Certification in Digital Transactions: Determinants of Effectiveness in the Context of Information Asymmetry

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Abstract

Digital transactions enable individual consumers and organizations to exchange goods and services in an easy and flexible manner, driving market dynamics and promoting new business models. Increased speed in transactions and volatility in market participants, however, come at the downside of frequent evaluations of transaction partners and the need for deliberate decision-making in the light of growing product and service complexity. Digital environments make it harder to inspect products or services, which may rely on critical platforms or infrastructure that are completely hidden from transaction partners but are substantial to service quality. In consequence, information is distributed unequally between transaction partners and measures have to be adopted to overcome this asymmetry to build trust and foster transactions.

Certifications are a means to signal true quality between transaction partners by providing information, to which regard specific requirements are fulfilled. In the certification process, an evaluation against a predefined set of criteria is performed and official documentation by a third-party certification authority is provided. By inspecting this documentation, potential transaction partners are provided with introspection into otherwise unobservable aspects of product or service quality. Hence, certifications can help to bridge information asymmetry prior to transactions. While they have been adopted in various contexts and were subject to prior research, understanding about their inner workings is limited and findings on their effectiveness remain inconclusive. The focus of prior research has been on the effect of mere presence vs. absence of certifications. While the findings of these studies helped to understand the effect of certifications as unitary cues, they did not investigate how the particular design of certificates in terms of their assurances influences their effect. Moreover, the results were ambiguous as some could find significant influences on the formation of trust and the intention to transact, while others could not. Besides, another important aspect was hardly covered: the embedding of certification in its environment. This includes characteristics of the transaction parties that perceive a certification, their prior relationship, and the context, in which the certification is used.

To contribute to a better understanding of certification effectiveness, incorporating its internal characteristics and external embedding, four research studies have been conducted. The first study provides a literature review on the theoretical frameworks used in existing research on certifications in Information Systems. Study two focuses in detail on certifications and their content, investigating differences in relative importance of assurances between customers and providers in the context of cloud service certifications. Shifting the focus from its content to characteristics of recipients, the third study analyzes how the effect of certification changes, depending on prior experiences in a customer-provider relationship. An online scenario experiment was conducted, simulating e-commerce purchase decisions at different qualities and quantities of prior shopping experience. The fourth study investigates a particular form of certification in the context of the sharing economy. In an online experiment, the role of certification of users' identity on the formation of trust and intentions to engage in a transaction was analyzed.

The findings of these studies enrich the theoretical understanding of certifications in Information Systems in different aspects. Shifting the focus of investigation from certification as a unitary cue to a bundle of assurances, it becomes apparent that one certification can be perceived differently depending on recipient characteristics and the relative importance of assurances. Moreover, the certification's environment plays an important role towards its effectiveness. Influencing factors as industry, the prior experiences in a provider-customer relationship or the transaction context were identified. Besides, on a research level, the theoretical lenses used to study certification varied in prior research, which may partly explain for ambiguous findings. Overall, this thesis finds that a more fine-grained, context-aware analysis of certifications in Information Systems is beneficial to understand their influence on market participants and to enable better prediction of their effectiveness in practice.

Zusammenfassung

Die Digitalisierung der Kommunikation vereinfacht Transaktionen zwischen Individuen und Organisationen. Mehr Flexibilität im Austausch von Gütern und Dienstleistungen führt zu höherer Marktdynamik und fördert die Entstehung neuer Geschäftsmodelle. Allerdings erschweren höhere Transaktionsgeschwindigkeiten und eine volatilere Zusammensetzung der Märkte die Entscheidungsfindung, insbesondere in Anbetracht höherer Komplexität von Produkten und Dienstleistungen. Die digitale Umgebung kann eine umfassende Beurteilung erschweren, gerade dann, wenn Angebote auf einer Plattform oder Infrastruktur basieren, die für potentielle Kunden nicht einsehbar ist. Die Folge ist eine ungleiche Verteilung von Informationen zwischen Transaktionspartnern und die Notwendigkeit von Maßnahmen, um diese Asymmetrie auszugleichen, Vertrauen aufzubauen und dadurch Transaktionen zu erleichtern.

Zertifikate können eingesetzt werden, um Informationen über die tatsächliche Qualität von Produkten oder Dienstleistungen zwischen Transaktionspartnern auszutauschen. Im Zertifizierungsprozess wird eine Evaluation gegen definierte Kriterien von einer Zertifizierungsstelle durchgeführt und das Ergebnis in offizieller Form dokumentiert. Potentielle Transaktionspartner können diese Dokumentation einsehen und dadurch Informationen über einen Anbieter sowie dessen Produkte und Dienstleistungen gewinnen, die anderweitig nicht zugänglich sind. Damit helfen Zertifikate dabei, die Informationsasymmetrie zwischen Parteien im Vorfeld einer Transaktion zu überbrücken. Obwohl sie in mehreren Kontexten eingesetzt werden und in früheren Studien untersucht wurden, ist das Verständnis über die Wirkungsweise von Zertifikaten begrenzt und die Ergebnisse über deren Effektivität sind nicht eindeutig. Der Fokus bisheriger Forschung lag auf der gesamtheitlichen Wirkung eines Zertifikats, insbesondere dem Vergleich von Angeboten mit und ohne Zertifizierung. Diese Studien haben wichtige Beiträge zum Verständnis der Wirkung von Zertifikaten geliefert, allerdings wurde nicht geklärt, wie das konkrete Design eines Zertifikats in Form der enthaltenen Zusicherungen sich auf dessen Effektivität auswirkt. Darüber hinaus sind die bisherigen Ergebnisse nicht eindeutig, da einige Studien signifikante Einflüsse von Zertifikaten auf die Bildung von Vertrauen und Transaktionsabsicht nachweisen konnten, diese jedoch in anderen Studien nicht bestätigt wurden. Ein weiterer Aspekt, der in bisherigen Studien nur vereinzelt adressiert wurde aber von Relevanz für dessen Effekt ist, liegt in der Umgebung eines Zertifikats. Dazu gehören die Charakteristika der Partei, die ein Zertifikat empfängt bzw. interpretiert, das bisherige Verhältnis der Transaktionsparteien und der Kontext, in dem das Zertifikat eingesetzt wird.

Um die Effektivität von Zertifikaten besser zu verstehen, wurden vier Studien durchgeführt, die verschiedene Aspekte der internen Charakteristika sowie externer Einflussfaktoren untersuchen. Die erste Studie stellt die Ergebnisse einer Literaturrecherche zu den theoretischen Rahmenwerken vor, die in bisheriger Forschung im Bereich Information Systems zu Zertifikaten verwendet wurden. In der zweiten Studie wurden Unterschiede in der Wahrnehmung von Zertifikaten zwischen Anbietern und Kunden untersucht. Dabei wurde die relative Wichtigkeit verschiedener Zusicherungen innerhalb eines Zertifikats im Kontext von Cloud Computing verglichen. Dagegen beschäftigt sich die dritte Studie mit dem Einfluss der bisherigen Beziehung

zwischen Anbieter und Kunde auf die Wirkung eines Zertifikats. Es wurde in einem Onlineexperiment untersucht, in wie weit die Qualität und Quantität bisher gemachter Transaktionserfahrungen bei der Wahrnehmung des Zertifikats eine Rolle spielen. In der vierten Studie wurde eine konkrete Form der Zertifizierung im Kontext der Sharing Economy untersucht. Dabei wurde in einem Onlineexperiment der Einfluss einer Zertifizierung der Nutzeridentität auf die Bildung von Vertrauen und die Intention zur Durchführung einer Transaktion analysiert.

Die Ergebnisse dieser Studien tragen zum theoretischen Verständnis von Zertifizierung in der Information Systems Forschung bei. Die Verschiebung des Untersuchungsfokus von Zertifikaten als eindimensionale Signale hin zu einer Betrachtung als Bündel einzelner Zusicherungen zeigt, dass die gleiche Zertifizierung von unterschiedlichen Empfängern anders wahrgenommen wird, abhängig von deren Charakteristika und der Wichtigkeit einzelner Zusicherungen. Darüber hinaus spielt die Umgebung, in der ein Zertifikat eingesetzt wird eine wichtige Rolle für dessen Effektivität. Einflussfaktoren wie der Wirtschaftssektor, vorherige Erfahrungen in einer Kunde-Anbieter-Beziehung oder der Transaktionskontext wurden als relevant identifiziert. Hinsichtlich der Forschung zu Zertifizierungen wurde gezeigt, dass die bisher verwendeten Theorien variierten. In den dadurch unterschiedlich angelegten Studien wurden teilweise gegensätzliche Ergebnisse zur Wirkung von Zertifikaten gefunden. Eine Konsolidierung der theoretischen Rahmenwerke kann dazu beitragen, Ergebnisse besser vergleichbar zu machen und relevante Aspekte bei der Untersuchung zu berücksichtigen. Insgesamt zeigen die Ergebnisse der Studien, dass eine feingranulare und kontextsensitive Analyse von Zertifizierungen notwendig ist, um deren Einfluss auf Marktteilnehmer zu verstehen und damit die Vorhersagbarkeit ihrer Wirkung in der Praxis zu verbessern.

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List of Abbreviations

AVE	Average Variance Extracted
B2B	Business to Business
B2C	Business to Consumer
BWS	Best Worst Scaling
C2C	Consumer to Consumer
CFI	Comparative Fit Index
CMM	Capability Maturity Model
CPA	Certified Public Accountants
CSA	Cloud Security Alliance
CSC	Cloud Service Certification
DV	Dependent Variable
ELM	Elaboration Likelihood Model of Persuasion
FSM	Factorial Survey Method
HTMT	Heterotrait-Monotrait Matrix
IaaS	Infrastructure as a Service
IID	Independent and Identically Distributed
IS	Information Systems
IV	Independent Variable
M	Moderator
PaaS	Platform as a Service
RMSEA	Root Mean Square Error of Approximation
RQ	Research Question
SaaS	Software as a Service
SD	Standard Deviation
SEM	Structural Equation Modeling
SET	Social Exchange Theory
TLI	Tucker Lewis Index
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action

1 Introduction

1.1 Motivation and research question

Digital service transactions are ubiquitously present in private and professional life. Using the internet, for instance, individuals may rent private accommodation on Airbnb, while organizations are enabled to outsource payment processing to a third-party online provider such as Stripe. This has been enabled by a shift in the economy from products to digital services (Benlian et al. 2018; Williams et al. 2008), as well as technological developments. Especially, the proliferation of cloud computing (Elumalai et al. 2016) allows providers to offer modular functionality via Software-as-a-Service (SaaS) models and lets customers combine and integrate services and providers as best fits their requirements (Benlian et al. 2011). While these developments increase flexibility, they pose risk, as information is not equally distributed between transacting parties and reviewing claims made by another party is inherently difficult.

Driven by reduced time to market in digital production and lower market entry costs, a high variety of services and service providers exist. Besides, customers deliberately integrate services and share data (e.g., MIT Technology Review / Oracle 2017). While providers advertise their services as superior, customers try to select the best available option. In consequence, a higher number of selection decisions have to be made in spite of the given information asymmetry between providers and customers. Especially, when digital services are provided in a cloud-based model, customers have no insight into their inner workings and can hardly judge their true quality (e.g., in terms of availability or data privacy). This reduces transparency and calls for alternative measures to create trust between customers and providers to overcome the unequal levels of insight into a focal service offering.

Information Systems (IS) certifications are a means to signal true quality between a service provider and customer by providing information, to which degree specific requirements are fulfilled by a service and/or service provider. Certification refers to the process of evaluation against a predefined set of criteria and providing official documentation in case these criteria are met, which enables introspection to a customer without the need for personal investigation. They are widely adopted in practice (e.g., Cloud Security Alliance's "STAR" or TRUSTe's "Certified Privacy") and meet increasing demand, especially among enterprise customers (Hochmuth et al. 2013; KPMG 2017). While IS certifications have been adopted in business to business (B2B) as well as business to consumer (B2C) contexts and have been subject to prior research, understanding about their inner workings is limited and findings on their effectiveness remain inconclusive.

The focus of prior research on IS certifications has been on their ability to change users' perceptions as a single cue (i.e., certificate presence vs. absence). Multiple studies have investigated how presence of an IS certification changes customer trust or purchase intention (Sturm et al. 2014). While the findings of these studies help to understand the effect of certifications, they have two major shortcomings. First, there is little understanding regarding how their characteristics (i.e., the design of the certificate) affect the overall effect. While there are significant

differences in how a certificate is designed (e.g., in terms of the assurances provided or the issuing party), a mere investigation of presence vs. absence treats all certificates equally and does not control for differences in the effects that may be caused by varying certificate design. Hence, it remains unclear whether or not certain certificate characteristics cause effects in consumers. Second, the current findings on certification effectiveness are inconclusive. A group of studies has found the presence of IS certifications causing positive effects (i.e., improving customers' perceived assurance, trust or purchase intention) (Hu et al. 2010; Kaplan and Nieschwietz 2003a; Kim and Kim 2011; Mavlanova et al. 2016; Nöteberg et al. 2003; Yang et al. 2006). In contrast, there are studies that did not find increased levels of perceived assurance, trust or purchase intention in presence of IS certifications (Hui et al. 2007; Kim et al. 2008a; Lowry et al. 2012; Mauldin and Arunachalam 2002; McKnight et al. 2004; Rifon et al. 2005). These contradicting findings call for further research to provide consistent results on the effect of IS certifications. However, one may also conclude that a more systematic and nuanced analysis is needed: as these studies differ in terms of applied theory, research context, and effect variables, they are hard to compare, which may partially explain their ambiguous findings.

There are two main levels, on which to improve understanding of IS certification: analysis of the characteristics of a certification and analysis of its embedding in the IS certification ecosystem (i.e., the context and environment, in which certification is applied). On the one hand, certifications differ, for instance, in the assurances that are provided (e.g., availability of a service, matureness of a process or reaction time of a service) or the way they are assessed (e.g., by a third party on-premise or automatically online). Investigating the effect of these characteristics may enable a more profound prediction of certificate effectiveness. On the other hand, certifications are embedded in an ecosystem, which also determines their effect. This includes characteristics of provider and customer (e.g., overall trust disposition of a customer inspecting a service and its certification), their prior relationship (e.g., whether a customer has made a transaction with the same provider before) and the certification environment (e.g., whether the certificate is accompanied by other trust-building cues or how it is presented). Including these internal and external factors into the analysis of IS certification may increase transparency and help to better understand and predict the effect of a specific certification on customers' perceptions. This thesis contributes to the research stream by investigating how internal and external factors influence IS certifications and their effectiveness.

Research Question (RQ): How is the effectiveness of IS certifications affected by their internal characteristics and external embedding in a certification ecosystem?

Four research studies were conducted, contributing to answer this overall research question. These studies are included in separate chapters in this thesis and were previously published as articles in IS research outlets. The structure of the thesis is discussed in detail in the next section.

1.2 Thesis structure and synopses

This thesis is divided into seven chapters. After motivating the research in the introductory chapter, an overview on the research context is presented in chapter two. At the center of the

thesis, there are four research articles presenting four studies conducted to contribute to answering the overall research question. These articles have been published in peer-reviewed outlets and were slightly revised from their published versions to provide a uniform, consistent layout throughout the thesis. The chapters three to six are each constituted of one article in the order as presented in Figure 1-1, which gives an overview on all articles. In chapter three (article one), a literature review on theoretical lenses in IS certification research is presented. The fourth chapter (article 2) deals with the relative importance of assurances in cloud service certifications as perceived by consumers and companies. Chapter five (article three) provides a longitudinal perspective, investigating the role of prior purchase experience on the effect of IS certification on e-commerce customers' intention to purchase. Subsequently, in chapter six (article four), identity verification as a form of single-assurance certification is investigated in an online experiment in the context of the sharing economy. Finally, chapter seven concludes this thesis, giving a summary on the contributions to research and practice.

Article 1	**Toward a unified view of IS certification: A structured literature review on theoretical lenses** Löbbers, J.; Siegfried, N.; (2018) 26th European Conference on Information Systems, Pittsburgh, UK
Article 2	**Strategic signaling through cloud service certifications: Comparing the relative importance of certifications' assurances to companies and consumers** Lansing, J.; Siegfried, N.; Sunyaev, A.; Benlian, A.; (2019) Journal of Strategic Information Systems (28:4)
Article 3	**Do bad experiences loom larger than good ones? The role of prior purchase experiences on the effectiveness of IS certifications** Siegfried, N.; Winkler, N.; Benlian, A.; (2020c) Journal of Decision Systems (29:2)
Article 4	**The Trust-Building Nature of Identity Verification in the Sharing Economy: An Online Experiment** Siegfried, N.; Löbbers, J.; Benlian, A.; (2020a) 15th International Conference on Wirtschaftsinformatik, Potsdam, DE

Figure 1-1. Article overview

The studies published in these articles have been conducted within the scope of the research project "Unblackboxing IT Certifications: Eine dekompositionelle Analyse von IT-Zertifikaten in elektronischen Märkten" funded by the Deutsche Forschungsgemeinschaft under grant award numbers BE 4308/3-1 and BE 4308/3-2.

In the following, short summaries of the four research articles (chapters three to six) are presented. They provide an overview on the motivation and main findings of each article and how it contributes to answering the overall research question. The articles were written by multiple authors (as each study has been conducted in a joint effort by multiple researchers) and express the ideas of all respective authors. Accordingly, the articles as well as the following summaries are written from the first-person plural point of view, i.e., referring to the authors using "we".

Article 1

Toward a unified view of IS certification:
A structured literature review on theoretical lenses

While certification had been subject to multiple studies in the IS domain, the findings lacked consistency. One aspect, in which these studies differed, and which we presumed as an important, yet unstudied antecedent to contradictory results was the theoretical lens used by scholars. In this literature review, we searched for prior work on IS certification and analyzed the theoretical lenses used in relevant articles. We found a high distribution for theoretical arguments based on trust, while also many studies did not explicitly use any theoretical framework. Despite a relatively low distribution in the set of articles, we found that signaling theory as well as cue utilization and cue consistency theory are promising theoretical approaches to study the effect of IS certification. Overall, we identified thirteen different theoretical lenses used and reason that this plurality, while being only one variable factor among many (e.g., research context, participant sample or type of certification), makes it hard to compare results across studies. This article contributes to the overall research question as it identifies the heterogeneous theoretical lenses as a potential cause to mixed findings on IS certification effectiveness. The results provide an overview on theories used, their distribution and recommendations for future studies on which theories to base their investigation.

Article 2

Strategic signaling through cloud service certifications:
Comparing the relative importance of certifications' assurances to companies and consumers

In contrast to the black box perspective taken by many studies in IS certification research, customers may not only be interested in the presence of a certification for a certain service or product, but in the exact assurances provided by a certification. This becomes more relevant when the strategic importance of a service is high or when other services of a customer rely on the focal service. In this article, we investigate the relative importance of assurances in cloud service certifications to both customers and organizations. Participants were asked to weigh the importance of different assurances using a best-worst scaling survey. Based on our findings in article one, we used signaling theory as the theoretical lens in this study. While privacy, security, and availability were found to be the most important assurances to both consumers and companies, their relative importance varied substantially. We further found that participants evaluate certifications as a bundle of signals with varying importance. The article contributes to the overall research question as it provides evidence for the shortcomings of a black-box approach, which neglects the varying relative importance of single assurances to individual customers and service providers. Contradictory results in prior IS certification studies may be due to the fact that certificates may have consisted of varying assurances, which were weighed differently by the respective participant samples. Based on the findings, we recommend future research to investigate certification on the level of assurances or at least control for participants' relative importance to be able to better compare and understand results on certification effectiveness.

Article 3

Do bad experiences loom larger than good ones?
The role of prior purchase experiences on the effectiveness of IS certifications

Apart from its specific assurances, the environment in which an IS certification is deployed plays an important role towards its effectiveness. Multiple factors as recipient characteristics, usage context, or interactions with other informational cues constitute this environment. In this article, we focus on the specific environmental factor of prior purchase experience. The study aims to investigate how customers' prior experience with an e-commerce vendor interacts with the influence of IS certification regarding customers' perceived levels of trust and their intention to purchase. We reviewed relevant theory and hypothesized that higher levels of experience will overshadow the influence of IS certification, because of its more direct nature. A scenario-based experiment was conducted, in which multiple combinations of positive and negative prior experiences with certified and uncertified online shops were simulated. Our results indicate that prior shopping experiences moderate IS certifications' effect, however, depending on the quality and quantity of the experiences made. While negative experiences decrease IS certifications' influence on trust in a vendor, positive experiences do not alter their effect. More specifically, we found that the more negative experiences were present, the lower was an IS certification's effect on trust. The findings indicate that IS certifications effect cannot be analyzed in separation from the customer-provider relationship. However, vendors can benefit from this interaction by incorporating customers' prior experiences and using IS certification more deliberately.

Article 4

The Trust-Building Nature of Identity Verification in the Sharing Economy:
An Online Experiment

We have found in articles one and two that certification has been studied in a variety of contexts (e.g., e-commerce, stock market, or cloud computing) and that the effect of the certification as a whole depends on the portfolio of included assurances and their relative importance. Based on these findings, we assumed that a certification, which is context-specific and provides a single assurance, should render effective. In the context of the sharing-economy, verification is used to assure the identity of customers and providers on accommodation-sharing platforms. Despite its use in practice, little empirical evidence on the effectiveness of such verification was present in IS literature. In article four, we present the results of an online experiment with 232 participants, evaluating verified and non-verified user profiles on an accommodation sharing platform. We found that identity verification significantly increased participants' likelihood towards a transaction, while its effect was mediated by trust in the transaction partner. Moreover, we found that participants' general disposition to trust is a significant antecedent to their transaction intention. The findings contribute to the overall research question as they provide evidence for the effectiveness of IS certification in the context of the sharing economy. Moreover, they draw attention to the role of trust, which interacts with the effect of certification. Hence, it is important to control for participants' trust disposition and other trust-building factors in the certification environment when analyzing the effect of IS certifications on users' intentions.

The following articles were also published during my time as a doctoral candidate. These articles are, however, not part of this thesis:

Siegfried, N.; Rosenthal, T. and Benlian, A. (2020b). “Blockchain and the Industrial Internet of Things: A Requirement Taxonomy and Systematic Fit Analysis,” *Journal of Enterprise Information Management* (*forthcoming*).

Winkler, N.; Röthke, K.; Siegfried, N., and Benlian, A. (2020). “Lose Yourself in VR: Exploring the Effects of Virtual Reality on Individuals’ Immersion,” in *Proceedings of the 53th Hawaii International Conference on System Sciences (HICSS 2020)*, Maui, Hawaii, USA. Jan 7-10.

Schuhbeck, V.; Siegfried, N.; Dorner, V.; Benlian, A.; Scholz, M. and Schryen, G. (2019). “Walking the Middle Path: How Medium Trade-Off Exposure Leads to Higher Consumer Satisfaction in Recommender Agents,” in *Proceedings of the 14th International Conference on Wirtschaftsinformatik 2019 (WI 2019)*, Siegen, Germany. Feb 24-27.

Siegfried, N.; Löbbers, J.; Benlian, A., and Sunyaev, A. (2018). “Seeing Service Certification "Eye to Eye" - The Role of Perceptual Congruence Between Customers and Providers in IS Certification,” in *Proceedings of the 26th European Conference on Information Systems (ECIS 2018),* Portsmouth, UK. Jun 23-28.

Siegfried, N.; Koch, O. and Benlian, A. (2015). “Drivers of App Installation Likelihood - A Conjoint Analysis of Quality Signals in Mobile Ecosystems,” in *Proceedings of the 36th International Conference on Information Systems (ICIS 2015),* Fort Worth, Texas, USA. Dec 13-16.

2 Research Context

In this chapter, the research context of the four thesis articles is presented. The fundamental concepts regarding information asymmetry in digital transactions and IS certification are laid out. First, the concepts of information asymmetry and signaling theory are introduced, describing how they affect market economy and their characteristics in online environments. Subsequently, IS certification is presented as a quality signal to bridge information asymmetry in digital transactions, discussing its mechanics and factors determining its effectiveness. Finally, this thesis is positioned in the provided context.

Being aware of other theoretical frameworks relevant to the investigation of IS certification, signaling theory was chosen to be introduced in this section for best covering the whole certification process and embedding it into its economic context. Moreover, signaling theory is a widely applied theoretical lens in IS certification literature (Löbbers and Siegfried 2018; Sturm et al. 2014). More specific theories that focus on certain aspects (e.g., the elaboration likelihood model of persuasion (ELM) to describe the mental paths by which different kinds of information are processed) are not discussed in this section, however, more information and relevant literature can be found in chapter three.

2.1 Information asymmetry and signaling theory

The concept of information asymmetry is not unique to digital transactions, but fundamental to the dynamics of any online and offline market, in which actors possess different levels of information and have the freedom to choose, whether or not to participate in the market (e.g., Akerlof 1970; Mavlanova et al. 2012; Spence 1973). First, a general introduction to the concept is presented before focusing on the specifics in digital transactions.

The economics of information have helped to advance the understanding of classic market economy phenomena (Stiglitz 2000), their importance being recognized with the 2001 Nobel Memorial Prize in Economic Science. The central tenets of the economics of information are that information is imperfect, asymmetrically distributed between transaction parties and that the level of asymmetry is affected by actions of these parties (Stiglitz 2000). In essence, information asymmetry describes a situation, in which one party has different information than another party. A famous example is given in the seminal work of Akerlof (1970): on the market for used cars, sellers have an informational advantage. As they have been driving the car for a longer period of time, they have first-hand experience about its quality and reliability. A potential buyer only has the option to inspect the car but lacks information about its prior usage, leaving the seller in a better position to estimate the true value of the car.

When information asymmetry is present, it incurs the problem of adverse selection. Continuing Akerlof (1970)'s example, a buyer is interested in paying a fair price (i.e., a price that resembles the true value). Depending on the condition of a car, there may be cars with a lower fair prize (e.g., because they have been involved in accidents) as well as cars with a higher fair prize. As the true quality, however, is not observable to buyers, sellers will always claim their car to be

of higher quality and charge a higher price. In consequence, the fair price will then resemble the average quality car; buyers will not be willing to pay more than the fair price of an average car, as they cannot know the true quality of what they buy. This will drive high-quality sellers out of the market as their cars are worth more than the fair price of an average car. This is why the average quality in the market decreases, leading to a decline in the fair price of an average car (as the overall quality of cars in the market is lowered). This mechanism continues until only those cars of the worst quality remain in the market. Another market typically affected by adverse selection is private insurance (Cardon and Hendel 2001). For example, when buyers get older, health insurance companies increase premiums to reflect higher risk. They do not have information about the true health of all customers, so they assume average health and charge all customers a premium reflecting the risk of such average health. At a certain age, these premiums become unattractive to individuals with especially good health. In consequence, these individuals will discontinue their insurance. As the remaining customers are of lower health, the insurance company will raise premiums again leading to further healthy customers leave until only customers of the lowest health remain. In reality, this adverse selection effect can lead up to the collapse of a market (i.e., no offers remain for private health insurance to individuals that have exceeded a certain age).

Signaling theory provides a theoretical framework to describe how actors can send signals about true, unobservable quality to reduce information asymmetry and avoid adverse selection. The theory originated from Spence (1973), one of the 2001 Nobel Memorial Prize laureates, who investigated signals that job market candidates could use to communicate their quality to potential employers. A typical example given by Spence (1973) is higher education: by mastering the challenge of pursuing a higher education degree, candidates can express certain unobservable qualities (e.g., rigor, stamina, and intelligence), which are of interest to organizations. Signaling theory has been widely adopted in management literature to study situations, in which true quality could not be (fully) observed due to information asymmetry (Connelly et al. 2011). In the following, the key constructs to signaling theory are introduced.

In signaling theory, a signaler sends a signal to a receiver in order to change the receiver's perception about the signaler's ability to fulfill the receiver's needs (Kirmani and Rao 2000; Spence 1973). The signaler is an individual or organization, who has the intention to persuade the receiver and somehow has access to information, which is not accessible to the receiver. For example, signalers can be companies that want to market their products (Kirmani and Rao 2000) or recruiters that want to communicate the attractiveness of a job offer to candidates (Connelly et al. 2011). The receiver is also either an individual or organization that picks up the signal and may change behavior on its basis. This change in behavior is typically pursued by the signalers and benefits them in some way (e.g., the receiver buys the signaler's product after receiving the signal). Finally, the signal itself consists of private information in any form that is observable to outsiders and costly to fake, i.e., high costs are incurred to signalers that use the signal without actually providing the signaled quality. Signal cost is important, as signaling is only effective if it helps to divide the market into offerings of higher and lower quality.

If the cost for misleading signals is not higher than the expected additional income, actors with low quality will misleadingly signal higher quality. In consequence, all actors send the same signal, leaving customers without the ability to sort out their true quality. An example for a costly signal is a guarantee. Sellers who know about the high quality of their offering face a low risk of customers actually filling the guarantee, while low-quality sellers will shy away from offering such guarantee as their low-quality offering may lead to high anticipated guarantee cost. Hence, a guarantee is a reliable signal in the market to indicate high quality. Even for costly signals, however, it is not guaranteed that a signal achieves the desired effect at a receiver, as multiple factors (e.g., signaler and receiver characteristics or signaling environment) determine whether or not signaling is successful.

2.2 Quality signals in digital transactions

In physical transactions, customers can directly observe product quality to a certain extent, for instance by visual or haptic inspection. Contrary, in digital transactions – exchanges realized by means of digital communication on either physical (e.g., buying shoes in an online store) or digital (e.g., subscribing to online music streaming) products or services, direct observation is not possible. Hence, customers in digital transactions rely on informational cues when evaluating product or service quality prior to engaging in a transaction. While some of these cues can readily replace experiences in a brick-and-mortar store (e.g., product photos and videos for visual inspection), certain experiences can hardly be exchanged (e.g., fitting clothes), requiring other forms of trust-building to pursue customers. In addition, digital services introduce new types of risk due to their idiosyncrasies, which in turn pose a need for specific types of quality signals to address these uncertainties. For instance, SaaS offerings are typically served to a multitude of customers while running on a common platform or infrastructure (often realized by cloud computing). This form of provisioning introduces the risk, that customer data may become visible to other customers if no proper separation and security measures are in place. As such measures are not transparent and inspectable to customers, cues are required that build trust in customers regarding the vendor's capability to address these risks.

Typically, multiple informational cues are presented to customers in order to convey the quality of a product or service (Mavlanova et al. 2016). For example, vendors may provide reviews from other customers that report on their experience with a product or commit to a money-back guarantee in case that customers may be unsatisfied after their purchase (e.g., Hu et al. 2008). While these cues may add information for the customers, it remains challenging to verify them. As the vendor has control over these cues, customers may not know in advance about their authenticity (e.g., whether real customers have written presented reviews or if they were created by marketing staff) or to which regard the vendor will act on them (e.g., whether they will receive their money back in case of guarantee redemption). On a two-sided market platform, certain control is executed by the platform owner (e.g., Amazon controls the review sys-

tem and return process for Amazon marketplace transactions), while on a vendor-owned channel (e.g., a vendor's website) it is typically easy for vendors to manipulate their presentation and potentially overstate product or service quality (Mavlanova et al. 2016).

Informational cues in digital environments can be categorized according to the cost incurred to vendors, how easy it is for customers to verify them and when they are present in the time continuum of a transaction (i.e., pre-purchase, purchase or post-purchase) (Mavlanova et al. 2016). According to these categories, pre-purchase cues that incur high-costs to vendors are promising candidates to be reliable signals. Examples for such cues are live chat, regulatory compliance, consumer reviews, or third-party certifications (Mavlanova et al. 2016). While low-quality vendors tend to avoid costly and easily-verifiable cues, high-quality vendors, knowing about their true quality, do not refrain from displaying these cues. In consequence, the higher use of costly and easily-verifiable cues lets customers distinguish between high and low-cost vendors (Mavlanova et al. 2016). Hence, it is valuable to vendors and customers to distinguish cues along these categories to make a profound decision on their effect and which cues to present or look out for in a selection decision.

Given the multitude of cues and their complexity, differential effects as well as interactions between cues have to be considered when explaining or predicting customer behavior. For example, Hu et al. (2008) investigated the role of online customer reviews on product sales. While they found significant effects for the quantitative review scores (i.e., better scores leading to higher sales), other factors such as reviewer quality or product coverage (i.e., whether a product had few or many reviews) were also found to be important. Benlian et al. (2012) showed that not only do effects differ for different forms of online product recommendations but also depending on the type of product, which was recommended. While provider recommendations created higher levels of perceived usefulness to customers and were overall more effective in the case of search goods, consumer reviews elicited higher trusting beliefs and were found more influential to customers in case of experience goods (Benlian et al. 2012). These results show that cues can rarely be interpreted in isolation and have more nuanced effect dynamics than their rare presence or absence on a product or service website.

Apart from signals themselves, the characteristics of a signalee have an influence on the effectiveness of the signaling process as different receivers may interpret the same signal with varying outcomes. First, receivers need to be aware of the signal. If they are not looking for a particular signal or do not know what to look for, the intended effect will hardly occur (Connelly et al. 2011). Second, signalees process cues in their individual way, which may lead to differences in perceived signal strength or, in a more extreme way, giving different meanings to the same signal (Branzei et al. 2004). These differences may stem from prior experiences, cognitive biases, or personal expectations (Branzei et al. 2004; Rynes 1991). For example, short online service subscriptions may be positively associated with flexibility (avoiding lock-in effects), while they may have a detrimental effect on customers, who previously experienced a vendor going out of business and were in need to quickly migrate to stay operational. Signalers have to be aware that such characteristics may distort their signaling intentions and overall signaling

effectiveness with respect to a diverse group of receivers may be diminished. Moreover, playing together with the interaction effects between cues, Connelly et al. (2011) state that signalees may give "signals different strengths" and that they "may apply weights to signals in accordance with preconceived notions about importance" (Connelly et al. 2011, pp. 54-55). Consequently, the total effect of signaling depends on the focal receiver as well as the composition of available cues, which makes it more complex for practitioners to determine signaling outcome upfront. Figure 2-1 presents different influence factors to signal effectiveness and exemplary characteristics of these factors that have been found influential (Lins and Sunyaev 2017).

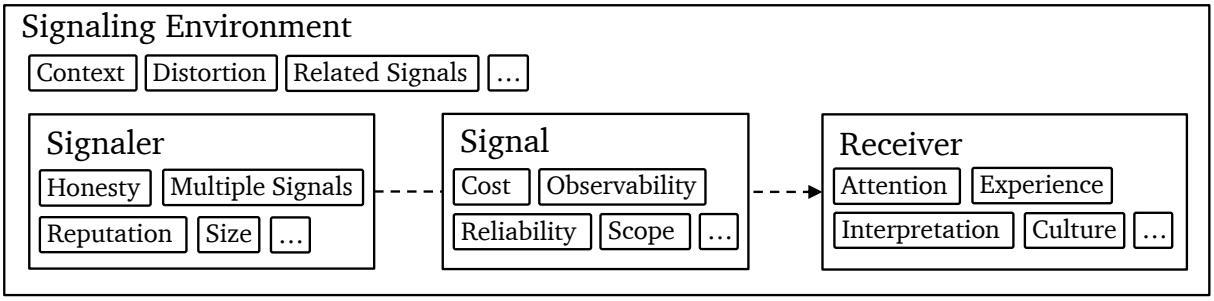

Figure 2-1. Influence factors on signaling effectiveness (based on Lins and Sunyaev 2017)

Taken together, inspecting the true quality of an online offer before engaging in a transaction is a challenging task. Customers lack essential information and the ability to ex-ante experience focal goods or services. While multiple cues exist to overcome this challenge, not all of them are effective. Especially cues that are easy to verify, costly to attain, and readily available before purchase are deemed to be reliable quality signals. However, often there is more to the effectiveness of a cue than its mere presence or absence – properties of the cue itself, the environment it is presented in or characteristics of the receiver can influence its effect. In the next section, IS certification is introduced as a dedicated cue that fits into the categories of a reliable signal and may be used to address information asymmetries in various contexts.

2.3 IS certifications as quality signals

Certification refers to the process of evaluating someone or something against a predefined set of criteria and providing official documentation in case of a positive evaluation. This general definition is rarely used in literature as it corresponds to general language use. For example, the Oxford dictionary defines certification as "the action or process of providing someone or something with an official document attesting to a status or level of achievement" (Oxford Dictionary 2020a). Most definitions are context-specific and especially used to express deviations from general language use or to provide higher specificity. In line with this approach, ISO/IEC does not provide a general definition for certification in their standard on conformity assessment, stating that "terms and definitions are given only where the concept defined would not be understandable from the general language use of the term, or where an existing standard definition is not applicable" (ISO/IEC 2004, p. 1). For example, certifications as ISO 9000:2015 on quality management systems apply to products, services, or systems, however, not to indi-

viduals (ISO/IEC 2015). On the other hand, there are certifications, which only apply to individuals. For instance, employees of an organization may be certified in the Information Technology Infrastructure Library (ITIL) best practices, however, an organization cannot be certified to be ITIL compliant (ITIL 2019). In consequence, narrow definitions for certification are used to describe the specific process in a certification context. While the term certification is mostly used to describe the action or process, the resulting document is called a certificate. However, in literature and practice, the term certification is sometimes also used to refer to the outcome (in this case, certification and certificate are used synonymously). Etymologically, the verb *certify* stems from Latin *certificare* (to make something sure or certain).

A typical certification process is initiated by a service provider, who wants to get a service certified. The service provider requests certification from an issuer or certification authority, which manages the certification criteria, against which services are evaluated and provides certificates in case of a successful evaluation. The issuer will assign an auditor, who evaluates the focal service against the authority's criteria. The result will be reported to the authority, which will provide a certificate to the service provider if the specified criteria were met. Figure 2-2 visualizes the key actors and steps in a generic certification process. There are variants, in which the certification authority will execute the service audit themselves without involving a third-party auditor. Moreover, there are self-assessment certifications, in which service providers themselves evaluate their services or products against specified criteria (e.g., CSA STAR Level 1 certification is based on self-assessment (CSA 2017)).

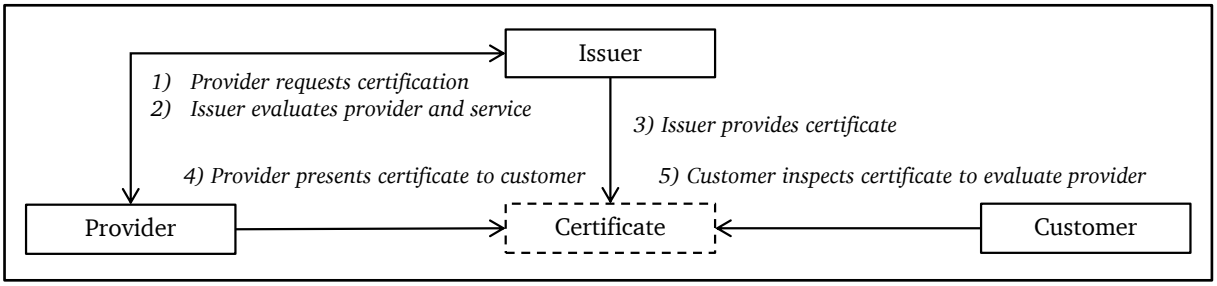

Figure 2-2. Key actors and general steps in a certification process

Certificates are the outcome of the certification process, providing formal documentation of requirement compliance to potential transaction partners. Each certificate provides one or more assurances, which are related to a specific aspect of the product or service and intended to dispel customers' concerns by providing information otherwise not accessible to customers before a transaction (Kim and Benbasat 2009; Tsai et al. 2011). For example, cloud service consumers may be worried about service availability at a provider. As potential customers, they have no insight into the provider's operations and no experience regarding the service quality, especially about the availability. A cloud service certificate may contain an assurance, stating that the service uptime is 99.9% and that measures are in place to secure this availability level. Inspecting the certificate, customers know about the availability they might expect and, due to the certification process, this information is more reliable than vendor advertising promises, which have not been verified in a third-party audit. Hence, providers use certificates to communicate product or service quality, which is otherwise hard to inspect for potential

customers. They intend to send a persuasive message that customers evaluate when assessing a provider prior to a transaction, having them perceive their offering in a more favorable way (Kim and Benbasat 2009; Yang et al. 2006).

This thesis focuses on IS certification, i.e., certification of information systems and digital services. Typical examples for IS certifications are cloud service certifications (e.g., CSA STAR), e-commerce security certifications (e.g., Trusted Shops) or data privacy certifications (e.g., EuroPriSe) for digital services. As stated before, certification is a general language term applying to multiple contexts. While there is no all-encompassing definition of IS certification, certain forms of certification can be specifically excluded. First, IS certifications are used to evaluate systems, digital services or products but not individuals. While there are certificates related to IT skills (e.g., Microsoft offers a variety of certified training about their software products (Microsoft 2020), these certificates are not considered IS certification in this thesis. Second, cryptographic certification is heavily used as a technical component in many IT systems but is also not considered to be IS certification. Cryptographic certificates are used to prove ownership of a key in public key infrastructures and are a foundation to encrypted communication, authorization, and authentication (NIST 2001). Besides, the certificates resulting from IS certification are usually digital documents and presented in online environments (e.g., on a service website). Most IS certifications provide a seal that can be used as a visual cue to easily communicate that a product or service is certified. These seals do not replace the certificate, however, they are easier to grasp for customers and can be embedded in, for example, a product detail page on a website.

IS certifications are qualified to be reliable signals, distinguishing service providers of low and high quality. In section 2.2, requirements for reliable signals were posed: availability of the signal in a pre-purchase state, verifiability by potential customers and differentiating cost to attain the signal for low- and high-quality providers (i.e., a high-quality provider has significantly less cost or effort to attain the signal than a low-quality provider, making it hard or at least costly to attain for imposters). In the following, details are provided regarding how these criteria are met by IS certifications, qualifying them to be reliable signals.

Pre-purchase availability is fulfilled, as customers are able to inspect certificates before engaging in a purchase transaction. In e-commerce, IS certifications are typically presented using their seal representation and further information is available either with the service provider or the certification authority. Prior to IT outsourcing or supplier selection decisions, typically a due-diligence process takes place, in which vendors present their certificates (Terlaak and King 2006). These certificates are easy to verify, as they typically come with a unique identifier, which allows them to check for their authenticity with the certification provider (Mavlanova et al. 2012). For example, all e-commerce shops certified with Trusted Shops are listed on the Trusted Shops website, making it easy for customers to verify, whether a shop using the certificate or seal on their homepage is actually certified (e.g., Trusted Shops 2020). This is an important advantage of IS certifications over signals that are only present on the provider's homepage due to the involvement of a third-party certification authority.

Complying with certification criteria poses different levels of cost or effort to low- and high-quality providers (Terlaak and King 2006). For example, when a supplier already has certain measures installed to ensure data security and privacy, attaining a privacy-related certification requires less effort. Such effort, however, may be strived for by some providers as internal improvements can be achieved by complying with the required criteria, usually being based on best-practices (Corbett et al. 2005; Terlaak 2007). As desirable provider attributes (e.g., privacy-awareness or quality-ensuring processes) lead to less effort in getting certified, certification becomes a distinguishing signal to potential customers and has been found to be able to create a competitive advantage to organizations (Terlaak and King 2006).

Given that IS certifications theoretically qualify to be reliable signals, they should be effective measures to bridge information asymmetry and support customers in making transaction decisions. Research on certifications ever since has investigated their effectiveness, however, many aspects remain unclear. As discussed in section 2.2, there is more than the information provided by a single cue (e.g., interaction effects, receiver characteristics, or signal embedding) that influences customer decision-making processes and eventually their transaction behavior. The following section provides more details on the investigation of IS certification effectiveness in prior research.

2.3.1 Review on IS certification effectiveness research

Effectiveness can be defined as "the degree to which something is successful in producing a desired result" (Oxford Dictionary 2020b). Hence, to investigate whether or not IS certification is effective, its desired result has to be defined first. In a literature review on cloud service certifications, four outcomes have been identified as dependent concepts in prior studies investigating IS certification: purchase decision, trust, perceived assurance, and perceived risks. These concepts have been confirmed by practitioners in qualitative interviews (Sturm et al. 2014). Trust and perceived assurance/risks are proposed as mediators to the eventual purchase decision in several studies (Belanger et al. 2002; Gefen et al. 2003b). Moreover, the majority of studies on IS certification in the e-commerce context uses customers' purchase decision or purchase intention as the outcome variable (e.g., Mauldin and Arunachalam 2002; Mavlanova et al. 2016). As described before, individual assurances in a certificate are intended to provide information on a service aspect, which lets this aspect be perceived in a more favorable way. Consequently, the certificate, as a bundle of assurances, conveys information about a set of favorable qualities in a service and, eventually, may be considered effective if it increases the likelihood of a customer to make a transaction with the provider of the certified service.

While multiple research studies have been conducted on IS certification effectiveness or have at least investigated IS certification as one driver towards individuals' transaction behavior, no unequivocal result can be derived from the findings. Multiple studies have found a significant positive impact of certifications towards achieving intended effects (e.g., Gefen et al. 2003b; Hu et al. 2010; Kim and Kim 2011; Mavlanova et al. 2016). However, another set of studies has been unable to confirm such a significant impact (e.g., Kim et al. 2008a; Lowry et al. 2012;

McKnight et al. 2004). While surprising at first, there are multiple exploratory approaches for this discord, including the content of certifications, their presentation in the certification context, mental processing of consumers, or the research framework and methodology in a particular study. Prior research found that different stakeholders may have unique and partly contrasting motivations for adopting a certification as well as differences in their perceptions of the resulting certificate (Lins et al. 2020; Löbbers et al. 2020). For example, it is apparently difficult to compare results of a privacy certification's effect on e-commerce customers with the effect of a cloud service certification in the context of B2B software outsourcing. Given the diversity of studies and results, scholars have called for further research on certification presentation and recognition (Kim et al. 2008a; Kimery and McCord 2008; Shu and Cheng 2012).

Different research streams have focused on particular areas to increase the understanding of IS certification effectiveness. One area focuses on contextual or perceptual contingency factors to IS certification. An example of such factors is individuals' level of understanding of certification (Lowry et al. 2012). Scholars argue that a better understanding of the influencing factors regarding the actors involved in certification and the context of the process helps to explain why and when a certificate unfolds its intended effects (e.g., Gao et al. 2010; Lowry et al. 2012). However, scholars as Lansing et al. (2018) propose that the features of a certification are at the center of understanding their effectiveness. As has been conjectured by Özpolat et al. (2013), differences between certifications may explain their varying effect. In a qualitative survey study, Lansing et al. (2018) identified several structural building blocks of a certification that were found important to practitioners. This approach is novel in a way that it examines certificates not as unitary cues, which are either present or not, but as bundles of assurances and characteristics. The majority of studies investigating IS certification had rather taken a black-box perspective, comparing presence and absence of a certificate without going into detail about the particular features of the certificate (Lansing et al. 2018; Sturm et al. 2014).

The ambiguous results from previous studies and the variety of research streams mentioned indicate that many aspects of IS certification are not fully understood and further analysis is required. While the majority of studies on IS certification had been conducted between 2000 and 2010, driven by the rise of e-commerce, new developments underline their significance and the need for a more detailed understanding of their effectiveness. For example, enabled by multi-sided online platforms, sharing economy services such as Airbnb.com or Blablacar.com facilitate consumer to consumer (C2C) transactions. Building trust and verifying the authenticity of transaction partners becomes even more important in this context as traditional institutional trust-building measures do not apply (Mazzella et al. 2016), underlining the importance of IS certification in practice and calling to improve its theoretical understanding.

2.4 Positioning of the thesis

Based on the findings of prior research and the aforementioned shortcomings, Figure 2-3 outlines an integrated model for the investigation of IS certification across two levels: IS certifica-

tion and the IS certification ecosystem. The IS certification level focuses on the particular certificate and its inherent characteristics as included assurances or the certification process. The IS certification ecosystem level includes the key actors involved (issuer, provider, and customer), their relevant characteristics and perceptions as well as relationships between the actors and the certificate. This includes informational cues beside the certificate itself that may cause interaction effects and influence the effectiveness of IS certification (e.g., the prior transaction history between customer and provider or the embedding in a multi-sided platform).

This thesis aims to contribute to the understanding of IS certification effectiveness, addressing four different aspects. These aspects reflect prior calls for research to (1) unify the way scholars investigate IS certifications to reduce ambiguity in results (Sturm et al. 2014), (2) better understand the features of certifications and their influence on effectiveness (Lansing et al. 2018), (3) learn about the embedding of IS certifications and how environmental factors influence its signaling power (Lins and Sunyaev 2017), and (4) investigate context-specific forms of certification to compare effects across different domains (Gopal and Gao 2009). Thus, each article focuses on a different contribution, however, all add up to increase the understanding of IS certification effectiveness. Figure 2-3 visualizes to which aspect of the integrated model each article aims to contribute.

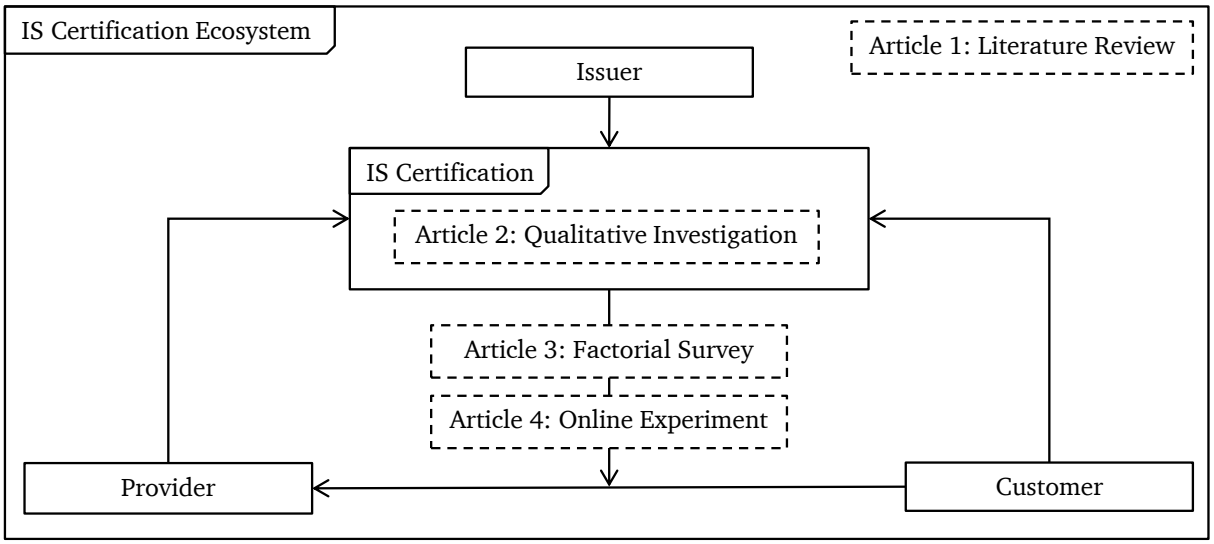

Figure 2-3. Levels of IS certification effectiveness analysis and article positioning

Article one addresses the diversity of theoretical frameworks used in prior research. There are multiple potential causes to the ambiguous results in previous studies on IS certification effectiveness. One of these causes may be given by the different theoretical lenses applied by researchers that complicate the comparison and consolidation of results. The second article investigates the relative importance of specific assurances validated by practitioners to provide a more fine-grained view on the signaling features of certifications. This perspective follows the work of Lansing et al. (2018) and Lins and Sunyaev (2017) to unblackbox certifications and investigate their building blocks rather than mere presence or absence of certifications. Article three focuses on the longitudinal aspect of IS certifications to better understand how their effect

changes subject to prior shopping experiences with a vendor (Özpolat et al. 2013). Understanding the influence of factors as time and prior purchase experience, contributes to an environment-aware investigation of IS certifications (Lins and Sunyaev 2017). The fourth article investigates a specific form of certification, the verification of identity, in the context of a sharing economy platform. A context-specific investigation addresses the need to understand, how specific environments influence the effect of IS certifications and to better understand how certifications can be specifically tailored to increase their effectiveness in a given usage scenario (Gopal and Gao 2009).

3 Theoretical Lenses in IS Certification Research (Article 1)

Title

Toward a unified view of IS certification: a structured literature review on theoretical lenses

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Abstract

IS certifications are frequently used measures to alleviate consumers' concerns or increase trustworthiness toward service providers. Yet, scholarly work trying to understand the effects of IS certification produces contradictory results. In particular, the diversity of theoretical lenses used renders it hard for researchers to stand on common ground. Utilizing a structured review of IS literature, we analyze more than 3100 articles to (1) identify commonly used theories for IS certification, (2) compare these theories using the certification ecosystem as conceptual basis, and (3) outline strengths and shortcomings of identified theoretical approaches. We contribute to the existent body of knowledge by presenting theoretical lenses in a structured way as well as evaluating their suitability in the context of IS certification. Our results suggest that some theories are well suited (e.g., Signaling Theory), yet researchers need to control for missing antecedents and avoid fragmentary use of theories. Further, we encourage researchers to draw on the Elaboration Likelihood Model and Cue Utilization/Consistency Theory as valuable, though underutilized theoretical lenses. Eventually, we suggest that future research should develop an integrated theoretical model since, according to our results, a blended theoretical lens may be most valuable to understand and predict the effectiveness of IS certification.

Keywords

IS Certification, IS Theory, Literature Review

3.1 Introduction

Products and services based on information systems are experience goods (Nelson 1970), hence, they inherently lack transparency as users usually (with the exception of open source systems) cannot inspect their inner workings (Neelamegham and Jain 1999). Driven by the shift from a product to a more flexible digital service economy (Williams et al. 2008) consumers have to consider data security and privacy – which are also hard to evaluate – when thinking about adopting a service. While consumers benefit as they become able to combine and integrate services from different providers almost seamlessly and uniquely tailored to their requirements (Benlian et al. 2011), providers have a need to accentuate their services avoiding to become an easily exchangeable commodity. Especially as companies, to an increasing degree, move their IT toward public clouds (IDC 2017). To face these challenges, mechanisms are required, which provide support to assess the hidden characteristics of information services.

IS certifications are frequently used measures to alleviate consumers' concerns, regain consumers' control over the vendor's action (Mousavizadeh et al. 2016) or increase trustworthiness toward providers (Aiken and Boush 2006). These certifications are third-party audits that evaluate a company's internal processes and services against a prescribed set of evaluation criteria (ISO/IEC 2004). In response to the above mentioned challenges of information asymmetry, practitioners have an increasing demand for certifications in IS (KPMG 2017) which is also reflected by a growing stream of IS certification research (e.g. Lansing, J., Sunyaev, A. 2013; Lowry et al. 2012; Mavlanova et al. 2016). Prior research already investigated certifications in various application areas, such as assurance seals (Mauldin and Arunachalam 2002; Park et al. 2010), trust marks (Aiken and Boush 2006; Rüdiger and Rodríguez 2013), authenticators (Rust et al. 2002), or third-party endorsements (Biswas and Biswas 2004; Suri and Monroe 2003). Notwithstanding the valuable contributions, research on IS certification still produces diverse results with no clear answer to whether, and if so under what circumstances, third-party certifications are effective (van Baal 2015). Williams and Grimes (2010, p. 65) for example state, that "existing empirical evidence on their [trust marks] use is, however, at best mixed". Others claim that the diversity of levels of analysis, contexts, and theoretical lenses resulted in a vast, heterogeneous body of knowledge, which prevents accumulation and consolidation of certifications' effect mechanisms (Sturm et al. 2014). Especially the variety of theoretical lenses makes it hard for researchers to compare prior work and encumbers a more unified study approach. To enhance this situation, we are going to analyze theories used in prior investigations.

This paper strives to review prior relevant literature in the area of IS certification to investigate and compare the divergent theoretical lenses that were taken to understand and predict the effectiveness of IS certification. In doing so, we first provide theoretical background information on IS certifications and their surrounding ecosystem. Thereafter, we present the approach to our structured literature review, in which we investigated more than 3100 publications from 88 IS journals and major IS conferences. Systematically introducing and comparing the different theoretical lenses, we provide an overview on the theoretical landscape of IS certification research. With respect to the different aspects of the certification ecosystem, we identify

strengths and shortcomings of particular theories. Finally, we argue to dissociate from a one-size-fits-all approach of theory application. Rather we encourage future research to develop an integrative theoretical model to enable for improved analysis.

3.2 Theoretical background

IS certifications are a method in which the company's internal processes and services are assessed using a prescribed set of evaluation criteria via an audit by a third instance. This audit formally accepts that the standards defined by the criteria is encountered (ISO/IEC 2004). Such certifications provide assurances on certain aspects of the service or process and offer verified information about otherwise unobservable attributes (Kim and Benbasat 2009; Tsai et al. 2011). There are three central structural elements to certification: (1) *content* (i.e. the assurances made), (2) *source* (i.e. the issuing and auditing instance), as well as (3) *process* (i.e. the rigor and frequency of the audit process) (Benlian et al. 2018; Lansing et al. 2018; Lansing, J., Sunyaev, A. 2013). The value of certification derives from its effect to the parties involved in its use, supporting them in bridging informational gaps, which is why we are not going to analyze certifications in isolation but as part of a certification ecosystem.

The certification ecosystem describes the interplay between parties involved in the process of issuing, auditing, implementing and utilizing a certification. In analogy to natural ecosystems, describing a system of living organisms and the interaction with their non-living environment (Chapin et al. 2011), we use this term to refer to the social system surrounding and interacting with a certificate. The ecosystem analogy has previously been used, for example, in strategic management (Moore 1997). Within this study we consider four types of stakeholders in the IS certification ecosystem: first, the provider of a product or service, who exploits IS certification for different reasons (e.g., to signal higher quality or compliance). Second, the consumer inspecting an IS certification, for instance in advance to a product or service adoption decision. Third, the auditor, who is evaluating the product, service or process to be certified against the predefined criteria. And finally, the issuer defining the certification criteria and eventually issuing the IS certificate (Windhorst and Sunyaev 2013). Following Karimov et al. (2011), we utilize the IS certification ecosystem as a conceptual basis to assess and compare certification theories as well as their strengths and shortcomings.

Before elaborating on specific theoretical lenses within the IS certification ecosystem, one should recall the endemic general perception of theory in social science. Following Rudner (1966) the role of theory is to increase scientific understanding. More specifically, Bacharach (1989, p. 498) views a theory as "a system of constructs and variables in which the constructs are related to each other by propositions and variables are related to each other by hypotheses". Acknowledging that every theory is subject to certain bounding assumptions to define its application limits (Dubin 1978), the objective of theory is twofold: first, theory should facilitate understanding of a phenomenon under investigation (i.e. process knowledge) and second, theory should allow for prediction (i.e. outcome knowledge) (Dubin 1978). Thus, a good theory

in IS certification research should allow both, to predict the outcome of certification implementation and help to understand why certification lead to the intended. While a variety of theoretical approaches on IS certification are applied in prior research, results on their effectiveness remain ambiguous and lack predictive power.

Regardless of the growing body of knowledge for IS certification, there is no unified view. However, previous studies can predominantly be assigned to one of the four following research perspectives (Gopal and Gao 2009; Heras-Saizarbitoria and Boiral 2013; Lins and Sunyaev 2017): first, the efficiency gains perspective, exploring IS certifications to gain internal improvements (e.g. quality improvements) (Heras-Saizarbitoria and Boiral 2013). Second, institutional perspective, utilizing IS certification to increase institutional legitimacy (Gopal and Gao 2009). Third, signaling perspective, where IS certification are investigated as transmitters of information signals (Terlaak and King 2006). Finally, trust perspective, in which the reassessment of belief formation related to the trustworthiness of a provider or its products or services is studied (Chang et al. 2012). Especially within the latter two research areas, various studies have used different theoretical lenses to analyze IS certification. However, obfuscation of the current theoretical landscape raises uncertainties to what extent the applied theories do support understanding of IS certification.

Acknowledging that: (1) theories in social science are adequate means to understand, explain and predict certain phenomena, and (2) recognizing the unsolved challenges in IS certification research in terms of effectiveness and predictive power of theories, the following questions remain unanswered: what are the dominant theoretical perspectives used in IS certification research, which aspects do they focus on and what are their strengths and weaknesses? The study at hand strives to shed light on these questions using a structured literature review.

3.3 Research methodology

In this paper, we use a structured literature review approach to identify and analyze theoretical motivations and applications for IS certification. Literature reviews constitute an opportunity to make a vigorous contribution to the topic under study, regarding both, relevance and rigor (Schryen et al. 2015; Schryen et al. 2017; Vom Brocke et al. 2009). Whereas the former is improved by refraining from multiple reinvestigations in the same topic (Baker 2000), the latter is enhanced through the effective use of the already existent knowledge base (Hevner et al. 2004). As suggested by Webster and Watson (2002, p. xiv) a literature review helps to “benefit from exposure to potential theoretical foundations” that are related to the topic under investigation (i.e. IS certification). In this literature review we collected a broad range of 88 IS journals as well as major IS conferences (e.g. International and European Conference on Information Systems) to ensure consideration of the most state-of-the-art research in the IS certifications area (vom Brocke et al. 2015). Webster and Watson (2002, p. xvi) further state: “you often must look not only within the IS discipline when reviewing […] theory”. Therefore, we included 64 high-ranked IS relevant journals from business administration, marketing and organizational research. As it was the aim to uncover theoretical perspectives used to explain perceptions and

outcomes of IS certification, we used a rather broad set of keywords. Across the above-mentioned set of journals and conferences, we searched publications by title, abstract, and keywords using the search terms *certify** OR *seal** in the following databases: Scopus, IEEExplore, AISel, and ACM Digital Library.

3.3.1 Literature selection process

We acknowledge that the process of excluding (and including) literature has to be made as transparent to the reader as possible "in order for the review to proof credibility" (Vom Brocke et al. 2009, p. 2207). Our initial search resulted in a set of 1138 publications. This initial set was then analyzed using title, abstract, and keywords to filter those publications that are helpful in pursuing the research aim. We excluded publications that were off-topic (e.g. dealing with irrelevant IS topics) (618), analyzed certification but in an, for this study, unrelated manner (e.g. health or human resource certification) (384), or where full-texts were not available (18). As expected, a majority of publications were excluded after this round and 118 articles remained. Thereafter, in-depth analysis of the remaining set of articles resulted in a further downsize to 57 publications. Using this set, forward (result: 1930 new articles) and backward searches (result: 40 new articles) were conducted to identify additional articles.

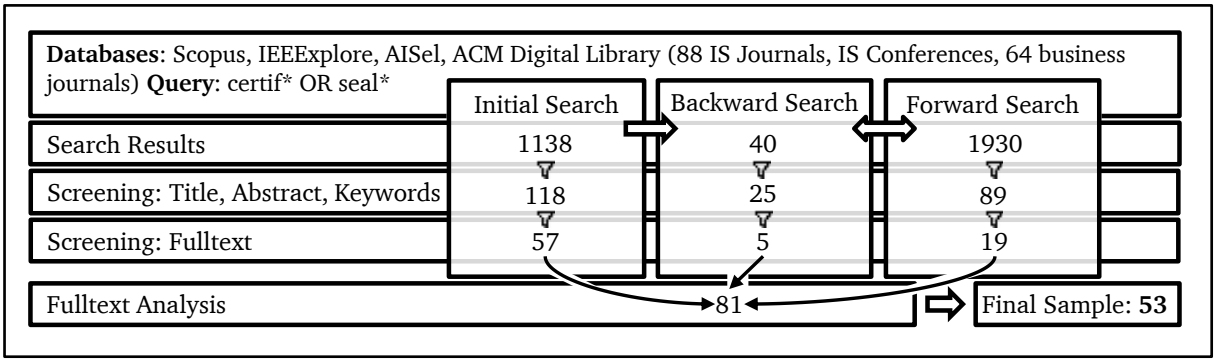

Figure 3-1. Literature review process

Again, a title, abstract, and keyword filtering process as well as in-depth analysis of the forward and backward search results led to a preliminary final set of 81 articles. During our research, a further reduction of 23 articles was performed. The reason for this was the identification of articles that did not support our research (e.g. research-in-progress or short papers without any explicit results). Additionally, since we only found five studies that were not conducted in an e-commerce context, we excluded them from our analysis to prevent potential biases. Thus, ultimately 53 articles were included in the literature review at hand. Figure 3-1 provides a visual overview on the selection process.

3.3.2 Classification of data

In order to analyze and make sense of the literature in a best possible manner we classified the articles among a set of predefined attributes (vom Brocke et al. 2015; Vom Brocke et al. 2009). We followed suggestions made by Hayes and Krippendorff (2007) and analyzed the data independently among authors to ensure best possible thoroughness, however, ultimately relied on a single final review made only by one of the authors. Although most of the attributes are self-

explanatory, some require further elaboration. Hence, all ten classification attributes are shortly elucidated hereafter. *Theory* states the underlying theory that was used to explain and understand the effect of IS certification. For research that either used no theory at all or the results could not be traced back to a uniquely identifiable theory (according to the author's perception), "no explicit theory" was used as a term to indicate this fact. "Multi-theory approach" on the contrary was used to specify that multiple theories were consolidated. *Context* indicates the environmental context in which IS certifications were studied. Due to the fact that IS articles were primary included into the literature review, the lion's share of research was conducted in an e-commerce context (at a later stage we only included articles from e-commerce contexts to prevent potential biases). *Certification as the central research aspect* specifies whether the certificate evaluated in the respective research was analyzed in isolation or as one among other cues and signals such as policy statement or website design (Chang et al. 2013; Karimov et al. 2011). Moreover, articles evaluated in this review either examined the impact of a single certificate or multiple certificates at once, which we coded *single or multiple certificates*. Where possible, it is indicated which certificate or seal was actually analyzed. The *dependent variable* indicates the dependent or outcome variable(s) of each study. *Line of effects* was utilized to briefly expound the effects of certain variables on other variables of the research model. It further provides insights, if the certificate is a key component of the research analyzed or if it merely constitutes a marginal aspect among a set of other constructs or variables. Furthermore, *methodology* outlines which quantitative procedure was applied to the data in each paper. Similar to the context attribute, we suspect that the empirical method may has influential impact on the final result of a study (cf. van Baal 2015). The *significance of effects* reports the effects of the variables analyzed as well as their manifestation of significance. Additionally, a*ntecedents and contingency factors* summarized possible antecedents and contingency aspects that had an influence on a certain research model. Eventually, *summary of main findings* briefly reports the major contributions of each study. The results can be found in a concept matrix shown in Table 3-1, however, due to space constraints, only four attributes (i.e. theory, context, dependent variable, and certification as the central research aspect) are depicted. The entire matrix is available from the authors upon request.

In order to comprehensively analyze and compare the identified theories the following section first, shortly elucidates how each theory is applied in the context of IS certification. This step is helpful in that it provides the necessary, basic understanding to compare the theoretical perspectives. Second, the theories are compared using the certification ecosystem as a conceptual environment.

3.4 Theoretical lenses of IS certification

This section provides a comprehensive overview of the results of this literature review. The theories identified and analyzed herein are Signaling Theory s5 articles), Trust Theory (including Trust Transference) (18 articles), Theory of Reasoned Action (TRA) / Theory of Planned Behavior (TPB) (5 articles), Elaboration Likelihood Model of Persuasion (ELM) (4 articles),

Social Exchange Theory (3 articles), Cue Utilization and Consistency Theory (1 article). Although the literature review revealed more theories than presented herein, some were omitted due to space constraints and lack of broader adoption. These theories are: Social Cognitive Theory (cf. LaRose and Rifon 2007), Processing Theory (cf. Williams and Grimes 2010), Social Contract Theory (cf. Faja and Trimi 2006), Prospect Theory (cf. Bahmanziari and Odom 2015; Park et al. 2010) and Contemporary Choice Theory (cf. Hui et al. 2007). Eventually, a non-negligible share of studies either used no theory at all or applied a theoretical approach that could not be explicitly assigned to a theory. These articles were classified as "no explicit theory". 5 studies used more than one theory ("Multi-theory approach"). Table 3-2 provides an overview of the theory distribution across analyzed studies.

3.4.1 Theories

3.4.1.1 Signaling theory

Signaling Theory is a theoretical lens often taken in the area of information economics and can be found in a variety of settings. Among others, in job markets (Spence 1973), real estate markets (Garmaise and Moskowitz 2004), insurance (Rothschild and Stiglitz 1976), or individual (Mavlanova et al. 2012) and organizational (Stump and Heide 1996) commerce. The theory is often used to explain the effects of information (i.e. signals) on one party provided by the other party of a transaction. Drawing on this theory, IS certifications are modeled as signals. Connelly et al. (2011) distinguish two key characteristics of effective signals: (1) signal observability, representing the degree to which external parties are able to recognize a signal, and (2) signal cost which are the related costs to send a certain signal. Aiken and Boush (2006) found that internet trust marks, compared to consumer ratings of the provider and investments in advertising, have the strongest influence on the firm's trustworthiness and willingness to provide personal information. Aiken et al. (2014) further elaborated that, expert-based certificates are more effective in South Korea compared to in the United States. However, in the United States, consumers rely more on government-affiliated certification than consumers in South Korea do. van Baal (2015) on the contrary postulates no significant effectiveness on purchase probability of two tested third-party seals in Europe. Yet, a study in the US revealed that varying web assurance seals (i.e. TRUSTe, BBBOnline, and Verisign) all significantly affect willingness to provide personal information (Wang et al. 2004). Finally, other authors claim that external signals (e.g. third-party issued certification) have a stronger effect on consumers' trust compared to internal signals (e.g. self-developed assurance statements) (Mavlanova et al. 2016).

Table 3-1. Concept matrix

Authors, Year	Theory	Context	Dependent Variable	Certification as central research aspect
(Aiken and Boush 2006)	Signaling	🛒	Perceived trustworthiness	No
(Aiken et al. 2014)	Signaling; Trust Transfer	🛒	Purchase intention	Yes
(Bahmanziari et al. 2009)	Trust	🛒	Purchase intention; Trust	No
(Belanger et al. 2002)	Trust	🛒	Purchase intention; Willingness to disclose information	No
(Chang et al. 2013)	Signaling	🛒	Trust in online vendor	No
(Chang et al. 2012)	Social Exchange	🛒	Purchase intention	Yes
(Clemons et al. 2016)	Trust	🛒	Willingness to purchase	No
(Faja and Trimi 2006)	No explicit theory	🛒	Willingness to disclose information; Willingness to purchase	No
(Fisher and Chu 2009)	TRA / TPB; Trust	🛒	Purchase Intention	No
(Goethals et al. 2009)	Trust	🛒	Trust	No
(Hassanein and Head 2002)	Trust	🛒	Purchase decision	Yes
(Houston and Taylor 1999)	No explicit theory	🛒	Purchase intention; Product quality; […]	No
(Hu et al. 2010)	Cue Utilization; Cue Consistency	🛒	Initial online trust	Yes
(Hu et al. 2002)	ELM	🛒	Willingness to purchase	Yes
(Hui et al. 2007)	Contemporary Choice Theory	🛒	Information disclosure	No
(Jiang et al. 2008a)	Social Exchange; Trust Transfer	🛒	Trust transfer	Yes
(Kaplan and Nieschwietz 2003a)	Trust	🛒	Willingness to purchase; perceived risk; perceived product quality	Yes
(Kaplan and Nieschwietz 2003b)	Trust	🛒	Purchase intention	No
(Ke et al. 2016)	Trust	🛒	Purchase intention	No
(Kim 2008)	Trust	🛒	Willingness to use	No
(Kim et al. 2008a)	No explicit theory	🛒	Purchase behavior	No
(Kim et al. 2015)	No explicit theory	🛒	Transaction intention	No
(Kim and Tadisina 2010)	No explicit theory	🛒	Initial trust	No
(Kim and Kim 2011)	No explicit theory	🛒	Initial trust; Perceived privacy empowerment	Yes
(Kimery and McCord 2002)	Social Exchange; TRA / TPB	🛒	Purchase intention	Yes
(Kovar et al. 2000b)	ELM	🛒	Purchase intention	Yes
(Lala et al. 2002)	No explicit theory	🛒	Purchase intention	Yes
(LaRose and Rifon 2007)	Social Cognitive Theory	🛒	Information disclosure intention; Purchase intention; Trust; […]	No

(Lee et al. 2004)	TAM; TRA / TPB	🛒	Purchase intention	No
(Lowry et al. 2012)	ELM	🛒	Behavioral intention towards website	No
(Mascha et al. 2011)	No explicit theory	🛒	Purchase intention	No
(Mauldin and Arunachalam 2002)	TRA / TPB	🛒	Purchase intention	No
(Mavlanova et al. 2016)	Signaling	🛒	Purchase intention	No
(Miyazaki and Krishnamurthy 2002)	Valence Framework	🛒	Perceived risk; Information disclosure; […]	Yes
(Mousavizadeh et al. 2016)	Trust	🛒	Purchase intention	No
(Nikitkov 2006)	No explicit theory	🛒	Purchase behavior	Yes
(Nöteberg et al. 2003)	No explicit theory	🛒	Purchase intention; Privacy concerns; Transaction integrity concerns	No
(Özpolat et al. 2013)	Trust	🛒	Purchase conversion	Yes
(Özpolat and Jank 2015)	Prospect Theory	🛒	Likelihood of shopping cart completion	Yes
(Park et al. 2010)	TRA / TPB	🛒	Satisfaction; Repeat purchase intention	Yes
(Pennington et al. 2003)	Trust	🛒	Purchase intention	No
(Peterson et al. 2007)	No explicit theory	🛒	Information disclosure	No
(Rifon et al. 2005)	No explicit theory	🛒	Information disclosure; Trust; Estimates of information practices; […]	Yes
(Wakefield and Whitten 2008)	Trust	🛒	Purchase intention	No
(Sha 2009)	Social Contract Theory	🛒	Customer trusting intentions	No
(Shareef et al. 2008)	No explicit theory	🛒	Trust formation; Purchase intention; Buying Satisfaction	No
(Utz et al. 2012)	No explicit theory	🛒	Perceived trustworthiness	No
(van Baal 2015)	Signaling	🛒	Purchase intention	Yes
(Wang et al. 2004)	Trust Transfer	🛒	Bookmarking intention; Willingness to disclose information	No
(West 2015)	No explicit theory	🛒	Trust	Yes
(Wu et al. 2010)	ELM	🛒	Purchase intention	No
(Yang et al. 2006)	No explicit theory	🛒	Trust	No
(Zhang 2005)	No explicit theory	🛒	Willingness to purchase	Yes

Notes: 🛒 E-Commerce; TRA/TPB=Theory of Reasoned Action; TPB=Theory of Planned Behavior; ELM=Elaboration Likelihood Model of Persuasion

3.4.1.2 Cue utilization theory and cue consistency theory

Cue Utilization Theory is a theoretical lens mainly used in marketing science to explain consumer's perception of product quality and is similar to Signaling Theory. Following Cox (1967), any information cue originates from the actual product – i.e. intrinsic, not alterable cues - or from product related attributes (e.g. third-party seals and certifications) – i.e. extrinsic, alterable cues (cf. Hu et al. 2010; Richardson et al. 1994). Since digital good's intrinsic cues are hard to evaluate, consumers rely more on extrinsic cues (Hu et al. 2010; Suri and Monroe 2003). Cue Consistency Theory moreover informs researchers about how consumers apply and process multiple, divergent cues in decision-making processes (Hu et al. 2010). In their study Hu et al. (2010) assessed different seal functions (i.e. security, privacy, and transaction-integrity assurances) and their influence on consumers initial trust. They found that the presence of one function (e.g. privacy) to enhance consumers' initial trust is negatively related to another function (e.g. security), concluding that an increase in seal functions' quantity not necessarily leads to an increase in consumers' initial trust.

3.4.1.3 TRA and TPB

A focal aspect of both theories is one's intention to perform a given behavior as well as the intention's influence on a specific behavior (Mauldin and Arunachalam 2002). In both theories, intentions are influenced by attitudes, which are described as the positive or negative feelings about performing a behavior and their respective favorability of consequences (Ajzen 1991; Eagly and Chaiken 1993). Building on Mauldin and Arunachalam (2002), IS certifications provide more reliable information about a product, which may not alter consumers attitudes toward risk, but positively change their attitudes regarding the likelihood of certain risk occurrences. Therefore, it is theorized that IS certifications change consumers' intentions and, ultimately, behaviors. In their study, Fisher and Chu (2009) compared two different kinds of web assurance seals: one (TRUSTe) issued from an accounting authority and one (WebTrust) not issued from an official body. According to their empirical results, both seals only have little influence on online purchase intention. Contrary, Lee et al. (2004) assessed the same web assurance seals, but found strong significant support for their hypothesis that seals affect perceived trustworthiness. Interestingly, Wakefield and Whitten (2008) extended the – at that time – prevailing opinion and claimed that not only assurance seals itself are decisive to increase consumers' trust, but also the credibility of the third-party issuing the seal.

3.4.1.4 ELM

The ELM embodies a theory of attitude change through persuasive messages (Petty and Cacioppo 1986a, 1986b). At the center of the ELM is the idea that humans put differing extents of mental effort (elaboration) into the processing of relevant arguments in persuasive messages. When high elaboration is present, central arguments are considered thoughtfully while in low elaboration, humans rely on peripheral cues. Bhattacherjee and Sanford (2006) have investigated its role for technology acceptance, Lowry et al. (2012) used it to analyze website privacy cues for online consumers and Wagner et al. (2014) analyzed the attitudes of customers using freemium music-as-a-service. In the context of IS certification, Kovar et al. (2000) first analyzed

if (1) exposure to WebTrust seal advertising, (2) consumer's knowledge about certified public accountants (CPA), and (3) consumer's degree of attention to the seals influences their purchase intention and transaction expectations. Hu et al. (2002), evaluating five different web trust seals, concluded that only those seals are effective that guarantee insurance (e.g. in case of lost shipments), security, and service reliability to the customer. Contrary and more recently, scholars attributed that privacy seals have the strongest effect on behavioral intention toward the website (e.g. perform a purchase). Yet, only when an understanding of the seal is present (Lowry et al. 2012).

Table 3-2. Theory distribution across identified studies

Theory	Relative distribution	Absolute distribution
Signaling Theory	8,6%	5
Trust Theory	31,0%	18
Prospect Theory	1,7%	1
TRA / TPB	8,6%	5
TAM	1,7%	1
Social Exchange Theory	5,2%	3
Social Contract Theory	1,7%	1
ELM	6,9%	4
Social Cognitive Theory	1,7%	1
Contemporary Choice Theory	1,7%	1
Cue Utilization / Consistency Theory	1,7%	1
Valence Framework	1,7%	1
No explicit theory	27,6%	16
Multi-theory approach	8,6%	5

3.4.1.5 Trust theory

The concept of trust has been applied to various contexts in the IS discipline, for instance in IT outsourcing (Lee et al. 2008) or corporate adoption of Software-as-as-Service (Heart 2010). McKnight et al. (2002) separate trusting beliefs (perceptions of trustworthiness), their influence on trusting intentions (willingness to depend on the trusted party) and actual trusting behavior (e.g. sharing personal information) in a nomological trust model in the context of e-commerce. Certifications as cues are object to customers' trust beliefs and can thereby influence their trusting intentions and actual behavior (McKnight et al. 2002; McKnight et al. 2004). Closely interwoven with Trust Theory is the concept of Trust Transference. A trust transfer – in terms of certification – takes place when the trustor (i.e. consumer) attributes trustworthiness to an unfamiliar party (i.e. provider) based on the latter's relationship with a trusted third-party (e.g. issuer of the certificate) (Doney et al. 1998; Jiang et al. 2008a; Zucker 1986). Research using the theoretical lens of trust to examine IS certification infer various outcomes. For instance, Bahmanziari et al. (2009) claim that externally provided "e-Assurances" (e.g. third-party seals), compared to internally provided "e-Assurances", are useless to increase consumers trust. Finally, and most interesting, comparing the effect of third-party seals and industry endorsement seals using Trust Theory, McKnight et al. (2004) posit that both have a slight negative influence on consumers' trusting beliefs and trusting intentions.

3.4.1.6 SET

As Jiang et al. (2008a, p. 841) state, "Social Exchange Theory provides the framework for examining how trust is defined and how it is initiated and developed in interpersonal and exchange relationships". Each interaction or exchange resides somewhere between being beneficial or being costly, i.e., leads to a positive or negative emotional state (Blau 1968). Among other aids, IS certification can act as viable means to positively influence consumers' emotional state, negatively affect perceived risk (Chang et al. 2013), and therefore improve their cost-benefit calculus. Studies in this research stream, for instance, evaluated certifications and seals with different functions (i.e. privacy, security, and reliability) on trust in the provider. In this regard, Jiang et al. (2008a) claim, that intensity of seal exposure and consumers' disposition toward third-party certification moderate the aforementioned effect. Similarly, Kimery and McCord (2002) used SET to research the effect of the VersiSign, TRUSTe, and BBBOnline seal on consumers' purchase intention, concluding that no seal showed any improvement in purchase intention expect the TRUSTe certification. More recently, researchers prove that third-party certification, provider reputation as well as the idiosyncrasies of providers' return policies all increase consumers' trust in the provider (Chang et al. 2013).

3.4.1.7 No explicit theory

A non-negligible share of studies did not explicitly build their research on a distinct theory. For instance, two meta studies were identified (Sturm et al. 2014; van Baal 2015), which did not conduct own experiments. While useful for an overview on prior work, the meta-approaches include multiple theories making it hard to assign an explicit theory label. Another group of publications expected certifications to have a significant effect, however, not based their work on theory but on prior studies ("we expect the same phenomenon" (Mascha et al., p. 405)) or practice ("one web site exhibiting the WebTrust seal reports that, after displaying the seal, sales increased" (Houston and Taylor, p. 93)). Others provide hypotheses on the effect of certifications without explicitly stating a theoretical background grounding these hypotheses on. For instance, Lala et al. (2002) expect certifications to act as "risk relievers" without clearly indicating why and how they relieve risk to customers. Moreover, a set of studies mention aspects of multiple theories, though, they do not fully apply these nor specify their interactions. Clemons et al. (2016) states that third-party certifications "can serve as a signal" (Clemons et al., p. 1122) while also claiming that they "would help create greater trust" (Clemons et al., p. 1125), tapping into both Signaling and Trust Theory. Miyazaki and Krishnamurthy (2002, pp. 31-32) conceptualize a seal of approval as to "attest to the particular privacy level that a particular online firm is providing" while stating it to be "a co-branding strategy" and "a one-principal […] several-agents […] problem".

3.4.2 Discussing theoretical lenses

This section compares the previous identified theories within the IS certification ecosystem to uncover potential overlaps, theoretical complementarities and deficiencies.

3.4.2.1 Certification in the ecosystem

Signaling Theory provides a powerful means to analyze the effectiveness of certification as information transmitter, though, it neglects the influence of possible contingency factors. Signaling Theory informs about how to design information as to become effective signals that are able to bridge information asymmetries, for example, by indicating product or vendor quality (Aiken et al. 2014). Yet, it is less certain whether consumers have to recognize and/or understand the signal (McCoy et al. 2009) or not (Ray et al. 2011) in order for it to be effective. While Mavlanova et al. (2016) differentiated between internal (e.g. privacy and security policies) and external (e.g. third-party seals) signals and their impact on purchase intention, Wang et al. (2004) focused on elucidating how multiple online signals (i.e. seals of approval, privacy disclosures, return policy, awards, and security disclosures) influence consumers' willingness to disclose personal information. Nevertheless, external signals issued by a trusted third-party were found to be more salient to customers than internal signals developed by the respective provider or vendor (Wang et al. 2004). Interestingly, none of the analyzed publications considered recognition or understanding of signals as a possible influence or contingency factor.

Similarly, Cue Utilization Theory suggests that artifacts (e.g. digital products) bear a set of product cues, which can act as quality signals to potential customers (Cox 1967) with the aim to reduce information asymmetries. Although only one study was found applying this theoretical lens to IS certification, results support the positive effectiveness of IS certification, yet in an interesting way: Hu et al. (2010) posit that third-party seals in general have a positive significant effect on initial online trust. They analyzed three types of seals simultaneously: privacy, security, and transaction-integrity assurance seals. The authors claim that the number of assurance functions in a certificate and consumers' initial trust follow a u-shaped curve. In-depth analysis revealed that only in the absence of security and transaction-integration assurances, privacy assurance certificates have a significant positive effect on consumers' initial trust. Oppositely, both security and transaction-integration assurances are only efficacious as long as privacy assurances are absent (Hu et al. 2010).

Analyzing Trust Theory in an IS certification context reveals that the theory is seldom used in isolation. Rather other theoretical lenses are combined with Trust Theory. However, in case it is, results mostly indicate no significant effects of IS certifications on dependent variables. Besides Signaling Theory (5 publications), Trust Theory was identified as the most commonly applied theoretical perspective (18 publications). Although, other studies (e.g., Kaplan and Nieschwietz 2003a; Kim et al. 2008a; Wu et al. 2010) used the term trust and occasionally integrated a trust construct in their research model, they did not necessarily rely comprehensively on trust as a theory. Interestingly, results, when utilizing Trust Theory, are considerably more diverse comparted to Signaling and Cue Utilization Theory. The majority of research studies concluded that IS certifications do not yield a significant impact on trust (Bahmanziari et al. 2009; Goethals et al. 2009; McKnight et al. 2004; Utz et al. 2012), purchase intention (Bahmanziari et al. 2009; Fisher and Chu 2009), or willingness to use (Kim 2008). Contrary, Chang

et al. (2012) claim to find a positive impact on purchase intention in the event that the certificate is issued by a large trusted organization (compared to small trusted organizations), however without indicating dimensions of organizational size measurement.

Further, the literature review revealed, that the social exchange perspective (i.e. SET) is seldom, in fact only once (cf. Chang et al. 2013), applied alone. Rather it is used in conjunction with other perspectives like Trust Theory (e.g., Jiang et al. 2008a) or the Theory of Planned Behavior (e.g., Kimery and McCord 2002). Articles identified to apply SET demonstrated homogeneous results compared to Trust Theory itself. All studies considered in this literature review found at least some evidence for the effectiveness of third-party certification on trust in the online vendor (Chang et al. 2013; Jiang et al. 2008a) or purchase intention (Kimery and McCord 2002) regardless of analyzing third-party certificates alone or in combination with other measures (e.g. vendor reputation or return policies).

During our research it became obvious that IS certifications do not play a focal role in TRA, TPB, or the decomposed TPB – as it is for example the case with Signaling or Cue Utilization Theory – but was rather treated as an antecedent. In past research, IS certifications were theorized to influence a person's attitude in a way that positively changed their perception regarding the likelihood of certain risk and henceforth affected their intention and behavior (Mauldin and Arunachalam, 2002). Comparable to the results of studies that were viewed through the lens of Trust or Social Exchange Theory, the above stated theories rendered divergent study outcomes. Within this research stream, research focused almost exclusively on purchase intention as a dependent variable. As one of the early studies, Lee et al. (2004) found that third-party seals have both significant positive effects on perceived risk (which in turn leads to increased purchase intention) and perceived trustworthiness. In this regard, they analyzed the effect of four commonly known web trust seals (i.e. BBBOnline, TRUSTe, WebTrust, VersiSign). In contrast, Kimery and McCord (2002) concluded that only the TRUSTe seal (assuring privacy related aspects) has a significant positive effect on trust and hence would increase purchase intention. Again, the lion's share of scholarly publications is not supporting the effectiveness of third-party certification. For instance, Fisher and Chu (2009) negate the significance of third-party seals on consumers trusting beliefs and therefore on online purchase intentions. In a similar stance, Mauldin and Arunachalam (2002) could not prove a direct effect of web assurances on purchase intention nor an interaction effect on the relationship between information risk and purchase intention.

Ultimately, corresponding to Cue Consistency Theory, the ELM is a theoretical perspective to illuminate in detail how consumers process informational cues. While some researchers concluded a positive impact of multiple certification and seals on willingness to buy (Hu et al. 2002), purchase intention (Lowry et al. 2012), and trust (Yang et al. 2006) using the ELM, Kovar et al. (2000) investigated a positive effect of a single third-party seal (i.e. WebTrust) on consumers intent to purchase. Yang et al. (2006) assert that the effect of third-party seals differs contingent upon the use of the central or peripheral cognitive route. Lowry et al. (2012) assert that third-party web assurance seals are most expedient when processed in combination with

other web site cues (e.g. good website quality and brand image) via the peripheral route. This is due to the lack of consumer's attention and understanding of certification and seals (Milne and Culnan 2004; Moores 2005) and, following the ELM, a reason to process information on the peripheral route.

3.4.2.2 Stakeholder of the ecosystem

To start with, Signaling Theory is able to provide a bilateral view on the IS certification ecosystem. On the one hand, researchers found that signals increase trust (Mavlanova et al. 2016) and therefore purchase intention of the consumer (Aiken et al. 2014) or willingness to provide personal information (Wang et al. 2004) (i.e. consumer side). On the other hand, Signaling Theory can inform about characteristics of signals, i.e. signal observability and signal costs (Connelly et al. 2011) allowing to optimize and improve the use of IS certification based signals (i.e. provider side). While signal observability determines the degree to which outsiders (e.g. customers) are able to observe and process signals, signal costs define the price for certain signals (Connelly et al. 2011). For instance, external signals (e.g. third-party certification) are usually associated with higher costs than internal signals (e.g. self-developed assurance statements) (Mavlanova et al. 2016). However, Signaling Theory completely neglects consideration of third-party institutions as an important stakeholder in the IS certification ecosystem. Even though not to the same extent as Signaling Theory, Cue Utilization and Consistency Theory may as well provide an understanding of how external cues are alterable in favor for providers. That is, providers knowing how customer adapt their information processing behavior when information cues are inconsistent can adjust their external, alterable information cues respectively. Miyazaki et al. (2005) for instance found that, given intrinsic cues are scarce, high price (extrinsic product quality cue) paired with a strong warranty (extrinsic vendor cue) has a synergetic interaction effect, in which either of both cues is strengthened by the presence of the other.

Contrary, TRA/TPB, Trust Theory, Social Exchange Theory and the ELM provide rather unilateral views on the IS certification ecosystem. All theories, with their own idiosyncrasies, are able to provide a great understanding of how consumers process IS certifications. TRA, TPB, and the decomposed TPB are adequate means to explain the formation of intentions, and hence, behaviors by the certifications' influence on customers' attitudes. Acknowledging that customers' attitudes are either evaluative (e.g. benefits and risks of a behavior) or affective (e.g. feelings toward a behavior) (Mauldin and Arunachalam 2002) one is able to alter attitudinal beliefs by means of IS certification to his or her favor. The ELM, in a different manner, provides insights about how (central vs. peripheral route) and under which circumstances (ability and motivation) (Petty and Cacioppo 1986b) customers process information conveyed by IS certification. The concept of trust transference, as a reasonable evolved consumer heuristic (Aiken et al. 2014), is the only perspective found to include a trusted third-party to explain trust development. In this regard, trust transference claims that not only the certificate or seal itself should convey information so as to increase institution-based trust, but also the third-party itself should uphold a purposive reputation as trust, according to trust transference, will allocate from the third-party to the service provider.

3.5 Research contributions

Based on our extensive literature review a set of contributions, and following in section 3.6, implications emerge. First of all, this review contributes to the existent body of knowledge by identifying relevant theoretical lenses used to explain and understand the effects of certification in the IS context. Further, through the detailed analysis of the identified theories, we are able to provide insights about strengths and shortcomings of the applied theoretical perspectives.

To start with, Signaling Theory provides a powerful means to investigate the certificate itself, however, disregards the influence of third-parties, which is central to certification. Researchers tried to integrate this aspect, for example, by examining certification stemming from different sources (e.g. government-affiliated, expert or consumer-based certification) (Aiken et al. 2014). Further, Signaling Theory assumes that the receiver of a signal recognizes and understands informational signals (Kimery and McCord 2006; McCoy et al. 2009). However, most of the studies evaluated herein do not integrate signals' recognition and understanding as contingency or moderating factors or simply assume that signals are recognized and understood by consumers (e.g. Aiken and Boush 2006; Wang et al. 2004). Yet, some scholars seem to direct their participants to be, in particular, aware of certain website stimuli. For example, Aiken et al. (2014, p. 99) instructed participants „to pay special attention to the website they were about to see" and Mavlanova et al. (2016, p. 63) state "participants were asked […] to evaluate the website by examining the store's design and content". Those instructions may bypass the need for consumers' own recognition of certifications, nevertheless, raises questions, if the respective experiments are prejudiced and hence, their results reliable. In contrast, we found that the ELM is able to touch upon the issue of missing recognition and understanding since it demonstrates how IS certifications are perceived via the central or peripheral route (Lowry et al. 2012; Milne and Culnan 2004; Moores 2005), contingent upon consumers' ability and motivation (Petty and Cacioppo 1986b).

Trust Theory moreover, in most cases, is only applied partially. That is, authors claim to base their research on Trust Theory, however, only used a simplified or fragmented form of it (Kaplan and Nieschwietz 2003a, 2003b; Nikitkov 2006). Additionally, we found a variety of studies that blended Trust Theory with other approaches such as TRA / TPB (Fisher and Chu 2009), SET (e.g. Chang et al. 2013; Jiang et al. 2008a), or Signaling Theory (Clemons et al. 2016). Therefore, the question can be raised, if the application of Trust Theory in isolation is expedient to analyze the effectiveness of IS certification.

Likewise, TRA / TPB are often only applied to a minor extent. For instance, TPB claims that perceived behavioral control, subjective norms and attitude affect individuals intention, which in turn influences their behavior (Ajzen 1985, 1991; Ajzen and Fishbein 1973). The studies analyzed herein mostly postulate that IS certification and seals only affect attitudes (neglecting the influence of subjective norms and perceived behavioral control) and eventually their purchase intention (e.g., Kimery and McCord 2002; Lee et al. 2004). Yet, studies conclude that IS certification have no effect on purchase intentions (Mauldin and Arunachalam 2002; Pennington et al. 2014). Therefore, we scrutinize the correct application of such theories and reliability

of results. Finally, we found that a non-negligible part of the research did not apply any theory at all. On the one hand, this lays research studies open to attack and questioning. On the other, allows scholars to conduct future research.

3.6 Scientific and practical implications

Our research implications can be summarized as follows: first, since various studies showed that consumers are mostly unaware or unable to understand IS certification (Kimery and McCord 2006; Kovar et al. 2000; Yang et al. 2006) it may be beneficial to utilize the ELM as an extension to, for instance, Signaling Theory to explain consumers' behavior. Second, Cue Utilization in combination with Cue Consistency Theory are valuable means to more thoroughly understand and predict consumers' behavior. For example, in a way that "multiple sources of information are more useful when they provide corroborating information than when they offer disparate conclusions" (Miyazaki et al., p. 147). Interestingly, only one study applied Cue Utilization and Consistency Theory (Hu et al. 2010), leaving great potential for future research to further exploit this theoretical perspective.

In terms of practical implications, we hope that the insights given in the paper at hand may direct future research more properly in applying relevant theoretical lenses that will then result in reliable study outcomes that practitioners can utilize. Choosing and applying appropriate certification that fits to customers' preferences may eventually lead to increased customer acquisition rates and revenue increases. Moreover, practitioners will be provided with detailed information on customer perception of IS certification. However, considering for example the ELM, practitioners may derive knowledge for future studies that go far beyond the boundaries of IS certification. We are convinced that practitioners applying or utilizing service-centric business models (e.g. based on Cloud Computing) can benefit greatly from multiple theoretical perspectives on IS certifications, as effective IS certifications can support the transformative potential of electronic markets and ecosystems in general (cf. Benlian et al. 2018).

3.7 Limitations and future research

This work is subject to multiple limitations. First, this literature review is restricted to the results that we identified by the use of our search terms and journal selection. Yet, reviewing more than 3100 articles from the IS literature, we are confident that we presented a representative perspective of theoretical lenses on IS certification. Nevertheless, theoretical lenses of certification used in other research areas such as computer science or health science might as well have revealed interesting insights. Second, we were only able to present, to our perception, the most common theories. Four other theories have been identified, however, were not analyzed and discussed due to missing broader application.

This study also provides a fundament for future research avenues. First, we advocate research aiming to evaluate IS certifications' recognition and understanding in context of Signaling Theory. We believe that consumer have to, at least some extent, recognize and understand IS certification in order for them to be effective. The mere presence of certification (particularly their

visualization in form of, e.g., seals) is not sufficient. Moreover, scholars may administer to incorporating consideration of third-parties to Signaling Theory. Second, based on our review we are confident that ELM and Cue Consistency Theory are valuable perspectives to explain thoroughly how consumers process IS certification. Future research should therefore empirically investigate this possibility. Eventually, we believe that a single theory is merely able to comprehensively explain the effect of certifications. Hence, we encourage scholars to conduct research targeting a contingency approach to IS certification, for example by developing an integrative theoretical model. Structural contingency theory (cf. Hoffer 1975) in IS research has, for instance, previously found appeal in IS outsourcing issues (cf. Cheon et al. 1995).

3.8 Conclusion

Prior research has found that studies aiming to investigate the effectiveness of IS certification produce diverse results. A major cause for this is the variety of theoretical approaches used in such studies. In this extensive review of more than 3100 scientific articles we identified and compared the six most widely used theories to understand IS certification. Thereby we disclosed central strengths and weaknesses of each theory, provide contributions and implications, and point to future research opportunities. Especially, we call upon future research to sound out opportunities to develop an integrative theoretical model that comprehensively explains and understands certification in the IS certification ecosystem.

4 The Relative Importance of IS Certifications' Assurances (Article 2)

Title

Strategic signaling through cloud service certifications: Comparing the relative importance of certifications' assurances to companies and consumers

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Abstract

Cloud service certifications (CSCs) are assessed by practitioners to support strategic cloud adoption decisions with the aim to reduce information asymmetries. Both businesses and consumers scrutinize CSCs' assurances as ex ante signals indicating a cloud provider's future service quality. While some research has examined the aggregate effects of certifications on decision variables, recipients' evaluations of certifications and their assurances before making IT-related decisions have received little attention. Furthermore, prior research has predominantly focused on privacy and security assurances in e-commerce certifications. Drawing on signaling theory, we propose that certifications are signals that recipients decompose into a set of fine-grained assurance signals that they weigh to evaluate certifications. We evaluate the responses of 113 company representatives and 317 consumers to a best-worst scaling survey to examine the relative importance these two groups attach to ten assurances from CSCs. Our results show that similar to other online contexts, security and privacy are important assurances, but additional assurances related to availability, the customer friendliness of contracts, and legal compliance are also demanded, particularly by companies. Privacy, security, and availability are most crucial to both companies and consumers, but their relative importance varies substantially between the two groups. Post-hoc subgroup analyses reveal significant differences in assurances' relative importance for provider and user companies, adopter and non-adopter consumers as well as companies using different types of services and from different industries. Our findings indicate that recipients evaluate certifications as a bundle of signals with varying importance due to recipients' characteristics and context. With this conceptualization, we contribute to an advanced understanding of the sense-making of certifications and lay out how it influences cloud service adoption theories. Our study has practical implications for certification authorities that design CSCs as well as for providing insights to cloud service providers on customers who draw on CSC assurances when making cloud service adoption decisions.

Keywords

Certification, Assurance, Cloud computing, Signaling theory, Best-worst scaling

4.1 Introduction

With the advent of cloud computing, the role of technology is profoundly shifting for companies and consumers alike. For businesses, technology is moving from serving as a support function to playing a strategic role and is defining winning business models (Benlian and Haffke 2016; Tallon et al. 2019). For consumers, technology has become increasingly embedded into their daily lives. Disruptive technologies such as cloud computing have dramatically altered the way companies and consumers access technology and use distributed resources (Benlian et al. 2018; Merali et al. 2012). Cloud services are evolving more rapidly in terms of functionality and underlying infrastructure than past on-premises technologies, leading to shorter adoption and replacement cycles, while at the same time becoming less transparent in terms of their inner properties and working mechanisms. As a result, it has become a strategic necessity for organizations and consumers to be informed about the technologies they adopt (Ravichandran 2018) and for technology providers to ensure that their customers are confident in making adoption decisions.

IT-related certifications have established themselves among company decision makers and consumers as tools that signal a provider's service quality in traditional IT outsourcing (e.g., ISO 27000 or the Capability Maturity Model, CMM) and in consumer e-commerce (e.g., TRUSTe) (Schneider and Sunyaev 2016). In such contexts, IT-related certifications traditionally function as strategic signals to build trust (Belanger et al. 2002), which plays a crucial role in users' adoption decisions for new technologies (Li et al. 2008). Cloud computing typically involves a self-service approach with few human interactions (Mell and Grance 2011). As a result, institutional trust-building signals that do not rely on personal interactions, such as IT-related certifications, become even more important (Lansing and Sunyaev 2016). Hence, concomitant with the proliferation of cloud computing among companies and consumers, organizations such as Cloud Security Alliance (CSA) and EuroCloud have started to develop a novel class of IT-related certifications: cloud service certifications (CSCs).

The main users of CSCs are company decision makers who evaluate CSCs as part of procuring a cloud service for their organization and consumers who evaluate CSCs in the context of selecting a cloud service for personal use. Making the right cloud service adoption decision is of strategic importance to organizations because such outsourced services not only allow to better manage cost and to internalize innovation (Aubert et al. 2015; Oshri et al. 2015) but they also contribute to overall service quality (e.g., reliability, responsiveness), which is directly related to organizational performance (Gorla et al. 2010). Yet, approximately half of all outsourcing relationships result in low performance, with service quality conflicts being one of the root causes (Lacity and Willcocks 2017). These challenges are particularly reinforced in cloud service adoption decisions, in which consumers and companies face numerous cloud-specific uncertainties on service quality concerning not only security and privacy but also, among other uncertainties, availability, interoperability, contracts, and legal compliance (Armbrust et al. 2010; Benlian and Hess 2011a; Marston et al. 2011).

CSCs signal cloud service quality and allow decision makers to make ex ante assessments, increase market transparency and ultimately support better adoption decisions, leading to better service fit and higher service quality. As such, the implementation of CSCs is of strategic importance for company decision makers and consumers when making cloud service adoption decisions (Khan and Malluhi, 2013; Sunyaev and Schneider, 2013). Moreover, CSCs need to be configured with the right composition of assurances to function as information signals and mitigate cloud-specific uncertainties. For example, Dropbox, a cloud service for storing and exchanging documents, needs to overcome users' uncertainties about the security, privacy, and continuous availability of and access to data when that data is stored in the cloud rather than on users' local computers (Dropbox 2017b). Without assurances covering specific service details, adopters would remain uncertain regarding service levels. For instance, they would not know whether their personal data gets locked in or lost due to non-interoperability or whether their personal data will be processed according to compliance rules and regulations by the cloud service provider.

While some of these uncertainties may also be covered by contracts, assurances allow for an in-advance check and are based on third-party inspection. To mitigate prospective adopters' uncertainty and facilitate the adoption of their service, Dropbox obtained ISO 27017 and CSA STAR certifications (Dropbox 2017a), two certification schemes that provide security assurance. Because these CSCs do not provide privacy or availability assurances, Dropbox is also certified as ISO 27018 (privacy) and ISO 22301 (business continuity, availability). In this example, ISO chose to develop separate certifications for each type of assurance. EuroCloud, by contrast, chose to bundle security, privacy, and availability assurances in one certification. Certification authorities must therefore make a strategic decision to define their nascent CSCs and include the most appropriate set of assurances for their respective target CSC recipient groups. Similarly, to foster the adoption of their cloud services, managers of cloud service providers face the strategic task of selecting a CSC that signals appropriate assurances to customers. If they do not know which assurances are more or less important to different customers, certification authorities and cloud service providers may develop or acquire CSCs that do not fit their customers' needs for assurance or that are too broadly scoped, which may obfuscate the CSCs' meaning and render CSC adoption uneconomical owing to complex certification processes. Thus, it is important to understand which assurances company decision makers and consumers value in a CSC when evaluating it as a decision factor for the adoption of a cloud service.

Prior IS research on certifications has conceptualized certifications as an aggregate signal and examined their effect on decisions and decision antecedents such as perceived risk, perceived assurance, and trust (Sturm et al. 2014). Furthermore, scholars have juxtaposed certifications' effects on these antecedents with those from other signals, e.g., disclosure statements or reputation (Kim et al. 2008a; Wang et al. 2004). Given that prior research focused on instances of real-world certifications, the implicit focus was put on certifications that provide either security or privacy assurances. Recent studies applying adoption theories in the cloud context, however,

found that adoption decisions are influenced by perceptions of uncertainties beyond those related to security and privacy, such as performance (interoperability, reliability), system unavailability, or contract conditions (e.g., Benlian and Hess 2011a; Bhattacherjee and Park 2014; Heart 2010; Repschlaeger et al. 2013). Prior to making an adoption decision on a cloud service without assurances beyond security and privacy (e.g., guarantees on the interoperability and availability of data or legal compliance), prospective cloud service adopters may therefore look for additional information to mitigate those uncertainties. The CSCs described above show that these certifications may contain one or multiple assurance signals, each addressing specific types of uncertainty that are relevant in the cloud context.

In the case of multiple signals, signaling theory posits that recipients *"may apply weights to signals in accordance with preconceived notions about importance"* (Connelly et al. 2011, p. 55). Few studies, however, have explicitly examined and juxtaposed recipients' perceptions of different assurances (e.g., Hu et al. 2010; Lansing et al. 2018). Moreover, within the IS certification literature, little research exists on company decision makers' perceptions of certifications and their assurances, although cloud computing has also increased the prevalence of certifications on software platforms in the business-to-business (B2B) context. Signaling theory also posits that signals are interpreted differently by recipients with diverging backgrounds (Connelly et al. 2011), suggesting a contingency perspective on assurances' effects. It is thus of theoretical importance to understand which assurances recipients value, to what extent an assurance is valued, and how each assurance's value differs across recipients (i.e., across companies and consumers) depending on the specific cloud context. In turn, such an understanding would provide a better explanation of the extent to which the different assurances in CSCs influence cloud adoption decisions and how this influence differs across contexts.

In this study, we use signaling theory to conceptualize CSCs as a bundle of signals (i.e., assurances) that a recipient observes and dissects for interpretation and juxtapose the differential relative weights that company decision makers and consumers ascribe to these assurances in CSC evaluations. Accordingly, we ask the following two research questions (see Figure 4-1 for a depiction of the interplay between the research questions):

RQ1: What is the relative importance of CSC assurances as perceived by companies and consumers?

RQ2: How does the relative importance of each assurance differ between companies and consumers?

In answering these research questions, we find significant differences in the relative importance of each assurance between companies and individual consumers. Moreover, we also find significant differences in individual consumers when comparing adopters and non-adopters and across companies when comparing customer and provider companies, exposing recipient group differences as a contextual factor. Further detailing this finding through post hoc analyses, we find initial evidence that *service type* and *industry regulation* are potential additional contextual

factors. Hence, based on our findings, we extend existing models in adoption contexts by shedding light into how recipients evaluate certifications as part of information systems adoption decisions. Our research contributes to research on the justification and evaluation of information systems in two important ways. First, by conceptualizing certifications as a bundle of weighted (assurance) signals, we determine that recipients make trade-offs between assurances. This suggests that the *weighting* of a certification's assurances is an important factor in assessing a certifications' efficacy in adoption decisions: adoption theories may have to be extended to capture the signaling effects of CSCs' assurances. Second, comparisons of the perceptions of assurances' relative importance by company decision makers and consumers and supplementary post hoc analyses reveal significant differences in recipients' trade-offs, which suggests that the weighting of a certification's assurances in adoption decisions is subject to the signaling environment and shaped by contextual factors such as recipient group differences, service type, and industry regulation.

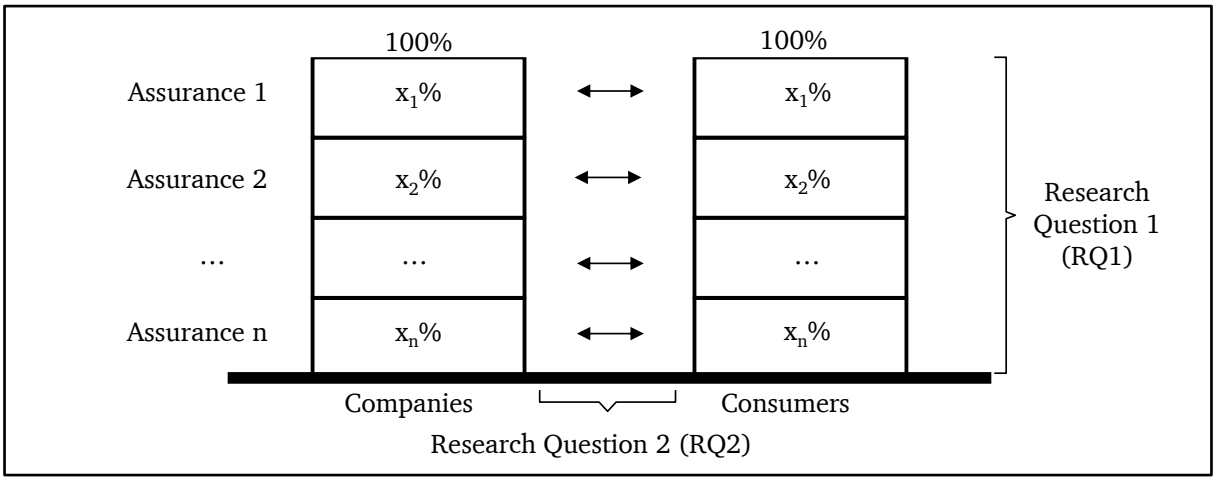

Figure 4-1. Research model

The remainder of the article is structured as follows. First, we discuss the relevant IS literature on certification assurances, describe the characteristics of CSCs, and outline the theoretical foundations of our research. Next, we describe the research methods used to identify and conceptualize the ten assurances of CSCs and the methods used to collect and analyze the empirical data collected from companies and consumers in an online, best-worst scaling (BWS) study. The fourth section presents the results of our analyses, and the article closes with a discussion of the findings, research and practical implications, limitations and future research directions.

4.2 Background and prior research

4.2.1 IT-related certifications in IS research

Certification refers to a process in which a company's processes and services are evaluated against a predefined set of criteria via an audit by a third party, which formally acknowledges that the standard defined by the criteria is met (ISO/IEC 2004). Certifications consist of one or several assurances that provide verified information about the attributes of a certified provider or service, thereby reducing uncertainties arising from information asymmetries (Tsai et al.

2011) or directly shaping recipients' perceptions, such as trust (Kim and Kim 2011). Therefore, providers adopt certifications to signal high quality (Gao et al. 2010), and recipients use them as informational cues when they assess a product or service (e.g., Aiken and Boush 2006; Gao et al. 2010; Wang et al. 2004). In business contexts, for example, certifications are used as differentiating factors in bidding processes (Gao et al. 2010). Similarly, e-commerce customers consider certification symbols displayed on websites as part of their evaluation of that website (Aiken and Boush 2006).

IS research has investigated a variety of certifications, ranging from certified management standards such as CMM (e.g., Gopal and Gao 2009), ISO 27000 (e.g., Ma and Pearson 2005), and ISO 20000 (e.g., Disterer 2012) to e-commerce certifications such as TRUSTe (e.g., Kim and Kim 2011; McKnight et al. 2004; Odom et al. 2002; Zhang 2005), Verisign (e.g., Lowry et al. 2012; Odom et al. 2002; Zhang 2005), and WebTrust (e.g., Odom et al. 2002). In B2B contexts, certifications' assurances are related to the provider and its *process* maturity, e.g., regarding software development (CMM), information security management (ISO 27000 series), and IT service management (ISO 20000). The consumer e-commerce certification literature has identified three types of assurances (Hu et al. 2010; Kim et al. 2004): *privacy*, *security* of the website and communication channel, and vendor *integrity*. E-commerce certifications provide either one of these assurances, such as TRUSTe (privacy) and VeriSign (security), or multiple assurances, such as WebTrust (privacy, security, and integrity).

The vast majority of the IS literature on certifications has examined how the presence of an e-commerce certification affects consumers' perceptions, particularly with respect to trust in providers (e.g., Hu et al. 2010; McKnight et al. 2004) and buying decisions (e.g., Kim et al. 2008a; Nöteberg et al. 2003), and has compared these effects with competing signals, such as privacy and security disclosures (e.g., Lowry et al. 2012; Wang et al. 2004). Most of these studies have focused on *privacy* assurance. Whereas some studies have found a significant effect of e-commerce certifications on trust in providers (e.g., Hu et al. 2010; Kim and Kim 2011), others have not found a significant effect (e.g., Kim et al. 2008a; McKnight et al. 2004). A vast number of studies devoted to identifying omitted moderator and mediator variables (e.g., decision makers' understanding of certifications; Lowry et al. 2012) or exploring additional theoretical lenses (e.g., argumentation theory for use of the effective *framing* of assurances; Kim and Benbasat 2009) have failed to find conclusive explanations.

Therefore, some studies have sought to examine how different assurances influence individuals' evaluation of certifications (e.g., Belanger et al. 2002; Hu et al. 2010; Odom et al. 2002; Zhang 2005). These studies have found that *privacy* and *security* are equally important to consumers and that consumers simultaneously seek both *security* and *privacy* assurances (Belanger et al. 2002; Odom et al. 2002). Similarly, other studies have found that *privacy, security*, and *integrity* assurances are equally effective in increasing consumers' trust; however, combining a privacy assurance with a security or integrity assurance attenuates a certification's effect on consumers' trust relative to combining a security assurance with an integrity assurance (Hu et al. 2010),

suggesting that the *composition* of assurances is a factor in an individual's evaluation of a certification. Furthermore, some evidence suggests that the importance of assurances changes with the product type. Whereas certifications that provide security and privacy assurances only increase consumers' willingness to pay for search goods, an integrity assurance increases consumers' willingness to pay for both search and experience goods (Zhang 2005).

In summary, a considerable body of knowledge exists on the effects of *privacy, security, and integrity* assurances on customers' decisions. The trade-offs that individuals make between the assurances provided by a certification are unclear, however, and the few studies that have compared assurances have been restricted to consumers only. Therefore, little is known about the evaluation of certifications and their assurances by company decision makers and consumers. Given that many CSCs provide multiple assurances and the hitherto inconclusive findings, it is necessary to elucidate how decision makers evaluate and weigh available assurances when they evaluate CSCs. Moreover, CSCs include novel assurances that are different from those in prior research and must be considered in an examination of decision makers' evaluations of CSCs.

4.2.2 Cloud computing-specific uncertainties and cloud service certifications

CSCs provide assurances that aim to dispel companies' and consumers' context-specific uncertainties arising from information asymmetries prior to cloud service adoption. Cloud computing is a model for the delivery and use of IT services that are provided on demand from a shared pool of computing resources and that can be rapidly provisioned and released with minimal provider interaction (Mell and Grance 2011). Although the two share some similarities, cloud computing has idiosyncrasies that clearly distinguish it from IT outsourcing or—in the case of consumers—e-commerce services (Schneider and Sunyaev 2016). Most importantly, cloud computing minimizes on-site installations and enables IT resources and data to be moved to remote services that are managed by a third-party provider and that have an unknown physical location (location independence; Iyer and Henderson 2010). The underlying IT infrastructures and IT architectures are highly distributed across geographies and are shared between customers (multitenancy), in contrast to single-tenant architectures in IT outsourcing. This setup allows resources to be rapidly adjusted to demand and charged on a per-use basis rather than on a fixed-fee basis. To achieve these benefits, cloud services are highly standardized, with a fixed set of features and a common code base for all customers (Benlian et al. 2011). Many cloud services offer interfaces that allow customization on top of common features and enable integration with other applications or services (Iyer and Henderson 2010). These interfaces are maintained by providers, however, and customers have little influence on further development and are forced to adopt future releases (Benlian et al. 2011). Together, these arrangements require a novel governance mode, and many established contractual clauses require re-examination (Marston et al. 2011).

Cloud computing's idiosyncrasies create context-specific uncertainties among companies and consumers, primarily concerning the *security* and *privacy* of data (Browning and MacDonald 2011). The security uncertainty involved in a cloud service differs from that involved in IT

outsourcing and e-commerce services because data must not only be protected from external attacks but also isolated between customers who share the cloud service. Cloud computing's distributed nature and location independence create privacy uncertainty with regard to which parties can gain access to data, for example, due to differences in standards that regulate government agencies' access to information (Marston et al. 2011). Furthermore, the academic (Armbrust et al. 2010; Marston et al. 2011; Susarla et al. 2010) and practitioner-oriented literatures (Badger et al. 2012; Browning and MacDonald 2011) have identified several uncertainties associated with cloud computing in addition to security and privacy. The literature on uncertainties in buyer-seller relationships (Dimoka et al. 2012) suggests that these uncertainties relate to either services or providers. *Service-related uncertainties* arise from information asymmetries about a cloud service and its underlying technology. The remote network access creates uncertainties about the *availability* of data stored in a cloud service. Most of the application programming interfaces of cloud services are proprietary; thus, customers cannot extract data from and migrate data between cloud services (Armbrust et al. 2010), generating uncertainty about *interoperability* with existing technology and across cloud services. Customers desire scalable cloud services but question cloud services' ability to achieve this promise (Venters and Whitley 2012), which generates uncertainty about the *flexibility* of adjusting resources. *Provider-related uncertainties* arise from information asymmetries about a provider's practices and (potential) behavior (Lins et al. 2018). Because of the distributed nature of cloud computing, assessing which jurisdictions apply to data stored in the cloud is difficult for customers (Marston et al. 2011), generating uncertainty about *legal compliance*. Moreover, many cloud service providers are nascent companies, which engenders concerns of companies going bankrupt (Marston et al. 2011) and thus uncertainty about *financial stability*.

CSCs vary in the assurances they provide to dispel these uncertainties. Some CSCs provide a single assurance: CSA STAR, General Services Administration FedRAMP, and ISO 27017 focus on *security*, while TRUSTed Cloud Data Privacy Certification and the European Privacy Seal focus on *privacy*. By contrast, a group of CSCs, including EuroCloud SaaS Star Audit and SaaS EcoSystem Trust in Cloud, cover multiple assurances that include service-related assurances, such as assurances of *availability* and *interoperability*, as well as provider-related assurances, such as *process maturity*, *legal compliance*, and customer-friendly *contracts*, in addition to privacy and security. CSCs differ conceptually from previously studied certifications in several major respects. To mitigate the uncertainties inherent to cloud computing, CSCs provide assurances whose scope differs from previously used assurances (e.g., privacy assurances from traditional, private outsourcing have to be adjusted for multi-tenant, public cloud offerings) or that have not previously been examined (e.g., assured real-time delivery of infrastructure in automatic scaling solutions). Moreover, these assurances address both provider-related uncertainties and service-related uncertainties. Thus, CSCs not only contain assurances about a provider and its processes or—in the case of e-commerce certifications—about the transaction medium but also enable companies and consumers to make judgments about the quality of the provided services. Whereas existing CSCs provide a variety of assurances that are similar in name, the scope and

meaning of these assurances differ across CSCs. To evaluate CSCs, companies and consumers must have a clear understanding of the assurances being provided. Given the lack of academic research on CSCs, a typology of assurances would improve the understanding of CSCs and provide a conceptual foundation for studying how decision makers evaluate CSCs.

4.2.3 Cloud service certifications as a bundle of signals

Building on the notion that in an adoption decision process, a recipient of a CSC—i.e., a company decision maker or private consumer—scrutinizes its assurances to gain information about the provider, we draw on signaling theory to conceptualize CSCs as a bundle of signals (i.e., assurances) that a recipient observes and dissects into more fine-grained signals for interpretation. By contrast, prior research conceptualized certifications as one-dimensional signals (e.g., Aiken and Boush 2006; Kimery and McCord 2006). Signaling theory thus provides a framework to understand which signals recipients seek in the context of cloud decisions and how different recipients aggregate the bundle of signals provided by a CSC (Connelly et al. 2011; Kirmani and Rao 2000).

Signaling theory is based on the premise that transacting parties "have different amounts of information regarding the transaction, and this information asymmetry has implications for the terms of the transactions and the relationship between the parties" (Kirmani and Rao 2000, p. 66). Signals are used by the more knowledgeable party, namely, the sender (e.g., a provider), to reveal unobservable quality and are transmitted as informational cues in various forms to the less knowledgeable party, namely, the recipient. For instance, a provider uses signals to convey the quality of a cloud service offering to consumers. These signals must be costly (i.e., requiring significant time or effort to fake) in order to reliably separate reputable senders from imposters (Connelly et al. 2011; Kirmani and Rao 2000). A rational recipient is expected to infer that a sender that is transmitting a costly signal is of high quality because not honoring the implicit commitment conveyed by the signal is economically unwise (Kirmani and Rao 2000). Three types of signals exist: individual-related signals, organization-related signals, and product-related signals (Connelly et al. 2011). Because different types of information asymmetries may exist in a given context, senders simultaneously deploy multiple signals, which recipients observe, interpret, and aggregate (Connelly et al. 2011). Connelly et al. (2011) note that recipients may calibrate the variety of available signals by "giving signals different strengths" (p. 54f) and that they "may apply weights to signals in accordance with preconceived notions about importance" (p.55). Recipients' interpretations of signals have nevertheless received little attention in research, and little is known about how recipients ordinally rank a signal in a set of signals and how this interpretation differs between different types of recipients (Connelly et al. 2011).

Signaling theory can be used to explain which and how assurances provided by CSCs influence company decision makers' and consumers' perceptions. As described in section 4.2.2, cloud service customers face various information asymmetries that manifest as uncertainties. Those information asymmetries generate a need for signals that relay information about unobservable

attributes of the cloud service and its provider. Because CSCs are issued by a trustworthy authority after a costly third-party audit, each assurance conveyed by a CSC is a signal that addresses a specific information asymmetry and provides information that recipients may use to form their expectations of a provider and its service and to predict the future qualities of the provider and its service (e.g., a provider's practices such as privacy protection or promises such as those regarding service quality or adherence to a code of conduct).

Following the types of signals in signaling theory, we distinguish between *provider-related assurances* and *service-related assurances*. Whereas provider-related assurances provide information about attributes of the provider organization, service-related assurances provide information about attributes of the provider's product (in this case the cloud service). Because security and privacy are preeminent concepts in research in online contexts and because security and privacy have been the two major types of assurances in the certification literature, we also distinguish *security* and *privacy* as separate assurance signals. This nomenclature of privacy, security, provider-related, and service-related assurances is consistent with the literature on information asymmetries in online contexts (e.g., Dimoka et al. 2012; Pavlou et al. 2007). Because higher information asymmetries imply an increased need for signals, we posit that when aggregating the set of assurance signals provided by a CSC, recipients weigh assurances based on the perceived extent of information asymmetry associated with that attribute of the provider or cloud service. Following signaling theory, which indicates that recipients have "*preconceived notions about importance*," the weight assigned to an assurance should vary between groups of recipients with diverging backgrounds, that is, differing signaling environments.

4.3 Research method

The objectives of this study are to identify the weighting of assurances in CSCs as well as to determine and compare differences in their relative importance between companies and individual consumers. We applied an inductive-exploratory sequential mixed-methods approach (Venkatesh et al. 2013) as depicted in Figure 4-2. An inductive-exploratory inquiry appeared to be most appropriate to identify the most salient assurances of CSCs, given the limited research on CSCs, the lack of a typology of CSCs' assurances, and the inconsistent meanings ascribed to assurances across existing CSCs. We first conducted qualitative expert interviews (Phase 1) to inductively develop and validate a typology of assurances for CSCs that is grounded in data. While the resulting typology of assurances is depicted in this section (see Table 4-1) as a conceptual foundation for the quantitative research that we focus on in this study, the results of phase 1 are reported in greater detail in (Lansing et al. 2018). Building on the typology of assurances developed in phase 1, we conducted a quantitative choice experiment using the best-worst scaling (BWS) method to examine the different perceptions of company decision makers and consumers of the relative importance of assurances (Phase 2), which reveals how recipients dissect and weigh signals (RQ1) and allows us to identify how this process differs across groups of recipients (RQ2).

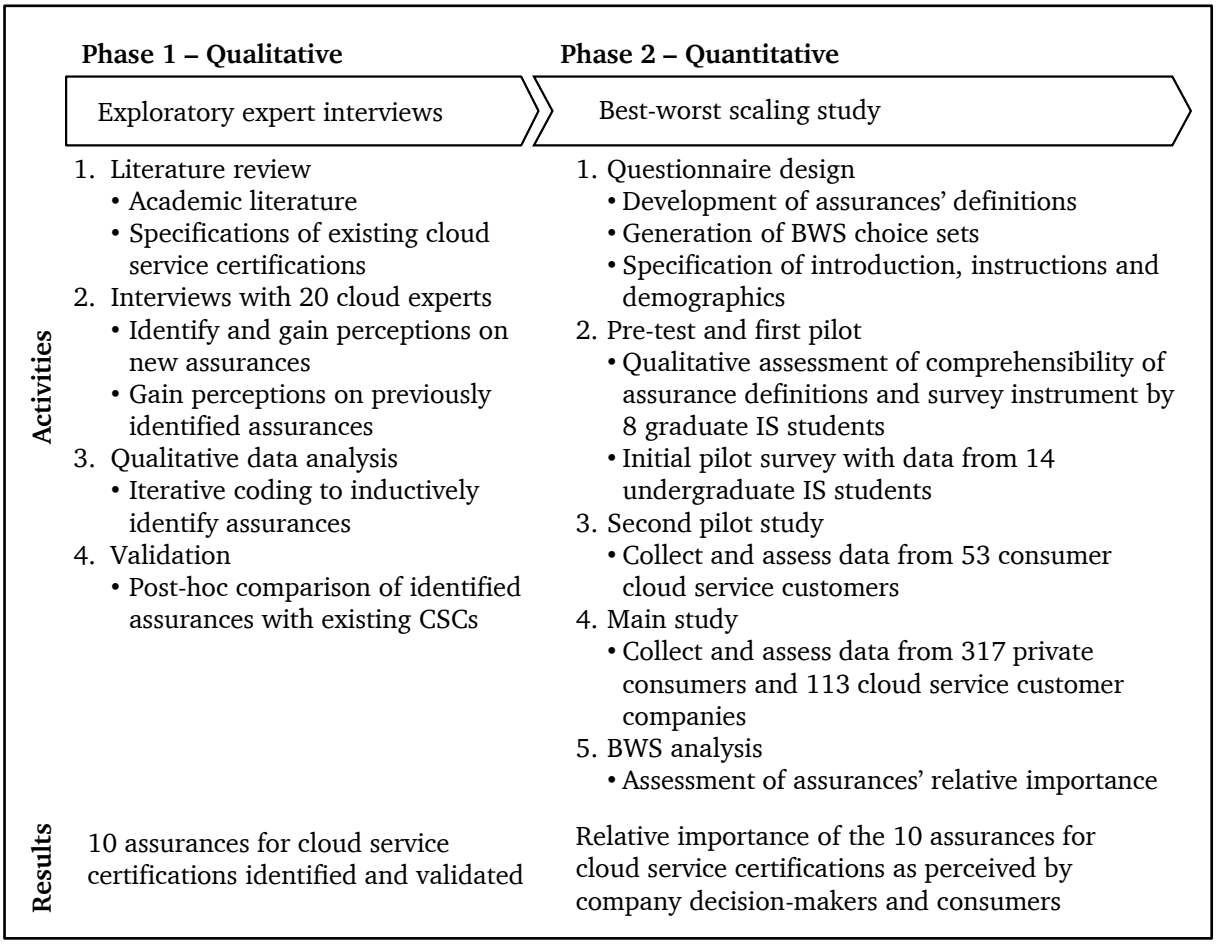

Figure 4-2. Overview of the research approach

4.3.1 Phase 1: Exploratory expert interviews

Interviewees were recruited by telephone inquiries to cloud service providers and customers, followed by emails asking for employees. We included cloud service providers and customers, aiming to gather data from both providers and recipients of CSCs to obtain various voices in uncovering the entire range of assurances (Myers and Newman 2007). Of the 20 interviewees, 12 worked for companies that provide cloud services (8 of these companies were also cloud customers themselves, purchasing cloud services from other vendors), and 8 worked for companies that used cloud services. Whenever possible, we conducted interviews with executive-level employees (9) because they make the ultimate decision regarding a cloud service's adoption (Dibbern et al. 2004) or – in the case of providers – acquiring a CSC. Eight interviewees were middle managers (8) who were responsible for evaluating potential cloud services (Benlian et al. 2009) and CSCs. We also interviewed consultants (3) because they are involved in selecting and implementing cloud services (Leimeister et al. 2010). Thirteen interviewees were affiliated with a business unit, and 7 were affiliated with an IT department. On average, the interviewees had 18 years of work experience and had been involved in 6 cloud projects. The interviewees' companies were primarily of medium and large size. Regarding the number of employees, 7 companies had fewer than 50 employees, 4 had between 50 and 500 employees, and 9 had more than 500 employees. Regarding revenue, 6 had less than €10 m of revenue,

7 had between €10 m and €250 m of revenue, and 5 had more than €250 m of revenue. Two interviewees preferred not to report their company revenue for confidentiality reasons.

We conducted the interviews via telephone between June and October 2012, applying a semi-structured interview protocol and following guidelines for qualitative interviews (Myers and Newman 2007). Questions were structured in three categories to gain an understanding of participants' backgrounds, experiences with cloud projects, uncertainties in cloud-related decisions, and perceptions about CSCs and their assurances. Regarding assurances, we first asked open questions to avoid imposing our own worldview and language on the interviewees (Myers and Newman 2007) and only then directly queried interviewees' views on the assurances and uncertainties that we had identified in the literature, existing CSCs, and prior interviews. The interviews were recorded, transcribed, and returned to the interviewees for communicative validation (Flick 2009).

Each transcript was coded by two IS researchers who were knowledgeable about IT-related certifications and CSCs as well as about signaling theory. The transcripts were analyzed by iterative descriptive and interpretive coding of interviewees' statements regarding assurances. This process resulted in a final typology of ten assurances, whose definitions along with coding examples of the interviewees' statements are depicted in Table 4-1.

As a final step after the coding process, we compared the inductively derived assurances with those of existing CSCs to ensure external validity. All identified assurances existed in practice, and no assurances of existing CSCs were overlooked. Moreover, all assurances corresponded with cloud computing-related uncertainties suggested in prior research. While existing CSCs provide a variety of assurances that are similar in name to the typology in Table 4-1, the scope and meaning of these assurances differ across CSCs or are only sub-assurances of superordinate assurances. In contrast to existing CSCs, the typology thus provides a set of mutually exclusive, clearly defined first-level assurances grounded in empirical data.

Table 4-1. Typology of assurances and example coding

Assurance	Definition	Illustrative quote for coding
Availability	The provider complies with performance commitments, ensures availability of data, and operates measures to prevent data loss.	Customer: "As a user, I only want a certification to include aspects of my concern. This includes **business continuity and availability** but also data security and protection according to contract as well as law and regulations."
Contract	The provider offers understandable contractual arrangements that conform to common business practices and the contract terms do not restrict the customers' property rights to their data stored in the cloud service.	Customer: "[…] no adhesion **contracts** are offered, and no small prints are hidden somewhere in the **terms and conditions** that were not visible during the self-serviced process."
Customer Support	The provider ensures the accessibility and responsiveness of customer support and practices a proactive information policy towards customers.	Provider: "Yes, very specifically: availability, responsiveness and response times of the support or **customer service**, number of languages spoken, and so forth; these kinds of things."
Financial Stability	The medium-term financial viability of the provider is assured.	Customer: "The certificate should state that the cloud provider has **financial reserves** for security or outages of 10% of revenue"
Flexibility	The customer can independently adjust the obtained capabilities and the adjustments are carried out automatically within a short period of time and with transparent costs.	Provider: "[…] that customers consume **what they need**, both in terms of **price model** and **technical scalability**, at adequate prices." Customer: "[…] **flexibility** of settlement. The hourly charging, in which I pay per **actual use** only, is an important aspect that does not or only rarely exists outside of cloud."
Interoperability	Customers can save and export data in standard formats, the cloud service offers open interfaces for integration with other cloud services or applications, and customers can access the cloud service independent of location via various devices.	Provider: "One of the biggest drawbacks of the cloud probably is that in fact you have some kind of **vendor lock-in**. […] It's basically the same with us. Although building upon open technologies, not all vendors or service providers have the expertise of operating a cloud service."

Legal Compliance	The provider complies with legal and regulatory requirements of cloud services.	Customer: "Separate certifications for privacy and **legal compliance** are not helpful, because these two often go hand in hand."
Privacy	The provider complies with applicable data protection laws, refrains from content-related analysis of the customers' data stored in the cloud service, completely and unrecoverably deletes all customer data after termination of the contract, and does not sell, rent or give away customer data to third parties.	Provider: "For me **data privacy** is more important than compliance topics because it does not change much." Customer: "Definitely **privacy** […] stating that in the way [the provider] handles data, it is compliant with requirements from the following countries, Germany, France, USA, etc."
Process Maturity	The business processes maturity of the provider aligns with established best practices in the IT service sector.	Provider: "[...] some certifications allow assessing **process maturity** to improve the internal organization – that's nice, but it's always enforced from outside."
Security	The provider has established measures to ensure that data are securely stored, transmitted and protected against unauthorized access by third parties and other cloud service users.	Customer: As a user, I only want a certification to include aspects of my concern. This includes business continuity and availability but also **data security and protection** according to contract as well as law and regulations."

4.3.2 Phase 2: Best-worst scaling study

4.3.2.1 Data collection

Two separate surveys were conducted to collect data from companies and consumers. Regarding companies, we followed a key informant approach (Homburg et al. 2012), aiming to solicit responses from key executive- or managerial-level informants who were directly involved in cloud-related decisions or who were direct advisors of company decision makers, such as consultants, because these individuals are responsible for evaluating CSCs and cloud services. We addressed both customer and provider companies and pooled their data for the analysis because their roles are interwoven in the cloud ecosystem (Leimeister et al. 2010). Respondents were drawn from a convenience sample compiled from personal industry contacts (different from the interviewees) of the authors and from carefully selected online professional interest groups focusing on cloud computing and certifications. The invitation explicitly addressed informants who were involved in cloud-related decisions and outlined the background required for respondents to answer the survey. Regarding consumers, the vast majority of Internet users use at least one type of cloud service (Mines et al. 2011), and thus all Internet users are the target population of CSCs. Therefore, our consumer sample was recruited by email from an open panel of Internet users with a broad spectrum of ages and education levels (called the "SoSci Panel"; SoSci Survey 2013). The survey instrument underwent a pretest and two pilots. For the pretest,

eight graduate IS students assessed the comprehensibility and face validity of the instructions and assurance definitions. Two pilot studies with 14 and 53 consumers, respectively, were conducted to gain a preliminary assessment of how consumers might weigh the ten assurances and to confirm the applicability of the approach.

4.3.2.2 Survey and quantitative choice experiment procedures

The quantitative choice experiment was carried out with the help of a survey that presented choice options but did not manipulate any information across participants. The survey sent to companies and consumers was identical. It proceeded in four steps. The framing step (step 1) ensured that all subjects had a common baseline understanding by explaining the study context. To this end, the survey gave a definition of cloud services (including the example of Microsoft Office Web Apps and its functionality) and CSCs (including the analogy of general inspection for cars). In step 2, the subjects were introduced to the experimental procedure. The subjects were instructed to place themselves in the position of a decision maker who determines whether to adopt a cloud service that is certified with a CSC whose assurances will be evaluated in the following task. In order not to bias subjects, we specified a cloud service in general and did not name any specific brand or type of cloud service nor any specific brand or type of CSC. In the choice experiment (step 3), subjects were presented with 15 unique subsets of four of the ten assurances in the form of a choice card. For each of the 15 cards, each subject was asked to select the most and least important assurances (see section 4.3.2.4 for details on BWS). These choice sets jointly constituted a balanced incomplete block design, with each assurance appearing six times and each combination of two assurances appearing twice to avoid context effects. In deploying this design, we followed the guidelines of Orme for the maximum number of items per choice set (4 to 5 and less than half of the total number of items), the minimum required threshold of observations per item and per respondent (3), and the sufficient number of tasks per respondent (15). To avoid order effects, we ensured that each assurance was shown at each position in the choice sets (Cohen 2003). Finally (step 4), we asked both groups for their personal demographics, and company informants were asked to provide company characteristics (see the next subsection for the detailed information requested from the subjects).

4.3.2.3 Survey sample description and respondent demographics

We received 113 complete responses from company informants and 317 complete responses from consumers, which corresponded to 38% and 60%, respectively, of the persons who initially followed the hyperlinks to the surveys. Overall, over two fifths of the company respondents were managers or executives, approximately one sixth were employees, and approximately one third were management consultants (Table 4-2). The company respondents were highly involved in cloud-related decisions, scoring 4.98 (SD: 1.94) on a 7-point scale (1="very low" and 7="very high"), and were highly experienced, with approximately two thirds having over ten years of work experience. Furthermore, they had high levels of knowledge about cloud computing, 5.19 (SD: 1.29), and certifications, 4.75 (SD: 1.49). Of the 113 company respondents, 35.4% worked for a company that also provides cloud services to external customers. Of the 317 consumers, two thirds had adopted and used cloud services. Overall, the consumers were

predominantly young and highly educated (Table 4-3). On average, they had relatively high levels of knowledge about IT, 4.80 (SD 1.32) on a 7-point scale (1="very low" and 7="very high"), and medium levels of knowledge about cloud computing, 3.47 (SD 1.65), and certifications, 2.99 (SD 1.70). We conclude that all the respondents were highly qualified to answer the survey and elicit their preferences for CSCs' assurances.

Table 4-2. Company sample description (firm and respondent characteristics)

Sector		**Firm cloud usage**		
IT	63.7%	Customer: adopter		37.2%
Finance	8.0%	Customer: non-adopter		27.4%
Professional services	4.4%	Provider only		12.4%
Public	3.5%	Provider and customer		23.0%
Healthcare	2.7%			
Others	17.7%	**Firm cloud familiarity**	**Adopter**	**Non-Adopter**
		<1 year	14.7%	13.3%
Employees		1-3 years	44.1%	42.2%
<10	17.7%	3-5 years	17.6%	4.4%
10-49	15.9%	>5 years	10.3%	13.3%
50-249	14.2%	Do not know	13.2%	26.7%
250-999	8.0%			
≥1000	43.4%	**Respondent role**	**Business**	**IT**
No answer	0.9%	Executive	15.0%	8.8%
		Manager	10.6%	8.0%
Revenue		Employee	7.1%	9.7%
<2	15.0%	Consultant	14.2%	20.4%
2-10	15.9%	Other	6.2%	
10-50	5.3%			
50-250	11.5%	**Respondent work experience**		
>250	34.5%	<1 year		1.8%
No answer	17.7%	2-5 years		14.2%
		6-9 years		18.6%
		≥10 years		65.5%

Table 4-3. Consumer sample description (respondent demographics and experience)

Age		**Internet use**		
<20 years	4.1%	<5 years		1.3%
20-29 years	44.5%	5-10 years		23.0%
30-39 years	18.0%	11-15 years		49.5%
40-49 years	13.6%	>15 years		26.2%
>49 years	19.9%			
		Cloud adoption		
Gender		Adopter		66.6%
Female	52.4%	Non-adopter		33,3%
Male	47.6%			
		Cloud use/familiarity	**Adopter**	**Non-adopter**
Education		Not at all	-	16.0
Still in school	0.6%	<1 year	22.8%	18.9%
High school	44.8%	1-3 years	54.0%	45.3%
Bachelor's degree	17.0%	3-5 years	18.5%	11.3%
Master's degree	30.3%	>5 years	4.7%	8.5%
Doctoral degree	3.5%			
Other	2.2%	**Cloud adopter usage domain (may coincide)**		
Prefer not to say	1.6%	Private		94.3%
		Education		61.1%

4.3.2.4 Best-worst scaling

BWS is a proven method in marketing and related research used to measure preferences regarding a set of attributes (Louviere et al. 2013). BWS extends a random utility choice model used in regular choice experiments by adding a second choice to each choice situation and asking for the least and most important options. Our choice of BWS was motivated by two primary considerations. First, BWS allowed us to measure the explicit trade-off decisions company decision makers and consumers make regarding the assurances provided by a CSC on an individual level. Therefore, BWS is ideally suited to examining individual recipients' interpretation and calibration of a set of signals (RQ2). Second, from a methodological perspective, BWS has several advantages over traditional preference elicitation methods, such as rating scales (e.g., Likert scales). Rather than answering a series of rating-scaled questions, it enforces trade-offs, which ensures that respondents discriminate between attributes (Louviere et al. 2013). Because BWS is scale free and thus avoids potential response biases, it allows for robust statistical comparisons between respondents (Louviere et al. 2013). Thus, BWS is particularly useful for comparing the weighting of assurance signals between companies and consumers (RQ2).

In analyzing the data, we applied the "MaxDiff" psychological model, which assumes that respondents cognitively process all possible pairs of best-worst choices in each choice set and that they choose the most extreme options (Louviere et al. 2013). In the context of this study, a respondent chooses the best-worst pair of assurances from a choice set c that maximizes the utility difference $U_{diff}^{c} = U_1 x_1^c + U_{2i} x_2^c + \cdots + U_{10} x_{10}^c$, in which U_a denotes the utility of assurance $a \in A = \{$*availability, contract, customer support, financial stability, flexibility, interoperability, legal compliance, privacy, process maturity, security*$\}$ and x_a^c takes a value of one if assurance a is selected as most important, negative one if assurance a is selected as least important,

and zero otherwise. Following random utility theory, the utility of an assurance $a \in$ A is $U_a = v_a + \varepsilon_a$, where v_a denotes the observed systematic utility and ε_a denotes the random error. Because each chosen pair of assurances provides implicit information about the rank of the nonchosen assurances compared with the chosen assurances, data for each choice set may be expanded to the implicit pair-wise choices (Louviere et al. 2013). The probability of choosing assurance a from the pair $(a, b), a, b \in$ A is $P(a = best|a, b) = P(v_a + \varepsilon_a) > P(v_b + \varepsilon_b)$. If the errors ε are independent and identically distributed (*iid*) Gumbel variates, this probability is $P(a = best|(a, b) \in C) = \mathrm{e}^{v_a}/(\mathrm{e}^{v_a} + \mathrm{e}^{v_b})$. The parameters v_a may be estimated by a multinomial logit model of the pair-wise choices (Louviere et al. 2013). Regarding our research questions, the estimated v_a values for each respondent represent the assurances' relative weights in the utility function and thus elucidate which assurances matter more or less to the respondent relative to the other assurances.

4.4 Results

4.4.1 Main study

Analyzing the data from the exploratory interviews resulted in a typology of ten assurances for CSCs (see Table 4-1), which was used as input for the BWS study. To analyze the BWS results, we used a multinomial logistic regression to estimate the utility of each assurance for each respondent by following the guidelines of Louviere et al. (2013). To facilitate the interpretation and aggregation of the utilities (i.e., regression coefficients) across respondents, we calculated each assurance's choice probability ($\exp(v_a)/\sum_{n=1}^{10} \exp(v_n)$), which indicates an individual's perceived relative importance of an assurance on a percentage scale.

Figure 4-3 shows the mean relative importance that companies and consumers ascribed to each assurance and the cumulative relative importance of the four categories of assurances (privacy, security, provider-related, and service-related). In addition, Figure 4-3 depicts the results of Welch's *t*-tests for the mean equality of the relative importance of the assurances between the two groups. Overall, the results show that companies and consumers' perceptions regarding the importance of assurance domains differ significantly. Companies ranked privacy, security, and availability highest and financial stability, flexibility, and process maturity lowest. The joint relative importance of service-related assurances (availability, flexibility, interoperability) is 23.3%, and the joint relative importance of provider-related assurances (legal compliance, contract, customer support, financial stability and process maturity) is 18.1%. By contrast, consumers ranked privacy, security, and availability highest and financial stability, process maturity, and flexibility lowest. The results of a Hoteling's T^2-test show that the absolute values of the relative importance of the assurances differ significantly between the two groups, $p<.01$ ($T^2 = 3.15$ at 9 and 420 degrees of freedom). A comparison of single assurances between the two groups using Welch's *t*-tests furthermore reveals significant mean differences for privacy, security, and legal compliance assurances. Driven by the notable difference in the perceived relative importance of these assurances, consumers perceive the joint relative importance to be 20.1% for service-related assurances compared with 10.0% for provider-related assurances.

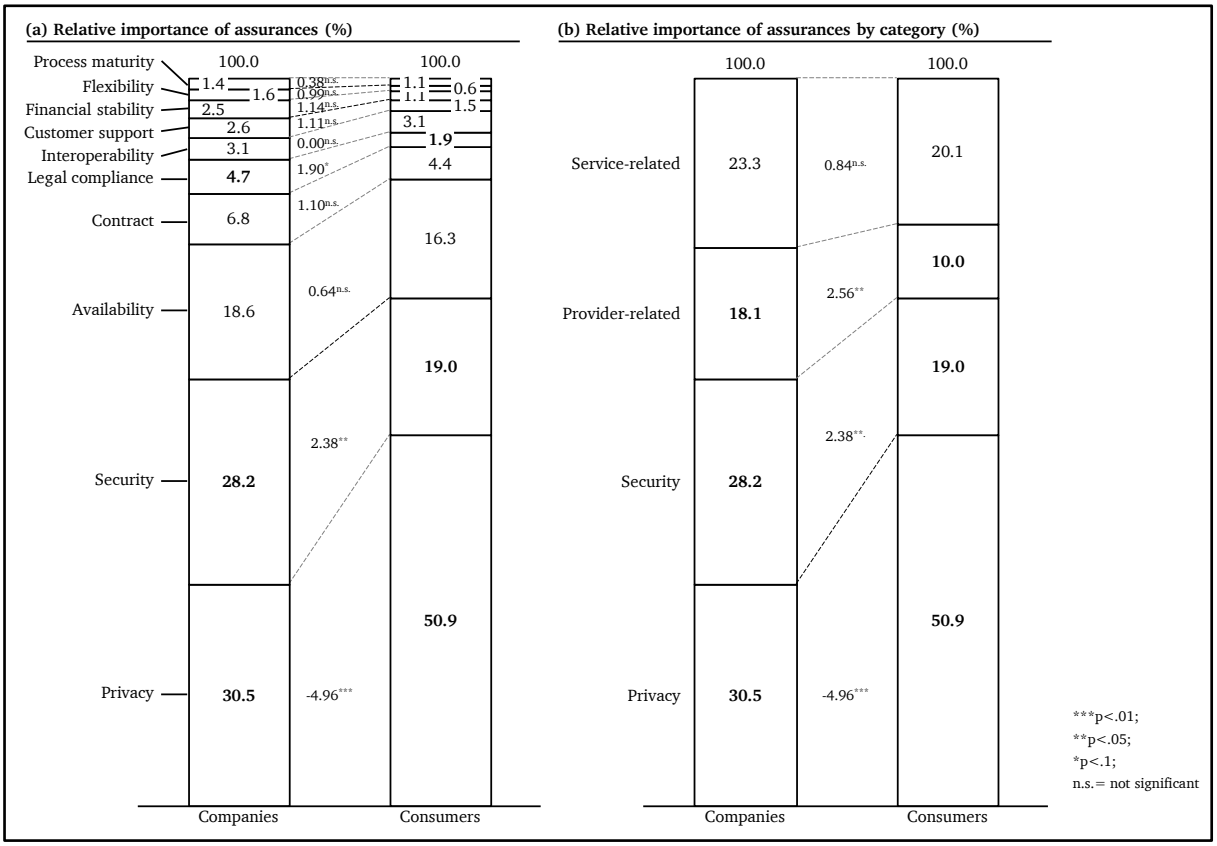

Figure 4-3. Relative importance of assurances to companies and consumers

4.4.2 Post hoc analyses

In terms of signaling theory, companies and consumers are distinct groups of recipients from different signaling environments. Hence, the significant differences between companies and consumers suggest that recipients' weighting of assurances is contingent on the signaling environment. To further shed light on influencing factors in this environment, we conducted exploratory post hoc analyses to derive a structured and theory- and data-grounded set of potential contextual factors.

A review of the cloud computing literature under the lens of signaling environments revealed three key contextual factors: (1) recipient characteristics (Benlian and Hess 2011a) that manifest as group differences, (2) type of cloud service (Benlian et al. 2009) and (3) industry regulation (Marston et al. 2011). Our main results reported in section 4.1 already present one recipient group difference: being an adopter vs. a non-adopter. However, signaling theory suggests that additional group differences may influence adoption decisions. Senders use signals to dispel uncertainties among recipients and will thus have a perception of the importance of a specific signal (e.g., security vs. contract) that may or may not match recipients' perceived view of its importance. In cloud contexts, providers of cloud services are often also users of cloud services (e.g., Dropbox building on Amazon's infrastructure services) and are thus both recipients and senders of signals. Thus, being a provider vs. not being a provider might be another recipient group difference that could impact the weighting of assurances. The cloud literature identified the *type of cloud service* (e.g., Software-as-a-Service (SaaS) vs. Platform-as-a-Service

(PaaS) vs. Infrastructure-as-a-Service (IaaS); Benlian et al. 2009) as a contextual factor in adoption decisions, suggesting it also as a contextual factor for the weighting of CSCs' assurances. Finally, the requirements of cloud services vary greatly across industries, and highly regulated industries in particular (e.g., health) are stated to have specific requirements for cloud services compared to less-regulated ones (Marston et al. 2011), suggesting the level of *industry regulation* as a third contextual factor.

In sampling the data, we collected demographic variables that allowed us to further dissect the two datasets and to specifically analyze for the three contextual factors. For (1), recipient characteristics, we dissect the company dataset into respondents from cloud service provider companies and (potential) customer companies as well as (potential) customer companies into adopters and non-adopters of cloud services. We also dissect the consumer dataset into adopters and non-adopters of cloud services. Comparing consumers and customer companies, we found customer companies ascribe higher importance to contract and legal compliance assurance and less importance to privacy assurance than individual consumers (Table 4-4). In the company dataset, providers ascribe less importance to contract assurance and higher importance to security assurance than customer companies, but there are no differences between adopter and non-adopter customer companies (Table 4-5). Within the consumer dataset, adopters ascribe significantly higher importance to availability and interoperability assurances and less importance to security assurance than non-adopters (Table 4-6).

Table 4-4. Assurances' relative importance to customers from the company sample and to individual consumers from the consumer sample

Assurance	Relative importance (%)		Subgroup comparison	
	Customer companies	Individual consumers	t	p
Availability	**20.4**	**16.3**	.930	.355
Contract	**9.9**	4.4	**1.685**	**.096**
Customer Support	2.4	1.5	.750	.455
Financial Stability	3.5	1.1	1.353	.180
Flexibility	1.8	.6	.794	.430
Interoperability	2.3	3.1	-.685	.495
Legal Compliancy	**5.3**	1.9	**1.719**	**.089**
Privacy	**32.4**	**50.9**	**-3.685**	**.000**
Process Maturity	2.0	1.1	.635	.527
Security	**20.1**	**19.0**	.270	.788

Note: Assurances marked in bold are considered relevant (relative importance ≥5%); t- and p-statistics are marked in bold if p<.1.

Table 4-5. Assurances' relative importance by recipient group differences in the company sample

Assurance	Relative importance by sub-groups in the company sample (%)				Subgroup comparisons			
	Provider	Customer			Provider vs. customer (overall)		Customer adopter vs. non-adopter	
		overall	adopter	non-adopter	t	p	t	p
Availability	**15.2**	**20.4**	**20.9**	**19.7**	-.899	.371	.142	.888
Contract	1.3	**9.9**	**10.4**	**9.1**	**-2.602**	**.011**	.201	.841
Customer Support	3.0	2.4	3.5	1.0	.303	.763	1.193	.238
Financial Stability	0.6	3.5	4.3	2.4	-1.660	.101	.597	.552
Flexibility	1.3	1.8	2.7	.5	-.331	.741	.894	.376
Interoperability	4.7	2.3	1.7	3.0	.795	.431	-.690	.492
Legal Compliance	3.6	**5.3**	4.2	**6.8**	-.646	.520	-.630	.532
Privacy	**27.0**	**32.4**	**31.2**	**34.0**	-.810	.420	-.293	.770
Process Maturity	0.4	2.0	3.0	.7	-1.084	.282	.951	.347
Security	**43.0**	**20.1**	**18.1**	**22.8**	**3.097**	**.003**	-.582	.563

Note: Assurances marked in bold are considered relevant (relative importance ≥ 5%); t- and p-statistics are marked in bold if p<.1.

Table 4-6. Assurances' relative importance by recipient group differences in the consumer sample

Assurance	Relative importance by subgroups in the consumer sample (%)		Subgroup comparison: Adopter vs. non-adopter	
	Adopter	Non-adopter	t	p
Availability	**20.7**	**7.7**	**4.25**	**.000**
Contract	3.9	**5.3**	-.78	.435
Customer Support	1.3	1.9	-.69	.490
Financial Stability	.8	1.8	-1.17	.244
Flexibility	.6	0.8	-.31	.760
Interoperability	4.2	1.0	**2.70**	**.007**
Legal Compliance	1.5	2.8	-1.19	.235
Privacy	**49.8**	**53.3**	-.70	.482
Process Maturity	.6	2.0	-1.28	.202
Security	**16.7**	**23.5**	**-1.77**	**.079**

Note: Assurances marked in bold are considered relevant (relative importance ≥ 5%); t- and p-statistics are marked in bold if p<.1.

To examine (2), the impact of the type of cloud service, we approximated differences between customers using different types of services based on reported use. We rely on an approximation because in the experiment, type of service was not part of the manipulations and was held constant across all groups. Table 4-7 shows the relative importance of assurances to company customers who reported using different types of services in the form of Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). We found that customer companies in many cases use several types of services. To examine differences between types of services, we compared company customers who reported using a specific type of service with non-adopters of any cloud service (Table 4-8) as well as with company customers who reported not using just this type of service (Table 4-9). We only found significant differences

between PaaS adopters and non-adopters for interoperability, for SaaS and non-SaaS adopters for contract, and for PaaS and non-PaaS adopters for privacy.

Table 4-7. Assurances' relative importance to company customers by type of service

Assurance	SaaS	Non-SaaS	PaaS	Non-PaaS	IaaS	Non-IaaS	Non-Cloud-Adopter
Availability	**19.5**	**31.3**	**19.9**	**21.9**	**18.8**	**28.5**	**19.7**
Contract	**11.8**	.3	**7.4**	**13.4**	**8.7**	**16.7**	**9.1**
Customer Support	2.6	**10.0**	4.2	2.7	2.4	**7.4**	1.0
Financial Stability	3.3	**12.1**	**8.7**	.0	**5.5**	.0	2.4
Flexibility	3.0	.0	.5	4.9	3.4	.0	.5
Interoperability	2.0	.0	.3	3.1	2.2	.0	3.0
Legal Compliancy	3.4	**10.1**	3.8	4.6	4.4	3.3	**6.8**
Privacy	**32.1**	**25.1**	**41.4**	**21.0**	**33.3**	**23.6**	**34.0**
Process Maturity	3.4	.2	.1	**5.8**	3.8	.0	.7
Security	**19.1**	**10.9**	**13.7**	**22.5**	**17.5**	**20.6**	**22.8**
Note: Values in %; Assurances in bold are considered relevant (relative importance ≥ 5%).							

Table 4-8. Differences in the relative importance of assurances between adopters of different types of services and non-cloud-adopters

Assurance	SaaS vs. Non-Cloud-Adopters		PaaS vs. Non-Cloud-Adopters		IaaS vs. Non-Cloud-Adopters	
	t	p	t	p	t	p
Availability	-.029	.977	.021	.984	-.107	.916
Contract	.393	.696	-.243	.809	-.067	.947
Customer Support	.824	.414	1.024	.317	.740	.463
Financial Stability	.275	.784	1.101	.282	.801	.427
Flexibility	.923	.362	-.093	.926	.946	.351
Interoperability	-.528	.599	**-2.128**	**.041**	-.384	.702
Legal Compliancy	-.837	.407	-.642	.524	-.544	.589
Privacy	-.196	.845	.661	.512	-.065	.948
Process Maturity	.975	.336	-1.476	.149	1.014	.318
Security	-.443	.659	-1.039	.304	-.643	.523
Note: t- and p-statistics are marked in bold if p<.1.						

Table 4-9. Differences in relative importance of assurances between adopters and non-adopters of different service types

Assurance	SaaS vs. Non-SaaS-Adopters		PaaS vs. Non-PaaS-Adopters		IaaS vs. Non-IaaS-Adopters	
	t	p	t	p	t	p
Availability	-.583	.587	-.184	.855	-.642	.534
Contract	**2.378**	.023	-.692	.493	-.633	.540
Customer Support	-.732	.503	.377	.709	-.747	.474
Financial Stability	-.711	.513	1.592	.127	1.571	.126
Flexibility	1.124	.269	-.932	.362	1.124	.269
Interoperability	1.187	.243	-.982	.338	1.188	.244
Legal Compliancy	-.665	.540	-.198	.844	.284	.780
Privacy	.553	.599	**1.961**	**.058**	.726	.481
Process Maturity	1.137	.263	-1.181	.251	1.233	.227
Security	.74	.485	-.941	.352	-.252	.805
Note: t- and p-statistics marked bold if p<.1						

To examine the impact of (3), the level of regulation in an industry, we categorized the sample into highly regulated industries (Finance, Health) and classified all remaining industries as less-regulated industries. Table 4-10 shows the relative importance of assurances to each subset and the results of t-tests. We only found significant differences in contract, customer support, and financial stability assurances, which are all less important in highly regulated industries. Given the low sample size for some industries (see Table 4-2), however, these results only give a first indication and should be interpreted with care.

Table 4-10. Assurances' relative importance to company customers by level of industry regulation

Assurance	Relative importance (%)		Subgroup comparison	
	Highly regulated (Finance and Health)	Non-highly regulated (all other industries)	t	p
Availability	**10.1**	**22.0**	1.093	.295
Contract	.2	**11.4**	**3.094**	**.003**
Customer Support	.0	2.8	**2.127**	**.037**
Financial Stability	.0	4.1	**2.027**	**.047**
Flexibility	**10.0**	0.4	-.955	.364
Interoperability	.7	2.5	1.350	.182
Legal Compliancy	**15.1**	3.7	-1.059	.316
Privacy	**37.8**	**31.5**	-.414	.687
Process Maturity	.0	2.3	1.411	.163
Security	**26.0**	**19.2**	-.478	.642
Note: Assurances marked in bold are considered relevant (relative importance ≥ 5%); t- and p-statistics are marked in bold if p<.1.				

4.5 Discussion

Driven by the need for fast responses to changing markets and customer demands (Ravichandran 2018; Tallon et al. 2019), organizations are increasingly relying on cloud services, which allow for short update cycles and flexible IT use. As these services affect fundamental aspects of a company's business model rather than only technical aspects (e.g., when outsourcing ERP or CRM to cloud services), the decision to adopt a certain cloud service is of a strategic nature

and calls for the alignment of business and IT to make the right selection. In this study, we juxtapose the differential relative weights that company decision makers and consumers ascribe to assurances in CSC evaluations based on the notion that certifications are a bundle of distinct signals rather than an aggregate signal. The discussion of our key findings that follows lays the groundwork for theory on how the relative importance of CSCs' assurances depending on signaling environments influences cloud service adoption decisions.

4.5.1 Synthesis and discussion of the key findings

Figure 4-4 summarizes our key findings and shows how they are related to recipients' adoption decisions. This provides a first step towards a theory of how recipients evaluate certifications as a weighted bundle of signals as part of adoption decisions. Our key findings are depicted on the left-hand side of Figure 4-4, which indicates that CSCs are a bundle of signals that are weighted by recipients to form an aggregate signal, and that the subjective weighting of assurances is shown to be contingent upon the signaling context, manifested by contextual factors such as recipient group differences, service type, and industry regulation. Tables 4-4 to 4-6 show which assurances specifically resonate with which type of recipients, Table 4-7 shows which assurances matter for which types of service (e.g., Infrastructure-as-a-Service vs. Software-as-a-Service), and Table 4-10 shows which assurances matter in highly regulated vs. non-highly regulated industries.

The right-hand side of Figure 4-4 depicts Sturm et al. (2014)'s basic conceptual model of a certification's role in adoption decisions, which is derived from a structured literature analysis of 42 empirical studies of certifications in various contexts and grounded in signaling theory (e.g., Kirmani and Rao 2000), trust theory (e.g., Kim and Benbasat 2006, 2009), and an elaboration likelihood model (e.g., Bhattacherjee and Sanford 2006; Lowry et al. 2012). The model proposes that a recipient's perceptions of a CSC have a negative effect on perceived risks, a positive effect on perceived assurance, and a positive effect on the recipient's trust in the cloud service, which mediate a CSC's signaling effect on the recipient's adoption decision.

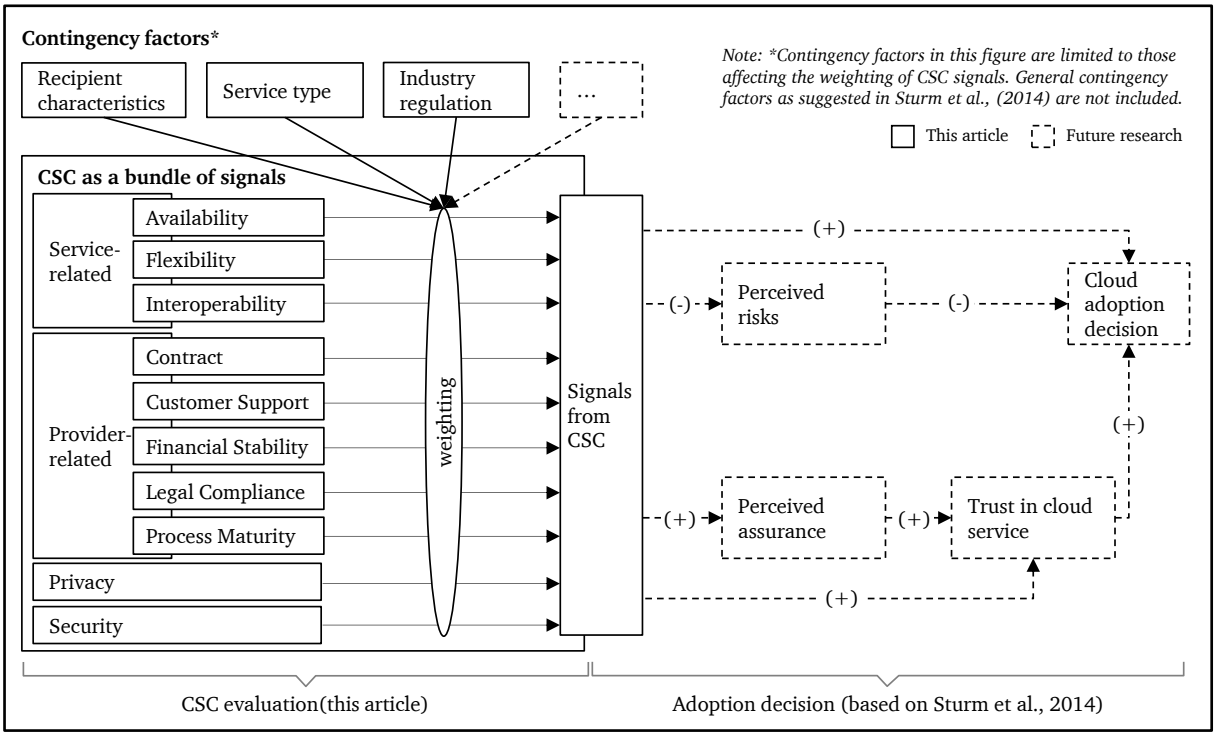

Figure 4-4. Summary of key findings and relation to adoption theory

Incorporating the two findings outlined above extends the conceptual model such that a recipient's subjective weighting of the bundle of signals in a CSC is an input to the adoption decision for the certified cloud service and thus influences both the antecedents of the adoption decision and the adoption decision itself. Recipients evaluate certifications as part of cloud adoption decisions considering recipient characteristics (i.e. adopters vs. non-adopters) and, based on initial evidence, service type and industry regulation. This theory has a number of boundaries: the weighting of assurances represents only a general view of cloud services, and weights for specific types of cloud services cannot be inferred; the influence of recipients' differences in assurances' weights is bound to the characteristics shown in Tables 4-4 to 4-10, and the proposed effects of these assurances on adoption decisions and their antecedents requires empirical validation.

4.5.1.1 Contextual factors: Recipient groups, type of service, and industry regulation

The analysis of BWS data across groups and subgroups of recipients shows that certification recipients' value multiple assurances in a certification but focus on a limited set of assurances. In the context of CSCs, privacy, security, availability, contract, and legal compliance emerge as the most salient assurances across recipients because they constitute the major share of relative importance. By contrast, recipients across groups ascribe only low relative importance to interoperability, customer support, financial stability, flexibility, and process maturity. The information processing literature posits that decision makers reduce cognitive strain by focusing on less data (Miller 1956) and the most useful information while ignoring other relevant information (Slovic and Lichtenstein 1971). This suggests that in an adoption decision, recipients would evaluate a CSC primarily in terms of whether it provides privacy, security, availability, contract, and legal compliance assurances.

The fundamental differences regarding how company decision makers and consumers value different assurances provided by CSCs, however, suggest a contextual perspective on the aggregation of signals by recipients. Specifically, the main study and the post hoc analyses suggest that *recipient characteristics* (i.e., provider vs. customer, company vs. consumer, adopters vs. non-adopters) are a contextual factor that influences the weight a recipient ascribes to an assurance in a CSC (Tables 4-4 to 4-6).

For individual consumers, the three assurances of privacy, security, and availability seem to be of highest value. The post hoc analyses confirm this finding for adopters but also show that non-adopters ascribe significantly lower relative importance to availability and interoperability and almost exclusively value privacy and security assurances. Companies, by contrast, seem to have more sophisticated and balanced needs for assurances compared to individual consumers, given that the top five assurances (privacy, security, availability, contract, and legal compliance) account for approximately the same cumulative relative importance as consumers' top three assurances (privacy, security, and availability). The two additional assurances, contract and legal compliance, have higher relative importance among companies than among consumers, suggesting that companies remain reluctant to use standardized contracts as formal controls and that they question key promises of cloud computing, such as location independence or privacy and security on multi-tenant infrastructure. Additionally, companies ascribe significantly lower relative importance to privacy and significantly higher relative importance to security. These findings are consistent with the literature in that executives are predominantly concerned about the data security, contractual loopholes, and legal compliance of cloud services (Benlian and Hess 2011a; Narasimhan and Nichols 2011). A possible explanation for the difference in the importance of privacy is that companies have accumulated more expertise in assessing providers' privacy practices from the long-established use of IT outsourcing, whereas using and storing personal documents in a cloud service is novel to consumers. Furthermore, the post hoc analyses on the responses from company representatives revealed further evidence for the contextual factor of differences in recipient characteristics. We found that decision makers from provider companies focus predominantly on security, privacy, and availability, whereas decision makers from (potential) customer companies also focus on contract and legal compliance, and that the latter is consistent across non-adopter and adopter companies.

While the main focus of our study was how recipient characteristics influence the subjective weighting of assurances, post hoc analyses of our data also provide indications of further contextual factors, in particular, the *type of cloud service* used as well as the *industry regulation* of companies that use cloud services (Table 4-7 and Table 4-10, respectively). Both post hoc analyses must be interpreted with care, however, because our research design did not explicitly manipulate service type and includes too few data points for a comprehensive comparison of assurances' relative importance to customer companies from different industries.

4.5.1.2 CSCs as a bundle of signals in cloud adoption decisions

The insights into how different groups of recipients evaluate certifications as a bundle of signals provide useful information regarding the role of certification in theories on adoption decisions

in general and for adoption decisions in the context of cloud computing. Prior adoption theories focused on certifications as one-dimensional signals whose presence or absence altered recipients' perceptions of assurance, risk, and trust (see Figure 4-4 and section 4.5.1). Our findings, however, suggest that the role of certifications in adoption decisions is more complicated and that adoption theories must consider (1) recipient characteristics (e.g., provider companies vs. customer companies vs. personal consumers; adopters vs. non-adopters), (2) the type of service, and (3) the level of industry regulation.

First, our findings suggest that recipients focus on a selection of assurances from certifications that they perceive as most relevant. From an adoption theory perspective, this implies that recipients process and weigh a number of signals whose effect on recipients' risk, assurance, and trust perceptions could depend on the extent to which a certification contains multiple assurances that match recipients' view of the subjective importance of the assurances. Recipients who perceive that a certification does not reflect the assurances that they value most (e.g., privacy, security, availability) may disregard the certification altogether. The conceptual model in Figure 4-4 shows that the past certification literature included the aggregate constructs of perceived risk, perceived assurance, and trust to capture a recipient's aggregate interpretation of certification signals. In light of the finding that CSCs are a bundle of signals and each signal is interpreted and weighted individually by a recipient, adoption theories might incorporate specific constructs that capture recipients' interpretations of these signals.

Second, the substantial differences in how recipients weight assurances indicate that the efficacy of a certification in an adoption context could greatly depend on the recipient and the signaling environment. Following signaling theory's tenet that recipients calibrate the variety of available signals according to their *"preconceived notions about importance"* (Connelly et al. 2011, p. 55), we find indications that those *"notions about importance"* depend on contextual factors such as recipient characteristics, service type and industry. In sum, our findings indicate that the effect of certifications on adoption antecedents such as perceived risks, perceived assurance, trust, and adoption decisions are moderated by contextual factors such as recipient characteristics, service type, and industry.

Transferring these general propositions to the specific context of cloud computing, several implications emerge for theories to explain and predict the role of CSCs in cloud service adoption decisions. As discussed in sections 4.2.2 and 4.2.3, the ten assurances are signals that each address a specific type of information asymmetry. Given the particular importance of security, privacy, and availability, related constructs should be included in a theory about the role of certification in cloud service adoption decisions. These may be either formulated around the related risks (perceived security risk, perceived privacy risk, or perceived availability risk) or as assurances (perceived security assurance, perceived privacy assurance, or perceived availability assurance). While not focusing on the impact of certifications, some cloud adoption theories nonetheless include a selection of these constructs. For example, Benlian and Hess (2011a) found that security risks and performance risks decrease SaaS adoption intention mediated by perceived risk; Bhattacherjee and Park (2014) found that security concerns have a negative

effect on adoption intentions; and Heart (2010) found that perceived risk of system unavailability and perceived risk of data insecurity both have negative effects on adoption intention mediated by perceived risk. Our findings indicate that cloud adoption theories should be extended to also include constructs for availability, privacy, and security assurances in consumer contexts and constructs for legal compliance and contract assurances in business contexts. In terms of trust, in addition to trust in the provider that is predominant in past adoption theories, our findings suggest that trust in technology (Lankton et al. 2014) could also be included to capture perceptions about cloud service technology (i.e., tap into service-related assurances of availability, interoperability, and flexibility). Furthermore, our results suggest that in the context of individual consumers, individuals who use a cloud service weight CSC assurances differently than non-users. In business contexts, whether the decision maker is employed by a company that is also a cloud service provider, the type of service adopted, and the industry are factors that impact weightings. Hence, our findings indicate that in those contexts, constructs related to recipient characteristics, type of cloud service, and industry regulation should be included as moderators in cloud adoption theories. The focus of this research was on the subjective weighting of assurances as perceived by different groups of recipients; the effect of certification assurances on adoption decisions and their antecedents merits further research.

4.5.2 Research implications and contributions

The findings discussed above extend prior research on IT-related certification and strategic decision-making in the context of service adoption. While carefully selecting services is important to avoid conflicts in outsourcing relationships (Lacity and Willcocks 2017) and to improve organizational performance (Gorla et al. 2010), the signaling role of CSCs in such contexts has not been investigated in depth. In this regard, our findings have three implications.

First, our results present insights into the inner workings of IS certifications, which remain black boxes in the majority of prior work treating certifications as unitary cues. In the same manner in which single trusting beliefs may be of different importance to an overall trust effect on customers' satisfaction (Xu et al. 2016), single assurances differ in their importance to customers. We demonstrate that conceptualizing certifications as bundles of strategic signals that are weighted separately by certification recipients provides a useful approach for elucidating recipients' evaluations of certifications. In particular, this conceptualization implies that recipients not only assign weights to different signals but also may dissect a single signal into finer-grained signals that are weighed against each other. With this novel approach of applying signaling theory to certification research, we advance knowledge of how certifications' assurances (i.e., their content) influence IT-related decisions by introducing the *weighting* of assurances as a factor to be considered. We propose that adoption theories may be extended to reflect IS certifications as a bundle of signals. This bundle influences adoption drivers such as perceived risk and trust and ultimately service adoption (Belanger et al. 2002; Li et al. 2008).

Second, the fundamental differences in how decision makers and consumers weigh and rank assurances highlight the important role of the recipients' subjective interpretations of the certification's assurances, confirming findings in the signaling literature that a signal's interpretation hinges on subjective *"preconceived notions about importance"* (Connelly et al. 2011, p. 55), which has implications for adoption theories. This is consistent with prior research, as strategic decisions, even when they are data-driven, are subject to the nature of the situation and contingent on the individual decision maker's preconditions, and acknowledging this helps avoiding failures in strategic decision-making (Aversa et al. 2018). We found that depending on the context into which a certification enters as a signal, the dominating signals (and group of signals) within the certification changes. Specifically, recipients' subjective interpretation of a signal depends on the recipient's characteristics (e.g., whether s/he is a decision maker from a customer company or a provider company or a consumer who has adopted or not yet adopted a cloud service). We also found indications that other contextual factors such as service type and industry merit further empirical research. Our research highlights that a contextual perspective of recipients' evaluations of certifications is important when examining their effect on adoption decisions. Hence, the inconsistent findings on certifications' effects (see section 4.2.1) might be explained by a lack of clarity about the extent to which a certification containing multiple assurances matches the subjective importance recipients ascribe to the assurances provided by the certification in that context.

Third, this article contributes to the literature by validating the conceptual typology of CSCs' assurances that was developed in qualitative, grounded research (Lansing et al. 2018) in a quantitative choice experiment and integrating it into the frameworks of information systems signaling and adoption research. The typology maintains conceptual consistency with the literature by including the established assurances of security, privacy, and provider integrity/processes. These assurances are complemented by a novel group of service-related assurances that address product uncertainties (i.e., availability, flexibility, interoperability), reflecting a class of assurances that are not covered by prior certification literature. Furthermore, provider integrity/process assurance is broken down into a fine-grained set of assurances (i.e., contract, customer support, financial stability, legal compliance, and process maturity assurances), which allows for a more nuanced study of the dimensions of process assurance. In this regard, our study is in line with recent IS research that the problem of information asymmetry becomes more complex as experience and credence goods enter online markets (Dimoka et al., 2012). Understanding the fine-grained structure of assurances and the impact of recipients' subjective interpretations allows for better analysis of decision-making tasks. Overall, our typology has practical value for researchers because it provides a strong conceptual foundation for future research seeking to examine which and how assurances mitigate uncertainties in cloud computing contexts.

4.5.3 Practical implications

Cloud adoption decisions have increasing strategic importance for IS practitioners, as the growing uptake of cloud computing and the SaaS operating models demonstrate (Gartner 2018). This study delineates *to what extent* CSCs' assurances are important to company decision makers

and consumers, supporting their adoption decisions. The results have practical implications for certification authorities and cross-organizational certification initiatives, cloud service providers, and cloud service customers.

Several strategies for certification authorities and initiatives to develop and promote CSCs may be drawn from the results. First, authorities and initiatives that intend to develop CSCs that encompass multiple assurances may use our results as a blueprint to set the scope of their certification standard, such as the number and stringency of audit criteria used for each assurance. In light of the focus of companies and consumers on a handful of assurances, authorities and initiatives are advised to not "assure everything" but rather to focus on a small set of important assurances, such as privacy, security, and availability. Moreover, less important assurances should be certified as a supplement to basic CSC. Second, the divergent relative importance of assurances between different groups of recipients (Tables 4-5 to 4-6) suggests that various types of CSCs with different scopes are desired. Therefore, our results may be used to determine how to strategically position CSCs in the certification market, for example, by only addressing consumers and highlighting their preferred assurances (privacy, security, availability) in marketing material. In addition to these strategic implications, the relative importance of assurances to different groups of recipients may provide guidelines for designing more coherent and comprehensible certification reports. Such reports are important because they provide necessary information to recipients on the exact purpose and standard of a CSC. Given that any uncertainty about the underlying standard may undermine a certification's value (Harbaugh et al. 2011), authorities and initiatives are advised to highlight and communicate assurances based on their relative importance for the intended audience (e.g., for consumers by presenting privacy first, security second, availability third).

Cloud service providers may use our results when evaluating alternative CSCs in selection processes. Providers who target consumers are advised to seek a CSC that highlights privacy, whereas providers who target companies are advised to seek a CSC that balances security, privacy, and availability. Because a single CSC usually does not cover all assurances and because acquiring multiple CSCs might be uneconomical, providers may learn from our results that a hybrid strategy may be advisable. Such a hybrid strategy involves having the most important assurances addressed by a third-party CSC authority and providing the remaining assurances with low relative importance (e.g., process maturity and flexibility) in the form of self-provided assurance statements. Self-provided assurance statements have been found to be almost as effective as third-party assurances if they are properly formulated (Kim and Benbasat 2009).

Finally, cloud service customers may use our empirical results as a guideline to evaluate cloud services and CSCs because the empirical results outline the aspects of cloud services that other customers, particularly more knowledgeable companies, consider to be critical. Scrutinizing these aspects may facilitate an organization's adoption of services that are of higher quality and fit, which pays off as IS service quality drives organizational performance (Gorla et al. 2010). In particular, customers who are less familiar with cloud computing may use our results to weight information in adoption decisions for cloud services or in evaluations of a CSC.

4.5.4 Limitations, future research, and conclusion

As with all research, this study has some limitations that provide avenues for future research. First, because our research model was evaluated using cross-sectional data, the results reflect a snapshot of companies' and consumers' perceptions of the relative importance of assurances. As cloud services are under continuous development, new features may lead to new uncertainties, which may require different, currently non-existing third-party assurances. Therefore, replication of our study is necessary to confirm the validity of our results over time.

Second, although our sample sizes are statistically sufficient to estimate the relative importance of assurances and although the demographic variables suggest that the respondents were highly qualified to participate, the respondents were key informants and were obtained from convenience samples. This sampling and data collection methodology, while having advantages for an exploratory study, also limits the study's generalizability, and the results should be extrapolated to populations with caution (Lee and Baskerville 2003). Future research may, for example, draw random samples from company directories or explore different customer segments to increase the generalizability of the results. In this regard, cross-cultural settings and geographically distributed samples may cross-validate our findings. While cloud services tend to be offered globally, customer distinctions based on cultural differences may affect assurances' importance. The adoption of new computing paradigms (e.g., manifested in trust propensity or tendency to outsource) is particularly prone to such influences (Messerschmidt and Hinz 2013).

Finally, our findings are context-specific and are only generalizable to the boundaries of a general view on cloud services and the measured contextual factors and not to specific types of cloud services. Our research examined the weighting of assurances, not the model of assurances' effect on adoption decisions and their antecedents depicted on the right-hand side of Figure 4-4. For the latter, we describe how adoption theories, and specifically cloud adoption theories, could be extended by adding constructs that tap into the ten assurances identified in our study and suggest contextual factors such as recipient differences, service type, and industry regulation. As indicated in Figure 4-4, our research design focused on measuring the relative importance of assurances across different groups of recipients; future research could build on our results and explicitly measure the effect of assurance signals on adoption decisions (e.g., grounded in signaling theory), for example, by applying a decompositional method such as a conjoint survey. Such an approach should also investigate service type and industry regulation in a more structured way to overcome the limitations of our low sample size post hoc analyses based on reported measures, which only provide initial evidence for the existence of these two contextual factors. Thus, a further promising direction for future research would be to use a conjoint survey in an experimental setting in which participants were given different information on the type of cloud service that is certified, which would allow empirical confirmation of this potential contextual factor. To further examine our indicative findings on industry regulation as a contextual factor, we suggest replicating the study with a larger sample made up of recipients from across different industries.

To conclude, CSCs are emerging as a novel class of IT-related certifications that aim to assist both companies and individual consumers making cloud service adoption decisions. As strategic signals, CSCs convey information relevant to these adoption decisions across various assurances. We conceptualized and validated a typology of assurances that are provided by CSCs and presented an empirical analysis of the different perceptions companies and consumers have regarding which assurances they value most in comparison to one another. Our research is a novel attempt to explicitly examine and compare trade-off evaluations of certifications between two groups with different levels of expertise in managing information asymmetries. Through this study, we aimed to provide insights that may be helpful for both researchers and practitioners and that may motivate further research on how companies and consumers use CSCs in their cloud computing adoption decisions.

5 Prior Purchase Experiences' Effect on IS Certification Effectiveness (Article 3)

Title

Do bad experiences loom larger than good ones? The role of prior purchase experiences on the effectiveness of IS certifications

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Abstract

IS certifications are important sources for customer trust building in e-commerce. However, little is known about how their effect changes between initial and repeat purchases, despite many other aspects of e-commerce are customized to customers' shopping history. In this study, we investigate how prior purchase experiences with the same vendor moderate the effect of IS certifications on purchase intention via customers' trust in a vendor. We propose a research model based on Expectation Confirmation Theory and test our hypotheses using the factorial survey method with a sample of 160 participants evaluating 480 scenarios. Our results indicate that prior shopping experiences moderate IS certifications' effect, however, depending on quality and quantity of the experiences made. Most importantly, negative experiences decrease IS certifications' influence on trust in a vendor. Our findings facilitate more refined theory-building efforts in IS certification research and help to guide e-commerce vendors in their IS certification deployment practices.

Keywords

IS Certifications, Expectation Confirmation Theory, Factorial Survey Method, Trust

5.1 Introduction

In e-commerce, customers have to make a decision whether they trust an online vendor before engaging in a purchase transaction. This decision is typically subject to information asymmetry, as the vendor has access to relevant information (e.g., about product or service quality, data privacy or website security), which is not readily available to customers. Hence, customers have to base their decision process on informational cues (Mavlanova et al. 2012). In this study, we investigate the interaction of two cues, which each have been found to significantly affect e-commerce decision making on their own: IS certification and prior shopping experience with a vendor.

Repeat purchases are crucial to a vendor's success in e-commerce. Analyzing the e-commerce market in the USA, 41 percent of revenue was found to be generated by returning customers (Adobe 2012). Moreover, returning customers are less price sensitive, while typically fewer cost is required to retain these customers compared to winning new ones (Vides 2014). Given the importance of repeat purchases, it is surprising that little is known about how returning customers perceive informational cues typically present in an e-commerce environment (e.g., IS certifications, customer reviews or security measures). As they have already made experiences in shopping with a vendor, they may interpret cues differently than initial customers. Understanding the interaction between prior shopping experiences with a vendor and informational cues bears the potential for vendors to adapt cues based on customers' experience to better support their decision-making process and increase the likelihood of a repeat purchase.

IS certifications are third-party attestations of products, processes or systems, widely adopted by e-commerce vendors and typically presented on their websites (Schneider et al. 2014; Scholz et al. 2017). For example, the Trusted Shops certification is adopted frequently in German retail e-commerce, ranging from consumer electronics to apparel online stores (Trusted Shops 2020). Given the information asymmetry between vendors and customers and the various risks digital services are facing (e.g., system vulnerabilities or hacker attacks (Belanger and Crossler 2011; Subashini and Kavitha 2011)), IS certifications are important in consumers' purchase decision-making and have been found especially important regarding privacy and security in online shopping (Löbbers and Siegfried 2018; Sturm et al. 2014). Despite the importance of repeat purchases and the proliferation of IS certifications, little is known about their interplay. More specifically, it is still unclear how the effect of certifications changes over the course of a customer-vendor relationship.

While IS certifications have been found an effective means to reduce uncertainty in e-commerce transactions, it remained vague how their effect is different for initial versus repeat purchases (Özpolat et al. 2013). Certifications were found to have a significant influence on customers' trust and purchase intention (Sturm 2014). However, most studies were cross-sectional and did not include shopping history with the vendor in their research model (e.g., Kaplan and Nieschwietz 2003a; Lowry et al. 2012). Nevertheless, scholars have previously mentioned that varying levels of shopping experience with a vendor might have influenced their results regarding the effectiveness of IS certifications (Özpolat et al. 2013). Prior purchases cumulatively

contribute to customers' experience, a currently under-researched characteristic of actors involved in the certification process (Lins and Sunyaev 2017). Moreover, van Baal (2015) found that multiple cues can have compensating effects when presented together and called for further research on the contingency effects of IS certification, especially mentioning the need for an investigation across different stages in a customer-vendor relationship.

In this study, we want to contribute to a better understanding of the effect of IS certifications in initial and repeat purchase decisions, answering the research question: *How does prior shopping experience with a vendor influence an IS certification's effect on purchase intention?* We build on Expectation Confirmation Theory (ECT) and propose a research model that postulates customers' prior shopping experiences with a vendor as a moderating factor to the relationship between certification and purchase intention. Customers' prior shopping experiences with the online vendor are described through confirmation or disconfirmation of beliefs, which reflect whether customers' expectations in prior purchase experiences were either met (positive experience) or not (negative experience). To test our hypotheses, we conducted an online study using the scenario-based Factorial Survey Method (FSM). In total, 160 subjects evaluated 480 scenario vignettes, which were subsequently analyzed using multiple regression. Our results suggest a significant moderating influence of prior shopping experience on IS certifications' effect, which is subject to both the quality and quantity of prior experiences. Negative experiences decrease the effect of IS certifications on purchase intention via trust in a vendor, while positive experiences do not influence its effect.

Our findings advance the understanding of IS certifications by shedding light on how their effectiveness is moderated by customers' prior experiences with a vendor. Including a temporal perspective on IS certification effectiveness helps to dissolve uncertainty mentioned in prior work, which suggests that initial and repeated purchases might have a different influence on IS certifications' effect (Özpolat et al. 2013), and adds to the understanding of the certification ecosystem (Lins and Sunyaev 2017): prior shopping experiences are among the important characteristics of customers as one of the major parties involved in the certification process (beside vendors and certification authorities). Hence, we contribute to existing theory by confirming that e-commerce certification shapes customers' intention to purchase by altering their level of trust in a vendor and extending its understanding by investigating the moderating effect of disconfirmation of beliefs from prior purchase behavior. Practitioners may benefit from our results as they can incorporate information about the shopping history of a customer in their implementation and presentation of a certificate. We discuss implications of our research and lay out possible avenues for future research in the final sections of this work.

5.2 Theoretical background

5.2.1 IS certifications as trust building cues in e-commerce

IS certifications are used by e-commerce vendors to reduce information asymmetry (Choudhury and Sabherwal 2003) and build trust in customers to foster purchase transactions (Lutz et al. 2018). For example, the BBB Accredited Business certification (BetterBusinessBureau 2020) in the USA or the Trusted Shops certification (Trusted Shops 2020) in Germany indicate to customers that an online store was found to meet the requirements of these certifications. Generally, certifications are third-party attestations of products, processes or systems and provide information to which degree a predefined set of criteria is met. In an e-commerce context, IS certifications can, for example, provide information to customers about security, privacy and service quality of online vendors (Özpolat et al. 2013). This is achieved by reviewing and revealing integrated protective measures (McKnight et al. 2004), for instance, IS certifications can ensure, how online providers manage data security or ensure data privacy (e.g., Trusted Shops, CPA WebTrust or EuroPriSe) (Lutz et al. 2018; Schneider et al. 2014). As in e-commerce environments customers primarily interact with unknown service providers and experience a high degree of insecurity (Gefen 2004; Pavlou and Gefen 2004), IS certifications are relevant cues to alleviate consumers' concerns about perceived risks and to build trust.

Trust is an important driver of e-commerce purchase decisions (Gefen 2002b; Pavlou and Gefen 2004). It can be defined as "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another" (Rousseau et al. 1998, p. 395). When being in a state of trust, perceptions of uncertainty, risk or dependence are mitigated or diminished (Mayer et al. 1995; Rousseau et al. 1998). In IS research (besides being studied in various other disciplines), trust has been investigated in multiple contexts such as outsourcing (Lee et al. 2008), e-commerce (McKnight et al. 2002), online communities (Benlian and Hess 2011b) or cloud computing (Lansing and Sunyaev 2016). Especially in e-commerce, it has been found to reduce customers' perceived risks and increase their transaction intentions (Pavlou and Gefen 2004). To build trust in e-commerce, customers need to perceive a vendor's ability, integrity and benevolence (McKnight et al. 2002). Trust has also been found an important construct in the analysis of IS certifications, both as an underpinning theoretical framework (Löbbers and Siegfried 2018) as well as a direct outcome variable and mediator to purchase intention (Löbbers and Benlian 2019; Sturm et al. 2014).

Prior research on IS certifications has mostly covered their effectiveness in terms of ability to persuade customers into transactions, while aspects regarding their inner workings and embedding remain only vaguely understood (Lansing et al. 2018; Lins and Sunyaev 2017; Özpolat et al. 2013). Several studies have analyzed IS certifications as binary cues (i.e., presence or absence of a certification) to customers, generating mixed results on their influence on transaction intentions (e.g., Kimery and McCord 2002; Lee et al. 2004; Mauldin and Arunachalam 2002; Pennington et al. 2003). Lansing et al. (2018; 2019) contributed to the understanding of IS certifications by widening the binary view and analyzing the specific assurances in a certifica-

tion as a portfolio of signals. Another research stream to improve the understanding of IS certifications and resolve ambiguity regarding their effect focuses on understanding contingency effects and the ecosystem, in which certification takes place (Lins and Sunyaev 2017). The certification ecosystem encompasses environmental factors and the interplay of actors (i.e., service provider, auditor, issuer and consumer (Benlian et al. 2018; Windhorst and Sunyaev 2013)) involved in the process of certification creation, testing, implementation and use (Lins and Sunyaev 2017). Important aspects are characteristics of senders and receivers (e.g., vendors and customers' expectations and experiences), the environment (e.g., presence of related informational cues) and certification characteristics (e.g., fit to the product or service). With this study, we aim to contribute to this stream of research by focusing on a specific aspect of actor characteristics: the prior transaction experience between customer and vendor.

Despite the wide adoption of IS certifications in e-commerce practice and the importance of repetitive purchases, research has not yet investigated in detail how IS certifications interact with the purchase history between vendor and customer. The majority of prior work did not explicitly distinguish between first-time customers and repeat shoppers when measuring the effect of IS certifications (e.g., Liu and Tang 2018). Özpolat et al. (2013) acknowledged that such differences might exist in their analysis of privacy certifications on 9098 online shopping sessions. However, they were not able to control for prior shopping experience. Moreover, van Baal (2015) argued that various cues can have a compensatory effect when presented together. As IS certification and prior shopping experience are both known to influence customers' trust and purchase intentions (Pavlou and Gefen 2004; Sturm et al. 2014), interaction effects are likely to be relevant. Both scholars call for further research investigating the longitudinal aspect of certification (Özpolat et al. 2013; van Baal 2015), pointing out that examining the purchase history between vendor and customer (i.e., customers' prior experiences) can help in evaluating long-term effects of IS certification in e-commerce.

5.2.2 Expectation confirmation theory and purchase intention

Winning a new customer is about 5 to 25 times more expensive than to retain an existing one (Gallo 2014). While this insight has become a commonplace, facilitating management practices as customer retention, churn rate and loyalty programs, it is far from trivial to implement. The key question to effective customer retention is: why do customers purchase again at the same vendor? Multiple explanations have been given to the question of repurchase, mostly focusing around customers' experience with their initial purchase (e.g., Liao et al. 2017; Sullivan and Kim 2018; Zhou et al. 2018). The different phases relevant in the analysis of repurchase can be displayed along a time continuum. Customers that have not previously interacted with a vendor are in a pre-purchase stage. A plethora of factors influence customers in this stage (e.g., general experience, price or recommendations) (Liao et al. 2017) and are integrated in their mental calculus whether to buy or not to buy at the vendor. If the initial purchase is made, the customer transitions into the post-purchase stage. In this stage, expectations meet first-hand experience and customers will form an opinion about their relationship with the vendor. Finally, in the

post-purchase stage, customers may decide to transact again with the vendor, leading to repurchase. To build successful loyalty strategies, it is necessary to identify the most important drivers of consumers' repurchase or switching behavior (e.g., Maicas et al. 2009). Strong indicators found in marketing research are customers' satisfaction or dissatisfaction regarding their prior purchases. While satisfaction induces a reuse behavior, dissatisfaction leads to a switching behavior (Chuah et al. 2017). A theoretical framework to explain for customers satisfaction or dissatisfaction is provided by ECT, based on the comparison of product or service performance with previous expectations (Chih et al. 2012).

ECT origins in consumer behavior literature and is also referred to as expectation disconfirmation theory (Oliver 1980). It has been used in various contexts (e.g., automotive (Oliver 1993)) to explain and predict consumer satisfaction and post-purchase behavior. The central tenet in ECT is that customers' satisfaction with a purchase determines their intention to repurchase (Oliver 1980, 1993). Customer satisfaction, in turn, is influenced by perceived performance (i.e., what the user experiences after the purchase) as well as their pre-purchase expectations (i.e., what the user anticipated to experience after the purchase). The comparison of expectation and perceived performance can lead to disconfirmation (perception<expectation) or confirmation (expectation>=perception), which will have a positive or negative influence on satisfaction, respectively (Oliver 1980). Confirmation can be investigated more thoroughly by making a distinction between exact confirmation and overachievement, however, in this study only disconfirmation and confirmation are considered. The aspect of expectation has been subject to several discussions, since humans are known to adjust perceptions such as expectation as they learn about new information (e.g., Bem 1972; Harry Helson 1964). Consumers may adjust their expectations in retrospective as they acquire experience in the post-purchase stage. As the personal, first-hand experience is more realistic (Fazio and Zanna 1981), it may overshadow expectation and dominate customers' perceptions (Lankton et al. 2014; Spreng and Page 2003). This becomes more explicit as the period between the formation of an initial expectation and perceived performance gets longer. While in an instant purchase situation (e.g., subscribing to an online service) or a simulation, this time span is minimized and the expectation may be less biased, the risk of expectations altered in retrospective has to be considered when generalizing to different purchase situations.

Despite the prevalence of IS certifications as trust-building cues (Lansing et al. 2018; Özpolat et al. 2013) and the importance of recurring purchases in e-commerce (Mittal 2016; Sánchez García and Curras-Perez 2019), surprisingly little is known about how the effect of IS certifications changes in regard to the purchase history between vendor and customer. Although various studies make important contributions to our knowledge of the operating mechanisms of certifications as well as to influencing factors on customer's purchase behavior, an investigation across different moments in the customer-vendor relationship history is still missing. While findings suggest that the effect of certifications is likely influenced by customers' shopping experience, there is a lack of empirical evidence to support this relationship.

5.3 Research model and hypotheses development

To answer our research question of how prior shopping experiences with an e-commerce vendor influence IS certification's effect on customers' purchase intention, we provide a research model addressing the call for an investigation that includes prior experiences (Lansing et al. 2018; Özpolat et al. 2013; van Baal 2015). We model shopping history with a vendor as a combination of positive and negative experiences based on confirmation or disconfirmation of customers' expectations. The proposed research model is displayed in Figure 5-1 and consists of four major elements: the presence of IS certification on a vendor's website (Lansing et al. 2018; Özpolat et al. 2013), the positive and negative prior experiences customers made while shopping with the vendor (Liao et al. 2017), customer's trust in the vendor and their intention to make a purchase with this vendor (Oliver 1980).

Our hypotheses cover the interplay of these constructs in three distinct effect types: direct effects, moderation and mediation. In H1, we postulate that the effect of IS certifications on customers' purchase intention is mediated by trust. This mediation relationship has been previously used in IS certification literature (e.g., Kim et al. 2008a) and has been found to reflect decision reality. Purchase decisions are usually not influenced by a single factor but the overall perception that, based on many singular cues, the risk of involving in a transaction is reasonable. Moreover, multiple studies investigating the effect of IS certifications have confirmed this mediation effect (Sturm et al. 2014). Building on ECT, customers' prior shopping experiences with the vendor are reflected as confirmation or disconfirmation of beliefs: expectations from previous transactions are either met or not, leading to confirmation or disconfirmation of beliefs in the vendor. For example, customers, who made a bad experience due to vendors abusing their private data will have lower trust in a privacy certification displayed on the vendor's website as the past experience overshadows the certification's trust building effect. In H2a and H2b we capture the direct effect of confirmation and disconfirmation on customers' trust, while in H3a and H3b we postulate its moderating effect on the influence of IS certifications.

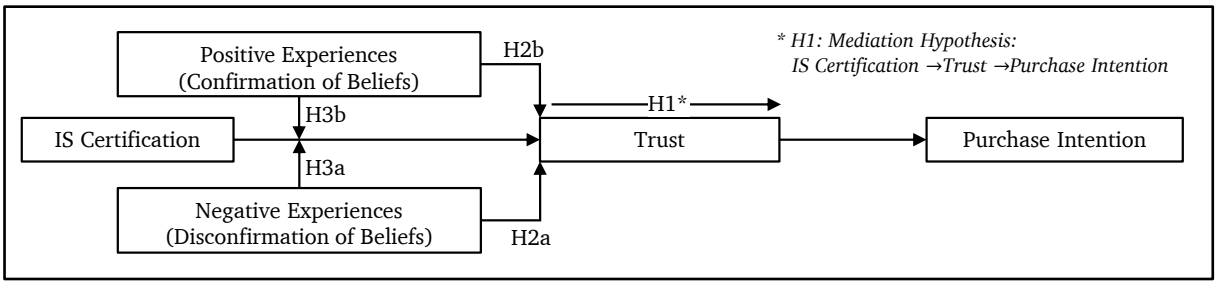


Figure 5-1. Research model

Confirmation and disconfirmation of beliefs aggregate over time, as every purchase provides a singular feedback loop between customer and provider. Before making purchase$_{t,}$ at a specific point t in time, customers already have collected experiences from purchase$_{t-1}$ or multiple prior purchases (except when making the first purchase with a new vendor). Based on these experiences and the information publicly present about the vendor (e.g., website, reviews, presence

of IS certifications), customers form an expectation$_t$ with regard to how they expect the transaction for purchase$_t$ to be fulfilled. After the transaction is finished, customers have collected first-hand information$_t$, which may be positive (e.g., goods were as expected, delivery was timely, no unwanted use of personal information) or negative (e.g., no goods or wrong goods delivery, service outage, data breach). Comparing this information$_t$ with their expectation$_t$ leads to either confirmation or disconfirmation of beliefs about the vendor. In turn, these experiences will influence the expectation$_{t+1}$ for subsequent purchases. This influence happens directly (by affecting customers' trust) and indirectly by increasing or decreasing the effect of trust-building cues such as IS certifications.

5.3.1 Hypotheses development

IS certifications have been found powerful means to build e-commerce customers' trust in a vendor, which in turn leads to repeat purchase transactions (Cui et al. 2019). E-commerce vendors are often using certifications to prove that their online store meets defined data, security and quality requirements (Kim and Benbasat 2009). Thus, using IS certifications, vendors strive to reduce customers' perceived risk and to mitigate information asymmetries between vendors and customers (McKnight et al. 2004; Siegfried et al. 2018). As online transactions have an impersonal nature, researchers evaluate trust to be crucial in building up a buyer-seller relationship (Ba and Pavlou 2002; Gefen 2002b) and to foster repeated transactions (i.e., purchases) with an online provider (Sun 2010).

Based on its definition, customers' trust in a vendor is reflected as their willingness to accept vulnerability in expectation of favorable vendor behavior (Jiang et al. 2008b; Kimery and McCord 2002). To build up this trust, vendors have to reliably communicate their benevolence, integrity and ability (McKnight et al. 2002). As certification is hard to fake (due to third-party attestation) and costly to implement (as vendors have to undergo the certification process), it transmits vendors' good intentions. Incurring the required cost and effort to get certified shows that vendors are willing and able to invest in future transactions, signaling both competence and benevolence. Furthermore, certification signals integrity as users have proven that they are telling the truth (i.e., a third party has evaluated their claims regarding certain criteria). A vendor that has shown to be willing (benevolence) and able (competence) to invest into providing true information (integrity) qualifies towards being trusted.

H1: The presence of an IS certification on an e-commerce website increases customers' intention to purchase by raising the level of trust towards the vendor.

Evaluating why customers realize a repurchase with the same e-commerce vendor, researchers have outlined customers' experience with their initial purchase as an influencing factor (e.g., Liao et al. 2017; Sullivan and Kim 2018). As the buyer-seller relationship in an e-commerce context is characterized by uncertainty, vulnerability and certain risks (Guo et al. 2018; Petter et al. 2008), online vendors need to mitigate such negative factors. Overcoming uncertainties and risks, online vendors try to build up trust (Kim et al. 2008a; Pavlou 2003). However, in the

online purchase context, customers' trust in an e-commerce vendor is often changing and evolving due to ongoing evaluation of second-hand information and experience-based first-hand knowledge or searching new information after unforeseen events (Fang et al. 2014; Kim and Benbasat 2006, 2009). Evaluation of this combined information may then lead to trust, defined as individuals' expectation that others will not engage in improper behavior (Rousseau et al. 1998).

If customers' initial expectations meet the perceived performance of an e-commerce vendor, it will lead to a confirmation of beliefs (Oliver 1980, 1993). This implies that a certain risk has not materialized. This personal experience will result in customers' first-hand knowledge about the e-commerce vendor (Fang et al. 2014; Kim and Benbasat 2006, 2009), which strengthens their intention to get involved with the vendor despite the existence of risk. The abstract risk has not become a concrete danger, which is why a confirmation of beliefs leads to an increasing trust level. An underperformance of customer's initial expectations will, in contrast, lead to a disconfirmation of beliefs (Oliver 1980, 1993), which results in reduced trust towards the vendor as certain risks have occurred and the customer is disappointed about the shopping experience with the vendor.

H2a: A disconfirmation of beliefs from prior purchases with the same vendor decreases customers' trust in the e-commerce vendor.

H2b: A confirmation of beliefs from prior purchases with the same vendor increases customers' trust in the e-commerce vendor.

The long-term experience in a customer-vendor relationship changes the effect of IS certifications as a trust-building factor. The positive and negative experiences lead to confirmation or disconfirmation of customers' beliefs with respect to their expectations prior to a transaction. Accordingly, the ECT describes customers' post-purchase satisfaction as a result of expectations, perceived performance and disconfirmation of beliefs. However, in addition to their direct effect on trust (as postulated in H2), confirmation and disconfirmation of beliefs influence the effect of other trust-building means. IS certification is one of these means, which has been found to increase customers' trust (McKnight et al. 2004; Moores and Dhillon 2003; Odom et al. 2002; Park et al. 2010). Scholars demand evaluating such additional factors, which can influence customers' purchase intention, especially in the e-commerce context (Mittal 2016; Sánchez García and Curras-Perez 2019), as customers are in the position to easily compare the market and are able to quickly search for alternative suppliers (Liao et al. 2011; Yim et al. 2007).

Negative experiences from prior shopping transactions reduce the trust-building effect of IS certifications. Providing assurances checked by third-parties, IS certifications support customers' decision making as they provide novel information that a consumer cannot easily check prior to a transaction. For instance, regarding data privacy practices or website security (Chang et al. 2012; Lutz et al. 2018; Terlaak and King 2006). If customers' prior shopping experiences result in an underperformance of their initial expectations, we assume that the disconfirmation

of beliefs influences the relationship of IS certification and customers' trust. Specifically, customers are disillusioned by the unmet expectations and their negative first-hand experience overshadows the second-hand assurances made by the certification. The initial information asymmetry between customer and vendor is now reduced (as the customer has gained additional information in the transaction), which diminishes the effect of IS certification. Therefore, we postulate:

H3a: A disconfirmation of beliefs from prior purchases with the same vendor lowers the effect of IS certification on customers' trust in the e-commerce vendor.

We further argue that positive experiences leading to a confirmation of beliefs in prior shopping experiences will also lead to a reduced trust-building effect of IS certifications. This may seem counter-intuitive at first glance, as the experience made was positive. However, first-hand knowledge, based on former shopping experiences, will have a stronger influence on customers' purchase decision than second-hand information through IS certification (Fazio and Zanna 1981; Liao et al. 2017). After a successful purchase, customers have gained first-hand experience on whether vendors stand up to assurances specified in a certification. Hence, the need to rely on third parties (i.e., certification authorities) is reduced and the newly gained first-hand experience will overlay second-hand trust building information as given by IS certifications. Moreover, consumers like to behave in a consistent manner with their formed attitudes (Fazio and Zanna 1981), which has a direct effect on behavioral intention (Bagozzi et al. 1992; Fazio and Zanna 1978): customers will tend to buy again at the same vendor if they previously made positive experiences. Hence:

H3b: A confirmation of beliefs from prior purchases with the same vendor lowers the effect of IS certification on customers' trust in the e-commerce vendor.

5.4 Research methodology

To test our hypotheses, we conducted an online experiment using the FSM (Jasso 2006; Rossi 1979; Wallander 2009), a variation of the scenario method. In the FSM, vignettes are presented to the subjects, which are "written descriptions of realistic situations" (Trevino 1992a, pp. 127-128). Subsequently, participants are asked to answer questions related to the presented vignettes. Scenarios can improve realism in decision-making situations as they provide additional details while ensuring the uniformity of these details across respondents (Alexander and Becker 1978). Moreover, they are useful to measure behavior that may be hard to observe otherwise (e.g., studying unethical behavior (O'Fallon and Butterfield 2005; Trevino 1992b). The FSM is different from traditional scenario-method surveys in a way that specific elements (e.g., text passages or images) within the scenario take different values in the experiment. This allows to integrate the rich number of factors afforded by field surveys with increased control and orthogonality as provided by experimental designs (Rossi 1979). The FSM has also been demonstrated to be effective in assessing individuals' perceptions of and reactions to specific information privacy and security related stimuli in IS research (Lowry et al. 2017; Warkentin et al.

2017). Using statistical sampling, a fraction of all available vignettes (the full factorial population) is assigned to each participant. In contrast to traditional experimental designs, this allows to collect estimates for a wide variety of factors and levels while keeping the complexity for an individual subject at an acceptable level. The FSM has been widely applied in sociological studies (Wallander 2009) and has been used in IS to study, for instance, user accountability (Vance et al. 2015), update policies (Fleischmann et al. 2016) or policy violations (Hu et al. 2011).

A typical business to consumer (B2C) e-commerce context was used for the scenario. Participants were put in the position of Tom, an online shopper, who is in the decision-making process of purchasing a consumer laptop at an electronics e-commerce store. There were three factors that we manipulated across two and four levels respectively, yielding a factorial of 2*4*4=32 vignettes. These factors were (1) presence or absence of a certificate, (2) number of positive prior purchase experiences with the same vendor and (3) number of negative prior purchase experiences with the same vendor. As an example, the following vignette text has been generated for the vignette with factor values presence of certification, no positive and two negative prior experiences: *"Tom has already made 2 prior purchases with the shop: He made 2 negative experiences, in which his expectations regarding the transactions and the certification were not met. The shop is certified with an e-commerce certification seal"*.

The number of positive and negative experiences was varied across the levels of 0, 1, 2 and 5 experiences. This allows to distinguish between having no prior purchase experience, single experience and multiple experiences. Moreover, mixed effects between a certain number of positive and negative experiences can be analyzed as we are using a full-factorial design that allows for analysis of interaction terms between factors. Five has been chosen as the upper border as a five to one ratio is known from prior research to balance humans' uneven perception of positive and negative events. For instance, a ratio of five to one for positive to negative interactions in a relationship predicts marriage success (Gottman and Levenson 1999), while it has been found that in general five good experiences are required to overcome the psychological effect of one bad experience (Baumeister et al. 2001).

While a full-factorial design (i.e., all 32 vignettes) was used, not every vignette was answered by every participant. We assigned each participant to a block of three vignettes, as a number of four to six vignettes is recommended as an upper border to avoid participant fatigue (Auspurg and Hinz 2015). These eleven blocks of three vignettes each were generated using a D-efficient design (Auspurg and Hinz 2015). In addition to the written description, we used a visual representation of the web shop to make the scenario more immersive. While not adding new treatment factors, we reinforced the textual manipulations with visual cues: If the web shop was said to be certified in the vignette text, a certification seal was displayed. Moreover, if Tom was said to have made any prior shopping experience with the shop, his name was shown as the currently logged-in user in the visual shop representation.

The factorial survey was composed of initial scenario instructions, control items, vignettes with measurements and post-vignette items. First, participants were presented with general instructions on privacy and how to navigate the survey. In the second step, they answered control variables for alternative explanations. Third, they were presented with three randomly assigned vignettes. For each vignette, subjects were asked to report the levels of trust and purchase intention from the perspective of scenario character Tom. Fourth, post-vignette items were presented including manipulation checks and sociodemographics (age, gender, job, education, income).

Consistent with previous research, we measured purchase intention on a 7-point Likert scale with three items adapted from Stewart (2003). To cover the multiple facets of trust, we used eight measurement items based on (Einwiller 2003; Fang et al. 2014; Garbarino and Lee 2003; Jarvenpaa et al. 2000), which were also assessed on 7-point Likert scales. To account for alternative explanations, we further included the following control variables: age, gender, education, self-reported certification expertise, general disposition to trust (based on McKnight et al. 1998), e-commerce usage intensity (based on Venkatesh et al. 2008) and perceived effectiveness of e-commerce institutional mechanisms (based on Fang et al. 2014). All control variables were measured on a 7-point Likert scale.

Our sample was recruited from an online panel for scientific studies. The overall population of the panel included 101,306 subjects, who were between 20 and 50 years old with a majority being full-time employees. From this general panel, a pre-selection of participants from English-speaking countries in Europe and North America was made (i.e., 43,256 subjects). From this pre-selected population, the panel providers randomly selected participants, and invited them stepwise in small batches to take part in the survey. We collected 166 responses, of which 6 subjects were filtered out due to speeding, leaving us with a final sample of 160 respondents. However, the level of analysis in this study, as typical in the factorial survey method, is not the participant but the vignette (Jasso 2006). As every participant rated three vignettes, the final sample size that went into statistical analysis for this study was 480. The average age of participants was 30.66 with a standard deviation of 10.01 years. A total of 79 subjects were female, 81 being male. Means and standard deviations for all variables can be found in Table 5-1.

5.5 Analysis and results

We used moderation and mediation analyses based on multiple regression (Hayes 2018) to analyze our data and test our hypotheses. We first report results on preliminary analyses for nonresponse bias, manipulation checks, randomized group assignment and psychometric properties of the constructs, followed by checking for evidence to our hypotheses.

We assessed nonresponse bias by verifying that there were no significant differences between early and late respondents (Armstrong and Overton 1977). We compared both samples based on their sociodemographics: T-tests between the means of the early (first 50) and late (last 50) respondents showed no significant differences ($p > 0.05$), hence, nonresponse bias was unlikely

to have affected our results. Three manipulation checks were used to ensure that subjects perceived our treatments. After the last scenario evaluation, they were asked whether (1) the presented online shop was certified, (2) Tom had already made (2) positive experiences with this shop and (3) whether he made negative experiences with the shop before. Every participant in the final sample had answered all manipulation checks correctly. We further checked randomized assignment of participants to the different vignettes by multiple one-way ANOVAs. There were no significant differences in age ($F = 0.52$; $p > 0.05$), gender ($F = 1.20$; $p > 0.05$), education ($F = 0.79$; $p > 0.05$), income ($F = 0.75$; $p > 0.05$), occupation ($F = 0.99$; $p > 0.05$) or e-commerce usage intensity ($F = 1.02$; $p > 0.05$) across the different vignette block groups. Thus, our results indicate that these factors did not cause the differences in participants' levels of trust and purchase intention.

Table 5-1. Descriptive statistics and psychometric properties

	Construct	Mean	SD	α	4††	5††	6††	7††	8††	9††	10††	11††
1	Age°	30.66	10.01									
2	Gender (female)°	0.49	0.50	-								
3	Education†°	3.14	1.30	-								
4	E-Com. Intensity	4.06	1.55	-	-							
5	Trust Disposition	4.30	1.29	0.85	-.03	.82						
6	PEEIM‡	4.67	0.97	0.82	.08	.38***	.60					
7	Certification	-	-	-	-.01	-.03	-.03	-				
8	Pos. Experience	-	-	-	.03	.03	-.01	.00	-			
9	Neg. Experience	-	-	-	-.11*	-.04	-.08	-.02	.03	-		
10	Trust	4.38	1.60	0.98	.09	.20***	.25***	.22***	.32***	-.52***	.92	
11	Purchase Int.	4.32	1.79	0.91	.09	.14**	.21***	.18***	.29***	-.48***	.88***	.89

n = 160; *p < .05; **p < .01; ***p < .01; α = Cronbach's Alpha; † ranging from (1) high school or equivalent to (5) doctoral degree; °constructs not significantly correlated with any other construct ‡PEEIM=perceived effectiveness of e-commerce institutional mechanisms †† Inter-construct correlation, square root of AVE

For the latent constructs in our model (trust, purchase intention, trust disposition and perceived effectiveness of e-commerce institutional mechanisms), we assessed psychometric properties by examining internal consistency, convergent validity, and discriminant validity using confirmatory factor analysis. The loadings of the measurement items on their respective latent variables were above the threshold value of 0.70 (Hair et al. 2010) and were all significant ($p < 0.05$). Furthermore, measurement items did not have cross-loadings above 0.40 on the unintended constructs, and the square roots of average variance extracted (AVE) were consistently larger than relevant inter-construct correlation coefficients, suggesting discriminant validity (Hair et al. 2010). All inter-construct correlations, square roots of AVE and Cronbach's alpha are displayed in Table 5-1; matrices of item loadings and cross-loadings are available from the authors.

The internal consistency of all constructs clearly exceeded the threshold of 0.70, implying acceptable reliability (Fornell and Larcker 1981). Hence, the constructs represent theoretically and empirically distinguishable concepts.

Analyzing hypotheses H1 - H3, we use a moderated mediation analysis as specified in PROCESS model 8 of Hayes (2018). All calculations were performed using bootstrapping with a 95% bias-corrected confidence interval and 1,000 samples; reported coefficients are unstandardized. Table 5-2 provides an overview on the direct and indirect effects analyzed. We included control variables into the model and measured their effect on purchase intention and trust, finding no significant influences for age, gender, education, e-commerce usage intensity and trust disposition ($p>0.05$). The self-reported level of certification expertise ($b=-.09$; $p<0.05$), perceived effectiveness of e-commerce institutional mechanisms ($b=.35$; $p<0.01$) and trust disposition ($b=.13$; $p<0.05$) have a significant effect on trust, while not affecting purchase intention ($p>0.05$). While a higher level of certification expertise had a lowering effect on trust, a higher perception of perceived effectiveness of e-commerce institutional mechanisms led to higher trust levels. As the effect of these variables did not qualitatively affect the patterns of our results, we omit reporting the controls in the subsequent sections.

H1 suggested a mediation relationship, in which the presence of an IS certification increases customers' purchase intention by raising their level of trust in the vendor. According to our data, the presence of IS certifications significantly increases customers' trust in the vendor ($b=1.07$; $p<0.001$), while the level of trust has a significant positive effect on their purchase intention ($b=.99$; $p<0.001$). More importantly, we found a significant mediation effect of IS certification on purchase intention via trust (indirect effect=1.06; standard error=.189; bias-corrected confidence interval = [.709, 1.436]). While the direct effect of IS certification on purchase intention is significant in a model without mediator (c-path: $b=.70$; $p<0.001$), the direct effect becomes insignificant in the mediation model (c'-path: $b=-.06$; $p>0.05$). In sum, our results show that IS certification has a positive indirect effect on purchase intention via trust.

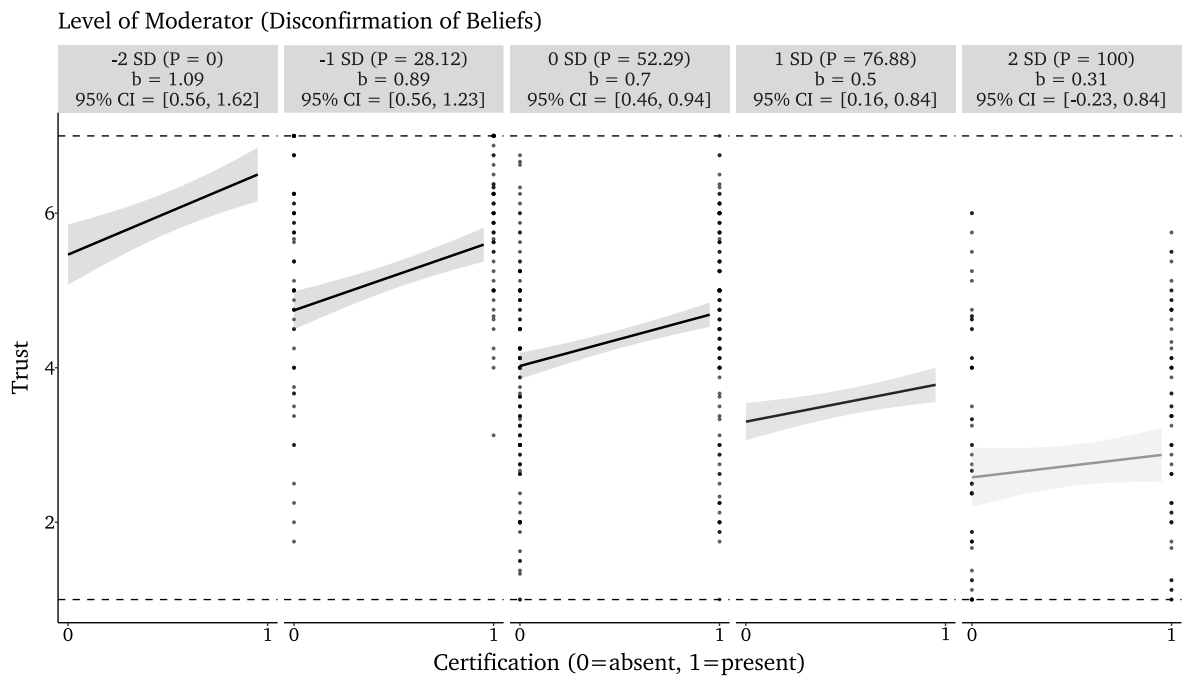
Table 5-2. Results from mediation and moderation regression analyses

Direct and indirect effect paths	Coefficient	Boot SE	Lower CI	Upper CI
IS Certification → Trust	1.07***	0.189	0.708	1.437
Confirmation of Beliefs → Trust	0.29***	0.038	0.219	0.367
Disconfirmation of Beliefs → Trust	-0.35***	0.049	-0.443	-0.253
Trust → Purchase Intention	0.99***	0.047	0.898	1.089
IS Certification → Trust → Purchase Intention	1.06***	0.189	0.709	1.436
IS Certification x Conf. of Beliefs → Trust	0.003	0.051	-0.090	0.110
IS Certification x Disconf. of Beliefs → Trust	-0.17**	0.063	-0.290	-0.049

*Note: We conducted inferential tests for the effect paths based on 1,000 bootstrap samples generating 95% bias-corrected bootstrap confidence intervals; *p<0.05; **p<0.01; ***p<0.001*

H2a and H2b suggested the number of positive and negative prior shopping experiences to increase or decrease customers' perceived level of trust in the vendor, respectively. Analyzing the direct effects, we found that the number of positive prior experiences significantly increases

customers' trust in the vendor (b=.29; p<0.001), while the number of negative prior experiences has a significant negative effect on trust (b=-.35; p<0.001). As both coefficients showed expected signs and were found significant, we accept H2a and H2b.



Note: SD=Standard Deviation; P=Percentile; b=Slope Coefficient; CI=Confidence Interval

Figure 5-2. Interaction of disconfirmation experiences and IS certification

Finally, H3a and H3b postulated moderating relationships as the number of positive and negative prior shopping experiences with the same vendor negatively influence the effect of an IS certification on trust in the vendor. To test for these effects, we investigated the moderators' interaction with IS certification. We found that, while the number of positive prior experiences has no significant relationship with the effect of IS certification on trust (b=.003; p=0.96), a higher number of negative prior experiences significantly decreases the effect of IS certification on trust (b=-.17; p<0.01).

To provide additional detail to H3a, we analyzed the conditional indirect effect of IS certification on purchase intention among different levels of prior negative experiences. We do not report conditional indirect effect coefficients for the number of positive experiences as the interaction effect coefficient was found to be not significant. Without any prior negative experience, we found a coefficient for the conditional indirect effect of b=1.09 (confidence interval = [.56, 1.62]), indicating that presence of a certificate increases customers' purchase intention by 1.09 units. However, when negative prior experiences were present, the conditional indirect effect was lower depending on the number of negative experiences. At the mean level of negative experiences (1.89), the conditional indirect effect was only b=0.7 (confidence interval = [.46, .94]), going down to b=0.5 (confidence interval = [.16, .84]) at one standard deviation above the mean (3.75). At a level of two standard deviations above the mean, the conditional indirect effect was no longer significant. Put differently, at a higher level of negative experiences

with a vendor, there is no significant difference in trust towards this vendor depending on the presence or absence of IS certification. This indicates that the effect of IS certification on purchase intention gets diminished as the number of negative prior shopping experiences with the same vendor increases. Figure 5-2 visualizes this relationship: While certification leads to a significant difference in customers' trust when no negative prior experiences were present, the slope is gradually reduced as the number of prior negative experiences increases.

5.6 Discussion and implications

Repeat purchases are an important driver of e-commerce providers' revenues. This led prior research to investigate the different trust sources of first-hand experience and second-hand knowledge in initial and repeat shopping transactions, influencing e-commerce customers' intention to purchase (e.g., Fang et al. 2014; McKnight et al. 1998). Although IS certification is a form of second-hand knowledge widely used on e-commerce websites, little is known about how its effect changes across initial and repeat purchase situations. We aimed to contribute to understanding this difference by investigating the research question: How does prior shopping experience with a vendor influence an IS certification's effect on purchase intention?

First and foremost, our study provides evidence that prior shopping experiences with the same vendor change the effect of IS certifications on trust in the vendor. However, this moderating effect goes beyond the simple dichotomization between initial and repeat purchase as it depends on the valence of the hitherto made experiences. According to our data, confirmation of beliefs, i.e., when shopping experiences meet the customers' expectations (i.e., positive experiences), does not change the effect of IS certification on trust. In contrast, we found that disconfirmation of beliefs (i.e., negative shopping experiences, that did not meet customers' expectations as vendors underperformed) decreases the trust building effect of IS certifications. These results extend prior studies regarding differential effects of IS certifications subject to customers' prior experiences with a certified vendor (Özpolat et al. 2013). While differences in consumer experience with a vendor were only assumed, we substantiate the moderating effect of prior shopping experience in our data.

Second, the moderating effect of previous shopping experiences differs not only based on valence and quality, but also with regard to the quantity of shopping experiences: Higher numbers of repeated disconfirmation experiences decreased the trust-building effect of IS certifications. This suggests that customers lose faith in IS certificates as they gather more first-hand experience of non-confirming transactions. Putting this reinforcing effect differently, every negative transaction becomes more detrimental in the presence of certification than in its absence, as the amount of trust lost seems to be greater when a certification is present. This is in line with ECT, as the accumulated higher expectations – through the additional trust building cue of IS certification – did not meet customers' experiences. Nevertheless, in this study, assurance was still perceived slightly higher for certified vs. non-certified websites. This may change as the quantity of disconfirmation experiences further increases.

For confirmation of beliefs, no difference was found. Regardless of whether customers had one or many prior experiences in which their expectations were met, the trust-building effect of the certification was not affected. This finding is contrary to our expectations as we assumed that first-hand experience will have a stronger influence and override secondary trust sources in repeat purchase decisions. According to our data, however, it seems that customers' perceptions are not changed as they did not learn about whether a certification's assurances hold true. This may be due to the fact that the assurances were not demonstrably challenged. For instance, when an IS certificate assures data privacy and all e-commerce transactions were executed as expected, customers do not know whether their data was actually handled properly or just no repudiation became apparent. This is consistent with the findings of Fang et. al. (2014) who found that first-hand experiences do not necessarily override or cancel out secondary sources of trust. In their analysis of structural trust in e-commerce, they found that perceived effectiveness of e-commerce institutional mechanisms as a secondary source of trust had a significant effect in initial and repeat online purchases.

Third, our study provides evidence for IS certifications' positive trust-building effect on e-commerce customers' purchase intention. While there is prior work confirming this relationship (e.g., Hu et al. 2010), other studies could not find a positive influence by IS certification (e.g., McKnight et al. 2004). Our data shows a significant positive effect of IS certification on purchase intention, mediated by customers' trust in the vendor, which confirms the general influence as well as the specific mediation relationship as postulated by prior research (Sturm et al. 2014). Moreover, we found significant direct effects for confirmation and disconfirmation experiences from prior shopping on trust in a vendor. These effects are in line with the literature (e.g., Garbarino and Lee 2003; Jarvenpaa et al. 2000), however, we add to the scholarly understanding as we put this effect side by side with IS certifications as a second-hand source of trust.

Finally, we would like to draw attention to the interplay between positive and negative experiences, i.e., when confirmation of beliefs and disconfirmation of beliefs have both happened in the customer's shopping history with a vendor. Our research design allowed us to disentangle these effects instead of lumping them together into an aggregate construct as prevalent in previous research using ECT-based models (e.g., Liao et al. 2011). Investigating trust and distrust, Moody et al. (2017) have found that both are distinct components rather than opposite ends of one continuum. Our results add to this argument as we find that positive experiences do not alter the trust building effect of IS certifications while negative experiences diminish their effect. This taps into the findings of Benlian (2013), stating that bad experiences and events loom larger than good ones and thus have a stronger impact on our decision-making. The finding may be helpful to researchers in building research designs which allow for a nuanced analysis of trust building cues in e-commerce, which may provide additional insights over a combined measure.

From our findings we derive three major implications for e-commerce practitioners that engage with their customers over multiple purchases via an online shop. First, we recommend vendors, who use a certificate as a trust building means, to not compromise on its presentation for loyal,

recurring customers. It may be tempting to use additional space to display customized offers to recurring customers based on prior transaction data. However, our results indicate that prior positive experiences do not alter the trust building effect of IS certifications. For a recurring customer that has been previously confirmed in her trust towards the vendor, the certificate may serve as a constant reminder that this trust is appropriate.

Second, when specific evidence (e.g., a bad review, order cancellation or complaint message) indicates a customer had a disconfirmation experience, vendors have to be cautious with how they present IS certifications. To the customers, the assurances of the certificate may appear like a mockery as they stand contrary to their first-hand negative experiences. The results of our study suggest that negative prior shopping experiences diminish a certification's trust building effect, which is why vendors may decide to temporarily (i.e., just after a disconfirmation incident) turn off its display and rather focus the customer's attention on a new, positive experience (e.g., offering a special discount to compensate). This should, however, be integrated in a strategic response towards the customer and not be implemented as a standalone measure.

Third, if a vendor currently is not using any form of IS certification, we recommend to start implementing it. In line with prior findings, our study confirms the positive effect of IS certification on customers' intention to purchase as certification increases customers' trust in a vendor. While a plethora of trust building cues (e.g., prior purchase experience, structural trust or customer reviews) on an e-commerce website influence a customer, certifications can provide a powerful addition to a vendor's current portfolio of cues. In combination with the aforementioned suggestions, IS certifications can be effectively concerted with a customer's shopping history to increase their effectiveness.

5.7 Limitations, future research and conclusion

This study is subject to several limitations that provide opportunities for future research. The most salient limitation is the artificial experiment setting given by the use of scenario vignettes. This method was chosen as it is difficult and bias-prone to investigate actual customer behavior in the repurchase context. Many factors influence a focal purchase decision, while it is also hard to control for customers' prior experiences. Therefore, prior IS research harnessed vignette scenarios to investigate behavior in a controlled environment (e.g., Vance et al. 2015). Moreover, we asked participants whether they found the scenario to be realistic (mean=5.6) and if they could put themselves into the scenario character's position (mean=5.8) using 7-point Likert scales, which indicates that the scenario was perceived to be rather realistic. However, our findings are limited to the scenario context and further investigation is required.

We encourage researchers to go forward in two directions: first, qualitatively analyzing loyal customers of an e-commerce shop regarding their perceptions of IS certification and second, quantitatively investigating the effect of hiding a certificate for a treatment group of recurring customers on an e-commerce website. Future research may also consider longitudinal field experiments, which may help to increase our results' external validity. Another limitation is that our study focuses on IS certification and prior shopping experiences, while other trust building

factors are not taken into consideration. This was intentional as we aimed to isolate the interaction between these two factors. However, in the certification ecosystem more aspects (e.g., regarding the environment, in which the certification is placed or personal attributes of customers (Lins and Sunyaev 2017)) are relevant and may be part of future studies investigating IS certifications in a broader context. This would also be beneficial from the aspect of replicating our findings in a different setting.

In conclusion, this study extends our understanding of the role of IS certifications in the online repurchase context by investigating the moderating role of customers' prior shopping experiences on IS certifications' effect on trust in an e-commerce vendor. We found that quality and quantity of previous shopping experiences are relevant and that negative experiences loom larger than positive ones: While positive experiences do not alter the effect of IS certifications, negative experiences of disconfirmation decrease IS certifications' influence on trust in a vendor. This effect gets stronger as the number of negative experiences increases. Our findings contribute to the comprehensive understanding of the certification ecosystem and address prior calls for research that suspected different effects of IS certification subject to customers' prior shopping experience with a vendor. We hope to provide a starting point for future research to further explore the interplay between prior shopping experiences and IS certifications and help e-commerce providers to implement IS certification more effectively on their websites.

6 Certification of User Identity in the Sharing Economy (Article 4)

Title

The trust-building nature of identity verification in the sharing economy: an online experiment

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Abstract

Despite being widely used in practice and often asserted to be an effective trust-building mechanism, little empirical evidence exists regarding the effect of identity verification on sharing economy platforms. We theoretically develop a model based on signaling theory to explain how identity verification strengthens users' intention to engage in sharing economy transactions by increasing the level of trust towards a verified transaction partner. To test our hypotheses, we design a between-subject online experiment comparing subjects' perceptions of identity-verified and non-verified user profiles on an accommodation sharing platform. Data was collected from 232 participants and analyzed using covariance-based structural equation modeling. We found identity verification to significantly increase transaction intention, while its effect was mediated by trust in the transaction partner. Moreover, trust disposition was found to be a significant antecedent of users' transaction intentions. We discuss our findings and provide implications for theory and practice.

Keywords

Sharing Economy, Identity Verification, Trust, Signaling Theory

6.1 Introduction

The need to build trust online increases as the rise of collaborative consumption shifts transactions towards consumer-to-consumer (C2C) contexts (Sundararajan 2016). Technology is going to enable and drive this shift, for example, by disintermediation through distributed ledger technologies (Beck et al. 2018) or increased sharing of resources through autonomous capabilities (Munster 2018). Contrary to companies in a business-to-business (B2B) context, consumers are affected less by regulations or trust building transparency measures (e.g., corporate compliance and disclosure requirements). Instead, trust is built by embedding transactions in social communities (Granovetter 1985), typically interacting on a digital sharing economy platform (Mazzella et al. 2016).

While it is widely argued that trust is crucial to the success of sharing economy platforms (Hawlitschek et al. 2016b; Ismail 2017; Ufford 2015), there is no consensus regarding the recipe to build it. A variety of mechanisms (e.g., user feedback, advance-payments or quality scores) are proposed and implemented by platform owners (Mazzella et al. 2016). One aspect frequently mentioned in this regard is identity verification. Not only is identity verification widely used (e.g., by BlaBlaCar or AirBnb), there are also several third-party vendors offering tailored solutions to bring identity verification into existing sharing economy services (e.g., Trulioo or Jumio).

Previous research has mentioned identity verification as a means to build trust and reduce uncertainty in a sharing economy context, however, without providing empirical evidence (Hawlitschek et al. 2016a; Mazzella et al. 2016; Teubner 2014). Few studies have implicitly assumed its positive influence on trust and purchase intention and investigated contingency effects, such as strategies to get users into verification (Schneider et al. 2017) or specific types of identity verification, such as biometric verification (Yang and Padmanabhan 2010). While supplier certification has shown to be successful on B2B platforms (Koh et al. 2012), the verification of consumers' identity on sharing economy platforms has been scarcely researched. Moreover, empirical evidence remains inconclusive about the true influence of identity verification. For instance, in one study on Airbnb listing prices, the verification of hosts did not show significant effects at all (Teubner et al. 2016). The lack of empirical investigation of identity verification leaves important and interesting gaps in current IS literature to be addressed. Moreover, practitioners benefit from better understanding identity verification as it is difficult to compare its effectiveness to other trust building means and therefore makes it hard to decide whether an implementation is adequate. We aim to contribute to the understanding of identity verification's effect by focusing on the research question:

RQ: How does verification of a user's identity affect other users' intention to engage in an online transaction on a sharing economy platform?

Drawing on signaling theory, we argue that verification of a user's identity positively affects transaction intention by increasing other users' trust in the potential transaction partner. As trust is a multi-dimensional construct, we include users' general trust disposition and trust in

the sharing economy platform into our research model. To test our hypotheses, we conducted an online experiment with 232 participants, simulating sharing economy profiles with verified and non-verified user identities. Our results indicate that identity verification has a positive effect on users' transaction intention, however, platform trust and individuals' general trust disposition exhibit stronger predictive power to transaction intention.

Our study provides contributions to the understanding of verification in the sharing economy. Our findings indicate that verifying identity on a sharing economy platform effectively increases trust in the verified user, however, it does not standup to the expectation to solely build or break trust. On the one hand, it is only one cue among many affecting trust in a transaction partner, on the other hand, higher level aspects of trust (i.e., platform trust and general trust disposition) are important to users as well. Therefore, practitioners should consider how to effectively bundle identity verification with other trust building means, for instance, integrate it with a platform guarantee or insurance helping to build institution-based trust.

6.2 Theoretical background

6.2.1 Sharing economy

Since the emergence of online services such as Airbnb, many terms such as S*haring Economy*, *Gig Economy* or *Collaborative Consumption* have been coined to describe what distinguishes these services from priory existing competitors with *Sharing Economy* being the one most widely used (Cheng 2016; Sundararajan 2016). While there is no consensus to its meaning, definitions center on the distribution of resources between individuals (Cheng 2016). In this study, we are following the definition of Stephany stating that the sharing economy focuses on „the value in taking under-utilized assets and making them accessible online to a community, leading to a reduced need for ownership" (Stephany 2015, p. 205, p. 205). This definition includes transactions which are compensated as well as non-reciprocal sharing as commonly embedded in the literal meaning of sharing (Belk 2010).

6.2.2 Signaling theory

Signaling Theory, originating in job market theory, focuses on the reduction of information asymmetry between two parties (signaler and signalee) by communicating positive, imperceptible qualities of the signaler (Spence 2002). The core elements to the theory are signaler and signalee, the signal exchanged and the signaling environment in which the process takes place (Connelly et al. 2011). It provides rich explanation for the mechanisms between these elements and how they act together towards reduction of information asymmetry (Connelly et al. 2011). The signaler typically has an advantage in terms of information over the signalee and uses signals to convey the true quality of an offer. Therefore, she uses a signal, which is an informational cue (e.g., about her trustworthiness, the security of an online platform or quality of a service) that otherwise would not be observable to the signalee (Aiken et al. 2004). As an example, we transfer these concepts to the sharing economy: An Airbnb host is a signaler, while a guest is a signalee, due to the different levels of information. While the host knows about the

exact value of the offered accommodation, the guest lacks information and can only rely on cues (signals) presented on the hosts' Airbnb profile (signaling environment).

6.2.3 Trust

Trust has been subject to research in social sciences for many years, however, a widely acknowledged definition is still absent (Cook and Wall 1980; Luhmann 1979). It is a key mechanism in interpersonal exchanges, which are subject to vulnerability, uncertainty and dependency (Bradach and Eccles 1989). McKnight et al. (2001) separate three aspects of trust: trusting beliefs (perceptions of trustworthiness), their influence on trusting intentions (willingness to depend on the trusted party) and actual trusting behavior (e.g., sharing personal information). Trusting beliefs center around the conception that parties will behave in accordance with the trusting party's confident expectations by exhibiting ability, integrity, and benevolence (Luhmann 1979; Mayer et al. 1995). As such expectations are met, risk and uncertainty are reduced, which is why trust has been found to be a key predictor of initial and repeat purchase transactions (Flavián et al. 2006; Gefen 2002a; Li et al. 2006). Due to the triadic nature of this trust concept, no single formal definition can be given. However, the understanding of trusting beliefs, intentions and behavior throughout this study follow the definitions given by McKnight et al. (2001).

An important aspect to trust in the sharing economy is that, beside directly relying on a specific other person, trust can be built knowing that "favorable conditions are in place that are conducive to situational success in a risky endeavor or aspect of one's life" (McKnight and Chervany 2001, p. 37, p.37). This is referred to as institution-based trust, relying rather on situational normality and structural assurances than idiosyncrasies of an individual (McKnight and Chervany 2001).

6.2.4 Prior research on verification in the sharing economy

Verification refers to a special type of certifications, which are generally defined as third-party attestations that verify conformity to specified requirements (Sturm et al. 2014). There are different types of verification used in practice, for instance identity verification based on official documents (e.g., passport) (2017; Teubner et al. 2016) or biometric information (2010). While certification requirements can be very specific (e.g., > 99.99% availability of an online service), verification typically describes a binary assessment of whether or not a certain information is true (lat. veritas = truth). In the sharing economy context, the third-party role is taken by the platform providers. We use the terms verification and identity verification synonymously in this work as we, in accordance with most online platforms, focus on this type of verification.

Although prior research acknowledges the proliferation of verification on sharing economy platforms (Hawlitschek et al. 2016b; Mazzella et al. 2016; Teubner 2014) little is known about its actual effects on users and their activity on the platform. Mazzella et al. (2016) argue that verification is an important strategy to reduce uncertainty and build trust stating that "users need to know that everything they see online meets a required level of goodwill and authenticity, as ensured by the third party providing the sharing platform" (Mazzella et al. 2016, p. 27, p. 27). However, no empirical result is presented to confirm this need or the actual effect of

such platform provider verification. Other studies focused on contingency effects of verification, without establishing evidence for its actual benefits. For instance, Schneider et al. (2017) investigated nudging strategies for verification on a car sharing platform, while Yang and Padmanabhan (2010) analyzed biometrical procedures for online identity verification.

Few studies have empirically assessed the impact of verification on users' platform activity. Teubner et al. (2016) hypothesized that ID verification increases users' trust on the sharing economy platform Airbnb, leading to higher listing prices for a verified host. However, in a hedonic price regression on Airbnb listings, they could not find a significant effect of ID verification (Teubner et al. 2016). Airbnb, however, is a monetary sharing economy platform at which the price itself may serve as a strong signal to guests. As there is no compensation in non-monetary platforms, different mechanisms are in place (e.g., social embeddedness may replace price as a proxy for quality) and verification may have a different effect. In B2B transactions, supplier verification significantly increases trust in transactions (Koh et al. 2012). For C2C transactions, similar investigations are missing.

The central gist of previous studies is that verification may increase users' trust on a sharing economy platform, which may lead to increased transaction likelihood (Mazzella et al. 2016; Mittendorf 2017; Teubner 2014; Teubner et al. 2016). Similar arguments have been made on different online platforms such as online dating (Gibbs et al. 2011). However, these studies were mainly based on retrospective survey results asking for respondents' perceived trust during platform usage instead of manipulating treatments in a controlled experiment environment. There is a lack of empirical evidence regarding whether verification of users' personal information on a sharing economy platform affects their transactions on the platform. We aim to contribute to this body of knowledge by investigating the influence of verification on users' trust and intention to engage in a sharing economy transaction.

6.3 Research model and hypotheses

Drawing on signaling theory, we propose a research model that postulates the influence of verification on users' intention to engage in a sharing economy transaction. We include identity verification and disposition to trust as independent variables, users' intention to engage in a transaction on the platform as dependent variable and trust in the platform as well as trust in the transaction partner as mediator variables. We theorize that identity verification's effect is mediated by users' trust in the transaction partner. Further, we include general trust disposition and trust in the sharing economy platform for a comprehensive analysis of relevant trust aspects (Botsman 2017). The complete model is outlined in Figure 6-1 and subsequently described in detail.

In terms of signaling theory, a sharing economy platform provides a signaling environment. The consumer that offers sharing on a platform is the signaler while a user that engages in the offered sharing transaction is the signalee. A portfolio of profile cues (e.g., identity verification or user reviews) serves as signals. Each signal potentially builds trust in the signalee, referring to cue-based trust (i.e., based on the stimuli on the online profile) rather than experience-based

trust built from prior personal experience (Wang et al. 2004). The main objective in a sharing economy context is the realization of a sharing transaction. We follow prior studies by concentrating on users' intention to engage in such a transaction as a proxy for actual transactions.

Trust mediates the influence of signals on users' intention to engage in a transaction as a crucial aspect to the sharing economy. Verification of one's identity typically involves the check of official documents (e.g., an ID card) by a third-party and resembles a special form of certification. Prior research investigates the influence of certification on trust and transaction intention (e.g., in e-commerce purchase decisions) (Sturm et al. 2014), especially including trust as a mediator (Belanger et al. 2002; Gefen et al. 2003a; Wang et al. 2004). Besides, trust has been identified as one of the crucial concepts in the sharing economy and a main driver to consumers' engagement (Hawlitschek et al. 2016b; Hawlitschek et al. 2016a). Following these studies, we propose verification's effect on transaction intention to be mediated by trust in a transaction partner.

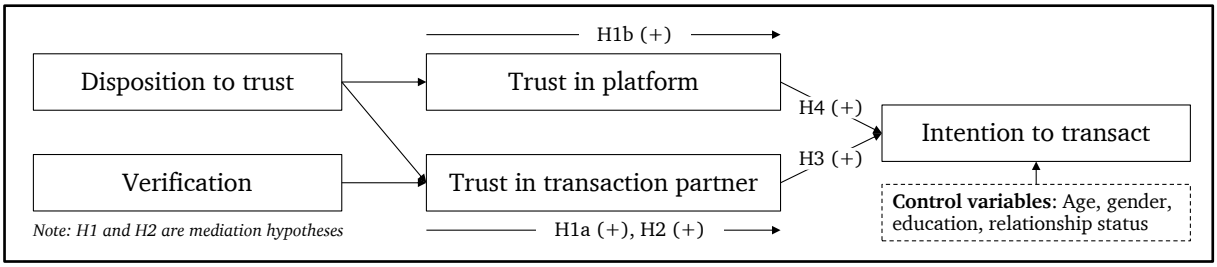

Figure 6-1. Research model

Irrespective of a verified transaction partner, the personal disposition of users is an important antecedent of the participation in sharing economy transactions. The faith in general others, developed over a lifetime, has been found a strong antecedent of trusting beliefs in a specific situation (McKnight et al. 2002). Hence, users, who are generally inclined towards trusting others, will have a higher intention to trust a sharing economy transaction partner, too. Disposition to trust is a personality construct that reflects the extent to which a person demonstrates „a consistent tendency to be willing to depend on others across a broad spectrum of situations and persons" (McKnight and Chervany 2001, p. 38, p.38). This tendency is based on lifelong experiences and independent of a specific trusted party. It rather resembles one's faith in humanity and applies to trusting, for instance, an unknown e-commerce shop as well as trusting strangers in the street (Gefen 2000). Disposition to trust has been found to positively influence institution-based trust, as well as trusting beliefs and intentions (McKnight and Chervany 2001). It both influences consumers' initial online trust (Wu et al. 2010) as well as trust in larger institutions as the internet or government (Bélanger and Carter 2008). We propose that individuals with a higher general disposition to trust are more likely to trust a sharing economy platform as an institution but also have higher levels of trusting beliefs towards potential transaction partners. We further argue in H3 and H4 that higher levels of trust in a transaction partner and platform have a positive significant effect on users' transaction intention. Hence:

H1a: Disposition to trust enhances users' intention to engage in a sharing economy transaction by increasing their level of trust in the sharing economy platform.

H1b: Disposition to trust increases users' intention to engage in a sharing economy transaction by strengthening users' trusting beliefs towards a potential transaction partner.

Trusting beliefs are cognitive perceptions about the trustee, evaluating whether the other person has beneficial characteristics (e.g., goodwill, honesty, expertness or caring (Mayer et al. 1995; McKnight and Chervany 2001)). If trusting beliefs towards individuals are high, their attributes or characteristics create a feeling of relative security (McKnight and Chervany 2001). They become trustworthy, meaning that they are considered willing and able to act in the trustor's interest (McLain and Hackman 1999). There are three main subconstructs to trusting beliefs: competence (having the ability to do what one needs done), benevolence (being motivated to act in one's interest) and integrity (making good faith agreements, telling the truth and fulfilling promises) (McKnight and Chervany 2001). To increase trust in a sharing economy transaction partner, verification needs to build up trusting beliefs, representing the basis for trusting intentions and ultimate trust-related behavior.

In terms of signaling theory, verification fulfills requirements to a reliable signal: First, verification is hard to imitate as it is usually based on third-party checks of official government documents. Second, spurious usage of verification comes at a high price: users, who act opportunistically using their verified identity, risk receiving negative reviews, reduced future sharing opportunities and ultimately being blocked from the platform. Verification of a user's identity establishes trusting beliefs in other users by signaling competence, benevolence and integrity. As verification is hard to fake and costly when used by low quality signalers, it transmits users' good intentions, i.e., benevolence. Taking the required cost and effort to get verified, shows that users are willing and able to invest in future transactions, signaling both competence and benevolence. Furthermore, verification signals integrity as users have proven that they are telling the truth (i.e., a third party has confirmed that their identity is correct). A user that has shown to be willing (benevolence) and able (competence) to invest into providing true information (integrity) about herself, qualifies towards being trusted. Taken together, trusting beliefs in a verified transaction partner are increased as verification provides a reliable signal to the transaction partner's trustworthiness. We further argue in H3 that a higher level of trust has a positive significant effect on users' transaction intention. Hence, we argue that:

H2: Verification of a user's identity strengthens other users' intention to engage in a sharing economy transaction by increasing trust in that user as a transaction partner.

Trust in transaction partner and sharing economy platform reduce users' perception of vulnerability and increase their likelihood to engage in a transaction. We argue that verification and disposition to trust increase users' intention to engage in a transaction by enhancing trust in the platform and the potential transaction partner (cf. H1a, H1b, and H2). In accordance with prior work (Gefen et al. 2003b), we propose that a higher level of trust, as a specific belief about the transaction partner, is associated with a higher level of intention to engage with the partner. The online setting of e-commerce also provides a trust challenge, due to the greater ease with

which vendors can behave opportunistically (Reichheld and Schefter 2000). This especially applies to the sharing economy, in which transactions are typically initiated via online platforms open to everybody. Moreover, sharing economy transaction partners (who are typically consumers) are often not subject to regulations (e.g., hotel safety regulations for Airbnb (Tapper 2018)), which might have equipped consumers with an additional layer of security (i.e., control through third-party authorities) in traditional transactions. Trust in a transaction partner helps to reduce the social complexity by lowering the perceived risk of undesirable, opportunistic behavior. When trusting beliefs are present (i.e., users believe in transaction partners' competence, benevolence and integrity (McKnight and Chervany 2001)), users are encouraged to take risks, i.e., engage with the transaction partner:

H3: Trust in a potential transaction partner increases users' intention to engage in a transaction with that partner.

Trust in a platform is a form of institution-based trust that lowers users' insecurities by providing a transaction environment based on situational normality and structural assurances. Sharing economy transactions usually take place on online platforms, which are operated by institutions especially created for this purpose (e.g., Airbnb, Couchsurfing or BlaBlaCar). Part of the risk involved in a sharing economy transaction is on the side of these institutions (e.g., privacy of shared information or correct processing of payments), which is why it is important that they are also trusted by users. As the object of trust (i.e., the online platform) is an institution rather than an individual, we are tapping into institution-based trust, which can be achieved by providing structural assurances (e.g., the Airbnb host guarantee) and situational normality and thereby lead to the perception of a stable, "normal" environment, in which transactions can take place. When environments are unstable, normality cannot be guaranteed or abnormal situations occur (e.g., payments are lost), a situation or structure may become untrustworthy (McKnight and Chervany 2001). Having institution-based trust in a sharing-economy platform means that users can rely on the absence of abnormal situations and attached additional risk, encouraging them to engage in a transaction on the platform.

H4: Trust in a sharing economy platform enhances users' intention to engage in a transaction on the platform.

6.4 Research methodology

We conducted a between-subject online experiment with two groups to test our research model. Participants were presented a user profile on an online accommodation sharing platform. They were given the scenario of searching accommodation for an upcoming trip with the specific task of inspecting the focal profile in order to make a decision whether they would like this user as their host. We based our experiment design on the accommodation sharing platform Couchsurfing. Both groups were presented an identical, artificial user profile with the manipulation that the profile presented to one group was verified, while for the other group it was not verified. Figure 6-2 presents the verified experiment profile. In comparison, the non-verified profile was

missing the green frame around the profile picture and stated “Non-verified profile”. Subjects were assigned to one of the two groups on a random basis.

Participants were first presented information about the experiment procedure as well as general explanations about accommodation sharing platforms and the specific process of a sharing transaction to establish common knowledge across subjects. Subsequently, we asked for participants’ trust disposition (Wu et al. 2010) and their disposition towards sharing economy platforms (Kim et al. 2018) using 7-point Likert scales. After presenting a task description, the platform user profile was displayed. We then collected the users’ trusting beliefs in the platform and the profile (Bahmanziari et al. 2009) and their intention to engage in a transaction (Bhattacherjee 2002) with the user seen in that profile. Dependent variables were also measured on 7-point Likert scales. Finally, we conducted manipulation checks: We checked for the treatment manipulation (i.e., whether participants recognized the profile verification) but also for the influence of cues that were not changed across groups (e.g., gender of the user displayed on the profile). Moreover, to test for non-response bias we compared data from early and late respondents (Armstrong and Overton 1977). Results from a t-test conducted on age ($p>0.05$), income ($p>0.05$) and marital status ($p>0.05$) exhibited no significant differences, rendering it unlikely that non-response bias was an issue within the data set used.

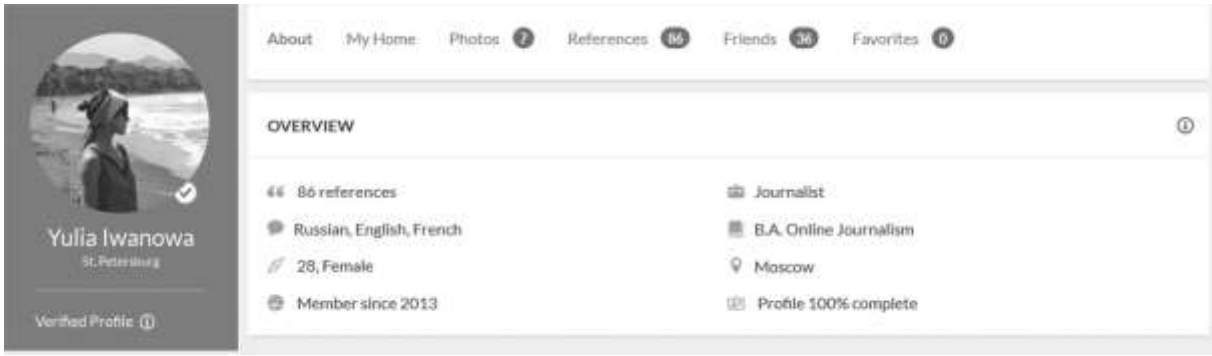

Figure 6-2. Verified Couchsurfing profile as shown in the experiment

A total of 268 participants were recruited for the online survey. Thirteen participants were excluded from analyses because they failed to complete the online survey, while 23 were removed due to failed manipulation checks, which left us with a final data sample of 232 participants. We have distributed the survey among graduate students and asked each participant for redistribution. In our sample 70.26% of subjects were students, while 25.00% were employed professionals (4.74% preferred not to answer). The majority of participants (50.43%) was between 20 and 24 years old, followed by 32.76% in the range of 25 to 29. Only 1.72% were younger than 20 and 15.09% older than 29. This distribution of age and a high rate of students is realistic to our scenario, as the average user on Couchsurfing is below 30 years of age and accommodation sharing is popular with young individuals and students (Priskin 2008; Rosen et al. 2011).

6.5 Analysis and results

We used covariance-based structural equation modeling (SEM) to assess the measurement model and test the hypothesized structural model. SEM allows the simultaneous assessment of

multiple dependent variables as well as statistical mediation and moderation. Moreover, the underlying measurement model can be assessed within the context of the theoretical model, making it superior to multiple regression and traditional path-analytic techniques. In our analysis, we followed the two-step process of outer and inner model assessment to ensure reliable results as the analysis of the inner (structural) models' paths relies on the reliability and validity of the outer (measurement) models' constructs (Anderson and Gerbing 1988).

The overall model fit was good, having values above 0.95 for the incremental Tucker Lewis and Comparative Fit indices as well as an acceptable level for Root Mean Square Error of Approximation (CFI=0.957, TLI=0.955, RMSEA= 0.056). We assessed the measurement model to check for psychometric adequacy. First, we checked for individual item reliability. Each item should show a substantial correlation with its construct. For reflective items, as solely present in our model, this can be assessed by item loading, i.e., its variance explained by the construct. Loadings should not be lower than 0.7 (Hair et al. 2017), which is fulfilled in our model. Second, internal consistency was assessed based on item inter-correlations, measured by Cronbach's alpha and composite reliability (Cronbach 1951). Values exceed the recommended threshold of 0.7 for all constructs (α_{disp_trust}= 0.84, $\alpha_{trust\_platform}$ = 0.85, $\alpha_{trust\_partner}$= 0.94, $\alpha_{int\_transation}$= 0.95) (Fornell and Larcker 1981). Taken together, these results indicate that the measurement model is reliable. We then assessed convergent validity, i.e., whether all items in a construct's block unidimensionally represent their construct (Henseler et al. 2009). As recommended, we calculated the average variance extracted (AVE) for latent variables, which were greater than the recommended threshold of 0.5 for each construct (1981).

Finally, discriminant validity was examined to confirm that different latent variables actually exhibit significant difference (Henseler et al. 2009). We checked the Fornell-Larcker criterion (Fornell and Larcker 1981), stating that the AVE of each latent variable should be greater than its squared correlation with any other variable (which is equal to the AVE's square root being greater than the variables' correlations, which we used for simplified reporting). This is the case, as the values in Table 6-1 confirm. We also checked the Heterotrait-Monotrait Matrix (HTMT). Recently introduced, the criterion has showed superior performance in detecting discriminant validity in a Monte Carlo simulation study compared to cross-loadings analysis and the Fornell-Larcker criterion (Henseler et al. 2015). The computed HTMT values for our model can be found in Table 6-1. All values are below 0.85, which satisfies $H_{0.85}$, the HTMT criterion with highest specificity (Henseler et al. 2015). We conclude that overall measurement model validity has been established.

Table 6-1. Measurement model descriptive statistics and discriminant validity measures

	Disp. to Trust[1]	Trust (Plat.) [1]	Trust (Part.) [1]	Int. to Trans. [1]	Mean (SD)
Disposition to trust	0.766	0.300	0.307	0.304	4.75 (1.11)
Trust (platform)	0.305	0.732	0.364	0.416	4.48 (1.36)
Trust (partner)	0.340	0.104	0.894	0.722	4.92 (1.18)
Intention to transact	0.325	0.271	0.690	0.933	4.60 (1.68)

Note: [1]□ latent variable correlation, ■ $\sqrt{AVE}$, ■ HTMT matrix

As our first hypotheses propose a mediating relationship, we follow a three step mediation assessment involving independent variable (IV), mediator (M) and dependent variable (DV) (Hair et al. 2017): First, we analyze the indirect effect ($IV \rightarrow M * M \rightarrow DV$), second we inspect the direct effect ($IV \rightarrow DV$) and third the total effect (indirect + direct effect). For hypotheses H3 and H4, we directly inspect path coefficients, which are equal to direct and total effect as no mediation relationship is present. The analyses were performed using 5000 bootstrap samples.

Disposition to trust has a significant indirect effect on transaction intention via trust in transaction partner (β=0.297, p<0.001), hence, we accept H1a as users' disposition to trust positively influences their transaction intention mediated by trust in the transaction partner. Moreover, disposition to trust has a significant indirect effect on transaction intention via platform trust (β=0.077, p=0.027), hence, we accept H1b as users' disposition to trust positively influences their transaction intention mediated by trust in the platform.

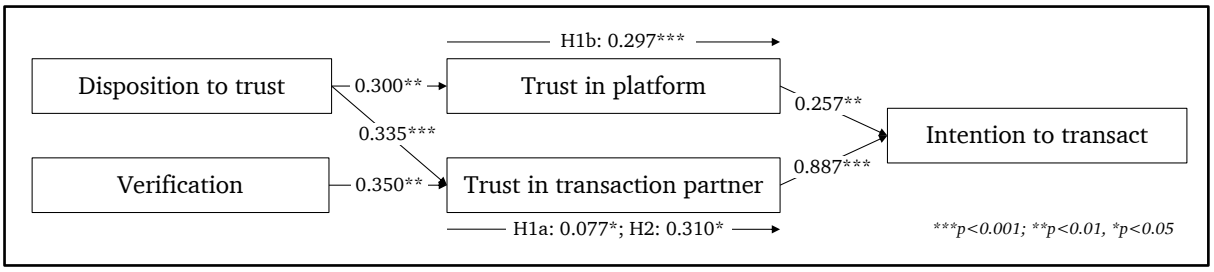

Figure 6-3. Analysis results (research model with path coefficients)

Verification has a significant indirect effect on intention to transact (β=0.310, p=0.019), while its direct effect on transaction intention is not significant (β=0.182, p=0.242) in presence of the mediator. As verification positively influences transaction intention by increasing trust in transaction partner, we accept H2. The direct effect of trust in transaction partner on users' intention to engage in a transaction is positive and significant (β=0.887, p<0.001), hence, we accept H3. Trust in platform also has a positive effect on transaction intention, however, the effect size is smaller (β=0.257, p=0.008). Accordingly, we also accept H4. The four control variables included did not exhibit significant effects ($p_{age} = 0.928, p_{gender} = 0.473, p_{relationship} = 0.537$, $p_{edu} = 0.140$); path coefficients are also displayed in Figure 6-3.

6.6 Discussion

The aim of this paper was to investigate the influence of identity verification on users' intention to engage in a sharing economy transaction. First, we found that verification of a user profile

significantly increases other users' intention to engage in a transaction with the focal user. This effect is mediated by trust in transaction partner, indicating that verification itself does not directly alter users' intentions, but builds up trusting beliefs towards a potential transaction partner. These trusting beliefs have a strong influence on users' transaction intention, which is resembled in our data, as an increase of trust by one standard deviation (sd) leads to a 0.87 sd rise in the intention to transact.

Second, trust in the platform, beside trust in the specific transaction partner, has a significant positive effect on users' intentions to transact. Moreover, both trust aspects are significantly influenced by users' personal disposition to trust. Individuals, who have generally more faith in others, are also more inclined to trust a sharing economy platform and the potential transaction partners using it. The influence of trust disposition on both aspects is balanced, as indicated by close path coefficient values (0.300 and 0.335). These coefficients are about the same size as found for verification. This may be interpreted as the rather small role of identity verification as a single cue versus the general trust disposition of consumers in regard to their intention to engage in the sharing economy.

Our findings contribute to the sharing economy literature as they provide empirical evidence to the often-asserted positive influence of identity verification on sharing economy transactions. While this influence was assumed (Mazzella et al. 2016; Teubner 2014), only few studies have explicitly investigated its role (Teubner et al. 2016). Moreover, there are empirical data analyses which could not support an expected positive effect of identity verification (Teubner et al. 2016; Teubner et al. 2017). Our study makes a contribution as it explicitly focuses on the role of verification, using the controlled environment of an online experiment to analyze its effect.

Verification, as a form of certification, differs from website cues typically present on sharing economy profiles as they connect the profile with a real identity and are provided by a third-party. According to our results, identity verification, as a signal, makes users more credible, building up trust and in turn increases transaction intentions towards them. Our findings confirm prior conceptualizations of trust in the sharing economy, stating that trust affects peers, platform and product (Hawlitschek et al. 2016b). While we did not check for trust in the product (i.e., accommodation sharing), our results support the relevance of both trust in the platform and transaction partner (i.e., peer).

Besides, our results show the importance of users' personal trust disposition. Sharing economy literature in general is subject to a self-selection bias: Consumers that reveal increased dispositions to trust are more inclined to be users of a sharing economy platform. When studies focus on sharing economy users, they unintentionally deal with individuals exhibiting higher overall trust levels. Our study draws attention to this aspect and includes three aspects of trust: 1) one's general trust disposition, 2) one's trust in a sharing economy platform and 3) trust in an individual as a potential transaction partner. Future work in the context of the sharing economy may benefit from adopting these different trust levels into their research model.

Our findings have practical implications to both platform users and providers. Platform users may benefit from verifying their identity as they become more trustworthy as potential transaction partners. However, we encourage users to interpret identity verification as additional means instead of a silver bullet. In our experiment, we compared verified and non-verified user profiles. While these profiles were in other aspects identical, they were not empty but prefilled with information (e.g., profile picture, name, number of friends). Having a verified but empty profile may likely not bring the desired effect, however, this remains subject to further investigation.

Platform providers should offer verification to their users to foster transactions. Having more verified users on their platform may increase overall trust and ease of transactions. However, they should also not overestimate the power of verification and combine it with other mechanisms to build trust on the platform (e.g., user reviews). Forcing every user on a platform into verification may be counterproductive as the signaling power diminishes: High quality users can no longer decide to undertake additional efforts to get verified in order to distinguish themselves from others. The significant effect of users' trust disposition also leads to implications for platform providers. First, providers may want to measure the current trust levels among their users. When only individuals with high levels of overall trust are using the platform, there may be opportunity for improving the platform's trustworthiness to also attract consumers with lower trust levels. Special treatment in form of personalized onboarding to overcome initial trust barriers or guarantees may be offered to new users to increase ex-ante trust in the platform.

6.7 Limitations and future research

Our study is subject to limitations, which provide opportunities for future research. First, we have only investigated identity verification, masking the influence of other trust building cues present on sharing economy platforms. This setting was chosen to isolate the effect of verification, preventing interactions, which make interpretation of a single effect more difficult. However, future studies may consider a portfolio of cues and their simultaneous effect on trust and transaction intention. Second, we used an artificial online experiment to test our hypotheses. While we built the experiment platform in the appearance of the Couchsurfing platform, users are still in an artificial setting and not really inclined to engage in a transaction. This setting was necessary as many external factors influence transaction decisions (e.g., whether one has time to go for a Couchsurfing trip or not). In our experiment, we could specifically instruct participants and control for external factors. Although this approach is widely accepted within the IS research stream and beyond, we strongly encourage scholars to exploit field experiments or experience-sampling studies to provide further meaningful insights as well as to strengthen external validity of our findings. Another limitation is given by the student sample, as has been frequently used in e-commerce research (Yoon and Occeña 2015). While a major share of accommodation sharing users are students and resemble the age distribution of our sample (Priskin 2008; Rosen et al. 2011), further research with more diverse samples is required to

increase generalizability. Moreover, future research may look into the transferability of our results for other forms of sharing (e.g., verifying driver's licenses in ride sharing) to extend validity of the findings in the entirety of the sharing economy.

7 Thesis Conclusion and Contributions

The rise of digital services challenges individuals and organizations to make a growing number of transaction decisions by means of a click. Due to a lack of insight into the workings of these services, no ability for physical inspection, and a dynamic number of available providers, customers face a lack of information to make good transaction decisions. IS certifications provide a means to overcome information asymmetry in digital transactions by providing results from third-party evaluation against pre-defined criteria. While IS certifications have been subject to prior research, many aspects regarding its effectiveness remained unclear. Hence, the aim of this thesis is to improve understanding of how the effectiveness of IS certifications is affected by their internal characteristics and external embedding in a certification ecosystem. Four studies have been conducted to contribute to this research question. In the following sections, the main theoretical and practical contributions of these studies are presented. Finally, limitations and opportunities for future research are discussed.

7.1 Theoretical contributions

Overall, this thesis contributes to a better understanding of IS certifications and their effectiveness as a quality signal in the context of information asymmetry. The articles included in this thesis focus on four different aspects across two levels of analysis: the relative importance of assurances (IS certification), the influence of time and prior purchase experience as well as a specific usage context and the role of the theoretical framework used for scholarly investigation (IS certification ecosystem). While both levels contribute to answering the research question, they provide different perspectives on the topic and are discussed separately in the following section.

IS certifications have been frequently analyzed in a binary way (i.e., a service either is certified or not), although most certifications contain multiple assurances providing insight on different aspects of a service (e.g., availability and privacy) (Lansing et al. 2018). The findings of article two suggest to understand IS certifications as bundles of signals with varying importance subject to recipient characteristics. For example, the results indicate that while individual consumers find higher value in privacy assurances, organizations attach greater importance to service availability. Hence, in treating IS certifications as unidimensional signals, one loses important information, which in consequence may lead to wrong conclusions. Multiple recipients may significantly differ in the assurances they deem important and how they come to a conclusion in their evaluation of the value provided by an IS certification and in turn regarding their intentions towards a certified service. Following the conceptualization as a bundle of signals, analyses of effectiveness can trace down subjects' decisions to the value they ascribed to different assurances contained in an IS certification. This may help to improve understanding effectiveness and contribute to the investigation of strategic decision-making by explaining and predicting how adoption drivers as perceived risk and trust are influenced (Belanger et al. 2002).

Prior research has conjectured that the interpretation of IS certifications depends on the ecosystem, in which they are embedded and the context of a certified service (Lins and Sunyaev 2017). The findings from article two add to this stream of research by presenting evidence to the importance of industry regulation and service type as context-specific factors that influence how recipients perceive IS certifications. For instance, the findings indicate that a security-oriented certification may resonate better with organizations in highly-regulated industries than in non-highly-regulated ones. In consequence, comparing certificates across recipients and contexts without controlling for these effects may lead to biased results on certification effectiveness.

Another important aspect of the certification ecosystem was found in article three: the influence of prior experience with a certified vendor. While it has been mentioned in prior studies that longitudinal effects may influence the effectiveness of IS certifications (Özpolat et al. 2013), little evidence has been presented. The findings of article three confirm that the trust-building effect of IS certifications is different between initial and recurring purchase decisions. However, the results go beyond a mere dichotomization and show that the quality of hitherto made purchase experiences is relevant in determining the effect for upcoming decisions. While positive experiences were not found to alter effects, negative experiences diminished the positive influence of IS certifications on consumer trust. Hence, it is important to integrate the past relationship between vendors and customers into analysis when reasoning about the effectiveness of IS certifications. Especially, in the domain of e-commerce, in which the majority of prior analyses were carried out (Sturm et al. 2014), results have been ambiguous; contrary to IT outsourcing or other strategic decisions that occur sparsely and require extensive preparation, shopping transactions occur densely and are likely to be biased by previous experiences between a vendor and a customer.

Depending on the context, in which IS certification is deployed, specific aspects are of importance. In the sharing economy, transactions take place between individual users, often with reduced compliance and regulation compared to similar transactions between individuals and organizations. Due to this characteristic, users have an increased demand to know whether a potential transaction partner is authentic. The findings from article four indicate that certifying users' identity can be an effective measure to prove authenticity and build trust. While certification had been found to significantly increase levels of trust in a transaction partner (e.g., Hu et al. 2010; Wu et al. 2010), no prior work has investigated the effect in isolation in the context of the sharing economy. Previous studies, incorporating a variety of trust-building cues on sharing economy platforms, could not provide an unambiguous picture due to interaction effects. The results from article four indicate that the certification of identity increases trust in a transaction partner, controlling for general trust dispositions between subjects. This corresponds to the findings of article two: as only the identity was checked, the certification contained a single assurance, avoiding differing relative importance of assurances between recipients being a potential bias to results on effectiveness. Overall, theory building on IS certifications can benefit

from these findings by better understanding the roles of context, prior experience, and recipient characteristics as relevant environmental factors.

Besides the characteristics of an IS certification and the ecosystem, in which it is deployed, the research setting for its investigation is a factor to be considered in order to improve clarity and unambiguity in results. The findings of article one contribute to this aim in providing an overview of theoretical lenses used in past research on IS certification. Many studies were found not to be based on an explicit theory or loosely using concepts of trust. While it had been mentioned before that consumers are frequently incapable of fully grasping IS certifications (i.e., being aware of their existence, understanding their characteristics and being able to explain the processes leading to certification) (Kimery and McCord 2006; Kovar et al. 2000; Yang et al. 2006), only a few studies have applied theories suitable to deal with varying degrees of rational processing. For example, the ELM incorporates two routes of mental processing (central and peripheral), which reflect both attitude change from critical thinking processes as well as from heuristic cues. The results of article one may be useful for scholars to gain an overview of previously applied theoretical lenses and how results differ across studies based on the same theory. Moreover, recommendations are provided on advantages and potential problems with specific theories to guide scholars in future studies.

7.2 Practical contributions

Beyond the theoretical contributions of the thesis, there are multiple implications and recommendations for action, which might be useful to practitioners. The three main actors involved in IS certification are service providers, customers, and certification authorities (i.e., issuers), which will be addressed by the contributions presented in this section.

First, certification has been found to bridge information asymmetry and foster transactions in different contexts. Hence, we recommend practitioners to take it into consideration when selecting measures to build trust and increase customer activity. In article two, managers considered IS certifications valuable cues to make cloud computing adoption decisions, especially when relevant but hardly inspectable aspects of service quality are covered. Moreover, article three provides evidence that IS certifications drive repeat purchases in an e-commerce scenario. Article four indicates that certification of users' identity can increase levels of trust between users on an accommodation sharing platform.

Second, while IS certification was found able to provide beneficial influence, findings indicate that providers and customers have to pay special attention to the fit between a particular certificate and its audience. Article two shows that the relative importance of a certificate's assurances differs between customers and service providers, indicating that providers should investigate the needs of their customers before making a certification adoption decision. On the one hand, as certifying every aspect of a service may be infeasible (as no certification provides full coverage) or uneconomical (as getting certified by multiple authorities may incur significant cost), providers should focus on the most important assurances for their customers and tap into other sources of trust-building for less important ones. On the other hand, it is recommendable

that customers, who are facing an adoption decision, scrutinize IS certifications. They may follow a two-step approach, in which they first clarify their needs towards a service and its vendor before comparing these needs with assurances of IS certifications available in the market. If providers or certification authorities do not have sufficient data on particular customer needs, article two indicates that the customer's industry can provide a valuable cue to gauge demand for specific assurances, for example, privacy and security may have higher relative importance in heavily regulated industries.

Third, besides the contents of a certification, recipient characteristics were found to play an important role in IS certification effectiveness. In article three it could be shown that prior shopping experiences with a vendor influence the effect of IS certification on customers' trust towards a vendor. Providers may use these findings in practice by incorporating their knowledge about a customer's transaction history and dynamically adapting how they deploy certification. Based on the results, it is recommended that providers do not compromise on the display of a certification for recurring customers as it maintains a trust-building effect even in presence of prior positive transaction experiences. However, in circumstances when multiple negative experiences occurred, providers may want to steer customers' attention away from certification.

Fourth, the context in which a certification is deployed was found to influence its effectiveness, giving practitioners additional leverage in their certification deployment. In a platform context, as investigated in article four, providers must not only decide whether or not to adopt IS certification, but whether they implement it as being compulsory or voluntary to all users. Leaving the decision up to users may enable those of higher quality to use IS certification as a signal to differentiate from ones of lower quality and increase dynamics on the platform. Furthermore, it may be beneficial to focus certification on a specific aspect that is of most relevance to customers, as it facilitates transparency and understandability while being easier to communicate: In article four we found that certification of users' identity, which makes an important contribution to building authenticity and trust, was a well-understood cue that leads to higher levels of trust and transaction intentions among subjects.

Fifth, in addition to the strategic implications for customers and providers, the findings on the relative importance of assurances to different groups of recipients as well as the influence of recipient characteristics on a certification's perception may provide guidelines for designing more coherent and comprehensible reports to certification authorities. Better fit of such reports (i.e., clearly communicating exact purpose and target audience) is beneficial as uncertainties about a certification's underlying standard may undermine its value (Harbaugh et al. 2011). By highlighting central assurances and tailoring communication (e.g., putting different assurances forward in marketing material for customers versus providers), the value of certification may be perceived more easily, fostering its adoption in the market.

Finally, practitioners may indirectly benefit from increased consistency in IS certification research as well as comprehensive theoretical models on their effectiveness. The findings of article one help scholars to get an overview of existing research and to focus on theoretical lenses

tailored to IS certification idiosyncrasies. Moreover, by incorporating factors as customers' prior experience with a vendor, relative importance of particular assurances and usage context, the explanatory power of theoretical models may be fueled, leading to a better understanding and increased predictive power, ultimately being especially valuable to practitioners.

7.3 Limitations and future research

The research presented in this thesis is subject to multiple limitations. Moreover, not every aspect of the research question could be covered within the four articles. Hence, scholars are encouraged to build upon the results presented, attain to their limitations, and to continue the investigation of IS certifications in digital transactions. Each article brings its particular limitations, which have been described in the respective sections at the end of chapters three to six. These limitations are specific to the research method and setting, for example, in article four an artificial online platform was used in the experiment. While this setting was deliberately chosen to control for external factors and focus on a single manipulation, it lacks the validity of a real decision context as given in a field study. Another example is the cultural and geographic homogeneity of the sample in article two. While cloud services are offered globally, customer distinctions based on cultural differences may affect assurances' importance. In addition to these particular limitations, the following section focuses on aspects regarding the research question that have not been covered in the four articles but may be of interest to advance understanding of IS certifications.

First, there are more aspects besides the assurances that distinguish IS certifications. Assurances, as studied in article two, are the most salient aspect upon which individual certifications can be distinguished, however, while only few studies have investigated distinction factors (e.g., argument quality of content (Kim & Benbasat, 2009); type and number of arguments (Hu et al., 2010)), other aspects may be relevant to customers' decision-making. For example, the certification process in terms of how assurances are evaluated may differ. Self-evaluation is inherently less reliable than a third-party audit, while on-premise audits may be more detailed than audits solely based on documents. This can be further analyzed in terms of the level of detail that is described in the audit report and how this information is presented to customers. These additional aspects are important to further uncover the building blocks of IS certifications and to investigate their influence rather than treating certifications as a black box.

Second, there may be trust transfer effects (e.g., Erdem and Swait 1998; Stewart 2003) from certification issuers to their certifications. Besides provider and customer, the issuer is the third key actor in the certification ecosystem. An issuer may offer multiple certifications and have its own reputation, often also offering a diversified product portfolio (e.g., Norton has offered IS certifications focusing on website security, while also offering desktop computer security products as antivirus scanning software (Rosch 2013)). Based on the experiences with an issuer or one of its products or services, individuals and organizations may have a certain level of trust towards this issuer. This trust may transfer to IS certifications offered by the issuer and especially help to establish new certifications in the market. This could lead to economies of scale

as the amount of trust towards issuers may grow with the number of IS certifications they have established. Investigating these effects on providers (i.e., likelihood to adopt an issuer's certification) and customers (i.e., intention to engage in a transaction given the issuers' certification) may add to the understanding of the ecosystem.

Third, the effect of IS certifications is subject to the relationship between providers and customers. The findings of article three provide initial evidence for such interaction, however, more in-depth analysis is required. With the factorial survey study, only an artificial setting was investigated. A field study that compares display vs. non-display of IS certification for recurring customers may increase the validity of the longitudinal effect proposed. Moreover, not only the quality and quantity of purchase experiences but the type of goods, average shopping cart value, or personal encounters with the provider (e.g., in terms of a customer service phone call) may be important. A provider that has proven to be accountable in case of problems or that has shown to deliver to its promises in a high-value transaction may be perceived more trustworthy, leading to a further diminished effect of certification in repeat purchases. Besides these aspects, it may be of interest to investigate customers over a prolonged period of time to measure their awareness of IS certification (e.g., by asking in a short survey after every purchase) as habituation effects may also partly explain for a reduced effect of certifications over time.

Fourth, some customers do not fully grasp IS certification and rather rely on its presentation, which may make them receptive to fake certifications. Dating back to an early study on housekeeping seals for retail products (Parkinson 1975), authors found that many participants could not distinguish between real and fake certifications. Prior research has found that the same problem exists for IS certifications as not all customers fully recognize or understand them (Kim et al. 2008b; Mauldin and Arunachalam 2002; McKnight et al. 2004). This may be due to a lack of rigor or application of mental shortcuts, such as only paying attention to a seal image without checking for its authenticity or the assurances it stands for. Most research in the area of IS certification, including two of the articles in this thesis, is done with university students, who are not a representative sample of the general population to study these effects. Therefore, future research may benefit from exploring IS certification perception with a wider range of subjects, including older and less educated population samples. It would be interesting to compare real and fake certifications with differing levels of assurances as well as manipulating how these certifications are presented to customers.

Fifth, it might be possible to aggregate trust-building effects from IS certifications. In the presented articles, the focus has been limited to a single provider and IS certification setting. However, customers typically shop at multiple vendors or use services from multiple platforms. When certifications are used by more than one provider, trust may transfer or aggregate. As customers may have made good experiences with certified shop A, they may have a higher tendency to transact with a hitherto unknown shop B if it deploys the same certification as shop A. Building upon this narrative, there may be providers that use the same certification as highly trusted entities (e.g., a customer's online bank) and may benefit especially from such trust transference. Moreover, transfer effects may occur between work and home environments as

prior research found that technology-driven stress may spill over, which may be mitigated by reducing risk using IS certifications in both contexts (Benlian 2020). Especially, when technology at home may be perceived intrusive (e.g., Benlian et al. 2019), certifications known from a professional environment may be recognized and provide required trust. Future research may combine investigation of such settings with the theoretical lens of ELM, which incorporates individuals' mental dual processing and allows to investigate the role of peripheral cues such as having the same certification as another known entity (Petty and Cacioppo 1986a).

Finally, the current focus of IS certification research has been on the pre-purchase stage (Mavlanova et al. 2016), paying little attention to post-purchase effects. However, there may be great practical potential in reinforcing IS certification effects after a purchase has been completed. For instance, providers may display the certification in post-purchase communication, underlining that the positive experience a customer made is in line with what has been assured by the certification in advance. This may help to strengthen the connection between certification and positive transaction outcomes. Issuers would also benefit from this connection as they could advise customers to look out for the same certification in the future to ensure that their upcoming transactions will also be positive. Therefore, future research should investigate, whether such effects can be achieved by comparing groups of customers that are presented with such communication after a successful transaction with groups who do not receive any message related to the certification.

In conclusion, the aspects mentioned before can be summarized into three lines of future research: Investigating the effect of particular building blocks in IS certifications as bundles of signals, analyzing the influence of key actors' characteristics and their relationships in the certification ecosystem as well as aggregate effects that go beyond single interactions with IS certifications. Taken together, findings in these research streams may improve reasoning about IS certifications and help to increase their effectiveness in bridging information asymmetries.

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