore, the SaaS use model requires a firm to have a different set of tasks in order to provide electronic support of its activities in comparison with the traditional on-premises model. In these tasks, a firm's business units have a prominent role. The use of SaaS should therefore be combined with changes/adaptations to a firm's ICT skills and organization to the above needs of the SaaS model. These will enable the exploitation of the full potential of SaaS and create substantial business benefits. In particular, the knowledge and skills of a firm's ICT personnel require significant adaptations. Furthermore, a firm's ICT-related structure needs to be adapted, by decentralizing decision making about business application software selection and introducing new governance, as do ICT-related processes (including new processes for the quality control of the externally produced SaaS services, and for the cooperation with the SaaS service providers) and ICT strategy, to fully benefit from SaaS services.

Our findings show that these adaptations are important for achieving high levels of operational benefits from SaaS, which include the achievement of cost reductions and quality improvements in the electronic support of a firm's operations/processes. At the same time, these adaptations seem to be crucial for achieving high levels of higher-order innovational benefits from SaaS for the rapid and low-cost electronic enablement of innovations in a firm's processes, products and services, and for adaptations to environmental changes/challenges and improvements of a firm's agility. Our study extends the existing limited research literature on the changes/adaptations to a firm's ICT skills and organization necessitated by the use of CC [18,33,45], providing evidence that these adaptations have a positive impact on both the operational and innovational benefits obtained from SaaS.

Furthermore, our findings indicate that a firm's ACAP has a moderate to strong effect on both the operational and the innovational benefits obtained from the use of SaaS services. Due to the extensive and continuously increasing and evolving supply of SaaS services, the continuous exploration of them, and the selection and use of the most appropriate ones for the electronic support of a firm's existing operations/processes, as well as planned innovations and smaller adaptations, is a knowledge-intensive task. It necessitates: a) the acquisition and assimilation of large quantities of knowledge from its external environment about SaaS services that can cost-effectively support a firm's operations as well as planned innovations/adaptations, and the numerous functionalities and capabilities they offer; b) the combination/integration of this external knowledge with extensive internal knowledge possessed by the firm concerning its operations and planned innovations/adaptations; c) and the exploitation of this combined/integrated knowledge for the selection and effective utilization of the most appropriate SaaS services. Hence, firms with high levels of ACAP will be able to better perform these three critical external knowledge

management tasks (i.e. a) to c) above), resulting in more operational and innovational benefits gained from SaaS. Here, it will be useful if firms take into account the findings of previous research on the determinants of a firm's ACAP [31,32,41]. Our study extends previous ACAP research, which concluded that ACAP is important for the successful assimilation of ICT-related innovations and the generation of business value from them [42,43] into this emerging SaaS adoption and use innovation.

ICT outsourcing research has found that contractual and relational governance are important for the success and benefits of ICT outsourcing [21–24]. Our study shows that these are not so important in the case of SaaS for the generation of business benefits. In particular, we found that contractual governance has a strong positive effect on SaaS innovational benefits, but does not affect the operational benefits gained from SaaS. Contractual governance has a very strong impact on the development of relational governance, providing support for the 'complementarity' argument on the association between these two governance mechanisms. In contrast to results presented in ICT outsourcing literature, relational governance does not affect either of these two types of SaaS benefits. A possible explanation for this is that according to previous relevant literature, the use of CC/SaaS services by firms is a specific form of ICT outsourcing, which has however some notable peculiarities [1,18,44], namely the provision of standardized ICT services with limited customization, rapidly provisioned and with minimal interaction between client and provider. In contrast, typical ICT outsourcing generally involves the provision of more complex ICT services, highly customized to the needs of the client, requiring more interaction and cooperation between the client and the provider. For the above reasons, the development of a relationship between the firm and its SaaS service providers is less important. The specific characteristics of SaaS (standardized services, limited customization, minimal client–provider interaction) result in less need for an intensive client–provider relationship.

Previous ICT outsourcing research has emphasized the importance of the relational governance of a firm's relationships with its ICT outsourcing service providers for achieving higher-order innovational benefits, through the collaborative development of innovations, based on close interaction and cooperation between personnel of the client and the provider ('collaborative innovation') [23,26]. However, in the case of SaaS services provision there is no such interaction and cooperation between the client and the provider for the development of innovations: the innovations are developed by the personnel of the client firm, and then existing SaaS services are sought for their electronic enablement and support. So relational governance is not important for achieving innovational benefits from SaaS. On the contrary, our findings indicate that to achieve these higher-order innovational benefits, what is important is the contractual governance. Comprehensive contracts including mechanisms and procedures for covering additional needs for new services and new technologies facilitate the rapid and low-cost electronic enablement of a firm's planned innovations. Our study extends previous research on the impact of contractual and relational governance on ICT outsourcing success and benefits [21–24] to an emerging and quite peculiar form of ICT outsourcing: the use of SaaS services.

Finally, the results of our study provide evidence that both the operational and the innovational benefits gained from SaaS positively affect firm performance. In particular, we found that SaaS operational benefits have a very strong positive effect on firm performance, while SaaS innovational benefits have only a moderate effect on firm performance. This indicates that firms achieve more substantial and performance-enhancing benefits from SaaS by using it to support their existing operations rather than to enable innovations. In general, our results reveal significant differences between the operational and the innovational benefits gained from SaaS, with respect to both their impact on firm performance and the factors that determine their magnitude. Our findings indicate that it is a firm's ACAP that has the strongest effect on the SaaS operational benefits, followed by the adaptation to the SaaS model, with both these effects being moderate to strong, while the contractual and the relational governance do not affect them. However, it is the adaptation to the SaaS model and then the contractual governance that have the strongest effects on the SaaS innovational benefits, with both of these effects being very strong, followed by the ACAP, with a moderate to strong effect. These important differences provide evidence for the usefulness of our approach of discriminating between operational and innovational benefits gained from SaaS that was adopted in this study.

6. Conclusions

Substantial adaptations are needed before firms performance improves by using Saas. In particular, we found that a firm's adaptation to the SaaS model and its ACAP positively influences the operational and innovational benefits gained from SaaS. Contractual governance positively affects only the innovational benefits; relational governance does not affect either of these types of SaaS benefits. These findings suggest that SaaS providers are at a distance from their clients and their interactions are formalized by providing standardized services with limited customization. Furthermore, we found that operational and innovational types of SaaS benefits have a positive impact on a firm's performance, with the operational benefits having a stronger impact than the innovational ones.

The insights gained from our survey can help firms to better prepare for their decision making concerning the maximization of the business benefits gained from SaaS. Firms should adapt their ICT skills and organization to gain the benefits from SaaS. In particular, important adaptations have to be made regarding a firm's ICT-related skills, structure, processes and strategy, changing the role of a firm's ICT unit, as well as its mentality to make it more business oriented, and increasing the involvement of the firm's business units in decisions concerning business application software. These SaaS adaptations are particularly important for gaining higher-order innovational benefits from SaaS. Also, in order to obtain more benefits from SaaS, firms should increase their propensity and capacity to identify and acquire relevant external knowledge (of the numerous and continuously evolving SaaS offerings, as well as the extensive functionality that each of them provides), and then assimilate this knowledge, combine it with their existing knowledge (of their internal operations as well as planned innovations), and use it to make high business value exploitation of SaaS.

In addition to the above implications for practice, our findings also have some important implications for research. In particular, they increase our limited knowledge of the factors influencing SaaS benefits and firm performance. Our findings show that research on these important topics should discriminate between operational and innovational types of benefits derived from SaaS, which differ significantly both in their determinants and in their influence on firm performance. Our study also extends our knowledge of the adaptations that SaaS requires in relation to a firm's ICT skills and organization, by providing evidence of their positive impact on the resulting operational and innovational benefits. Finally, our study extends to SaaS two long and important research streams: a) on ICT outsourcing, showing that in contrast to ICT outsourcing, relational governance is found to be less relevant for SaaS, and b) on ACAP to assimilate ICT-related innovations to generate of business value.

Our study also has some limitations. The first is that data is collected from the Dutch national context for firms using SaaS in their financial function. The results might have been influenced by the characteristics and the culture of this specific national context, and also by the characteristics and capabilities of this kind of software. Another limitation is that for the collection of data, we adopted a 'key informant' approach: for each firm data was often collected from its CEO, and therefore the data might reflect the opinion of this person. It would be good to

consider different research designs with data collection from multiple respondents within each firm. In addition, objective firms' performance data can be used for collecting some data. Likely, this would require a sector specific study as for example like profitable varies among sectors.

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Appendix A. Constructs' measurement items

Please answer the following questions on a scale of 1 to 5, where 5 = to a very large extent, 4 = to a large extent, 3 = to a moderate extent, 2 = to a small extent 1 = not at all.

Contractual governance

To what extent do the contracts you have signed with your SaaS service providers include:

CG1: the detailed services that have to be provided, their quality levels, the ways/procedures of their measurement and their prices?

CG2: specific penalties if these quality levels are not met

CG3: procedures for addressing changes in your needs (e.g. changes in the volume of services you need, or need for new services or technologies)

CG4: forms and procedures of communication with the SaaS service providers

CG5: procedures and terms for handling problems and for dispute resolution

Relational governance

To which extent have your relationships with your SaaS service providers the following characteristics:

RG1: there is extensive provision of information by your company to your SaaS service providers concerning e.g. your needs, your problems, your activities and internal business processes, your strategic goals, etc.

RG2: there is extensive provision of information by your SaaS service providers to your company concerning e.g. the SaaS services they can offer to you, their technological capabilities, ways for your firm to better exploit them, etc.

RG3: both parties have a positive attitude towards solving problems and resolving any disputes between your company and your SaaS service providers, aimed at the mutual benefit and satisfaction of both parties.

RG4: both parties have a positive attitude towards and flexibility regarding responding positively to the other party's request for changes (e.g. in the services).

RG5: both parties have a positive attitude towards and interest in having a long-term business relationship and cooperation.

Absorptive capacity

To what extent can your company:

AC1: easily recognize and acquire useful knowledge from your company's external environment (such as suppliers, partners and universities)

AC2: understand and assimilate this external knowledge

AC3: combine this external knowledge with your company's existing knowledge

AC4: integrate the externally acquired knowledge with the knowledge base of your company in order to enrich the latter

AC5: exploit this newly acquired external knowledge, in combination with existing relevant internal knowledge, to make innovations in your company's operations and processes

AC6: exploit this newly acquired external knowledge, in combination with existing relevant internal knowledge, to make innovations in your company's products and services

AC7: exploit this newly acquired external knowledge, in combination with existing relevant internal knowledge, to gain competitive advantages

SaaS adaptation actions

To what extent has your company's use of SaaS services been accompanied/followed by the following complementary actions and internal changes for your adaptation to the SaaS model:

AD1: enrichment of the knowledge/skills of your ICT personnel regarding SaaS (e.g. the technologies of SaaS, the capabilities it provides, its interconnection/integration with on-premises information systems, the monitoring/management of the contracts and business relationships with SaaS providers)

AD2: reinforcement of the knowledge/understanding that your ICT staff have about the operations, processes and goals of your company, and the business orientation of your ICT staff towards the achievement of business goals and the generation of business value and innovation

AD3: development of new relevant processes in your company (e.g. for the quality control of the SaaS services, for your cooperation with your SaaS providers, for the cooperation between your ICT unit and the other business units that use ICT for supporting their works and activities)

AD4: development of strategy concerning the use of SaaS services (e.g. what types of SaaS services will be used, for which groups of applications, and with what objectives, and which groups of applications will remain in on-premises systems)

AD5: decentralization of business application software-related decisions from the ICT unit to the other business units that use ICT for supporting their works and activities

AD6: change of the role of the ICT unit of your company: from provision of ICT services (through applications' development, software packages acquisition, systems administration and support) towards central coordination and support of the selection and use of various SaaS services, and also interconnection – integration of them with your own on-premises systems

SaaS benefits

To what extent has your company's use of SaaS provided the following benefits:

OP_BEN1: reduction of the cost of the electronic support of your activities and operations/processes

OP_BEN2: improvement of the quality of the electronic support of your activities and operations/processes (e.g. provision of more capabilities/functionalities, higher availability)

OP_BEN3: use and exploitation of new technologies to support your activities and operations/processes without the need for additional investments

INN_BEN1: rapid and low-cost electronic enablement of products/services innovations (=new products/services or significantly improved ones)

INN_BEN2: rapid and low-cost electronic enablement of innovations in your operations/process (=new operations/processes or significantly improved ones)

INN_BEN3: improvement of the 'organizational agility' of your company, defined as its ability to respond to various changes/challenges in its external environment (e.g. introduction of new products, services and pricing policies by competitors, changes in market demand

for your products and service, changes in customers' needs/preferences, opportunities for expansion in new markets)

Firm performance

How good has the performance of your company been in the last three years in comparison with your competitors in terms of:

FP1: profitability

FP2: sales revenue

FP3: market share

FP4: return on investment (ROI) (profits divided by the total assets of the company)

References

[1] A. Benlian, T. Hess, Opportunities and risks of software-as-a-service: findings from a survey of IT executives, Decis. Support. Syst. 52 (1) (2011) 232–246.

[2] S. Marston, Z. Li, S. Brandyopadyay, J. Zhang, A. Ghalsasi, Cloud computing – the business perspective, Decis. Support. Syst. 51 (1) (2011) 176–189.

[3] P.K. Senyo, E. Addaeb, R. Boatenga, Cloud computing research: a review of research themes, frameworks, methods and future research directions, Int. J. Inf. Manag. 38 (1) (2018) 128–139.

[4] W. Venters, E. Whitley, A critical review of cloud computing: researching desires and reality, J. Inf. Technol. 27 (3) (2012) 179–197.

[5] N. Wang, H. Liang, Y. Jia, S. Ge, Y. Xue, Z. Wang, Cloud computing research in the IS discipline: a citation/co-citation analysis, Decis. Support. Syst. 86 (2016) 35–47.

[6] R. Seethamraju, Adoption of software as a service (SaaS) enterprise resource planning (ERP) systems in small and medium sized enterprises (SMEs), Inf. Syst. Front. 17 (3) (2015) 475–492.

[7] J. Rodrigues, P. Ruivo, T. Oliveira, Software as a service value and firm performance – a literature review synthesis in small and medium enterprises, Procedia Technol. 16 (2014) 206–211.

[8] B. Iyer, J.C. Henderson, Business value from clouds: learning from users, MIS Q. Exec. 11 (1) (2012) 51–60.

[9] S. Malladi, M. Krishnan, Does software-as-a-service (SaaS) have a role in IT-enabled innovation? – an empirical analysis, Proceedings of American Conference on Information Systems (AMCIS), 2012, p. 2012.

[10] G. Garrison, R.L. Wakefield, S. Kim, The effects of IT capabilities and delivery model on cloud computing success and firm performance for cloud supported processes and operations, Int. J. Inf. Manag. 35 (4) (2015) 377–393.

[11] D.G. Schniederjans, D.N. Hales, Cloud computing and its impact on economic and environmental performance: a transaction cost economics perspective, Decis. Support. Syst. 86 (2016) 73–82.

[12] J. Goo, C.D. Huang, Facilitating relational governance through service level agreements in IT outsourcing: an application of the commitment–trust theory, Decis. Support. Syst. 46 (1) (2008) 216–232.

[13] J. Goo, R. Kishore, H.R. Rao, K. Nam, The role of service level agreements in relational management of information technology outsourcing: an empirical study, MIS Q. 33 (1) (2009) 1–28.

[14] L. Poppo, T. Zenger, Do formal contracts and relational governance function as substitutes or complements? Strateg. Manag. J. 23 (8) (2002) 707–725.

[15] W.M. Cohen, D.A. Levinthal, Innovation and learning: the two faces of R&D, Econ. J. 99 (397) (1989) 569–596.

[16] W.M. Cohen, D.A. Levinthal, Absorptive capacity: a new perspective on learning and innovation, Adm. Sci. Q. 35 (1) (1990) 128–152.

[17] D. Schlagwein, M. Hu, How and why organisations use social media: five use types and their relation to absorptive capacity, J. Inf. Technol. 32 (2) (2017) 194–209.

[18] S. Schneider, A. Sunyaev, Determinant factors of cloud-sourcing decisions: reflecting on the IT outsourcing literature in the era of cloud computing, J. Inf. Technol. 31 (1) (2016) 1–31.

[19] G. Hoetker, T. Mellewigt, Choice and performance of governance mechanisms: matching alliance governance to asset type, Strateg. Manag. J. 30 (10) (2009) 1025–1044.

[20] T. Huber, T. Fischer, J. Dibbern, R. Hirschheim, A process model of complementarity and substitution of contractual and relational governance in IS outsourcing, J. Manag. Inf. Syst. 30 (3) (2013) 81–114.

[21] M.C. Lacity, S. Khan, A. Yan, L.P. Willcocks, A review of the IT outsourcing empirical literature and future research directions, J. Inf. Technol. 25 (4) (2010) 395–433.

[22] H. Liang, J. Wang, Y. Xue, X. Cui, IT outsourcing research from 1992 to 2013: a literature review based on main path analysis, Inf. Manag. 53 (2) (2016) 227–251.

[23] I. Oshri, J. Kotlarsky, A. Gerbasi, Strategic innovation through outsourcing: The role of relational and contractual governance, J. Strateg. Inf. Syst. 24:3 (2015) 203–216.

[24] C. Qi, P. Chau, Relationship, contract and IT outsourcing success: evidence from two descriptive case studies, Decis. Support. Syst. 53 (4) (2012) 859–869.

[25] Y. Lu, K.R. Ramamurthy, Understanding the link between information technology capability and organizational agility: an empirical examination, MIS Q. 35 (4) (2011) 931–954.

[26] E.A. Whitley, L.P. Willcocks, Achieving step-change in outsourcing maturity: toward collaborative innovation, MIS Q. Exec. 10 (3) (2011) 95–107.

[27] Z. Cao, F. Lumineau, Revisiting the interplay between contractual and relational governance: a qualitative and meta-analytic investigation, J. Oper. Manag. 33–34 (2015) 15–42.

[28] P.J. Lane, B.R. Koka, S. Pathak, The reification of absorptive capacity: a critical review and rejuvenation of the construct, Acad. Manag. Rev. 31 (4) (2006) 833–863.

[29] S.A. Zahra, G. George, Absorptive capacity: a review, reconceptualization, and extension, Acad. Manag. Rev. 27 (2) (2002) 185–203.

[30] H.W. Chesbrough, Open Innovation: The New Imperative for Creating and Profiting from Technology, Harvard Business School Press, Boston, MA, 2003.

[31] A.L. Leal-Rodríguez, J.A. Ariza-Montes, J.L. Roldán, A.G. Leal-Millán, Absorptive capacity, innovation and cultural barriers: a conditional mediation model, J. Bus. Res. 67 (5) (2014) 763–768.

[32] N. Murovec, I. Prodan, Absorptive capacity, its determinants, and influence on innovation output: cross-cultural validation of the structural model, Technovation 29 (12) (2009) 859–872.

[33] A. Ragowsky, P. Licker, J. Miller, D. Gefen, M. Stern, Do not call me chief information officer, but chief integration officer: a summary of the 2011 Detroit CIO roundtable, Commun. Assoc. Inf. Syst. 34 (1) (2014) 1333–1346.

[34] S. Rogelberg, J. Stanton, Introduction: understanding and dealing with organizational survey nonresponse, Organ. Res. Methods 10 (2) (2007) 195–209.

[35] P.M. Podsakoff, S.B. MacKenzie, J.Y. Lee, N.P. Podsakoff, Common method biases in behavioral research: a critical review of the literature and recommended remedies, J. Appl. Psychol. 88 (5) (2003) 879–903.

[36] N. Roberts, Absorptive capacity, organizational antecedents, and environmental dynamism, J. Bus. Res. 68 (11) (2015) 2426–2433.

[37] Y. Chen, Y. Wang, S. Nevo, J. Jin, L. Wang, W.S. Chow, IT capability and organizational performance: the roles of business process agility and environmental factors, Eur. J. Inf. Syst. 23 (3) (2014) 326–342.

[38] J.F. Hair, C.M. Ringle, M. Sarstedt, PLS–SEM: indeed a silver bullet, J. Mark. Theory Pract. 19 (2) (2011) 139–151.

[39] K. Wong, Partial least squares structural equation modeling (PLS–SEM) techniques using SmartPLS, Mark. Bull. 24 (1) (2013) 1–32.

[40] C. Fornell, D.F. Larcker, Evaluating structural equation models with unobservable variables and measurement error, J. Mark. Res. 18 (1) (1981) 39–50.

[41] J. Vega-Jurado, A. Gutiérrez-Gracia, I. Fernández-de-Lucio, Analyzing the determinants of firm's absorptive capacity: beyond R&D, R&D Manag. 38 (4) (2008) 392–405.

[42] S. Gao, W. Yeoh, S.F. Wong, R. Scheepers, A literature analysis of the use of absorptive capacity construct in IS research, Int. J. Inf. Manag. 37 (2) (2017) 36–42.

[43] N. Roberts, P.S. Galluch, M. Dinger, V. Grover, Absorptive capacity and information systems research: review, synthesis, and directions for future research, MIS Q. 36 (2) (2012) 625–648.

[44] P. Mell, T. Grance, The NIST Definition of Cloud Computing, National Institute of Standards and Technology (NIST), 2011, pp. 1–3.

[45] L. Willcocks, W. Venters, E.A. Whitley, Cloud sourcing and innovation: Slow train coming? Strategic Outsourcing: Int. J. 6 (2) (2013) 184–202.

Euripidis Loukis is a full Professor in Information and Decision Support Systems of the Information and Communication Systems Engineering Department, University of the Aegean. Previously he has taught at the Postgraduate Program 'Athens MBA'. Also, he has been Information Systems Advisor at the Greek Ministry to the Presidency of Government, and National Representative of Greece in the Programs 'Telematics' and 'IDA' (Interchange of Data between Administrations) of the European Union. He has conducted extensive research in the areas of e-government, ICT adoption and impact, and decision support systems, and is the author of > 200 refereed publications in these areas. He has been honored with the International Award of the American Society of Mechanical Engineers (ASME) – Control and Diagnostics Committee, the Best Paper Award of the European and Mediterranean Conference on Information Systems (EMCIS) and the Most Innovative Research Award of the IFIP e-Government/e-Participation Conference. More information: http://www.icsd.aegean.gr/icsd_en/prosopiko/members.php?category=dep&member=46.

Marijn Janssen is a full Professor in ICT & Governance and Chair of the Information and Communication Technology (ICT) research group of the Technology, Policy and Management Faculty of Delft University of Technology. His research is focused on ICT-decision-making in situations in which multiple public and private organizations need to collaborate, in which ICT plays an enabling role, there are various ways to proceed, and socio-technical solutions are constrained by organizational realities and political wishes. He is Co-Editor-in-Chief of Government Information Quarterly (GIQ), Associate Editor of Decision Support Systems (DSS) and the International Journal of *E*-Government Reseach (IJEGR), conference Chair of IFIP EGOV series and is chairing tracks at the DG.o, ICEGOV, HICCS, ICIS and AMCIS conferences. He was ranked as one of the leading e-government researchers in surveys in 2009, 2014 and 2016, and has published over 500 refereed publications. More information: www.tbm.tudelft.nl/marijnj.

Ianislav Mintchev received his first Degree in Information and Communication Systems Engineering from the Aegean University, Greece, in June 2016, with distinction. His final Thesis project on "Factors affecting Cloud Computing benefits and its impact on firm's performance" was carried out at the Delft University of Technology with scholarship through the Erasmus program. In 2016 he started his professional doctorate in engineering at the Eindhoven University in Software Technology. During his Postmaster in Software Technology he did an internship at European Space Agency (ESA), as well as another internship at Philips. Later, he worked on a confidential ten-month project as software designer at ASML by solving a problem that its biggest clients, such as Intel and Samsung, were facing during the manufacturing process of their integrated circuits. Currently, he is working as embedded software engineer at Bosch Security Systems in projects aiming at the enhancement of the airports.