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DOES THE AUGMENTATION OF SERVICE LEVEL AGREEMENTS AFFECT USER DECISIONS IN CLOUD ADOPTION SCENARIOS? – AN EXPERIMENTAL APPROACH

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Research

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Abstract

Despite the benefits of cloud computing, customers are reluctant to use cloud services as they have concerns about data security and privacy. Many of these concerns arise due to the lack of transparency. Consequently, bridging the existing information asymmetry and, thus, fostering trust in the cloud provider is of high relevance. As service level agreements are an important trust building factor and due to their technical and complex nature, the augmentation of these is promising. Therefore, we investigate the effects of augmenting service level agreements (by means of augmented browsing) on the ease of the information gathering process and simultaneously on perceived information overload, comprehension and transparency in a web-based experiment. The results of our online experiment do not confirm our assumed positive effects of augmentation. Nonetheless, we show that the ease of gathering information about a cloud service positively influences the perceived trustworthiness. Furthermore, we demonstrate that the perceived trustworthiness of a cloud computing provider largely determines the intention to use its services. Thus, besides improving security, cloud providers not only have to communicate trust-critical information but also have to identify suitable measures of information provisioning that considerably improve transparency while lowering information overload.

Keywords: Cloud Computing, Augmentation, Information Overload, Comprehension, Transparency, Trust, Service Level Agreements.

1 Introduction

Despite many advantages like reducing costs and complexity as well as increasing flexibility (Armbrust et al., 2010), cloud computing still faces concerns regarding security and privacy (Ryan, 2011; Ko et al., 2011). By outsourcing data into the cloud ("cloudsourcing") the customer transfers the responsibility for and the control over these to a certain degree (depending on the chosen service model) to the provider (Sultan, 2010). The limitation of the level of (perceived) transparency (TR) leads to skepticism concerning the use of cloud computing on the customer side (Pearson and Benameur, 2010; Ko et al., 2011). Consequently, trust in the provider is of high relevance. One important trust-building factor is the service level agreement (SLA), which defines the "nature of the underlying service, target performance levels and obligations of the parties involved in the contract" (Stankov et al., 2012). SLAs contain terms and technical parameters that (potential) customers (in the following, *customers* means both *potential* and *current customers*) might only understand to a limited extent (Chakraborty and Roy, 2012; Milne and Culnan, 2004). As a consequence, the uncertainty and the possible misunderstanding of certain details can finally lead to a decision against the provider or the use of cloud computing services at all. Especially because SLAs are legally binding documents (Hedwig et al., 2011), it is important that all involved contracting parties fully understand the information contained herein. Therefore, providers should try to bridge the existing information asymmetry between customers and themselves in the sense of the principal-agency theory (Pavlou et al., 2007) as soon as possible. One possible solution to reach a higher (perceived) comprehension (CO) may be the augmentation of SLAs with background information. For example, terms can be enriched with their definitions or technical circumstances, which might seem to be complex for customers or are hard to understand (e.g., encryption methods of data during transfer) or they can be presented with explaining images or supporting information. Thereby, the digitalization of the information gathering process inter alia offers possibilities (i) to reduce the (perceived) information overload (IO), (ii) to sustainably improve the CO of information by the use of both multicodal and multimodal offerings, (iii) to increase the overall (perceived) ease of use (EOU) of the information gathering process and (iv) to *implicitly* suggest the customer that TR is desired from the provider's point of view by *explicitly* as well as proactively trying to bridge the existing information asymmetry and, thereby, rising the (perceived) benevolence as being part of the trusting beliefs (TB). Therefore, we want to investigate if the augmentation of specific terms in SLAs affects the (perceived) IO, (perceived) CO and (perceived) TR and ultimately the intention to use (ITU) or to adopt a cloud service.

From a practical point of view, up to now, the use of augmented SLAs in cloud computing environments is not common; the authors do not know a single provider enriching SLAs with information by means of augmentation. Additionally, from a scientific point of view, the body of knowledge is missing a synthesis of the topics *augmentation* and *SLAs* in particular. The results of such a research endavour would not only be interesting specifically for the context of cloud computing but also for other areas of application, where legally binding documents are used (e.g., terms and conditions). The corresponding research questions (RQ) are:

RQ1: Does the augmentation of SLAs in the context of cloud computing have an impact on the comprehension of technical terms and parameters?

RQ2: Does the provision of supplemental information in terms of augmented SLAs in cloud computing have an impact on the trust of (potential) customers in a cloud computing provider?

To answer these RQs, we first provide the theoretical background of our study with respect to augmented SLAs in the context of trust in cloud computing, IO, EOU, CO and TR. Second, we outline our methodical approach including our research design, its implementation and the data collection. Third, we describe the results in two parts: we present the effect of our experimental conditions on the independent variables, then we show the evaluation of the relationships that finally lead to the ITU a cloud computing service in a partial least squares (PLS) model. Lastly, we discuss our research findings, outline implications for theory and practice as well as limitations and future research directions.

2 Theoretical Background and Development of Hypotheses

2.1 Augmentation

The field of augmentation can be distinguished into several sub-scopes. For example, Ma et al. (2005) and Dimitrova et al. (2004) developed media augmentation in the context of the television program. In this case, the television program is enriched by additional content from websites (Ma et al., 2005; Dimitrova et al., 2004), e.g., by additional information on the news or background information on the actors in certain scenes. In addition, West et al. (2010) expand texts by topics related to the context; Ceglarek et al. (2011) try to improve the comprehensibility of texts by replacing specific terms with more general terms in dependence of the user.

In the context of augmented SLAs in cloud computing environments especially *augmented browsing* (AB) is of interest. AB means dynamically enriching a website with supplemental information without having the user to navigate to another website (Dai et al., 2011). Freundlieb and Teuteberg (2012) state that in information systems (IS) research the term *augmentation* is used in most cases in the sense of AB. In their study, sustainability reports are augmented with additional information according to the mouse position. Dai et al. (2011) focus on semantically annotating content, in their case search results from PubMed, a biomedical literature search engine. Additionally, in their paper, Carlson and Ruge (2014) present an approach for an augmentation of third-party websites with different contents in a context-sensitive way. Moreover, Carlson and Ruge (2014) define on-the-fly modifications of web content in order to individualize the browser experience for users. Examples for application areas are changing of user interfaces (e.g., hiding advertisements) and adding supplemental context-sensitive information (e.g., pop-up windows for the provision of annotations of scientific terms). In the context of our research approach an *augmented SLA* will be defined as the provision of supplemental information for an interested reader on demand by means of augmented browsing.

2.2 Trust in Cloud Computing

Trust is a complex concept, which has no universally accepted definition (Pearson and Benameur, 2010). For example, Lewis and Weigert (1985) state that there is a "[…] conceptual confusion regarding the meaning of trust […]", while Yamagishi and Yamagishi (1994) express that "trust is an elusive concept" and also Gambetta (1988) speaks of an "[…] elusive notion of trust". Depending on the discipline and the corresponding approach trust is interpreted differently. From an economic glance, trust is seen as rather calculatory or institutional, whereas psychologists focus mainly on characteristics and internal findings, both from trustor and trustee (Rousseau et al., 1998). One of the most often cited definitions of trust is the one by Mayer et al. (1995), who define trust as

> "*the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party.*"

Therefore, trust connects positive expectations with the willingness to take risks and to be vulnerable (Bijlsma-Frankema and Costa, 2005). Mayer et al. (1995) declare the trusting beliefs *ability* (TBAB), *benevolence* (TBBE) and *integrity* (TBIN) to be factors of perceived trustworthiness. In this context *ability* (also competence or expertise) comprises skills, competencies and characteristics that enable the trustee to fulfill the task assigned to him by the trustor. *Benevolence* (also motivation to lie, intentions or motives) is understood as the extent to which the trustee has a certain attachment to the trustor or, in other words, the extent to which the trustee's intentions are perceived as being good. *Integrity* (also value congruence, character, or fairness) comprises the definition of principles the trustor finds acceptable and the trustor adheres to. All of the three described factors finally lead to trust (Mayer et al., 1995). Depending on the point of view trust can be classified as interpersonal (between two individuals or groups), organizational (from one individual in an organization) or inter-organizational (organization as a collective in another one) (Zaheer et al., 1998; Mayer et al., 1995).

In the context of cloud computing there is also no universally accepted definition of trust (Ko et al., 2011). Primarily, trust in cloud computing mainly encompasses the trust in the provider, which is fundamental due to the shift of control and the missing transparency (Khan and Malluhi, 2010). That is, a customer has to trust the provider that he acts in his or her interest and delivers the cloud computing service(s) according to the contractually agreed provisions (Pearson and Benameur, 2010). Therefore, trust is a key factor, which can influence the decision of using a cloud computing service, especially when "cloudsourcing" sensitive information (Ko et al., 2011; Pearson and Benameur, 2010). Thus, we hypothesize:

H1: A customer's (perceived) trust in a cloud computing provider has a positive effect on the ITU a cloud computing service from this cloud computing provider.

2.3 Information Overload

IO is predominant when the processing of information, which are relevant for a decision, exceeds the capacity for this information processing (Tushman and Nadler, 1978). The results of IO are different negative effects (Eppler and Mengis, 2004). Overall, IO leads to stress, confusion and cognitive strain (Malhotra, 1984; Schick et al., 1990). Eppler and Mengis (2004) summarize that many countermeasures for the reduction of IO are discussed in literature. One of these countermeasures is the use of information technology (IT). By the use of computer-based IT the time both for processing the corresponding information and finding a decision can be reduced. IT offers faster information processing, making it possible to process additional information in order to reduce IO (Schick et al., 1990). One concrete example for the improvement of information processing is a hypertext system, which contains information (e.g., of textual nature) that can be viewed by the user only when required. The augmentation of texts or SLAs, respectively, works in a similar way: providing additional information for an interested reader on demand. Overall, we hypothesize that the perception of IO decreases with augmented background information on, e.g., complex coherences and/or technical terms:

H2: The provision of augmented SLAs reduces the (perceived) IO.

2.4 Ease of Use

The as-needed control and regulation of the information volume by the use of hypertext systems or augmented SLAs influence the ease of use. In case a customer needs further explanations of a technical term, he or she can access it directly without the necessity to do research on it somewhere else or, for lack of time, possibly makes wrong interpretations. Thus, the use of augmented SLAs requires less effort. The EOU describes how the customer can reach his targets by making use of IT, in this case augmentation (Corritore et al., 2003).

Moreover, by consulting scientific literature concerning online trust it can be stated that inter alia the ease of search, non-functioning or dead links and the navigation can influence trust (Corritore et al., 2003). These findings can also be transferred to the context of augmented SLAs in cloud computing: SLAs are partially available online (Stankov et al., 2012). When talking about web-based SLAs simplified mechanisms can be mentioned, such as augmentations or search functionalities. The latter have already been investigated in the same context of SLAs in cloud computing by Walter et al. (2014). SLAs, which are easy to use and from which information can be pulled without much effort, signal a high perceived control, minimize uncertainty (Corritore et al., 2003) and can be seen as a benevolent act by the provider (Walter et al., 2014). Therefore, concerning the EOU, we hypothesize:

H3: The (perceived) IO has a negative effect on the (perceived) EOU.

H4: The (perceived) EOU has a positive effect on the (perceived) TB.

2.5 Comprehension

In situations involving IO the loss of control, surplus of time needed, the ignorance of information and misinterpretations might be possible outcomes (Edmunds and Morris, 2000; Sparrow, 1999; Eppler

and Mengis, 2004). Another consequence of the reduction of the IO might be a higher CO. Furthermore, the CO is dependent on the provision of additional information. In terms of CO in connection with augmentation, Freundlieb and Teuteberg (2012) found that the augmentation of sustainability reports leads to a higher CO among readers. Furthermore, Dimitrova et al. (2004) show that additional information in the form of multimedia content can raise the CO. Consequently, the transfer of augmentation to the context of SLAs is highly promising.

Additionally, there might also be a connection between CO and the TB: in case a system or its way of working is presented in a comprehensible way, the trust in the system itself increases (Lee et al., 2004). Transferred to the present context, this might also be true for cloud computing services. If cloud computing services and their underlying systems are presented in a comprehensible way, it may have an influence on the formation of trust towards the corresponding cloud computing provider. Overall, we hypothesize:

H5: The (perceived) IO has a negative effect on the (perceived) CO.

H6: The provision of augmented SLAs increases the (perceived) CO.

H7: The (perceived) CO has a positive effect on the (perceived) TB.

2.6 Transparency

The trust in a provider may be influenced by TR. TR comprises the access to all relevant information, intentions or behaviors (Cramer et al., 2008; Turilli and Floridi, 2009). The supplement of information is the basic idea of augmented SLAs. TR in the form of, e.g., communicating a clear security profile can help customers to rate a provider's trustworthiness a priori (Khan and Malluhi, 2010). In the context of cloud computing, especially the functionality of security mechanisms is a relevant topic that gets much attention in scientific literature (Repschlaeger, 2013; Huang and Nicol, 2013; Pearson and Benameur, 2010; Stankov et al., 2012). Regarding this, particularly SLAs function as a trust mechanism (Kandukuri et al., 2009; Stankov et al., 2012; Khan and Malluhi, 2010; Huang and Nicol, 2013; Walter et al., 2014). By means of SLAs, providers can describe the underlying service, the targeted performance level and obligations of both involved parties in a transparent manner. The complexity and extent are dependent on the provided service(s). "Good" SLAs identify themselves with exact, clear terms and conditions without any room for interpretation(s). These give the customer certainty that the provider is confident to provide the service while maintaining the desired service quality. Moreover, the provider shows that he can express the SLAs in an easy and comprehensible way. Furthermore, he reveals and specifies the actual performance of the provided service (Stankov et al., 2012). A system or service, which appears to be transparent and controllable, reduces the risk and uncertainty in favor of trust (Corritore et al., 2003). To this effect, Ramgovind et al. (2010) come to the conclusion that SLAs are one of the most important documents to ensure TR. Furthermore, Pearson and Benameur (2010) describe TR as an important mechanism during the formation of trust. Consequently, SLAs should provide a comprehensive basis, reducing conflict potential and avoiding unrealistic expectations (Kandukuri et al., 2009). Ultimately, as mentioned above, the resulting transparency raises the trustworthiness. This may even be favored by making SLAs available to the public, especially when the customer has not yet interacted with the provider (Stankov et al., 2012). Thus, regarding transparency we hypothesize:

H8: The provision of augmented SLAs increases the (perceived) TR.

H9: The (perceived) TR has a positive effect on the (perceived) TB.

H10: The (perceived) TR has a positive effect on the (perceived) CO.

2.7 Research Model

Our hypotheses can be concluded to the following research model (*Figure 1*).

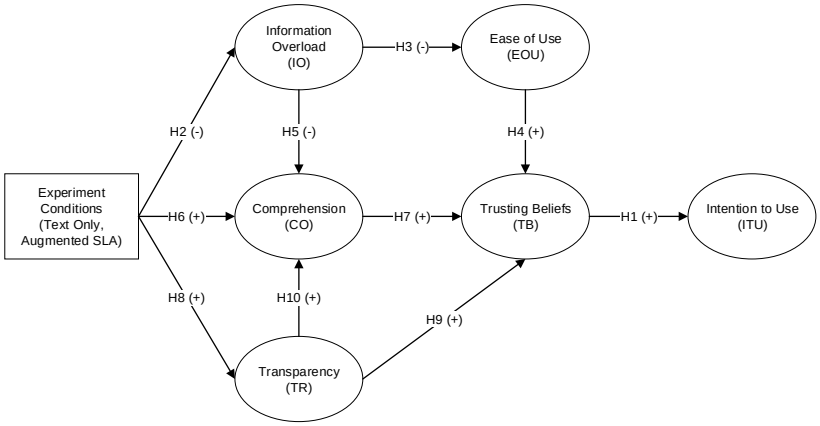

Figure 1. Research Model

3 Research Method

3.1 Experiment Design and Procedure

In line with our RQs, we examine the effects of an *augmented SLA*. Besides this one condition, we use a condition with *text only* as a control group. We use a randomized post-test-only design and randomly assign the participants into the two groups (i) Text Only (group 1, control group) and (ii) Augmented SLAs (group 2), as depicted in *Figure 2*. All participants are presented the same vignette (a short description of a fictitious character or a situation containing beliefs, attitudes, perceptions and information that are to be judged by participants), regardless of their group.

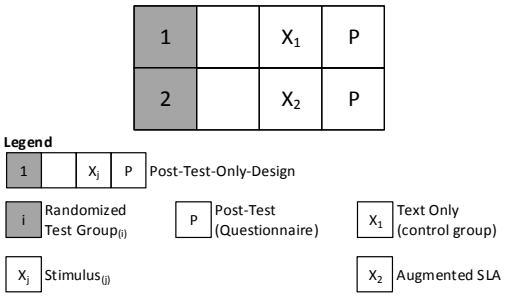

Figure 2. Randomized Post-Test-Only Design

In the style of Walter et al. (2014) our vignette puts the participants in the shoes of an intern in a fictional insurance company in order to provide a recommendation to their supervisor concerning a fictional cloud computing provider named *Up & Online Cloud Solutions* (U&OCS). The recommendation is based on U&OCS's SLA. Our study primarily aims at the participants' (perceived) IO, CO and TR, secondarily on the impact of these constructs on the EOU and the trust in the provider. In order to fulfill their tasks, both groups of participants are given consolidated SLAs. Since Walter et al. (2014) performed a similar study to ours and received significant results based on their stimuli, we adopted their SLA. Walter et al. (2014) prepared their fictional SLA on the basis of real cloud computing providers included in Gartner's Magic Quadrant for Public Infrastructure as a Service (Gartner Group, 2012) and validated it with the help of a list of relevant SLA characteristics published by Stankov et al. (2012). In addition to this text-based SLA (group 1, control group), group 2 is provided with an augmented version. Details on the augmentation can be found in section 3.2. After the stimulus (vignette and (augmented) SLA) both groups are asked about their recommendation to their supervisor. All participants have to specify the degree to which they recommend the use of cloud computing services from U&OCS. Furthermore, the participants have to reason their recommendation in a text field in order to avoid answers without much thought. Subsequently, the participants answer questions concerning the items of all hypothesized constructs.

3.2 Operationalization of Experiment Conditions

In order to create augmented SLAs a prototype was implemented with the use of HTML, PHP as well as JavaScript. All augmented terms are highlighted and stand out from the normal text but do not appear to be massive. The augmented content is shown with the help of a tooltip, which is a small window laid directly over the current content and is shown as soon as the mouse hovers over a (in this case highlighted) term and closes when the mouse leaves the respective term.

In order to answer the RQs the implementation of the augmentation is of great importance, on the one hand concerning the appearance and functionality, on the other hand concerning the augmented content. A poor implementation of augmenting additional information does not contribute to an increased comprehension and, thus, misses the aim of our research. Consequently, a structured procedure consisting of the phases (i) term selection, (ii) systematic literature review, (iii) implementation of the augmentation, (iv) evaluation and adjustment was developed to ensure the quality of the augmentation. Each of the phases is briefly summarized in the following.

Term Selection

The augmentation of SLAs refers to the provision of supplemental information concerning technical terms and parameters. In particular, these include terms that are used especially in the context of cloud computing. Stankov et al. (2012) summarize 20 characteristics that are typically contained in SLAs in cloud computing environments. These build the basis for our selection of terms that should be augmented. Furthermore, terms that might be confusing or incomprehensible for customers are augmented. In total 28 terms (e.g. Fees and Charges, Safe Harbor, SLA, Troubleshooting, IaaS) are identified, of which 11 are already contained in the glossary that is presented in the end of the U&OCS SLA.

Systematic Literature Review

Based on the term selection a systematic literature review according to Webster and Watson (2002) and vom Brocke et al. (2009) is carried out to identify best practices and recommendations for ways of information presentation in general and augmenting additional information in particular. In the beginning, the multimedia principle needs to be highlighted, which implies that humans learn faster and better with the help of texts and illustrations than solely with texts. The reason for this is that by using texts and illustrations several conceptual processes are triggered (Fletcher and Sigmund, 2005). Lim and Benbasat (2002), for example, prove the multimedia principle in the context of the comprehensibility of organizational information and explain that "[…] each representation plays a unique role in helping comprehension". Additionally, Larkin and Simon (1987) demonstrate the possible benefit of illustrations for comprehension. Based on that, Eitel and Scheiter (2014) examined the order of illustrations and texts with the result that it is irrelevant for the comprehension whether the text is shown before the illustration or vice versa. Folker et al. (2005) also demonstrate that color highlighting can lead to a more efficient information reception. By referencing a study by Freundlieb and Teuteberg (2012) it can be noted that embedding social networks and YouTube videos as part of the augmentation is not helpful and, in contrast, participants found it rather untrustworthy. Consequently, it can be summarized that augmentations should contain both texts and illustrations, whereas the order is irrelevant and comparisons can support comprehension.

Implementation of the Augmentation

The type and form of the implementation is based on the results of the systematic literature review. In order to get an overview on existing descriptions and along with it, to augment the terms with explanations that are as easily understandable as possible, we refer to relevant literature, government websites as well as the own creativity (e.g., for the creation of helpful illustrations). The texts are formulated in a clear, explicit and redundance-free way as well as enriched by examples and/or comparisons. By the use of, e.g., paragraphs and subheadings, the structure is clear as well. Illustrations are used when reasonable; here we do not follow a systematic approach.

Evaluation and Adjustment

In a group of 15 students the augmentation of the SLA is tested. In order to reach conditions that are similar to the planned experiment, the augmented SLAs are presented in the same way as they are in the actual experiment. After interacting with the SLA participants are asked to evaluate the augmentation of each of the terms. Major points of critique are too long texts, shortcomings concerning the illustrations and linguistic errors. Nonetheless, the majority of the evaluation participants noted that especially the illustrations, apart from the shortcomings, as well as the used examples and concise explanations are nearly always helpful. Following the evaluation all improvement potentials are realized.

3.3 Operationalization of the Constructs

The operationalization of the theoretical constructs derived beforehand requires a suitable measuring method. To be more precise, the theoretical constructs are latent variables. Therefore, the measured values need to describe the constructs as precisely as possible (Heeler and Ray, 1972). In order to measure these latent variables suitable items were determined. The questions concerning the constructs IO, TR, CO, TB and EOU are answered on a seven-point Likert scale ranging from *strongly disagree* (1) to *strongly agree (7)*. The construct ITU is scenario-based: the participants are asked whether or not they would recommend the cloud computing service to their supervisor. *Table 1* provides an overview of the constructs, their definitions and item sources.

Construct	Adapted Definitions	Item Source
Information Overload (IO)	"Information overload occurs when the information-processing requirements (information needed to complete a task) exceed the information-processing capacity (the quantity of information one can integrate into the decision-making process)" (Eppler and Mengis (2004) in accordance with Galbraith (1984) and Tushman and Nadler (1978)). In the context of the augmentation of SLAs in cloud computing IO implies that customers might feel overloaded when reading a SLA.	Hunter and Goebel (2008)
Comprehension (CO)	Comprehension is "the ability of consumers to process and subsequently use the information […]" (Milne and Culnan, 2004). It "[…] occurs when and if the elements that enter into the process achieve a stable state in which the majority of elements are meaningfully related to one another and other elements that do not fit the pattern of the majority are suppressed" (Kintsch, 1998). These elements can be "[…] perceptions, concepts, ideas, images, or emotions" (Kintsch, 1998). In the present context CO means the understanding and processing of information contained in the SLA.	Milne and Culnan (2004)
Transparency (TR)	TR "is the extent to which the organization provides relevant, timely and reliable information, in written […] form […]" (Williams, 2005). Transferred to this study TR relates to the extent to which a cloud computing provider supplies relevant, timely and reliable information concerning the cloud computing service(s) in the written form of a SLA.	Van Herpen et al. (2005)
Trust, Trusting Beliefs (TB)	The TB consist of the three factors integrity, benevolence and ability. Trust is defined as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer et al., 1995). In the present study the focus lies on inter-organizational trust and, thus, on the trust relationship from a customer to a cloud computing provider.	McKnight et al. (2002)
Ease of Use (EOU)	EOU refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). For our context, we need a broader definition that includes the experiment condition *Text Only*. Thus, in our study, EOU generally refers to the perceived ease of using a provider's SLA in order to find relevant information.	Davis (1989)
Intention to Use (ITU)	ITU is the intention to voluntarily use a system/new IT (Gefen et al., 2003). In the context of the present study ITU refers to the intention to voluntarily use the cloud computing service from the cloud computing provider. The measurement of ITU is scenario-based, i.e., in accordance to Walter et al. (2014) it is measured to what extent the participants in the role of an intern are willing to recommend the use of the cloud computing service based on the SLA to their supervisor.	Walter et al. (2014)

Table 1. Constructs and corresponding Item Sources

3.4 Data Collection

The previously outlined experiment (cf. section 3.1) was carried out as a web-based questionnaire in January 2015 with 326 undergraduate students in order to test our proposed hypotheses and to verify or falsify the causal relationships of the constructs. Conducting the experiment with a large proportion of students had the advantage that we were able to gather a sufficiently large sample of a homogenous group (e.g., regarding age and IS experience). Nonetheless, using students as participants is discussed

controversially in IS (see *Conclusion* for limitations) (Compeau et al., 2012). In the beginning of the experiment, the participants were randomly assigned to one of the two groups (*Text Only* and *Augmented SLA*); this step was unnoticeable for the participants. For all participants the experiment started with the introduction into the vignette. Afterwards, the participants were shown the corresponding (augmented) SLA. In the end, they were directed to the post-test to answer the items and had the possibility to leave a comment on the experiment. For our analysis we only used complete questionnaires and, additionally, checked for questionnaires with response patterns (i.e., *strongly disagree* for all items) and short processing times (i.e., where the participants answered remarkably faster than the average). In total 247 questionnaires remained (group 1 n= 137, group 2 n= 110; 64.78 % male, 35.22 % female; average age 20 years).

4 Results

4.1 Construct Validity and Reliability

Before we assessed the Common Method Bias (CMB), we checked for the Kaiser criterion, which assesses the sample adequacy. Since a value higher than .5 is the minimum requirement (Burns and Burns, 2008) and a value higher than .8 is very good (Frohlich and Westbrook, 2001), our result of .933 has to be interpreted as extremely positive. Additionally, Bartlett's test of sphericity results in a significance level of .000, indicating that there are some relationships between the variables (Burns and Burns, 2008). In order to provide reliable data for the estimated correlations, the sample size has to be sufficiently large, i.e., usually a ratio of 5:1, preferably a ratio of 10:1 between sample size and number of indicators is deemed sufficient (Costello and Osborne, 2005; Chin, 1998; Burns and Burns, 2008). With 247 questionnaires and 25 indicators we reach the rounded up ratio of 10:1, meeting the requirements. As both the Kaiser criterion and Bartlett's test of sphericity assure the sample's suitability, we tested for CMB using Harman's one-factor test (Cenfetelli et al., 2008; Podsakoff and Organ, 1986; Podsakoff et al., 2003; Sharma et al., 2009). We entered all 25 indicators into a factor analysis; the resulting factor explains 40.573 percent of the variance. It is unlikely that our data is subject to CMB as this explained variance of a single factor is below 50 percent (Liang et al., 2007; Cenfetelli et al., 2008; Podsakoff and Organ, 1986).

In a next step we carried out an explorative factor analysis (EFA) to assess one-dimensionality, i.e., to check to what extent the items measure *one* construct. Since ITU is scenario-based and measured with only one item, we left it out. When assessing all items *together*, we were able to extract four factors, whereas CO and EOU are listed together. This results most likely from the high correlation of the corresponding items. Accordingly, merging both constructs is conceivable. But, since in our research model we distinguish between CO and EOU, this step is waived. All factors have loadings greater than the threshold value of .4 except for item CO2. Therefore, item CO2 "*The U&OCS user information page does not contain terms that are confusing to me*" is dropped. Since we used reflective measurements in our study (Ringle et al., 2012), the meaning of the construct is not affected if an item is dropped (Jarvis et al., 2003). The communalities of the remaining items range from .4 to .751, thus, being in the desired range from .4 to .7 (Costello and Osborne, 2005). Additionally, after assessing the EFA for all items *together*, we assessed it separately for TB, which is the only construct that consists of more than four items. With factor loadings of at least .713 and .841 as a maximum as well as communalities between .458 and .707, we also got an adequate result. Consequently, after dropping item CO2, one-dimensionality can be assumed.

Subsequently, we assessed our construct's internal consistency reliability by calculating Cronbach's Alpha (CA), the inter-item correlation (IIC) and the corrected inter-scale correlation (CISC). All constructs are above the threshold value of .7 regarding CA and can therefore be considered as reliable (Nunnally and Bernstein, 1994). Only construct TB demonstrates a rather high value, which, however, is not to be evaluated negatively due to the high number of items. The inter-item correlation provides information on the average correlation of all items belonging to one construct; values higher than .3

are sufficient. The inter-scale correlation indicates to what extent an item contributes to the construct measurement or, in other words, to what extent an item represents the construct. The threshold value for inter-scale correlation is .5 (Zaichkowsky, 1985; Shimp and Sharma, 1987). Consequently, all results of the three criteria provide satisfactory results, whereby internal consistency reliability is fulfilled (see *Table 2*).

	Item	CISC	IIC	CA	FR	AVE	CO	EOU	IO	TB	TR	ITU
CO	CO1	.691	.566	.797	.881	.714	.845					
	CO3	.720										
	CO4	.523										
EOU	EOU1	.766	.606	.858	.905	.705	.761	.840				
	EOU2	.728										
	EOU3	.599										
	EOU4	.731										
IO	IO1	.708	.567	.795	.881	.712	-.538	-.567	.844			
	IO2	.642										
	IO3	.571										
TB	TBIN1	.806	.568	.929	.940	.612	.443	.538	-.217	.782		
	TBIN2	.712										
	TBIN3	.684										
	TBIN4	.730										
	TBBE1	.784										
	TBBE2	.652										
	TBBE3	.736										
	TBAB1	.692										
	TBAB2	.737										
	TBAB3	.707										
TR	TR1	.582	.508	.756	.860	.672	.462	.549	-.376	.577	.820	
	TR2	.597										
	TR3	.578										
ITU	ITU1	Scenario-based single item measurement					.168	.230	.008	.657	.328	1.000

Item CO2 was dropped during the EFA; CISC: Corrected Inter-Scale Correlation; IIC: Inter-Item Correlation; FR: Factor Reliability; CA: Cronbach's alpha; AVE: Average Variances Extracted; dark grey shaded cells: Square Root of AVE

Table 2. Construct Attributes

In terms of quality criteria of second order we calculated the indicator reliability (IR), the factor reliability (FR) and the average variances extracted (AVE). Regarding IR, all p-values are highly significant and the threshold value of .4 is exceeded for each item with TBB2 having the lowest (.721) and CO3 having the highest (.892) item loading. Concerning the factor reliability we received values with a minimum of .881 (CO). As all values are above the threshold value of .6 (Bagozzi and Yi, 1988), a good factor reliability is confirmed. Regarding the AVE the threshold value of .5 should be exceeded (Fornell and Larcker, 1981a); we meet this requirement. Furthermore, the square roots of the AVE, represented in the diagonal in *Table 2* (dark grey shaded cells), are higher than the correlations between constructs; thus, validity can be assumed (Fornell and Larcker, 1981b). The results show that this is the case for all of our constructs, indicating that our constructs are well-functioning and serve as a good basis for testing our hypotheses.

4.2 t-Test Results

In order to validate our hypotheses that are based on the effects of the two experiment conditions on IO (H2), CO (H6) and TR (H8), we conducted an analysis of means (two-sample t-test) to identify differences between control (Text Only) and experimental group (Augmented SLA). Considering the significance of the t values (see *Table 3*) of the constructs IO, CO and TR, no significant values (neither $p < .05$ nor $p < .1$) can be found. Even the t values are rather low with TR having the only value that is greater than 1. The interpretation of the results clearly leads to the conclusion that there are no significant differences between the two groups and the slight discrepancies are due to chance. Consequently, the hypotheses, which focus on the use of augmentation and its positive effects, have to be falsified; affected are hypotheses H2 (IO), H6 (CO) and H8 (TR).

Experiment Condition	Number of Participants	Information Overload		Comprehension		Transparency	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Text Only	137	3.9002	1.28679	4.3260	1.17049	4.4282	1.21936
Augmented SLA	110	3.9758	1.30295	4.2182	1.28936	4.6152	1.08759
		t	**sig.**	**t**	**sig.**	**t**	**sig.**
		-.456	.649	.688	.492	-1.256	.210

Table 3. Mean, Standard Deviation and t-Tests for Information Overload, Comprehension and Transparency

4.3 Partial Least Squares Analysis

In order to evaluate the remaining hypotheses concerning the outcomes of IO, CO and TR as well as their dependent variables, we make use of partial least squares structural equation modeling with SmartPLS (Ringle et al., 2005; Ringle et al., 2012).

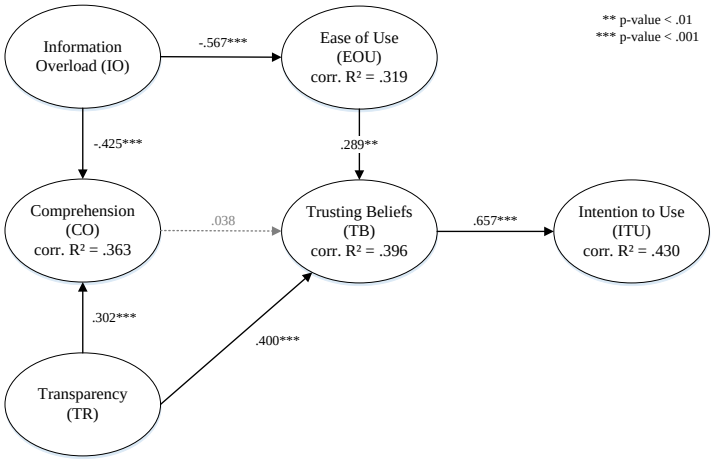

Figure 3. PLS Model

First, we analyzed the model fit. The statistics for CMIN/df = 2.723 and SRMR = .095 are in line with recommended threshold values (CMIN/df ≤ 3.00; SRMR ≤ .10) for statistical fit (Hair et al., 1998). The other indices are slightly above or below the threshold values (in brackets): RMSEA = .084 (RMSEA ≤ .08), NFI = .825 (NFI ≥ .90), TLI = .866 (TLI ≥ .90) and CFI = .881 (CFI ≥ .90). However, the overall model should not be discarded, since the borderline results are probably caused by small weaknesses in the model (e.g., small effect size in two paths) or the rather small sample size. Additionally, the threshold values are a topic that is discussed controversially not only within the IS discipline (Barrett, 2007). Therefore, due to only marginal deviations, we classify the model as acceptable.

Second, we looked at the path correlations and coefficients of determination (R^2) in our model. As can be seen in *Figure 3*, the coefficients of determination (R^2) are moderate for CO, EOU as well as TB and substantial for ITU. We find strong statistically significant relationships for almost all of our hypothesized construct relationships. Surprisingly, a very low coefficient of .038 between CO and TB (not significant, p = .629) points to a non-existent effect of CO on the TB. In addition, the outgoing negative path coefficients of the construct IO should be noted: the higher the IO, the lower the CO and the EOU. Both values are highly significant (p .000) and thus verify hypotheses H5 and H3. Each of the remaining paths represented positive inter-construct relationships. With the exception of the significant path coefficient from EOU to TB (p = .002) all values are highly significant (p = .000). Consequently, the hypotheses H1, H4, H7, H9 and H10 are confirmed. *Table 4* provides an overview of our hypotheses.

#	Hypotheses	Status
H1	A customer's (perceived) trust in a cloud computing provider has a positive effect on the ITU a cloud computing service from this cloud computing provider.	Supported
H2	The provision of augmented SLAs reduces the (perceived) IO.	Not Supported
H3	The (perceived) IO has a negative effect on the (perceived) EOU.	Supported
H4	The (perceived) EOU has a positive effect on the (perceived) TB.	Supported
H5	The (perceived) IO has a negative effect on the (perceived) CO.	Supported
H6	The provision of augmented SLAs increases the (perceived) CO.	Not Supported
H7	The (perceived) CO has a positive effect on the (perceived) TB.	Not Supported
H8	The provision of augmented SLAs increases the (perceived) TR.	Not Supported
H9	The (perceived) TR has a positive effect on the (perceived) TB.	Supported
H10	The (perceived) TR has a positive effect on the (perceived) CO.	Supported

Table 4. Overview of Hypotheses

5 Conclusion

5.1 General Discussion

Customers might face IO and lacks of CO due to the length and complexity as well as rather high amount of technical terms when reading legally binding documents such as SLAs for cloud computing services. Furthermore, these legally binding documents might influence the trust in a cloud computing provider as they include information about trust related issues such as availability of the service, the responsibilities of all parties involved and the provider's applied security measures (Anton et al., 2007; Stankov et al., 2012). Subsequently, a customer's trust in a cloud computing provider might influence the intention to use a cloud computing service from said provider. We assumed that augmenting SLAs is a suitable measure to considerably decrease IO as well as increase CO and TR. In order to help customers to cope with SLAs, to bridge the information asymmetry and to help them understand the contained technical terms in detail, we augmented a SLA in cloud computing in the sense of AB with background information on specific terms. Subsequently, we tested the effects on the independent constructs IO, CO as well as TR and the effects on the dependent constructs EOU, TB as well as ITU. With our study we validate the results by Walter et al. (2014) and show that the perceived trustworthiness of a cloud computing provider largely determines the ITU the services of a cloud computing provider. In this sense, we demonstrate the importance of communication for building trust in a cloud computing provider. Furthermore, we show that the EOU of the interface, which contains the needed information – in this case the (augmented) SLA – as well as the TR of the cloud computing provider and service significantly influence the trust towards the cloud computing provider. Additionally, we are able to verify that TR has a significant positive and IO has a significant negative influence on a customer's CO. However, our hypothesized relationships that are based on the augmentation have not been verified, to be more precise, we are not able to verify that augmenting SLAs has a significant

impact on a customer's IO, his or her CO of the SLA or the provider's TR. The worst case would be that the augmented content introduced more IO as it remedies and lowers the CO of the overall SLA instead of increasing it. In our study we did neither find a positive nor a negative relationship between the augmentation and its effects on the constructs IO, CO and TR. Also, we were not able to verify a connection between a customer's CO and his or her trust towards a cloud computing provider. As augmentation was found to improve comprehensibility in other contexts (e.g., see Ceglarek et al. (2011) or Freundlieb and Teuteberg (2012)), we assumed similar effects in the realm of SLAs. Not being able to verify our hypotheses concerning augmentation might have several reasons. For example, due to the legal character of SLAs they might not be the right environment for augmentation. Furthermore, the desired effect might have been suppressed by the provision of a glossary, which already contained some of the augmented terms. In addition, due to the limitations of an online experiment, we could not ensure that participants did not look up unknown terms elsewhere. Further, we have not checked for the participants' knowledge of the augmented terms. Consequently, it might have been the case that the augmentation was simply not needed and, thus, it did not have a significant impact.

5.2 Implications for Theory and Practice

Even if the CO has no impact on the TB, we tested for a possible relationship between CO and EOU in an alternative research model. The preliminary result indicates a significantly strong impact of CO on EOU. Therefore, a cloud computing provider should follow a balanced information policy by which understandable, clearly formulated and relevant information are made available inter alia in the SLA, which in turn have to be freely accessible. Hence, if cloud computing providers are transparent, they will increase their customers' trust and comprehension. However, providers have to ensure that the provision of information does not lead to an IO, which again would negatively influence CO and EOU. The examined option to augment SLAs with helpful background information could neither be evaluated positively nor negatively in the present study. Thus, no clear recommendation for or against the use of augmentation can be formulated. However, regardless of the technology the focus should ultimately be on the way of information provisioning in order not only to cover the information demand but also to improve the way of provisioning and, thus, forming trust on the customers' side.

5.3 Limitations and Future Research

Our presented research results have to be viewed in the light of some limitations. As mentioned before, the experiment was conducted solely with undergraduate students. However, we believe that students are an adequate target sample for our study (Walter et al., 2014) due to several reasons. First, previous research on online behavior found that when using a student sample the direction in which the general population is moving can be anticipated, as students are early adopters of innovative technologies like cloud computing (Gallagher et al., 2001). Second, research found that students do not differ significantly from others in their technology use decisions (Sen et al., 2006; McKnight et al., 2011). Therefore, it is substantiated to postulate that students constitute an adequate target population (Compeau et al., 2012), although students might not directly or fully represent the population of decision makers in cloud adoption scenarios. As the experiment was conducted online, the limitations of web-based experimenting apply (Reips, 2002). Concerning further research on augmenting SLAs in the context of cloud computing in a first step, the way of augmentation should be improved and, thus, eradicating any biases due to the implementation. In addition, the augmented content should be evaluated separately regarding IO and CO in order to completely exclude any possible adverse effects. Furthermore, an exploration among cloud computing customers could identify areas where augmented information might be needed instead of augmenting any possible content. In this context, even a stakeholder oriented approach is possible: whereas *normal* customers are offered augmented SLAs, *technophilic* customers might be annoyed by this additional option. Consequently, it should be possible for customers to turn the augmentation on or off when needed. As SLAs are legally binding documents, it has to be verified if augmenting these information is legally consistent.

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