LOOKING BEHIND THE STAGE: INFLUENCE AND EFFECT OF SOFTWARE-AS-A-SERVICE ON SOCIO-TECHNICAL ELEMENTS IN COMPANIES

Complete Research

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Abstract

With Software-as-a-Services (SaaS), benefits such as cost efficiency and flexibility gains are associated, which drive decision-makers to increasingly take this technology into account not only for supporting business processes, but also for core business processes. However, the trailing IT organizational impacts of SaaS integrations after the implementation phase often remain hidden. This paper examines the effects of SaaS on the perceived technical change radicalness and the perceived IT organizational changes from the perspective of the socio-technical systems theory. We derive a research model that is suited to IT employees at SaaS using companies to investigate the changes in their daily tasks. The model is tested with data collected from 66 IT employees from various sectors in German-speaking countries. The empirical results indicate that an increasing SaaS usage level leads to instability in the socio-technical balance of using companies. Especially the perceived individual job outcome, a measure for soft facts such as job satisfaction, indicates that SaaS affects internal IT employees in a negative sense. Our valuable findings help management to understand the need for balancing both their willingness for SaaS adoption and the social impacts. The understanding of this interrelation helps the enforcement of more sustainable SaaS implementations.

Keywords: Software-as-a-Service, Socio-technical systems theory, IT restructuring, IT organization

1 Introduction

The ease of use of Software-as-a-Service (SaaS) and the related advantages such as cost efficiency and scalability (Youseff et al., 2008; Marston et al., 2011) should not obscure the fact that SaaS may have extensive impacts on a company´s organizational IT structure. Literature argues that SaaS may adversely affect the complexity of managing the whole infrastructure of disparate information architectures and distributed data as well as software along internal and external data streams (Leimeister et al., 2010; Hoberg et al., 2012). Generally, the National Institute of Standards and Technology defines the term cloud computing (CC) as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell and Grance, 2011). But CC does not represent a new technology. Rather, it stands for a new paradigm for IT processes by consistently linking individual, existing technologies (Youseff et al., 2008; Leimeister et al., 2010). The majority of the research literature outlines three service models (Leimeister et al., 2010; Mell and Grance, 2011): "Infrastructure-as-a-Service (IaaS)", "Platform-as-a-Service (PaaS)", and finally SaaS. The focus of our investigation is SaaS, which ranges from simple supporting services such as travel management up to complex enterprise resource planning systems. With SaaS, there is a shift to asset free IT provisioning models where highly scalable hardware, software, and data resources are available by means of a network (Bharadwaj et al., 2013). The SaaS end user is able to obtain complete software services from encapsulated functions directly from the provider via the web, at any location and at any time (Bardhan et al., 2011), essentially, many key processes bypass the internal IT departments. By the construction of SaaS, specific tasks such as software customizing and engineering, which were mostly proceeded internally, switch to the CC provider (Marston et al., 2011). Contrary, other internal tasks change or gain even more attention, e.g., IT security and IT architecture management (Loske et al., 2014; Gupta et al., 2013). Having this constellation in mind, it is likely that, depending on the degree of SaaS usage, the company´s existing IT competences and organizational IT structures are unsuitable. In particular internal IT employees, who are responsible for managing SaaS processes, may experience major changes and disruptions in their daily work processes after the implementation of such systems. This is especially valid when SaaS is used for core business processes as these processes are often more complex and require special skills for the related job tasks. Consequently, internal IT employees may develop negative reactions toward these new systems (Venkatesh et al., 2010; Boudreau and Robey, 2005; Volkoff et al., 2007). Therefore, it is important to study how IT employees perceive changes in their work processes following a SaaS implementation in order to understand reactions and associated outcomes to these systems. Indeed, prior research has investigated many aspects of SaaS such as provider selection (e.g., Wind et al., 2012; Hoberg et al., 2012), or implementation processes (e.g., Low et al., 2011). However, organizational impacts of SaaS are assumed so far mostly argumentative-deductive and existing papers tackle the topic rather superficially on macro-level (Morgan and Conboy, 2013; Marston et al., 2011). For example, there has only been very limited research focusing on how IT employees react to new SaaS systems that change their work processes. Furthermore and to the best of our knowledge, there is no empirical research up to now that explores the SaaS implementation impact on IT-employees´ job outcomes and process performance. Such research will contribute to both CC research and organization management literatures and will be considered a valuable work at the intersections of these two fields. We seek to address these topics by conducting an individual-level research. Herein, we draw on socio-technical systems (STS) theory, an influential theory from organizational behavior, that has been widely used to study IT implementations and IT enabled changes in organizations (e.g., Lyytinen and Newman, 2008; Bala and Venkatesh, 2013). We focus the following two research questions:

- *Do IT employees´ tasks change significantly when using public SaaS for core business processes?*
- *Do IT employees´ perceptions of their individual job outcome and their individual work process performance change significantly when using public SaaS for core business processes?*

This paper is structured as follows. In the next section, we review previous research and discuss the theoretical foundation of this study. In section three, we derive our research model and the related hypotheses. In section four, we delineate our research methodology followed by the results of the data investigation. The subsequent discussion section highlights the important findings before we summarize the implications and limitations of this study. Finally, we conclude the paper in section six.

2 Theoretical Foundation

2.1 Previous research

At the outset of this study, we conducted a systematic literature review (Webster and Watson, 2002) by searching the databases of the top 30 IS journals according to the AIS journal ranking list, the proceedings of major IS conferences (ICIS and ECIS) as well as the Digital Libraries of ACM and IEEE for relevant extant research. We used the following search terms for the article title and article abstract: (cloud OR saas OR outsourc*) AND (organization* OR social OR employ*). As a result of, we found that even though the papers describe the three CC service types, they tend to analyze and discuss CC on the overriding level and miss conclusions for the specific CC types. Nevertheless, we identified two broad fields of research that are relevant to the present study. The ***first field*** focuses the overall business impact of CC on company´s internal organizational processes, whereby the social perspective represents just a slice of the cake. Within this field, we found 28 papers, whose publication years range from 2008 until 2014. The ***second field*** targets the interrelation between various more matured information systems and IT organizational fits, especially by the means of IT capabilities and IT knowledge. Thus, the latter field starts at an even earlier stage and covers a broader spectrum.

While analyzing research in the first field, we found that the majority of papers put special emphasis on the CC advantages when discussing the impacts on employees of cloud-using organizations. For instance, Marston et al. (2011) and Leimeister et al. (2010) underline the potential interoperability between employees of diverse functions. Furthermore, end users are able to make full use of the company´s information systems when also using less powerful devices like smartphones or tablets. This is confirmed by Polyviou et al. (2014), who write that portability is the most important implementation factor directly after cost advantages. Further, researchers argue that the end users´ job performance increases by being less dependent on in-house IT staff and having a higher ease of use (Gupta et al., 2013; Meer et al., 2012). When particularly focusing on internal IT employees, the statements become noticeably more differentiated. Here, the authors see strategic issues not only because CC usage is linked to large changes in the corporate IT structure and resulting in a host of intra-organizational challenges. Morgan and Conboy (2013) used the technological-organizational-environmental framework as a theoretical base for analyzing three case companies. Within the organizational sphere, they found that IT managers´ "fear of losing control" over their IT environment represents a major factor in the decision whether or not to use CC. Further, there is an implicit anxiety that IT employees´ jobs are getting obsolete. They conclude that adjusting skills and capabilities to suit the cloud landscape is essential. The arising challenges towards the IT employees' qualifications are also largely discussed by Janssen and Joha (2011). Interestingly, though, Lee et al. (2013) found that social factors like IT qualification and culture were most likely to hinder CC adoption in South Korea, even more than risk concerns. However, the studies by Malladi and Krishnan (2012), Alshamaila and Papagiannidis (2013), and Low et al., (2011) indicate that there is no significant influence of CC adoption on IT employees´ perceptions. Hence, as can be derived from the stated papers, it is important to differentiate between the CC effects of diverse stakeholders as the preconditions are fundamentally different.

The second field focuses impacts of more matured IT systems on organizational transformation and business performance. Hong and Kim (2002) noticed a remarkably high failure when implementing enterprise resource planning (ERP) systems during the 1990s. Their study explores the root of the high failure rate from an "organizational fit of ERP" view. The origin of the issue goes back to the fact that

companies shifted from in-house developed software to purchased applications often without the necessary adjustments in internal IT departments. The importance of social and technical alignment was emphasized by the studies of Sykes et al. (2014), Bala (2013), Wang (2010), Wang et al. (2006), and Lee et al. (2004) as well. In contrast, Brynjolfsson et al. (2000) focus on correlations between use of information technology and the needed extent of organizational change. They state that the correlations of both these factors and measures of the economic performance are not sufficient to prove that these factors are complements. Sabherwal et al. (2006) empirically tested the influence of the individual determinants on the success of information systems by means of a meta-analysis from 121 studies between 1980 and 2004. Their results underline the importance of user-related and contextual attributes for IT success. Surprisingly, in this study, user attitude has an extreme high influence on system quality. Ho et al. (2003) investigate "spin-offs" (due to IT changes), a procedure for outsourcing complete internal IT departments (including employees, systems, and operations) to separate external entities. Hence, internal IT employees change their role to external contractors. Findings of the survey show that the presence of strong ties between IT manager and contractor and the lack of prior outsourcing experience increase the persistence of managerial expectations. Even if "spin-offs" constitute an extreme form of transformation, the second research field indicates that the need for social and technical alignment was underestimated in the near past, when implementing new IT systems.

2.2 Socio-technical systems theory

This study is grounded on the STS theory (Rousseau, 1977), which is recognized as one of the most influential theories in explaining and analyzing a wide range of organizational behaviors across a variety of IT enabled changes (Venkatesh et al., 2010). A STS is any construct in an organization consisting of two interrelated subsystems that have independent origins but one conjointly goal to manage – the social subsystems (people and social structures) on the one hand and the technical subsystem (techniques and task) on the other (Venkatesh et al., 2010; Rousseau, 1977). The basic idea of STS theory posits that the social and technical subsystems recursively interact with each other to complete a joint optimization or a bilateral alignment – a state of system equilibrium that involves stable interrelationships within and across the components of these two subsystems (Lyytinen and Newman, 2008; Rousseau, 1977). Such a joint optimization is required for increasing business performance, reducing unintended deviation, and accomplishing general socio-technical system goals (Bostrom and Heinen, 1977; Rousseau, 1977). In aspects of this paper, a specific thesis of STS theory is especially important. The theory propagates that if there is an internal or external change in the arrangement of one of the subsystems, there will be instability in the overall system. This may lead to a high level of individual negativity towards the system. Therefore, individual perceptions and anxieties should be considered whenever changes are made in subsystems (Holman et al., 2005). Out of the vast amount of research using STS theory, the studies by Venkatesh et al. (2010) and Bala (2013) are especially relevant to our paper. These studies investigate organizational behavior on individual level or micro level by analyzing perceived changes during IT implementations. And both studies find STS theory particularly suitable for understanding the IT influences on work life balance and job outcomes.

Following Marston et al. (2011), we assume organizational misalignments and/or instabilities to occur in the STS equilibrium immediately after public SaaS and associated IT processes have been adopted for a company's core business processes. Even though the company expects overall long-term benefits related to the SaaS adoption (e.g., financials, firm performance), a considerable amount of time and effort is required for the social subsystem to react accordingly to the technical changes and vice versa. Given that the focus of this study is to understand how especially IT employees react on the trend on SaaS usage, we adopt STS theory for our study. While STS theory may be applied to virtually any behavior, it is plausible to expect that STS also provides an appropriate framework to explain an IT employee's behavior on SaaS. And although the hypotheses have their roots in that historical theory, we involve the latest theoretical and empirical research on SaaS that is relevant to our context. We believe STS to specifically provide our study with an adequate theoretical lens for the following reasons.

First, STS captures information about technical influences and social behavioral factors. These factors are deemed important in this study as we set out to explain IT employees´ individual perceptions in the organizational context, in which perception and behavior are likely to be influenced by already adopted SaaS as well as by the company's general intention to make increased use of SaaS. This calls for the need to consider IT employees´ perceptions and thus for the application of the STS theory as a general framework. Second, while still adhering to the STS theory, we follow Rousseau (1977) whose findings allows us to analyze the STS belief constructs individually to provide a deeper understanding about specific underlying factors that influence an IT employee's perception of changes due to SaaS. Therefore, we incorporate additional constructs into the model. The third reason why the application of STS is a suitable approach is that it aids us to predict and understand an employee's perceptions on SaaS adoption. According to Venkatesh et al., (2010), each belief construct reveals a different aspect of the behavior which can serve as a point of effect in an effort to change it. Researchers argue that before enacting interventions to organizational changes, it is crucial to understand which organizational elements are influenced by SaaS usage (Polyviou et. al., 2014; Leimeister et al., 2010). Thus, adopting STS eventually supports us in our intention to formulate managerial recommendations that address salient beliefs and thus facilitate IT departments to act in accordance with corporate objectives.

2.3 Research model and hypothesis

In this section, we derive the research model that aims to explain IT employees' perceptions on changes resulting from SaaS adoptions. Herein, we explicitly consider public SaaS. We separate the four major STS constructs organizational structure, people, tasks, and technology (Venkatesh et al., 2010) and deduce important antecedents based on extant research. Subsequently, we further elaborate our model by including a conceptualization of all relevant constructs. Starting with the technical subsystem, companies hope to gain a lot from public SaaS. The expected benefits include in particular cost advantages, efficient cross-company coordination, process performance increases, and higher process flexibility (Bharadwaj et al. 2013; Wind et al., 2012). Some researchers argue that public SaaS will bring new, and as yet unknown, innovation to adopting companies (McAfee, 2011; Marston et al., 2011). And even security might be a reason to move towards the cloud, especially when companies suffer from low security levels and hope to increase their IT security standards in this way (e.g., Cho and Chan 2013; Li et al. 2012). Therefore, the reasons for SaaS implementations are manifold and cannot be generalized. However, this study does not focus on macro-level cognitions and intentions but on individual-level. Previous studies have yielded important theoretical foundations regarding the influences on employees´ intentions to use various technologies (especially in the context of technology acceptance, e.g., Rogers, 2003). At the organizational-level of the analysis, the independent variable reflecting the increased usage (from the view point of the IT employee) is operationalized as the ***company´s increasing SaaS usage (CISU) for core business processes***. Public SaaS solutions are available for various applications, ranging from simple supporting services to comprehensive services that support a company´s core processes. As we assume that internal IT departments that adopt public SaaS for core processes face even bigger changes and challenges, also the forthcoming constructs and relations are all the more valid than in the cases in which SaaS is used for supporting processes only. Regarding the perceived technical change, we would like to aggregate this to three main topics that we derived from literature: IT security, IT architecture, and interfaces.

Almost all papers that discuss CC threats and technical challenges argue that security tasks change dramatically (e.g., Martson et al., 2011; Cegielski et al., 2012; Benlian et al., 2010). Working with CC providers who operate globally distributed networks of datacenters, the cloud service may face specific security risks (i.e. terrorism or cyber-attack) and may also present unique legal issues regarding liability for security infringement (Marston et al., 2011; Brender and Markov, 2013). Internal IT security knowledge is needed to evaluate these risks and advise internal process owners accordingly. The security changes associated with any offsite hosting of data and services (i.e. outsourcing or cloud) include the determination of who has access to customer data, denial of service attack prevention, perimeter

security policy, resource starvation, data backup, and compliance. This leads us to the variable ***perceived IT security changes (PISC)*** caused by SaaS adoption. Furthermore, transparent and clear interface configurations between internal systems and the provider are highly relevant and needed for an ease of data exchange. Unfortunately, this topic is not discussed largely in literature up to now. The SaaS provider makes his service available through a standard interface. Customer-specific configurations can only be made at the meta-data layer on top of the common code using interfaces provided by the vendor (Benlian et al., 2010). This operational topic may get even more complicated when customized cross-company SaaS is used. It is through the interfaces with the external environment that organizations expose themselves to the associated technical uncertainty (Cegielski et al., 2012), which leads us to the variable ***perceived interface configuration changes (PICC)***. And finally, it is important to access services and systems across platforms and infrastructures that interact smoothly with each other (beyond operational interface configuration). Hence, in order to be in a position to exchange data, have seamless access across physical locations, provide multiple entry points for users, and support a wide variety of data types, a suitable IT landscape is needed (Malladi and Krishnan, 2012; Venters and Whitley, 2012). This aspect is operationalized as ***perceived IT architecture changes (PIAC)***. However, with an increasing rate of SaaS changes and SaaS usage, all three factors will even more intensify the dependent variable ***perceived technical change radicalness (PTCC)***, a representative for an individual´s ability to understand and predict the relevant steps in specific core work processes. Herein, radicalness constitutes the degree of novelty, lack of experience, or departure from existing knowledge and practices (Aiman-Smith and Green, 2002). Thus, we hypothesize:

- H1: *The higher the perceived task changes in (a) IT security, (b) interface configurations, and (c) IT architecture due to SaaS usage, the higher will be the perceived technical change radicalness.*
- H2: *The higher the company´s increasing public SaaS usage, the higher will be (a) the perceived technical change radicalness and (b) the perceived IT organizational change.*

Building on the social aspects of STS theory, we suggest that when companies adopt SaaS and IT employees experience changes in the material aspects of their work processes (Pentland and Feldmann, 2008; Marston et al., 2011), employees will make needed adjustments to their work processes in order to achieve stability and/or a joint optimization that is necessary to cope with such changes (Lyytinen and Newman, 2008). Some internal IT employees may experience an increase in complexity of their work processes while others may feel a decrease compared to the pre-implementation assessment of work process complexity (Bala, 2013). Traditional STS-theory postulates that with the adoption of new IT, the skill variety will be enlarged. In particular, the scope of a job increases through extending the range of job duties, the responsibilities, and the employee-task relationship (Steers and Porter, 1991; Venkatesh et al., 2010). Considering SaaS, these traditional cognitions are only partly valid since some tasks will be enlarged (e.g., provider management, IT security management) while other tasks will be transferred to the CC provider (e.g., server administration). Being more specific, we follow Bala (2013) by stating that complexity will change in terms of "component complexity". That is, an IT employee involved in SaaS implementation and operation may experience an increasing number of distinct elements or components (e.g., activities, information and resource requirements) related to his or her work processes that he or she needs to handle. As the amount of components increases in an IT employee's daily work processes, the knowledge and skill requirements for carrying out these work processes also increase, which potentially leads to information overload and task conflicts (Wang, 2010; Campbell, 1988; Wood, 1986). Further, changes in different components of work processes can thus create a shift in the knowledge or skills required for execution (Wood, 1986). This misalignment in the socio-technical state has to be addressed accordingly within the IT organization. Finding the correct level of adjustment is particularly problematic during the early stages of SaaS implementation when community know-how is limited (Wang and Ramiller, 2009). We consider the component complexity aspects with the variable ***perceived IT organizational change (PIOC)*** and thus hypothesize:

- H3: *The higher the perceived technical change radicalness caused by the public SaaS implementation, the higher will be the influences on the perceived IT organizational change of the company.*

Finally, from our point of view, the alignment between the social and the technical sub-system can be measured by two dependent variables: ***perceived individual job outcomes (PIJO)*** and ***perceived individual process performance (PIPP)***. In aspects of *perceived job outcomes***,** we suggest that perceived technical and organizational changes will influence individual´s outcomes following the adoption of SaaS. In the organizational domain change literature, there is common sense that employees are primarily concerned with the impact of an organizational change on themselves and their work (e.g., Lau and Woodman, 1995; Rafferty and Griffin, 2006; Bala, 2013). An increasingly complex work process is difficult to execute because of increased components, conflicting interdependencies among the components, uncertainties associated with the components, and the lack of understanding (e.g., knowledge and skills) of the components (Blecker and Kersten, 2006). Within our research model (cf. Fig. 1), we investigate individuals´ *perceived job outcomes* by considering the following soft facts as items (e.g., Sykes, 2014; Venkatesh et al., 2010): job satisfaction, job acceptance, and job significance. If IT employees perceive a radical change in their work processes, it is likely to affect their job outcomes. As noted earlier, a radically different work process entails a new and/or different set of task and/or different information and resources. Some IT employees may find it difficult to include and act upon this radically different configuration of material aspects of their work processes. Existing literature and STS theory have found out that employees like to preserve the status quo in their work and create robust, deep process and structures (e.g., habits; Gersick, 1991). When there are changes inflicted on their habits, it is more probably that their individual job performance will be impacted as they attempt to cope with these changes (Beaudry and Pinsonneault, 2005). Moreover, radically changed tasks and structures are likely to evoke negative affective reactions among IT employees because they have to deviate from their prior routines, habits, and relationships that were substantiated over time and are a source of their success (Bala, 2013). In addition to influencing IT employees' job outcomes, we suggest that changes (increases or decreases) in perceived process complexity will influence employees' *perceptions of individual job process performance*. Drawing on the conceptualization of business process performance at the macro level (e.g., Nyaga et al., 2010), we follow Bala (2013) by defining process performance as the extent to which an employee believes that he or she is able to execute his or her work processes effectively and efficiently. Although it is a subjective evaluation, we assume that it is critical to understand if specific changes in work process will impact IT employees' self-assessment of the effectiveness and efficiency of process performance. When internal IT employees perceive that they are not able to execute their tasks effectively and efficiently, it is more likely that the SaaS adoption will not be advantageous to an organization. Thus, we hypothesize:

- H4: *The higher the perceived technical change radicalness caused by SaaS adoptions, the higher will be the negative influence on (a) perceived job outcomes and (b) perceived process performance.*
- H5: *The higher the perceived IT organizational change caused by SaaS adoptions, the higher will be the negative influence on (a) perceived job outcomes and (b) perceived process performance.*

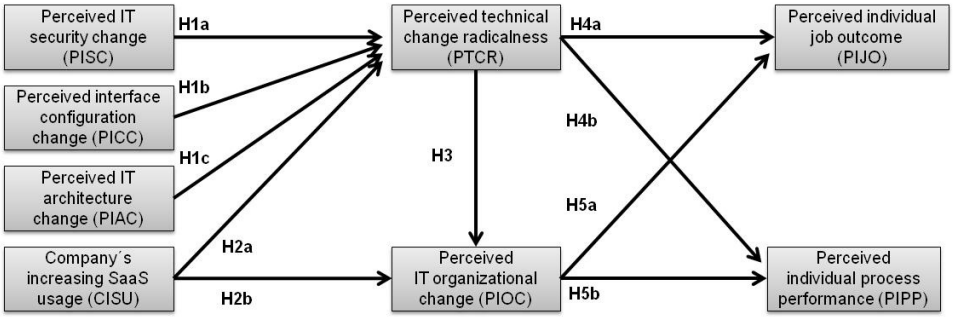

Figure 1. Research model

3 Research Methodology

3.1 Item development and pretesting

In an effort to test our research model in a quantitative manner that allows to statistically generalize the outcomes, we carried out a cross-sectional survey (Pinsonneault and Kraemer, 1993). The paper´s underlying measurement and analysis methods are described subsequently. In order to create suitable measurement items for this research, we first reviewed extant theoretical and empirical literature. Where feasible, we adopted measurement items of the constructs based on existing research and modified these to make them appropriate for our context. All constructs in the determined model are operationalized as reflective constructs following the proposed decision criteria presented by Jarvis et al. (2003) and Petter et al. (2007). The constructs were measured with multiple items on five-point Likert scales. We asked not only for dependent and independent variables, but also for control variables. We created an online questionnaire which was tested in two rounds of personal interviews with four different research colleagues at our institution. During the first round of interviews, we presented and discussed all initial measurement items with the interviewees. Based on the feedback that we received, several items were revised and simplified (MacKenzie et al., 2011). After the first round revisions, we again asked our colleagues for a second feedback. As a consequence, we revised some wordings to clarify ambiguous items and further enhanced the sequence of the questions which were purposefully randomized (Straub et al., 2004). (cf. appendix for details on single constructs).

3.2 Data collection

To test the proposed research model, we administered an online questionnaire and used two professional network platforms (xing.com and linkedin.com) to contact our target respondents directly. The data collection took place between April and August 2014. We especially searched for IT professionals who have at least two years of experience with SaaS implementations at using companies in German speaking countries (Germany, Austria, Swiss). Hence, we excluded IT professionals from SaaS providers, since the research model does not suit their individual job situation. Further, in the survey, we asked for SaaS usage in core business processes only, as we assume them to be more complex and more important not only for the company but also for the IT departments. Knowing that the differentiation between a core business process and a non-core process is difficult, we left it up to the subjective determination of the IT experts. Furthermore, we kindly asked to consider only the deployment type "public" SaaS, as the other services (private, hybrid, community) show a lower degree of outsourcing and hence involve smaller organizational changes. Due to these strong searching restrictions, we only received 102 completed questionnaires from IT professionals. Initially, 21 of the respondents had to be excluded from our sample as they were not well experienced in SaaS usage in their workplace (less than two year SaaS experience) although their profile indicated this. Additionally, we excluded another 15 from the remaining 81 respondents during data screening (Marcoulides and Saunders, 2006), because of unreliable responses (i.e., answering all questions with 5). Eventually, a sample of 66 usable and completed questionnaires was used in the data analysis, which corresponds to an actual response rate of 22.0 percent. Thus, with 66 usable questionnaires, we met the often applied rule of thumb which determines a minimum necessary sample size for PLS analysis, i.e., ten times the largest number of independent latent variables impacting a particular dependent variable in the inner path model (Chin 1998). A Monte Carlo simulation performed by Chin and Newsted (1999) indicated that PLS can adequately be performed with a sample size as low as 50. Moreover, a possible nonresponse bias was addressed by adopting the approach recommended by Armstrong and Overton (1977). We conducted the non-parametric Mann-Whitney U-Test (Mann and Whitney, 1947) to test for differences between the first third and the last third of the respondents' data. The test revealed no significant differences, so we concluded that non-response bias is not an issue in our study. As shown in Table 1, 63.6 percent of the 66 respondents in the final sample were male; and 34.9 percent were in the 40 to 49 age range. Further, 22.7 percent of the sampled employees hold an IT consultant role. The IT infra-

structure range also contains IT network engineering. Within the "other" range, there are roles included such as IT portfolio management, IT deployment, or IT project management. Looking at the branches, the automotive industry has the highest portion. Within the "IT" range, there are several industries included, for example, the printing industry (but not cloud providers).

Gender	Male: 63.6%				Female: 36.4%			
Age	20-29: 13.6%	30-39: 27.4%	40-49: 34.9%	50-59: 21.1%	> 60: 3.0%			
Position	Professional staff: 42.4%	First line supervisor:16.7%	Chief manager: 27.3%	Others: 13.6%				
IT job	IT consulting: 22.7%	IT infra-structure: 18.1%	IT architecture: 13.6%	Software engineering: 9.1%	IT service management: 9.1%	IT security: 9.1%	IT controlling: 7.6%	Others: 10.7%
Industry sector	Automotive: 22.7%	IT: 21.2%	Mechanical engineering: 16.7%	Banking: 12.1%	Chemical: 7.6%	Consumable goods: 7.6%	Others: 12.1%	

Table 1. Profile of respondents (n=66)

4 Data Analysis

4.1 Data analysis software

The structural equation modeling (SEM) was used to test the measurement and structural models. The component-based partial least squares (PLS) procedure was chosen and used for both the assessment of the measurement scales and the test of the research hypotheses. We decided to apply the PLS approach, instead of other SEM procedures, such as LISREL, because our response data do not follow a normal distribution which is not necessarily needed when applying PLS (Chin, 1998). For assessing the distribution of our construct indicators, we carried out the Kolmogorov-Smirnov test as well as the Shapiro-Wilk test. Further, compared with covariance-based SEM, PLS addresses the prediction of data and is basically more suitable for the explanation of complex relationships and considered robust to relatively small sample sizes (Chin et al., 2003; Fornell and Bookstein, 1982). To assess our model, we used the software application SmartPLS version 2.0.M3 (www.smartpls.com) for data analysis and closely followed the approaches given by MacKenzie et al. (2011) and Burda and Teuteberg (2013).

4.2 Measurement model assessment

First, we evaluated the individual item reliability and convergent validity of the defined constructs. Toward this end, we investigated the factor loadings of the individual items on their hypothesized constructs and the average variance extracted (AVE). All of the measurement items exhibit loadings that are significant at the 0.01 level on the hypothesized constructs and exceed the recommended minimum value of 0.707. Further, all AVE values are above the accepted minimum of 0.50, which indicates that the latent construct accounts for a minimum of 50 percent of the variance in the items. Thus, both conducted tests indicate an adequate degree of validity (Chin, 1998). In a second step, we assessed the discriminant validity of the defined constructs by comparing the square root of the AVE of each construct with all other inter-construct correlations. The results indicate that the measurement model shows sufficient discriminant validity. Here, the square root of the AVE for each of the constructs is greater than all other inter-construct correlations (Fornell and Larcker, 1981). Following the procedures by Gefen and Straub (2005), we also analyzed the cross loadings of the individual items. The test yielded that each item loading accounts for a minimum of 0.731 on the assigned target construct and is always smaller on other constructs which indicates adequate convergent and discriminant validity. Thirdly, we investigated the internal consistency and scale reliability by calculating the composite reliability (CR) and Cronbach's alpha (CA) values (cf. Table 2). The CR values for all of the con-

structs in our model are larger than 0.85 while the CA values are ranging from 0.73 to 0.85. This indicates a satisfactory reliability for both criteria since all values are above the generally accepted minimum thresholds of 0.6 or 0.7 respectively (Bagozzi and Yi, 1988; Gefen et al., 2000). Table 2 presents the outcomes of our assessment (cf. appendix for more details on the measurement model assessment).

	AVE	CR	CA	PIJO	PIPP	PTCR	PIOC	PISC	PICC	PIAC	CISU
PIJO	0.75	0.90	0.83	0.86							
PIPP	0.77	0.91	0.85	0.53	0.88						
PTCR	0.72	0.89	0.81	0.65	0.34	0.85					
PIOC	0.59	0.85	0.77	0.62	0.40	0.64	0.77				
PISC	0.66	0.85	0.74	0.69	0.43	0.76	0.68	0.81			
PICC	0.64	0.85	0.75	0.48	0.32	0.40	0.33	0.45	0.80		
PIAC	0.65	0.85	0.73	0.49	0.42	0.51	0.48	0.56	0.68	0.81	
CISU	0.65	0.88	0.82	0.53	0.36	0.62	0.58	0.64	0.29	0.35	0.80

AVE: Average variance extracted, CR: Composite reliability, CA: Cronbach's alpha,
Shaded cells: Square root of AVE

Table 2. AVE, reliabilities and latent variable correlations

4.3 Structural model assessment

As already mentioned, the structural model was estimated with the PLS approach. To test the significance of our loadings and coefficients, we conducted the bootstrapping re-sampling technique with 66 cases and 5,000 samples (Hair et al., 2013). In Figure 2, the estimates obtained by means of the PLS analysis are depicted, including standardized path coefficients, significance of the paths, and the amount of variance explained (R^2). Considering the R^2 values, Figure 2 shows that the determined model accounts for 49.2 percent of the variance in job outcome, 17.1 percent of the variance in process performance, 62.2 percent of the variance in perceived technical change, and 46.4 percent of the variance in perceived organizational change. The profiles of the respondents served as control variables: summed up, they account for an additional 2.9 percent in perceived job outcome and 0.9 percent in perceived process performance. Nevertheless, none of the path coefficients of our control variables on job outcome and process performance are significant. This is why we performed an additional analysis to examine the significance of the increase in R^2. Therefore, we first computed the effect size (f^2) of the control variables in accordance with Chin et al. (2003). Secondly, we conducted a pseudo F-test by multiplying the effect size by $(n - k - 1)$. Herewith, n is the sample size and k is the number of independent variables of the full model, i.e., including the five control variables (Mathieson et al., 2001). For job outcome and process performance, we calculated effect sizes of 0.07 and 0.06, which again implies only weak effects with an insignificant change in R^2 ($F = 0.95$, $p > 0.05$).

Acknowledging the significant path coefficients in Figure 2, Chin (1998) concedes a range of above 0.2 to be significant. This condition is not fulfilled by three paths (PICC>>PTCR, PIAC>>PTCR, PTCR>>PIPP). While the sizes of two of these paths coefficients show small but significant effects, we again conducted pseudo F-tests to examine whether the increase in the variance explained in PTCR and PIPP is significantly influenced by PIAC and PTCR, respectively. The test shows a little but significant effect size of 0.04 ($F = 4.19$, $p < 0.05$) for the path PIAC>>PTCR and no significant effect size for PTCR>>PIPP. Furthermore, we conducted a mediation test to determine whether PIOC mediates the PTCR. In line with Baron and Kenny (1986), mediation is given when the paths PTCR>>PIOC and PIOC>>PIPP are controlled, a previously significant relation between the independent (PTCR) and dependent variable (PIPP) is no longer significant. A full mediation would occur when the direct path PTCR>>PIPP is zero. With regards to Baron and Kenny (1986), our analysis in-

dicates that the influence of *perceived technical change radicalness* on *perceived individual process performance* is partly mediated by *perceived IT organizational change*. However, hypothesis H4b and H1b (marked with "n.s." in Fig. 2) are not supported, whereas the remaining hypotheses are supported.

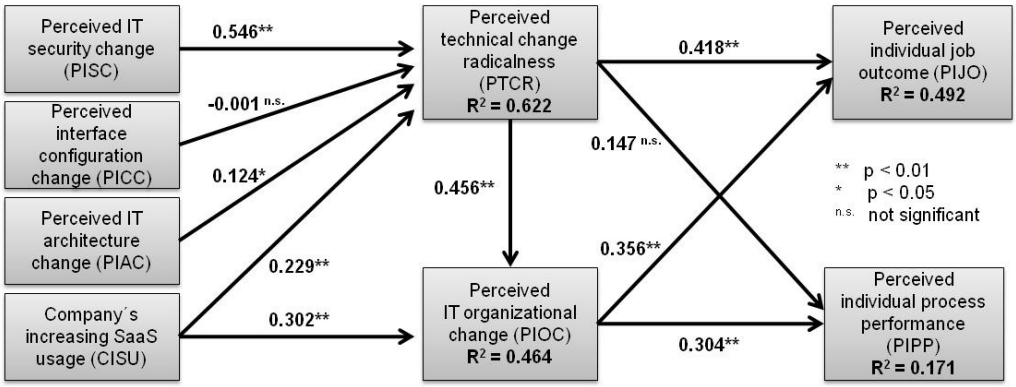

Figure 2. Results of the research model

5 Discussion

5.1 Summarization and interpretation of the results

This work makes several valuable contributions by empirically accomplishing two major objectives that have been derived from the research questions: 1) we examined the influence of the perceived technical task changes *(security, interfaces, architecture)* and *the company´s increasing SaaS usage* on *perceived technical change radicalness* and *perceived IT organizational changes*; and 2) we examined the overall impact of these changes on individual IT employees´ *perceptions of job outcomes* and *work process performance*. We developed a model consisting of eight constructs, that postulates that the higher the degree in *perceived security changes, IT architecture changes*, and the *company´s increasing SaaS usage*, the higher will be the *perceived technical change radicalness* in aspects of SaaS. Not surprisingly though, the *perceived IT organizational change* seems to be a lagging effect on *perceived technical change radicalness* with the second highest significance path coefficient in the model. These changes constitute an overall appraisal for the degree of perceived socio-technical change, as a mechanism through which especially the *perceived individual job outcomes* are affected negatively. Further, with an increasing level of perceived organizational changes through SaaS, IT employees experienced their *perceived individual process performance*, a subjective construct as well, to be decreasing. But this construct has the lowest R^2, which indicates that other factors, such as "perceived usefulness", might have an even more significant influence on the job performance. However, consistent with the STS theory and our research model, we find that public SaaS usage in core processes influences the social subsystem significantly in a negative sense. Overall, we receive good support for our theoretical model that is based on data collected from 66 IT experts.

5.2 Implications

This study makes three major contributions. First, it contributes to IT business process change literature. We found that while companies establish changes to the technical subsystems by introducing SaaS solutions and related business processes (cf. constructs CISU, PISC, and PIAC in Figure 2), internal ***IT employees may not always internalize these changes*** immediately (cf. constructs PTCR and PIOC in Figure 2). This may involve lower motivation, learning difficulties, as well as overall perceived decreases in efficiency and effectiveness. These attitudes and perceptions of the employees may lead to unfavorable actions and behaviors, which in turn may hinder success performance of SaaS business processes. Further, our findings indicate that in cases where the work processes resultant

from a SaaS implementation differ greatly from those prior to the SaaS solution, ***IT employees will take a longer time*** to achieve the state of joint optimization. It is likely that perceived radical changes due to SaaS (without an adequate involvement degree) can lead to an irreconcilable frustration. Hence, decision makers should involve all stakeholders in time. Although our measure of perceived organizational change is not an objective valuation of the degree in change, we found that it is a significant predictor of job outcomes and work process performance. It is probable that the initiator (e.g., end users, process owners, managers in construct CISU) of a SaaS implementation perceives the degree of radicalness as lower or ***has a less negative attitude towards SaaS*** than the related internal IT employees. Furthermore, looking through the lens of this paper, strongly fashion-driven SaaS implementations (Polyviou et al., 2014) ***are predestinated for forcing a partition*** between the IT employees and the rest of the company because of the likely missing social alignment. Thus, our recommendation for the "business process change" goes in line with Silver (1991) and Bala (2013). So, we propose to issue a joint-optimization-usage-guideline for related IT employees prior to the SaaS implementation in order to lower the perceived change radicalness. This could be enforced by the SaaS provider as well.

Second, this research contributes to the organizational change management literature. Prior research has already offered insights in factors that are relevant for successful organizational changes by discussing roles, responsibilities, management support, communications etc. (Cegielski et al., 2012; Leimeister et al., 2010; Malladi and Krishnan, 2012). Nevertheless, companies normally fail to manage organizational IT changes effectively (cf. section 2.1). Our results indicate that organizational ***changes are compellingly needed*** in cases where SaaS is used for core business processes intensively, as the new SaaS tasks differ greatly from the prior tasks (cf. PIOC in Figure 2). By the implementation of SaaS solutions, internal IT departments lose authority to some extent, and a hidden and ***reactive organizational restructuring process*** begins. This is indicated by the personal perceptions within our model and is also consistent with the founded job characteristics of Probst (2003). We found that perceived job outcomes (cf. PIJO in Figure 2), such as dissatisfaction or lower job significance, are strongly affected. Therefore, and due to the myriad of intended and hidden changes, we state SaaS implementations ***to be more challenging for companies*** than it may seem at first glance. Furthermore, our paper supports prior results in aspects of preexistent job uncertainties of internal IT employees (Morgan and Conboy, 2013). On those grounds, we recommend companies to proactively face organizational topics in order to avoid undesirable, hidden organizational reactions in the social sub-system.

Third, literature on CC argues that SaaS will bring new, and as yet unknown, innovation to adopting companies (McAfee, 2011; Marston et al., 2011). And due to the relatively low investments and the ease of testing services, the barriers inhibiting the innovation through SaaS are rather surmountable. However, in the context of our paper, thus, from the perspective of concerned, anxious IT employees, the predicted ***positive developments in the field of innovation would be unlikely*** to occur.

5.3 Limitations and future research

There are some limitations to be mentioned when interpreting the results of this paper. A key limitation of the paper is the sample, which is based on respondents' data from various regions of German speaking countries. Although the sample has a quite diverse set of data as to the respondents' characteristics, caution should be taken when these findings are to be ***generalized to other regions and countries***. This is because culture has not only been found to substantially affect negative and positive perceptions, but also other important IS phenomena such as technology acceptance or decision making (Leidner and Kayworth, 2006). Hence, to be able to generalize the findings, it is necessary to conduct additional studies with different sample demographics regarding the country and geographic region. Therefore, new datasets from distinct organizations ought to be collected. This would allow detailed analyses within one organization and an elicitation of context or organizational specifics. In a next step, these findings could be compared across countries and organizations. Another limitation lies in the ***cross-sectional design*** of this study which precludes a more dynamic view for understanding an IT

employee's perceptions over time. Although we based our research model on the established STS theory and a comprehensive literature review, a longitudinal design may provide a better understanding and confidence for the causes and consequences in IT employees' perceptions. As such, future research could proceed by surveying a group of individuals across time. Further, we did not differentiate between the ***various points in time*** after the implementation. Although SaaS is a specific deployment of CC, it is a quite new paradigm with strongly increasing usage rates (Van der Meulen and Rivera, 2014). Hence, up to now, almost all companies are unfamiliar with SaaS "cultures and strategies" (Marston et al., 2011). Prior research has suggested that there is a time lag before companies can benefit from new information systems (Sykes et al., 2014). Consequently, it is possible that the perceived degree in changes through SaaS and the perceived individual IT employee´s situation will go back to pre-implementation levels after a more extended period of time. Nevertheless, it is highly important to understand the occurring changes in job characteristics right after a SaaS adoption: because if companies are not able to manage the magnitude of the diversely perceived technical and social changes directly after the implementation, IT employees may take negative reactions, consistent with their perceptions (Herold et al., 2007), and may impede the increased SaaS usage in the long run. Hence, future research should investigate SaaS success in combination with IT employees´ perceptions at varying times after implementation. Further on, we distinguished between SaaS for core and non-core process only, while ***neglecting any further variations***. Towards this end, supply chain services could drive other findings than SaaS for financials. Moreover, we focused ***IT employees exclusively*** as we suggested that this organizational group is affected significantly by SaaS implementation (as indicated by our model). It would be a fruitful area for future research to investigate the expectations and perceptions of different company groups (e.g., end users, managers, IT employees) or even to include external providers. This would make insidious organizational restructuring processes more transparent and, at the end, facilitates the transfer from theory into practice. The fact that our research model exclusively investigates the ***perceived and subjective performance outcomes*** on an individual level constitutes another limitation of this paper, because the outcomes cannot necessarily be equated with the "real" and objective performance outcomes, neither of the individual IT employees, nor of the IT department.

6 Conclusion

We set out to examine the impacts of implementing SaaS on IT employees´ perceived job outcomes and work process performances. Thereby, we especially follow existing literature that states, mostly in an argumentative-deductive approach, that employees will experience significant changes in their workplace when SaaS is implemented (e.g., Marston et al., 2011). Our empirical results indicate that individual IT employees who deal with such implementations, of course experience significant changes in terms of technology and organizational processes. SaaS involves advantages such as interoperability, performance increase, or updates on-demand for both internal IT employees and the remaining stakeholders. But this paper hints at the fact that currently IT employees pay significant attention to the risks SaaS involves. Hence, management needs to understand both STS sub-systems in order to provide a profound implementation basis for sustainable SaaS usage. By means of a survey, this study empirically examines the cognitive and social factors that influence an IT employee's job perceptions from the date of the SaaS implementation. Up to now, there has been only little research regarding impacts of this kind. Moreover, the majority of papers discuss the business process changes in general terms instead of analyzing the perceptions of specific CC deployments or stakeholders. This research supports and extends recent works that examined the influence of CC on organizations (e.g., Morgan and Conboy, 2013; Lee et al., 2013; Malladi and Krishnan, 2012) as well as papers that investigate IT adoptions with the use of STS theory on an individual level (e.g., Sykes et al., 2014; Venkatesh et al., 2010). We have no doubt that a combination of both technological and socio-organizational measures is necessary for an effective SaaS integration management. Therefore, this research provides a deep understanding of IT employees' perceptions by highlighting the important factors that influence these perceptions. However, additional research is needed to generalize the findings of this study.

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Appendix

All additional tables to this paper are available online and contain additional information that had to be excluded from the present paper due to page limitations:

Table I: Variables and items of research model

Table II: Cross loadings

Table III: Mean, standard deviation, loading, T-statistics

The tables may be downloaded from:
https://www-assist.uwi.uni-osnabrueck.de/jede/looking_behind_the_stage_appendix.pdf