

# “May I help You?” Increasing Trust in Cloud Computing Providers through Social Presence and the Reduction of Information Overload

*Completed Research Paper*

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## **Abstract**

*Despite the potential benefits of Cloud Computing (CC), many (potential) users are reluctant to use CC as they have concerns about data security and privacy. Moreover, the perceived social distance to CC providers can increase risk perceptions. Thus, gaining users' trust is a key challenge for CC providers. The results of our online experiment confirm that the intention to use CC services is highly dependent on a user's assessment of a provider's trustworthiness. We show that embedding two different assistive website elements (Search Box and Social Recommendation Agent) into CC providers' Service-Level Agreements and privacy policies positively influences the perceived trustworthiness of a CC provider by reducing perceived Information Overload and increasing perceived Control as well as Social Presence. Thus, besides improving security, CC providers not only have to communicate trust-critical information but also have to facilitate the search process for that information in order to be perceived as trustworthy.*

**Keywords:** Trust, cloud computing, information overload, social presence, social recommendation agent, search box, assistive website elements, service-level agreements, privacy policies

## Introduction

Cloud Computing (CC) is a technology that has gained increasing attention due to its considerable advantages. Organizations can make use of this technology, for example, in order to reduce costs and complexity as well as to increase flexibility (Armbrust et al. 2010). Despite this positive outlook, CC still faces skepticism due to various concerns about data privacy and security (Ryan 2011). This lack of trust leads to a reluctance of many companies to hand over their (sensitive) data to CC providers (Garrison et al. 2012; LiebermanSoftware 2012). Thus, fostering (potential) users' (in the following, *users* means both *potential* and *current users*) trust in CC services is a major interest of CC providers. While previous studies in the field of CC focus on technical aspects and aim to improve the actual security of CC services (Yang and Tate 2012), other researchers have emphasized the importance of communication in fostering trust in CC providers (Garrison et al. 2012; Khan and Malluhi 2010; Öksüz 2014). In this regard, overcoming information asymmetry and enhancing transparency is of high importance. In order to facilitate the assessment of their trustworthiness, CC providers have to adequately inform users, e.g., about data storage locations, applied security mechanisms and privacy practices (Garrison et al. 2012; Khan and Malluhi 2010). This information is usually included in Service-Level Agreements (SLA) and privacy policies (Stankov et al. 2012). As a downside, the nature of this information is usually very technical, which makes it hard for users to fully understand (Milne and Culnan 2004). Moreover, as those contractual documents are often comprehensive and packed with information, users may feel cognitively overloaded. Consequently, users may find it difficult to extract relevant information that would serve as a basis for an assessment of a CC provider's trustworthiness. Thus, (perceived) information overload (IO) may be a barrier in both developing trust in a CC provider and adopting a provider's CC service.

One of the first endeavors to deal with IO on the web were search engines (Berghel 1997; Tegenbos and Nieuwenhuysen 1997). These tools help in filtering and selecting information from the vast amount of information in the Internet (Berghel 1997; Tegenbos and Nieuwenhuysen 1997). Such tools might also help to overcome IO caused by SLAs and privacy policies in the context of CC. By enabling users to pull the information needed by means of assistive website elements such as search boxes, they may feel less overloaded. Furthermore, they may perceive more control (CTRL) over their own search activities. Facilitating the retrieval of information from CC providers' SLAs and privacy policies may lead users to make positive attributions regarding a provider's trustworthiness, not least because the CC provider makes an effort to bridge the information asymmetry. Thus, the first part of the paper at hand evaluates the effect of an additional Search Box within SLA and privacy policy in the context of CC. We investigate the assistive website element's effects on users' perceived IO, CTRL, and subsequent effects on the (perceived) ease of use when searching a provider's SLA and privacy policy for relevant information (hereafter referred to as EOU), which may positively influence the trustworthiness of a CC provider.

Furthermore, especially in online environments, there is a high perceived social distance to providers making it difficult to establish trust in a relationship to customers (Gefen and Straub 2003; Pavlou et al. 2007). This equally applies for CC services as they are also mainly provided via the Internet. Studies in the field of e-commerce have shown that social interfaces added to recommendation agents lead to a perception of human warmth (Qiu and Benbasat 2009). These so called Social Recommendation Agents (SRA) do not only help users in searching for information (*like* search boxes) but also raise the perception of a human-like interaction and warmth (*in addition* to search boxes) (Hess et al. 2009). Thus, a SRA is like a search box extended by a human interface that can be interacted with. In academic literature, this perception of human warmth is conceptualized as (perceived) Social Presence (SP) and is considered as a prominent predictor of trust (Cyr et al. 2009; Qiu and Benbasat 2009; Short et al. 1976; Walter, Ortbach, Niehaves, et al. 2013). The role of communication in increasing trust in CC providers is still insufficiently researched (Öksüz 2014). While previous findings on assistive website elements such as search boxes and SRAs stem from different domains, the relationships in the context of CC are still largely unexplored. It is unknown whether a SRA only reduces IO or whether it also increases users' CTRL and SP in order to positively influence their trust and intention to adopt CC services. Therefore, in the second part of this study, we embed a SRA into the SLA and privacy policy of a CC provider. In this way, we evaluate the described relationships to IO, CTRL and SP. Moreover, we are interested to learn whether the positive effect of SP on trust holds true in the context of CC and whether trust in the CC provider leads to the intention to use (ITU) the provided CC services. The corresponding research questions (RQ) are:

- RQ1: Does the implementation of assistive website elements (i.e., Search Box and SRA) have an impact on the ease of searching for relevant information in CC providers' SLAs and privacy policies?
- RQ2: Do users have a different perception of human warmth when using an assistive website element (i.e., Search Box and SRA)?
- RQ3: Does the inclusion of assistive website elements (i.e., Search Box and SRA) in a CC provider's website influence a (potential) user's trust in the CC provider?

In order to answer these research questions, first, we provide information about the background of our study with respect to the role of SLAs and privacy policies in the context of CC, Trust, IO, CTRL, and SRAs. Second, we outline our methodological approach including our research design and data collection. Third, the results are described in two parts: we present information of the effect of our experimental conditions on the independent variables, then we show the evaluation of the relationships that led to trust in a partial least squares (PLS) model. Finally, we discuss our research findings, implications for theory and practice alike, and conclude with limitations as well as future research.

## **Theoretical Background and Development of Hypotheses**

### ***Service-Level Agreements and Privacy Policies in Cloud Computing***

CC is "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 a minimal effort or service provider interaction as a pool of computing resources" (Mell and Grance 2011, p.2). CC has become so prominent and successful due to its many benefits. For example, resources can be scaled easily and pay-per-use pricing models offer great flexibility (Armbrust et al. 2010). However, the use of CC is still subject to uncertainties. Users express concerns about data privacy and security (Ryan 2011). These concerns pose a great problem for CC providers as they face the challenge of gaining users' trust. Besides the implementation of security and privacy measures in order to enhance data security and privacy, transparency is a very important issue when CC providers aim to gain users' trust (Khan and Malluhi 2010). Users have to retrieve certain information in order to assess a CC provider's trustworthiness. For example, they might search for information on where their data is stored, which security and privacy measures have been implemented by the provider, and if their personal data is kept safe and private (Khan and Malluhi 2010). As this information is generally provided online, the CC provider's website serves as a major, often sole source for information. Whereas providers can use their website for signaling (Benlian and Hess 2011), users may screen these websites with respect to visual design, social cues and content in order to assess a provider's trustworthiness (Karimov et al. 2011). As in CC (sensitive) data is outsourced to other organizations, the role of the content dimension that includes informational components is of increased importance (Goo et al. 2009). Previous findings have shown that the textual information contained in websites may help potential users to build trust in providers of online services (Pavlou and Dimoka 2006). This is because the text information can provide specific information about the provider's ability, benevolence, and integrity (Pavlou and Dimoka 2006; Walterbusch et al. 2013). In the context of CC, relevant information for users' assessments of a provider's trustworthiness is mainly contained in SLAs and privacy policies (Stankov et al. 2012). The subjects of SLAs are information about trust related issues such as functionality and availability of the service, multi-tenancy rules, the responsibilities of all parties involved, penalties, and the provider's implemented security measures (Stankov et al. 2012). Privacy policies contain information regarding a provider's applied privacy measures in order to protect the users' privacy (Anton et al. 2007). These policies allow for insights into how CC providers handle their users' personal data. In this sense, SLAs and privacy policies give users some indications regarding the CC provider's trustworthiness (Öksüz 2014). Thus, SLAs and privacy policies seem to be a suitable focus for conducting trust research in the field of CC.

### ***Trust in Cloud Computing***

Despite the long, still ongoing scientific discussion and the increasing number of publications on trust in the last half century, there is still no consensus on a single definition of trust, neither interdisciplinary nor within the information systems discipline (McKnight and Chervany 2001; Walterbusch et al. 2014). Due

to this fact, a plethora of definitions from various disciplines exist in scientific literature (Hosmer 1995; Rousseau et al. 1998; Walterbusch et al. 2014). Nevertheless, these definitions often use the same conceptualizations and can be distinguished according to the respective school of thought, e.g., psychological or sociological, and the adopted perspective, e.g., inter-personal or inter-organizational (Josang et al. 2007; Walterbusch et al. 2014; Yamagishi and Yamagishi 1994). Instead of continually defining trust anew, authors increasingly switch to (a) synthesizing existing definitions or (b) only picking certain parts of existing definitions, which are most relevant for the respective research endeavor (Walterbusch et al. 2014). One of the most cited definitions of trust is by Mayer et al. (1995), who define trust as “the willingness of a party to be vulnerable [trustor; giving trust] to the actions of another party [trustee; receiving trust] 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” (p.712). Depending on the trust object, a distinction can be made between interpersonal trust (trust relationship between two individuals or groups), organizational trust (individuals’ trust in an organization), and inter-organizational trust (extent to which the members of an organization have a collectively-held trust orientation toward the partner organization) (Mayer et al. 1995; Rotter 1967; Zaheer et al. 1998).

Mayer et al. (1995) postulate the trusting beliefs (TB) *ability* (TBAB), *benevolence* (TBBE) and *integrity* (TBIN). In general, the trustor tries to assess the trustworthiness of the trustee based on the trustee’s (previous) actions as well as the aforementioned TB (Mayer et al. 1995). Whereas *ability* (also referred to as *competence*, *perceived expertise* and *expertness*) describes the group of skills and competencies needed to perform the trustor’s task, *benevolence* (also referred to as *motivation to lie*, *altruism*, *intention* or *motives*) focuses on the trustor’s belief if and to what extent the trustee intends to do good to the trustor. *Integrity* (also referred to as *personal* or *moral integrity*, *value congruence*, *character* or *fairness*) is the trustor’s perception that an appropriate set of principles, which the trustor accepts, is adhered to by the trustee (Mayer et al. 1995). In the context of CC, the TB refer to users’ beliefs in CC providers’ expertise, benevolence (Garrison et al. 2012) as well as in the effectiveness of the applied security and privacy mechanisms (Zissis and Lekkas 2012). Regardless of the manifestation of the antecedent TB, trust is not of relevance if a situation or a relationship does not involve any (perceived) risk (McKnight et al. 2002). To be more precise, trust is not needed when a situation or relationship is neither missing a positive nor involving a negative outcome. Transferred to CC environments, trust is of particular importance as companies outsource (sensitive) data or whole processes into the cloud and responsibilities are handed over to the CC provider (Benlian and Hess 2011; Walterbusch et al. 2013). Furthermore, due to a trustor’s unilateral dependency on the actions undertaken by a CC provider (e.g., keeping the applied security mechanisms up-to-date, as well as the lack of a face-to-face interaction, leading to perceived and behavioral uncertainties), the trustor exposes himself to vulnerabilities. Without doubt, everyday reports on data breaches, hacker attacks, malicious intrusion, and online frauds are examples for the dominant vulnerabilities in CC and the principal necessity of trust in CC environments.

*H1: The higher a user’s (perceived) trust in a CC provider, the higher the ITU a CC service from this CC provider.*

### ***Effects of Assistive Website Elements on Information Overload and Control***

IO describes the notion of receiving too much information exceeding the capabilities of the recipient (Eppler and Mengis 2004). There are several causes for IO, e.g., the quantity, frequency and intensity of the information or the way information is communicated (Eppler and Mengis 2004). A high level of uncertainty or complexity associated with information can also lead to IO (Schneider 1987). Furthermore, personal experiences and skills have an influence on the information processing capacity and thus determine IO (Owen 1992; Swain and Haka 2000). Research results have shown that IO has various negative effects. When the amount of information provided exceeds a person’s information processing capacity, the identification and selection of relevant information becomes increasingly difficult (Jacoby 1977). Thus, a person perceiving IO becomes highly selective and may ignore large amounts of information (Bawden 2001). Furthermore, a person affected by IO may not be able to use the information in order to make a decision of adequate accuracy (Malhotra 1982) or to make a decision at all (Bawden 2001). Overall, IO leads to stress, confusion, and cognitive strain (Malhotra 1984; Schick et al. 1990).

Literature suggests different means in order to overcome the problem of IO, e.g., originators of information could structure the information (Eppler and Mengis 2004). Moreover, the use of information

technology (IT) can help to enhance the individuals' information processing capacity (Eppler and Mengis 2004), e.g., by information quality filters. One of the first IT that was applied in order to deal with IO on the web were search engines (Berghel 1997; Tegenbos and Nieuwenhuysen 1997). By typing into a search box, users can retrieve relevant facts from a huge pool of information (Berghel 1997; Tegenbos and Nieuwenhuysen 1997). In the case of SLAs and privacy policies in websites' of CC providers, the inclusion of assistive website elements such as search boxes may help to find specific information that is relevant to users. Thus, instead of reading the information *pushed* by the CC provider, users can *pull* the needed information by using assistive website elements. For example, users wanting to know more about data storage locations will be able to pull this information more easily by applying a search box instead of skimming over an extensive text. Thus, assistive website elements may facilitate the overall search process and thus users' perceived ease of using CC providers' SLAs and privacy policies in order to find relevant information. In the following, the ease of using CC providers' SLAs and privacy policies in order to find relevant information or, more exactly, the ease of searching for relevant information, is called EOU. As assistive website elements such as a search box are provided in addition to the text, it is still up to the user whether to use it or not. By offering the choice to either browse the information or to make use of assistive website elements, users' perceived freedom of action and flexibility may be increased. Users may perceive that they can impact their own search activities (Lee and Benbasat 2011). Having more control may also positively impact the perceived ease of searching and interacting with SLAs and privacy policies. Thus, we hypothesize:

- H2: Providing assistive website elements in order to help users to find relevant information within SLAs and privacy policies reduces a user's level of (perceived) IO.*
- H3: Providing assistive website elements in order to help users to find relevant information within SLAs and privacy policies increases a user's (perceived) CTRL over the search activity.*
- H4: The lower a user's (perceived) IO when searching for relevant information within SLAs and privacy policies, the higher the (perceived) EOU.*
- H5: The higher a user's (perceived) CTRL when searching for relevant information within SLAs and privacy policies, the higher the (perceived) EOU.*

For the assessment of a CC provider's trustworthiness, it is important for users to have certain information regarding availability of the service, the responsibilities of all parties involved, and data security as well as privacy. As mentioned in the previous section, CC providers often provide such information in their SLAs and privacy policies. Based on the provided information, users can assess a provider's trustworthiness and decide whether the level of trust is sufficient to engage in a business relationship (Öksüz 2014). However, SLAs as well as privacy policies often contain much information and thus could cause IO. Furthermore, the technical aspects included in SLAs and privacy policies (data privacy and security measures) might be too complicated for users to be fully understood (Anton et al. 2007). In case of IO, users may have difficulties to find and select relevant information and to decide whether a provider is able to secure users' data and whether they can trust the provider. When providers take measures, such as inclusion of assistive website elements (e.g., search boxes or SRAs) in order to make it easier for users to retrieve relevant information, this may be considered as an act of benevolence. Users could believe that providers act in the users' interest. For example, studies have shown that a provider's effort in increasing the perceived comprehension of privacy policies has positive effects on trust (Milne and Culnan 2004). Moreover, when the search box works fine, it could be regarded as a signal of the provider's competence. Overall, we hypothesize that the perception of an eased search process is positively attributed to providers' trustworthiness:

- H6: The higher a user's (perceived) EOU, the higher a user's (perceived) trustworthiness of a CC provider.*

## **Social Presence through Social Recommendation Agents**

### **Recommendation Agents**

A recommendation agent is a program designed to find suitable answers to users' inputs or to provide recommendations at certain events such as the selection of a product on an e-commerce website. In e-commerce, these systems are used to assist users in screening and evaluating products (Xiao and

Benbasat 2007). In contexts involving information retrieval instead of product selection, recommendation agents can be interacted with to find and select information. Recommendation agents try to extract predefined keywords from a user's input (e.g., a question or combination of keywords) and search for these in related text documents, web pages, or a predefined so called knowledge base. Thus, the back-end algorithms work just like a search engine with autocomplete functionality. Even with the additional humanoid interface, i.e., a SRA, this functionality does not change. Only the presentation of the results is affected and additional social features are added. In this sense, SRAs have comparable functionalities to those of search boxes and can be counted as assistive website elements. Thus, we believe that regarding IO and CTRL, H2 and H3 also apply for SRAs.

## Social Presence

A SRA is a recommendation agent with a humanoid interface that assists users in information filtering and decision-making (Hess et al. 2009; Wang and Benbasat 2005). The social aspect of recommendation agents refers to social interfaces "that respond to users through verbal and nonverbal communication" (Chattaraman et al. 2012, p.2055). Thus, a SRA consists of two parts, a recommendation agent and a social interface. Most common and effective are interfaces that are designed human-looking (Nowak and Biocca 2003). However, SRAs do not necessarily have to be human-like (Hess et al. 2005). There are various design options, not only with respect to the avatar, i.e., the visual representation of the SRA. For example, SRAs may differ with respect to the degree of humanness, gender, dimensionality (2D vs. 3D), output modality (text vs. audio), or nonverbal cues (Nowak and Biocca 2003; Swinth and Blascovich 2002). What SRAs have in common is that they were found to evoke the perception of human warmth (Qiu and Benbasat 2009). Some studies even take this effect for granted by manipulating "the level of social presence [...] through the presence or absence of a virtual agent" (Chattaraman et al. 2012, p.2061). Previous scientific literature refers to these perceptions of human warmth as SP (Short et al. 1976). While SP was originally studied in the field of interpersonal communication media, it has been tested in other domains such as human images in websites (Cyr et al. 2009), shared online shopping environments (Zhu et al. 2010), or SRAs (Hess et al. 2009). All these SP studies have shown that SP can be designed by variations of the IT artifact (e.g., website, SRA) (Walter, Ortbach, and Niehaves 2013). As SP has positive outcomes such as *enjoyment* (Hassanein and Head 2007; Lombard and Ditton 1997) or *trust* (Cyr et al. 2009; Qiu and Benbasat 2009), researchers have tried to improve designs of SRAs in order to raise the perception of SP. Previous findings show that human interfaces (Nowak and Biocca 2003), voice output (Qiu and Benbasat 2005), extroverted and agreeable personality (Hess et al. 2009) as well as nonverbal cues (Hess et al. 2009) can increase SP. While previous findings mainly stem from the field of e-commerce (Al-Natour et al. 2011; Qiu and Benbasat 2005, 2009), the basic functions of information filtering, decision support as well as the social interface may also be effective in other contexts, in our case the CC environment.

*H7: Providing a SRA in SLAs and privacy policies will increase users' (perceived) SP.*

SP was found to be an antecedent of trust (Cyr et al. 2009; Hess et al. 2009; Qiu and Benbasat 2009; Walter, Ortbach, Niehaves, et al. 2013). This effect has been tested successfully for different SP designs. There are different reasons for explaining this mechanism, Gefen and Straub (2003) propose two. First, when more social cues are present, i.e., a higher level of SP is perceived, it is easier to spot untrustworthy behavior as such situations are more transparent. Second, in situations of this sort, it is easier to assess the character of another party. Thus, the formation of TB is facilitated. In addition, other explanations refer to the fact that people actually behave more socially when higher levels of SP, including less anonymity, are present (Rockmann and Northcraft 2008). Based on theory and previous empirical findings, there are strong arguments for hypothesizing that SP positively influences the perceived trustworthiness of CC providers.

*H8: The higher a user's (perceived) SP when searching for relevant information within SLAs and privacy policies, the higher the (perceived) trustworthiness of this CC provider.*

**Research Model**

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

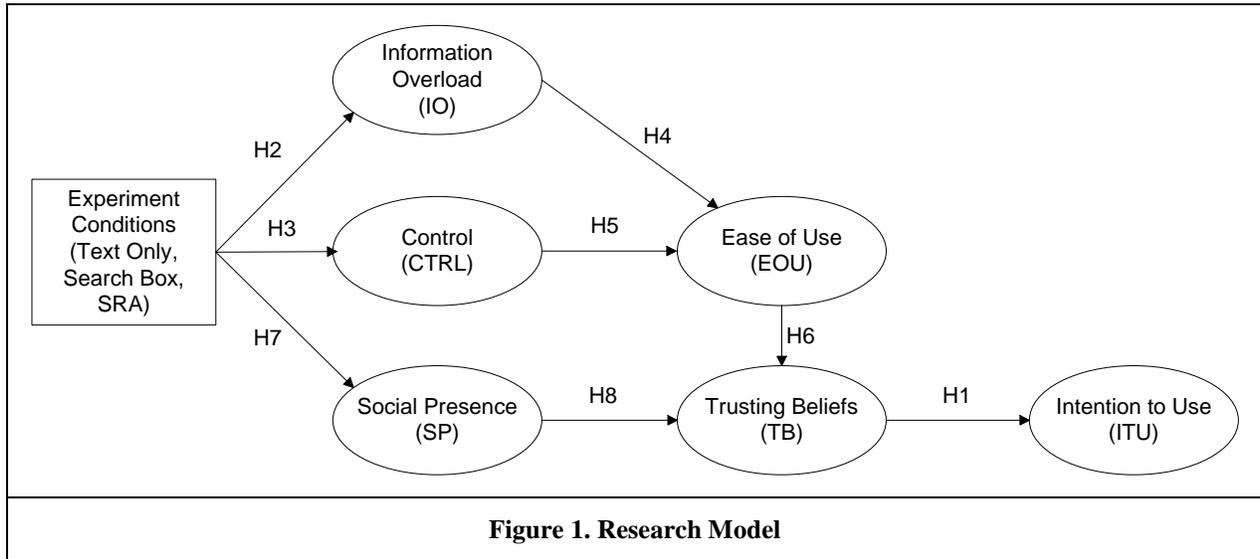


Figure 1. Research Model

**Research Methodology**

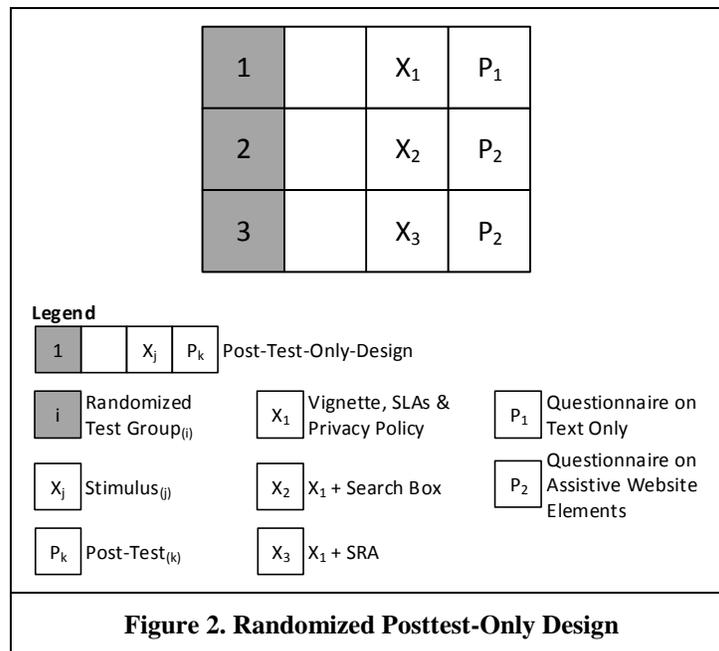
**Experiment Design and Procedure**

In line with our RQs, we separately examine the effects of the two assistive website elements Search Box and SRA, which are embedded into a CC provider’s SLA and privacy policy. Besides these two experiment conditions, we use a condition with Text Only as control group. Table 1 provides an overview of our experiment conditions and their hypothesized effect on IO, CTRL, and SP.

|            |                      | Experiment Conditions     |                                     |                                     |
|------------|----------------------|---------------------------|-------------------------------------|-------------------------------------|
|            |                      | Text Only (Control Group) | Text & Search Box                   | Text & SRA                          |
| Hypotheses | with respect to IO   | -                         | IO lower than control group (H2)    | IO lower than control group (H2)    |
|            | with respect to CTRL | -                         | CTRL higher than control group (H3) | CTRL higher than control group (H3) |
|            | with respect to SP   | -                         | -                                   | SP higher than control group (H7)   |

We use a randomized post-test-only-design and randomly assign the participants into the three groups (i) Text Only (group 1, control group), (ii) Text Only & Search Box (group 2) and (iii) Text Only & SRA (group 3), as depicted in Figure 2. The task for the participants is to act in a fictional but close to real-life situation; all participants are presented the same vignette. A vignette can be described as a focused description about a hypothetical real-life situation, limited to a bounded space, to which a subject is invited to respond to in various forms (Aronson and Carlsmith 1968; Finch 1987; Robert et al. 2009). In our case, the participants are put in the role of an intern in an internationally operating insurance company. Being in this position, the participants are asked to give their supervisor advice on the outsourcing of sensitive customer data to a fictional CC provider named Up & Online Cloud Services (U&OCS). As the participants have been repeatedly told that their advice has far-reaching implications, not least because the data that ought to be outsourced are sensitive customer data, the participants themselves are put in a vulnerable position. Our study aims at the participants’ perceived trust in a CC

provider rather than at the way they read, understand, or rate a given version of SLA and privacy policy. We indirectly provide keywords and search phrases through the role of the supervisor in the vignette. The supervisor guides the intern to focus on certain topics of particular interest when dealing with SLAs and privacy policies in CC (e.g., he states “Also, the data has to be online at all times. I think the corresponding term is called *availability* in the CC jargon, meaning the server’s accessibility and availability.”). In order to fulfill their tasks, all three groups of participants are given a consolidated SLA and privacy policy. The document was prepared by using SLAs and privacy policies from real CC providers included in Gartner’s Magic Quadrant for Public Infrastructure as a Service (Gartner Group 2012). In order to have all important facts included, the consolidated regulations were validated with help of a list of relevant SLA characteristics published by Stankov, Datsenka, & Kurbel (2012). With respect to this list, all relevant characteristics are included in our fictional company’s regulations (SLAs and privacy policies). Additionally to the consolidated regulations, group 2 and 3 are provided with assistive website elements in the form of (i) a Search Box and (ii) a SRA, respectively. After the stimulus, the three groups are asked about their recommendation to their supervisor. They have to specify the degree to which they recommend to use CC services from the CC provider. Furthermore, in order to avoid answers without much thought, the participants have to reason their advice in a text field.



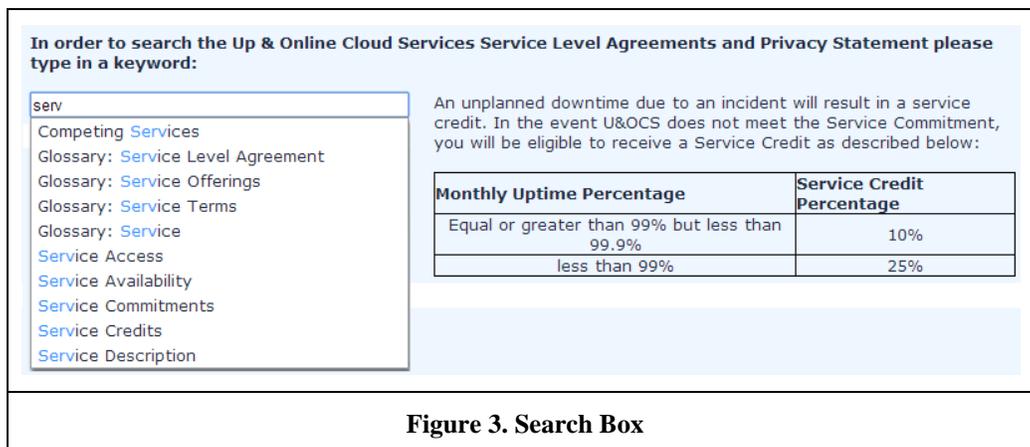
As a next step, the posttest is conducted. In order to develop appropriate measurement items for our study, we reviewed theoretical and empirical literature of the included constructs (see Table 2). The items are measured on seven-point Likert scales. Depending on the groups, the posttests only differ in the choice of words for a few measurement items (e.g., group 1: *information page* vs. group 2 and 3: *assistive website elements*).

| <b>Construct</b>  | <b>Adapted Definitions</b>   | <b>Item Source</b>   |
|---|--|--|
| Information Overload (IO)                                 | The notion of receiving too much information exceeding the information processing capacity of a recipient (Eppler and Mengis 2004). In the context of our paper, IO refers to SLAs and privacy policies, meaning that potential users might feel overloaded when reading a CC provider’s SLA and privacy policy.   | Hunter and Goebel (2008)   |
| Control (CTRL)  | The extent to which users perceive that they can impact their own search activities (Lee and Benbasat 2011). In the context of our paper, perceived CTRL refers to the extent to which potential users perceive that they can impact their own activities when searching for relevant information within a CC provider SLA and privacy policy.   | Bechwati and Xia (2003)  |
| Social Presence (SP)                                      | The perception of human warmth and sociability (Short et al. 1976). In the context of our paper, SP refers to the perception of human warmth and sociability of the SLAs and privacy policies.   | Gefen et al. (2003)  |
| Ease of Us (EOU)  | “The degree to which a person believes that using a particular system would be free of effort” (Davis 1989, p. 320). For our context, we needed a broader definition that includes the control group where no assistive website elements are present (i.e., absence of Search Box and SRA). Thus, in this study, EOU refers to the perceived ease of using a provider’s SLA and privacy policy in order to find relevant information, i.e., the ease of searching for relevant information within and interacting with the SLA and privacy policy. | Davis (1989)   |
| Trust, Trusting Beliefs (TB)                              | The willingness of a user to be vulnerable to the actions of the CC provider based on the expectation that the CC provider will perform a particular action important to the user, irrespective of the ability to monitor or control that CC provider (Mayer et al. 1995). In our paper, we focus on organizational trust meaning that we focus on the trust relationship from potential users’ to the CC provider.  | McKnight et al. (2002)   |
| Intention to Use (ITU) (CC services from the CC provider) | Intention to voluntarily use a new IT (Gefen et al. 2003). In the context of CC, ITU refers to the ITU CC services from a CC provider. However, in our study, ITU is scenario based. It describes the extent to which participants in the role of interns are willing to recommend the use of CC services to their supervisor.   | Scenario-based. At the end of the vignette, five selections of the final answer to the supervisor were provided, ranging from “I totally recommend this provider” to “I totally recommend <i>not</i> using this provider”. |

### Operationalization of Experiment Conditions

#### Search Box

With respect to the design of our experiment conditions, we use state-of-the-art technology. Regarding the Search Box, we extended an open access AJAX script<sup>1</sup>.



**Figure 3. Search Box**

<sup>1</sup> <http://www.devbridge.com/projects/autocomplete/jquery/>

Based on our consolidated regulations, we filled the AJAX script with a knowledge base consisting of key-value pairs (e.g., “Term” and “The term of this [...]”). An exemplary key-value pair is depicted in Figure 3.

### Social Recommendation Agent

Regarding the SRA, we conducted a pretest in order to find out what appearance (avatar) fits the domain of SLAs in CC. As there are no previous studies on SRAs in the context of CC, we evaluated several different avatars (e.g., male or female, casual or business clothing) with respect to their effect on SP and domain fit. We concentrated on anthropomorphic avatars as these are considered to evoke higher perceptions of SP than non-human like avatars (Nowak and Biocca 2003; Suh et al. 2011). Moreover we used gestures (Hess et al. 2009) and text-to-speech as “text-to-speech voice was perceived as significantly more trustworthy [...] than [...] only text” (Qiu and Benbasat 2005, p.88). After an appropriate SRA was identified (see Figure 4), we filled the script’s knowledge base with question and keywords-value pairs (e.g., “How will my data be secured?”, “security, secure”, “We work to protect the security of your information [...]”). Moreover, we provided our SRA with a personal background (e.g., education and marital status), the ability to interact socially (e.g., greetings and telling a joke) and basic general knowledge in different common domains (e.g., science, religion, geography, literature, history, and IT)<sup>2</sup>.

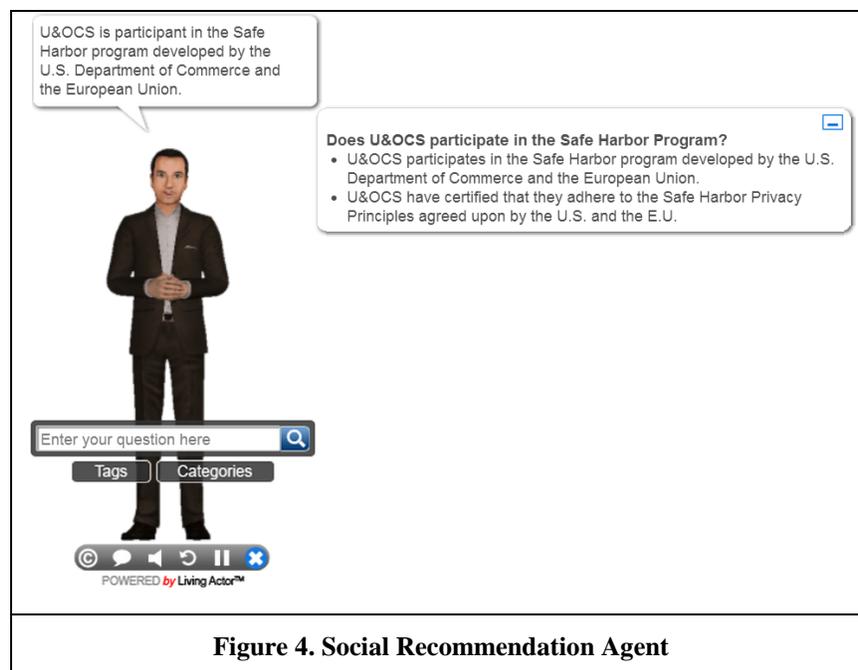


Figure 4. Social Recommendation Agent

As depicted in Figure 4, the participants may not only ask questions but are also able to make use of certain groups of questions ordered by tags (e.g., *Security* or *Payment*) as well as predefined categories (e.g., *Glossary*).

### Data Collection

In order to test our proposed hypotheses and to verify or falsify the causal relationships of the constructs (cf. Figure 1), we conducted the previously outlined online experiment in January and February 2014 with a total of 193 undergraduate and graduate students (group 1 n=68, group 2 n=61, group 3 n=64; 75.13% male, 24.87% female; average age 22.0 years; 84.98% undergraduate students, 15.02% graduate students). The participation was voluntary, but rewarded with incentives, i.e., we made a lottery of vouchers for a major online e-commerce shop. 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

<sup>2</sup> We used predefined knowledge bases that can be found online: <https://code.google.com/p/aiml-en-us-foundation-alice/>

(e.g., regarding age and IS experience). We only used completely answered questionnaires, i.e., 193 in number. With this amount of participants we met the often applied rule of thumb to determine a minimum necessary sample size for Partial Least Squares (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).

## Results

### Construct Validity and Reliability

As a first step, we assessed the validity and reliability of our constructs. Due to the self-reported nature of our data we tested for common method bias (CMB). Although we guaranteed all participants that their answers would be treated anonymously, their response could still be biased, for example, due to social desirable answer behavior (Liang et al. 2007; Podsakoff and Organ 1986). In order to test for CMB, we used Harman's one-factor test (Cenfetelli et al. 2008; Podsakoff and Organ 1986). We entered all 25 indicators into a factor analysis in order to extract a single factor. The resulting factor explains 34 percent of the variance. As this explained variance of a single factor is below 50 percent, it is unlikely that our data is subject to CMB (Cenfetelli et al. 2008; Liang et al. 2007; Podsakoff and Organ 1986). In addition, we controlled for Previous Experience with CC ( $\mu$  4.98,  $\sigma$  1.16), Computer Playfulness ( $\mu$  5.38,  $\sigma$  1.15; Hess et al. 2009), Disposition to (interpersonal) Trust ( $\mu$  4.25,  $\sigma$  1.19; Gefen and Straub 2004), and Disposition to Trust in Technology ( $\mu$  3.89,  $\sigma$  1.54; McKnight et al. 2011) by carrying out multiple analysis of variances and means (ANOVA and t-tests). We found no significant differences between the three groups of participants. Thus, we believe that our findings are primarily influenced by our experiment conditions and not by the participants' interpersonal differences.

In our study, we used reflective measurements which need to be tested regarding construct validity and reliability (Ringle et al. 2012). With respect to validity, all item loadings are above .6 and can therefore be considered reliable (Hair et al. 2013). However, in order to achieve better construct validity, we deleted all items with loadings below .7 as suggested by Nunnally and Bernstein (1994). Thus, we dropped TBBE2 (.6832) and IO3 (.6454). Regarding item loadings, all p-values are highly significant. As an overview, all results can be seen in Table 3.

| Construct                        | Item  | Item Loading | p-Value | Construct  | Item                      | Item Loading                           | p-Value |       |
|----------------------------------|-------|--------------|---------|--|---------------------------|--|---------|-------|
| <b>Information Overload (IO)</b> | IO1   | .8639        | .0000   | <b>Trusting Beliefs (TB)</b>                           | TBAB1                     | .7852                                  | .0000   |       |
|                                  | IO2   | .9093        | .0000   |  | TBAB2                     | .7725                                  | .0000   |       |
|                                  | IO3*  | .6454        | .0000   |  | TBAB3                     | .8148                                  | .0000   |       |
| <b>Control (CTRL)</b>            | CTRL1 | .7912        | .0000   |  | <i>Ability (TBAB)</i>     | TBBE1                                  | .8350   | .0000 |
|                                  | CTRL2 | .8415        | .0000   |  | TBBE2*                    | .6832                                  | .0000   |       |
|                                  | CTRL3 | .8939        | .0000   |  | <i>Benevolence (TBBE)</i> | TBBE3                                  | .7205   | .0000 |
| <b>Ease of Use (EAU)</b>         | EOU1  | .8316        | .0000   |  | <i>Integrity (TBIN)</i>   | TBIN1                                  | .7738   | .0000 |
|                                  | EOU2  | .8375        | .0000   |  | TBIN2                     | .7649                                  | .0000   |       |
|                                  | EOU3  | .7972        | .0000   |  | TBIN3                     | .7655                                  | .0000   |       |
|                                  | EOU4  | .8064        | .0000   | <b>Intention to Use Cloud Computing Provider (ITU)</b> | ITU                       | Scenario-based single item measurement |         |       |
|                                  | EOU5  | .7643        | .0000   |  |                           |  |         |       |
| <b>Social Presence (SP)</b>      | SP1   | .8214        | .0000   |  |                           |  |         |       |
|                                  | SP2   | .8191        | .0000   |  |                           |  |         |       |
|                                  | SP3   | .7667        | .0000   |  |                           |  |         |       |
|                                  | SP4   | .8382        | .0000   |  |                           |  |         |       |

\*item dropped

In order to assess our constructs' reliabilities we calculated Composite Reliability (CR) as well as Cronbach's Alpha (CA). Regarding CR, all constructs yield values higher than .6 and can therefore be considered as reliable (Fornell and Larcker 1981). As all constructs regarding CA are above the threshold of .7, this is also true for CA (Nunnally and Bernstein 1994). To evaluate convergent and discriminant validity, we used the square roots of the average variances extracted (AVE). These elements are represented in the diagonal in Table 4. The lower triangle represents the correlations between the constructs. If the values in the diagonal (shaded cells) are higher than the correlations between constructs, validity can be assumed (Fornell and Larcker 1981). The results show that this is the case for all of our constructs, indicating that our constructs are well-functioning and serve as a basis for testing our hypotheses.

|      | CR  | CA   | IO    | CTRL | EOU  | SP   | TB   | ITU   |
|------|---|------|-------|------|------|------|------|-------|
| IO   | .903                                      | .788 | .907  |      |      |      |      |       |
| CTRL | .880                                      | .799 | -.338 | .843 |      |      |      |       |
| EOU  | .903                                      | .867 | -.317 | .404 | .808 |      |      |       |
| SP   | .885                                      | .827 | -.093 | .242 | .385 | .812 |      |       |
| TB   | .927                                      | .909 | -.139 | .311 | .478 | .353 | .783 |       |
| ITU  | Scenario-based<br>single item measurement |      | -.090 | .246 | .313 | .294 | .717 | 1.000 |

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

### ANOVA and t-Tests Results

For the effects of the experiment conditions on IO, CTRL, and SP, we conducted both analyses of variances (ANOVA) and analyses of means (t-test). As these analyses refer to both distributions and measures of central tendencies, we provide an overview of mean values and standard variations as follows in Table 5.

| Experiment Condition        | Number of Participants | Information Overload |                    | Control |                    | Social Presence |                    |
|-----------------------------|------------------------|----------------------|--------------------|---------|--------------------|-----------------|--------------------|
|                             |                        | Mean                 | Standard Deviation | Mean    | Standard Deviation | Mean            | Standard Deviation |
| Text Only                   | 64                     | 4.078                | 1.310              | 3.707   | 1.136              | 3.520           | 1.225              |
| Search Box                  | 68                     | 3.602                | 1.392              | 4.382   | 1.155              | 3.300           | 1.137              |
| Social Recommendation Agent | 61                     | 3.589                | 1.313              | 4.581   | 1.057              | 3.900           | 1.127              |

### Information Overload and Control

In order to analyze the difference of both assistive website elements (i.e., Search Box and SRA) compared to the control situation (Text Only) we calculated an ANOVA with planned contrasts. Table 5 already shows that the mean differences for IO and CTRL for the assistive website elements differ in the hypothesized directions. Regarding IO, the difference is statistically significant ( $F(2,190) = 2.380$ ,  $p < .05$ ). For CTRL the difference between assistive website elements and our control condition is even stronger ( $F(2, 190) = 10.666$ ,  $p < .000$ ). Thus, our hypotheses H2 and H3 can be confirmed.

### Social Presence

We tested both ANOVA and t-tests for SP. While we could not identify overall differences among the groups ( $F(2, 190) = 4.355$ ,  $p = .014$ ), in line with our hypotheses, there are differences in local comparisons. We find significant differences between SRA and Text Only ( $p < .05$ ) and SRA and Search Box ( $p < .05$ ). The other pair, Text Only vs. Search Box does not yield any significant difference. In

addition, we conducted multiple t-tests which confirmed these results (cf. Table 6). The SRA evokes significant more SP than the Text Only condition ( $p < .05$ ) and the Search Box condition ( $p < .05$ ). Between Text Only and Search Box no significant differences regarding SP were found. These results indicate that also our hypothesis H7 can be confirmed.

| A          | B                           | Social Presence |         |
|------------|-----------------------------|-----------------|---------|
|            |                             | Mean difference | p-value |
| Text Only  | Search Box                  | .225            | .276    |
| Text Only  | Social Recommendation Agent | -.377           | .038    |
| Search Box | Social Recommendation Agent | -.602           | .002    |

**Partial Least Squares Analysis**

In order to evaluate the relationships between SP and its dependent variables as well as the outcomes of IO and CTRL, we make use of partial least squares structural equation modeling with SmartPLS 2.0 (M3) (Ringle et al. 2005, 2012).

First, we analyzed the model fit. The statistics for CMIN/df = 1.88, RMSEA = .068, and AGFI = .816 are in line with recommended thresholds for statistical fit (Hair et al. 1998). Thus, our model has a good fit. Second, we looked at the path correlations and coefficients of determination ( $R^2$ ) in our model. As can be seen in Figure 5, the coefficients of determination ( $R^2$ ) are moderate for EOU as well as TB, and substantial for ITU CC services. We find strong statistically significant relationships for all our hypothesized construct relationships. Especially EOU has a strong effect on TB. Moreover, the relationship between TB and ITU CC services is very strong. The associations between the constructs are significant when the effects of Previous Experience with CC, Computer Playfulness, Disposition to (interpersonal) Trust, and Disposition to Trust in Technology are controlled for. Regarding the control variables for the Trusting Beliefs, the path coefficient for Disposition to Trust is .01 (not significant,  $p = .417$ ), for Disposition to Trust in Technology .21 (significant,  $p < .000$ ), and for Previous Experience with CC .01 (not significant,  $p = .498$ ). Also Computer Playfulness as a control variable for SP (path coefficient .08, not significant,  $p = .155$ ) did not influence the core model's path coefficients. Thus, we can confirm all our hypotheses, namely H1, H4-H6, and H8.

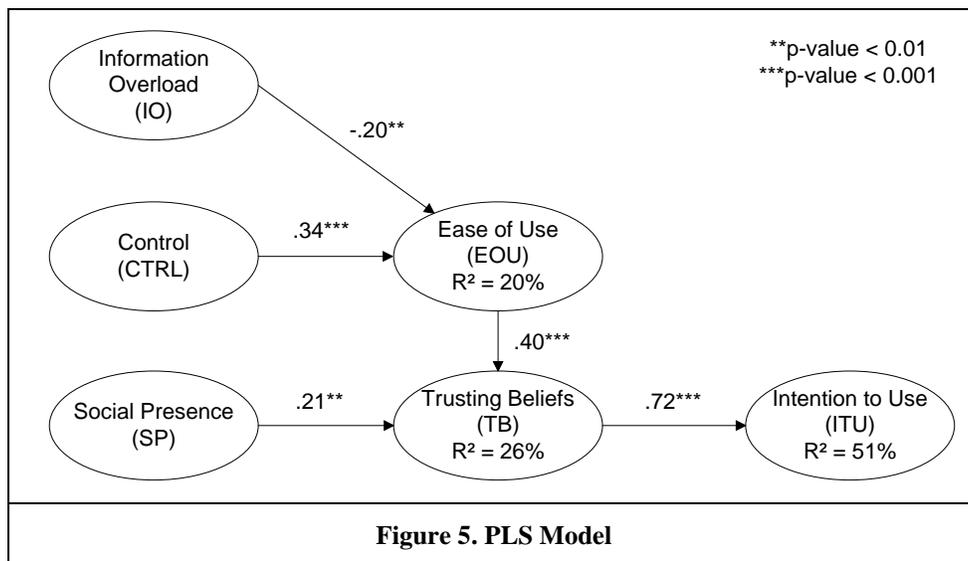


Table 7 provides an overview of our hypotheses.

| <b>Table 7. Overview of Hypotheses</b> |   |               |
|--|---|---------------|
| <b>#</b>                               | <b>Hypotheses</b>   | <b>Status</b> |
| H1                                     | The higher a user's (perceived) trust in a CC provider, the higher the ITU a CC service from this CC provider.  | Supported     |
| H2                                     | Providing assistive website elements (such as a Search Box or SRA) in order to help users to find relevant information within SLAs and privacy policies reduces a user's level of (perceived) IO.                     | Supported     |
| H3                                     | Providing assistive website elements (such as a Search Box or SRA) in order to help users to find relevant information within SLAs and privacy policies increases a user's (perceived) CTRL over the search activity. | Supported     |
| H4                                     | The lower a user's (perceived) IO when searching for relevant information within SLAs and privacy policies, the higher the (perceived) EOU.   | Supported     |
| H5                                     | The higher a user's (perceived) CTRL when searching for relevant information within SLAs and privacy policies, the higher the (perceived) EOU.  | Supported     |
| H6                                     | The higher a user's (perceived) EOU, the higher a user's (perceived) trustworthiness of a CC provider.  | Supported     |
| H7                                     | Providing a SRA in SLAs and privacy policies will increase users' (perceived) SP.   | Supported     |
| H8                                     | The higher a user's (perceived) SP when searching for relevant information within SLAs and privacy policies, the higher the (perceived) trustworthiness of this CC provider.  | Supported     |

## Discussion and Conclusion

### General Discussion

Users might have to rely on information provided by CC providers in order to be able to assess a provider's trustworthiness. As a CC provider's SLA and privacy policy includes information about trust related issues, such as availability of the service, the responsibilities of all parties involved, and the provider's applied security measures, these regulations are instrumental in the development of trust (Anton et al. 2007; Stankov et al. 2012). However, the length and complexity of these regulations may lead users to perceive IO. This makes it difficult for users to filter relevant information and to assess a provider's trustworthiness. In addition, the perceived social distance between providers and users increases users' risk perceptions and can make it hard to establish a trust relationship (Gefen and Straub 2003; Pavlou et al. 2007). Thus, the goal of our study was to investigate whether the implementation of assistive website elements (i.e., Search Box or SRA) helps in dealing with IO, lack of CTRL, and social distance. Our introduced Search Box and SRA help to increase the users' perceived EOU of a CC provider's SLA and privacy policy by reducing perceptions of IO and increasing perceived CTRL. Moreover, we show that a SRA additionally raises the perception of SP. We then analyzed whether the favorable effects of our assistive website elements positively influence users' perceived trustworthiness of CC providers and subsequently increase the ITU CC services. We showed that the perceived trustworthiness of a CC provider largely determines the ITU the services of a CC provider. In this sense, we demonstrate the importance of communication for building trust in a CC provider, whereby this trust-building process can be significantly influenced by implementing assistive website elements into providers' SLAs and privacy policies.

### Implications for Theory and Practice

Our findings confirm the importance of trust as a major influencing factor for CC adoption. In addition to CC studies with a focus on technical aspects, we clarify that also the role of communicating relevant information via assistive website elements is of high influence. A provider should, for example, not only implement certain security measures in order to enhance the security of the CC infrastructure but also communicate the implemented measures in order to gain potential users' trust. This is a valuable finding because it reveals that the perceived trustworthiness of a CC provider does not only depend on *what* information is communicated but also on *how* it is provided. This means, the information should not only be *pushed* by CC providers but rather the users should be able to *pull* the information they are interested

in. To be more specific, already the implementation of assistive website elements such as search boxes or SRAs can reduce perceived IO and increase a user's perception of CTRL. Both effects result in a higher perceived EOU of the overall information search process, which in turn positively influences potential users' perceived trustworthiness of a CC provider. These findings clearly demonstrate that the easier it is for users to find relevant information for the assessment of a CC provider's trustworthiness, the higher will be the trust placed in the provider. Transferred to the signaling theory, it can be stated that a provider's willingness and efforts to bridge the information asymmetry between user and provider can be seen as a benevolent act that is rewarded by users' higher levels of trust in providers. Thus, apart from the suggestion to implement search boxes and SRAs, we recommend to also consider that users' intentions to adopt CC services are not only dependent on actual security improvements but also on an adequate information provisioning. This involves educating users about critical information in such a way that users (a) can better pull the needed information and (b) understand it. As a consequence, providers should think about how to provide certain information. Providers may utilize visualizations to improve the comprehensibility of (complex) coherences (e.g., encryption mechanisms might not be comprehensible for non-IT users). Equally, other ways that make the services more transparent are conceivable.

With respect to SRAs, we find support for previous findings of SRAs' effect on SP and the relationship between SP and trust (as shown in the field of e-commerce) and additionally extend these to the context of CC. This fact points towards a much broader application spectrum of SRAs than initially assumed. Furthermore, compared to the outcomes of the Search Box in our study, the SRA evokes an even higher level of SP, which subsequently further increased a provider's trustworthiness and the users' intention to adopt CC services. Given this stronger effect, SRAs seem to be even more suitable to be included in CC providers' websites as they not only reduce perceived IO and increase perceived CTRL but also raise feelings of SP. While we conducted a pretest in order to find the most suitable SRA for our context, we were limited to a set of predefined avatars. There is still much research needed on SRAs, especially with regard to their design, interaction, personality, and capacity to express themselves (verbally or nonverbally). Thus, future developments of SRAs may evoke even higher levels of SP with stronger effects on the subsequent outcomes. By considering the positive outcomes of SRAs on CC adoption in our study that mimics a business situation, we clearly illustrate that past research in the field of SRAs was worth the effort. On this account, we hope to encourage researchers in the field to keep this path.

### ***Limitations and Future Research***

As any research endeavor, also our presented research has some limitations. As pointed out, we conducted the experiment mainly with students. The generalizability of models based on student samples is a controversial topic in IS (Compeau et al. 2012). Nonetheless, as students do not differ significantly from others in their technology use decisions (McKnight et al. 2011; Sen et al. 2006), they are an adequate target sample for our study. Furthermore, as we conducted the experiment online, the limitations of web-based experimenting apply (Reips 2002). For instance, we were not able to ensure that all participants concentrated on the experiment, did not talk or exchange results while the experiment was performed.

To the best of our knowledge, this is the first study to investigate the positive effects of SP in the context of CC. Future research may also consider other SP designs such as human images in websites (Cyr et al. 2009) to be evaluated in the CC context or, more generally speaking, in legal contexts. Our study presents very positive implications for implementing a SRA to a CC provider's SLA and privacy policy. However, future designs and improvements of SRA such as nonverbal cues and better text-to-speech functionalities may increase the perception of SP and subsequent positive effects on trust and CC adoption. In addition, a structured analysis of specific requirements of CC compared to e-commerce may lead to SRA designs (e.g., the features of the avatars) that even better fit the context. All in all, for the domain of CC, we encourage researchers to not only focus on technical advancements but also to take the users' informational needs into account, thus, to improve the communication between users and providers in order to overcome the existing information asymmetry.

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