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Why different trust relationships matter for information systems users

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Abstract
Technology acceptance research has shown that trust is an important factor fostering use of information systems (IS). As a result, numerous IS researchers have studied factors that build trust in IS. However, IS research on trust has mainly focused on the trust relationship between the user and the IS itself, largely neglecting that other targets of trust might also drive IS use from a user's point of view. Accordingly, we investigate the importance of different targets of trust in IS use. Therefore, we use the concept of a network of trust and identify four different targets of trust that are prevalent from a user's point of view. Afterwards, we develop our research model and evaluate it using a free simulation experiment. The results show that multiple targets of trust are important in the context of IS use. In particular, we highlight the importance of a second target – trust in the provider – which is equally important as trust in the IS itself. Consequently, IS providers should focus not only on fostering users' trust in their IS but also on positioning themselves as trustworthy providers. In addition, we show that a third target – trust in the Internet – has significant indirect effects on multiple constructs that impact IS use.
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Keywords: trust; multiple targets of trust; free simulation experiment; network of trust; trust in the information system; trust in the provider

Introduction

The importance of trust for technology acceptance has been shown in numerous studies throughout the information systems (IS) discipline (e.g., Gefen *et al*, 2003b; van der Heijden *et al*, 2003; Pavlou & Gefen, 2004; Wang & Benbasat, 2005; Connolly & Bannister, 2007; Datta & Chatterjee, 2008). The reason for this importance can be found in the value of trust as a mechanism to reduce social and technical complexity (Luhmann, 1979; Gefen, 2000; Lee & See, 2004). Indeed, trust plays an even more important role when it comes to IS use because of steadily increasing complexity due to system automations (Lee & See, 2004). Despite the fact that automation is supposed to ease the life of its users, automated systems are also becoming increasingly opaque and sophisticated (Lee & See, 2004). Furthermore, our society is becoming more and more digitized and interconnected. As a result, value in the digital age will increasingly be created through the cooperation of multiple stakeholders (Vargo *et al*, 2008; Leimeister 2012, 2015). An example of this development is the reliance of many recent IS on multiple sources, for example, recommendations or value added services provided by third parties to create value for their users. We believe this development changes the way we need to think about trust in IS.

To account for the increasing importance of cooperation for creating value in the digital age, we argue that research on trust in IS should focus on understanding the importance of different targets of trust that influence the effectiveness of IS. The idea of distinguishing between different targets of trust is in line with prior IS research on trust and trust research in related disciplines. McKnight *et al* (2002a), for example, highlight the importance of institution-based trust in the Internet environment and trust in a specific web vendor in e-commerce. Krasnova *et al* (2010) investigate the importance of trust in the provider of an online social network as well as trust in the other members of the network for reducing the perceived privacy risk of online social network users. They observe that only trust in the provider of the online social network has a significant negative effect on perceived privacy risk. Frazier *et al* (2010) focus on the impact of trust in the section leader and trust in the director on employees' ability to focus on job-related activities. The results show that only trust in the section leader has a significant impact on employees' ability to focus. These studies show that different targets of trust are important. Nevertheless, the authors did not describe how they identified the different targets and discussed if there are further targets of trust that are important in their case. This might cause problems, since importance targets might not be considered, and a consideration might alter the observed effects. In the case of Krasnova *et al* (2010), for example, trust in the online social network might also have an effect on perceived privacy risk. Regarding Frazier *et al* (2010), for example, trust in the co-workers might also affects employees' ability to focus on job-related activities. Thus, to avoid that we neglect an important target of trust, we follow Muir's (1994) approach and develop a network of trust containing the important trust relationships in the context of IS use. This allows us to identify the relevant targets of trust from a user's point of view, and to evaluate their importance afterwards.

On the basis of the network of trust in IS, we aim to answer the following research questions from a user's point of view: (1) What impact does a single target of trust have on other targets? (2) What impact does a single target of trust have on dependent constructs known from technology acceptance research?

To answer our two research questions, we develop our research model including hypotheses on the interplay between different targets of trust as well as their relationships to other constructs important for understanding IS use based on the network of trust in IS. Thereafter, we evaluate our hypotheses using a free simulation experiment.

Using this approach, we increase the IS discipline's understanding of the nature of trust in the context of IS use by showing that different targets of trust are prevalent and have distinct impacts on other important constructs fostering IS use. Further, we introduce Muir's (1994) idea of building a network of trust to IS research. Regarding practitioners, we offer more detailed insights on the different targets of trust prevalent and their importance in IS use in order to support them in more effectively designing of their IS.

The remainder of this paper is structured as follows. First, we present theoretical background on trust. We then build a network of trust in IS before developing the hypotheses for our study, after which we provide insights into our free simulation experiment as well as information on our data collection and analysis. We then report the results of the free simulation experiment and discuss the implications and limitations of our study, before the paper closes with a conclusion.

Theoretical background

Trust has been identified as an effective means of overcoming the increasing complexity of technology, organizations and interpersonal interactions that people have had to face (Lee & See, 2004). Since trust is studied by different disciplines in various contexts and is interpreted as being very multifarious (Abdul-Rahman & Hailes, 2000), numerous definitions of trust exist. Rousseau *et al* (1998) note that the different definitions have a common core, based on positive expectations and vulnerability. For our paper, we adapt the most often used trust definition (Rousseau *et al,* 1998), defining trust as the belief of a party (trustor) that it is worthy of making oneself *vulnerable to the actions of another party [trustee] based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party* (Mayer *et al,* 1995, p. 712).

Because of our interest in the importance of different targets of trust in situations where users face the decision of using a new IS or not, our scope lies on initial trust (McKnight *et al,* 2002b; Wang & Benbasat, 2005). This kind of trust is formed right after the user's first experience with an IS, and is especially important for two reasons. First, when users interact with an IS with which they are unfamiliar, their perceptions of uncertainty and risk about using the system are especially salient (McKnight *et al,* 2002b). Consequently, sufficient initial trust is needed to overcome these perceptions. Although trust research has shown that initial trust beliefs may change over time (Rempel *et al,* 1985; McKnight *et al,* 1998), users first rely on initial trust to determine the extent to which future interactions will take place (McKnight *et al,* 2002b; Koufaris & Hampton-Sosa, 2004). Second, low switching costs, high pressure of competition, as well as vendors' high expenses to attract new customers increase the importance of gaining high initial trust from users (Koufaris & Hampton-Sosa, 2004).

Furthermore, trust is commonly conceptualized as part of the relationship between people, groups of people and organizations or between users and IS. With the increasing complexity and interdependency of organizations and technology, more and more researchers argue that multiple trust relationships need to be considered, since the effects of trust vary depending on the targets of trust. A number of studies from organizational behaviour research provide empirical support for this approach, showing, for example, that employees evaluate different

targets of trust reflecting different authority referents inside an organization, and that these different targets of trust vary in their impact on dependent constructs (Aryee *et al,* 2002; Stinglhamber, 2006). Frazier *et al* (2010), for example, show that employees' ability to focus on the most important tasks depends on their trust in the section leader, not in the director of the organization.

A related result pointing to the existence of different targets of trust and their interplay in the context of trust in web vendors is reported by McKnight *et al* (2002b). The authors highlight that both users' institution-based trust in the Internet and their trust in a specific web vendor need to be in place before they are willing to conduct business with a specific vendor via the Internet. These examples highlight another characteristic of trust that needs to be considered. The way trust can be built and the targets of trust that need to be considered vary across different contexts (Abdul-Rahman & Hailes, 2000). As a result, the relevant targets of trust need always to be identified based on the situation under investigation.

Theory development

A network of trust in IS

Muir (1994) develops the concept of a network of trust especially to identify and analyse the different trust relationships prevalent when studying complex technical systems. A network of trust consists of the different parties prevalent and the trust relationships in which the parties are engaged. In their context, the parties of interest were: *designers*, the *system, operator 1, operator 2* (accounting for the fact that a system is run by multiple operators that share or trade tasks), *management* and *society*. The parties are connected using single- and double-headed arrows resembling the trust relationships between them. The parties *designers, operator 1, operator 2* and *management* share mutual trust relationships resembled by double-headed arrows. This indicates that, for example, *management* needs to trust the *operators* to control the system correctly, while the *operators* are asked to trust the policy decision, for example, safety/productivity trade-offs, made by *management*. The parties *system* and *society* instead do not share mutual trust relationship with the other parties, but only take the role of a trustor (only giving trust, *society*) or a trustee (only receiving trust, the *system*). Since Muir (1994) focuses on supervisory control systems used to control, for example, nuclear power plant or auto-pilots, *society* is part of the network of trust, since *society* needs to trust all other parties involved to run the system safely. In contrary, the other parties do not need to trust the *society* for developing and running a safe and efficient system. Regarding the *system*, it is the other way around. All parties involved need to trust the *system* to be useful in the particular context. The *system* instead is a technical artefact, and can only take the role of trustee in a trust relationship between human beings and technology (see, e.g., McKnight *et al,* 2011; Söllner *et al,* 2012; Söllner *et al,* 2013). We argue that such an approach, taking multiple trust relationships into account, should be used when studying trust in the context of IS use, since different trustees – resembling different targets of trust – are prevalent.

To build a network of trust in IS, we first need to identify the individual parties involved. Again, we want to emphasize that the network of trust is context dependent, and thus we tailor the network to the IS under investigation. We, for example, do not include Muir's party *society*, since the societal importance of the IS we study is not comparable to, for example, supervisory control systems for nuclear power plants.

The first two parties of the network of trust in IS are: the *user* (resembling *operator 1* of Muir's network) and the *system* itself. This is consistent with previous contributions that focus on, for example, user's trust in online recommendation agents (Wang & Benbasat, 2005; Komiak & Benbasat, 2006; Wang & Benbasat, 2007).

The *Internet* serves as an environment enabling the use of a plethora of IS. Consequently, users need to trust the Internet before using such systems. This argumentation is based on work by sociologists that have studied so-called institution-based trust of people in institutional structures, such as the legal or financial systems. They point out that people will be more likely to decide to interact in an environment they perceive to be trustworthy (see, e.g., Zucker, 1986). If they do not perceive the environment to be trustworthy, their perceptions regarding single actors in the environment are of minor importance. A comparable argumentation is used by McKnight *et al* (2002a, b) regarding the importance of institution-based trust in the Internet for successful e-commerce adoption. Focusing on initial trust in a web vendor, the authors show that institution-based trust in the Internet is especially important when deciding whether or not to interact with an unfamiliar web vendor. In such a case, users' initial perceptions of the web vendor will be based on their perceptions of the vendor's environment. Building on McKnight *et al*'s (2002a, b) results, Vance *et al* (2008) show that institution-based trust in the Internet influences users' trust in Amazon's mobile commerce portal. Since many IS – including the IS we use in our free simulation experiment – also use the Internet environment, for example, for identifying and communicating with other parties to effectively support their users, we include the Internet in the trust network for IS. The Internet is not part of Muir's original network of trust. An explanation might by that the supervisory control systems investigated by Muir did not rely on the Internet. This would not really be surprising, since the Internet was not popular and important enough when Muir wrote her paper that was published in 1994, since the Internet started to become mainstream with the emergence of the first web browsers in the beginning of the 1990s.

The fourth party of our network of trust is the *provider* of the IS. We know from e-commerce research that users' trust in, for example, a vendor's website, is not only determined by characteristics of this specific website, but is also dependent on the people or organization running

the website (Cyr *et al,* 2009). Marketing literature has shown that a relationship exists between customers' trust in a brand or company and their willingness to buy other products from the same brand or company (Chaudhuri & Holbrook, 2001). This suggests that the perceptions of the brand or company selling the product influence the perceptions about the product itself. Comparable results have been reported by Ba & Pavlou (2002) and Pavlou & Dimoka (2006). They purport that buyers on an online marketplace are willing to pay price premiums to sellers they trust. A related result has also been observed in the context of online social networks (Krasnova *et al,* 2010), where trust in the online social network provider showed a significant negative impact on users' perceived privacy risk. Qureshi *et al* (2009) show that trust is an important mediator of online customer repurchasing. Furthermore, Lowry *et al* (2008) report that branding is an important driver of trust in a website. These results imply that customers' trust in a brand or seller positively affects their trust in other products of the same brand or offered by the same seller. Since the effectiveness of the support that IS can offer to its users depends on the interaction with other suitable parties and data sources, the effectiveness of an IS is influenced by the people or organization responsible for it. The *provider* resembles Muir's parties *designers* and *management*. We merged both parties, since we consider the internal processes between different organizational units on the provider's side not to be relevant, since in our case, the users are not members of the same organization (compared to the operators of Muir's network). In our case, the users are comparable to customers who relate their experiences to the provider as a whole, and not towards single organizational units.

The fifth party of our network of trust is the *community of Internet users* (resembling *operator 2* of Muir's model, and the idea that the effectiveness of a system is influenced by other actors than just one user and the provider). Many IS – including the IS we use in our free simulation experiment – rely on third-party services or user-generated content to support their users. Providers offering complementary services and users providing user-generated content resemble other users acting in the Internet environment. Only if this community of Internet users offers valuable services or information, IS can provide effective support to their users. This is comparable to argumentations and results of contributions on online marketplaces (Pavlou & Gefen, 2004), and online social networks (Krasnova *et al,* 2010; Posey *et al,* 2010). Customers or members of an online social network need to trust the community of sellers of an online marketplace, such as eBay or a community of other members of an online social network, such as Facebook. Otherwise, they would not be willing to buy in online marketplaces or use online social networks, resulting in the disappearance of such institutions. The impact of user-generated content can also be illustrated by using the example of user recommendations on the Internet (Benlian *et al,* 2012). Many websites rely on, or enrich, their offers by using such user recommendations. IMDb, for example, is a widely known website relying on ratings of their users to build a ranking of movies. Recent surveys suggest that user-generated content is an effective means in situations where information such as personal experience is not available, since survey participants state that they have a high amount of trust in recommendations from other Internet users (Forrester Research, 2009; Nielsen, 2009). Consequently, the community of Internet users that potentially contributes to the IS is included in our network.

Altogether, five parties are involved in the network of trust: the *user*, the *IS itself*, the *Internet*, the *provider* and the *community of Internet users*. Figure 1 shows the complete network of trust, and the prevalent trust targets from a user's point of view. The point of view of a single user is important, since we will take this view for the remainder of the paper. This is important, since an IS needs to be adopted and used to provide its value (DeLone & McLean, 1992; Brenner *et al,* 2014). Thus, following approaches like TAM (Davis, 1989; Davis *et al,* 1989; Venkatesh & Bala, 2008), Trust-TAM (Gefen *et al,* 2003b) and UTAUT (Venkatesh *et al,* 2003), we focus on the user perceptions and their importance in the context of IS use. Thus, we focus on the four targets of trust prevalent from a user's point of view (the *IS itself,* the *Internet,* the *provider* and the *community of Internet users*) and the relationships among them, and among other constructs important in the context of IS use.

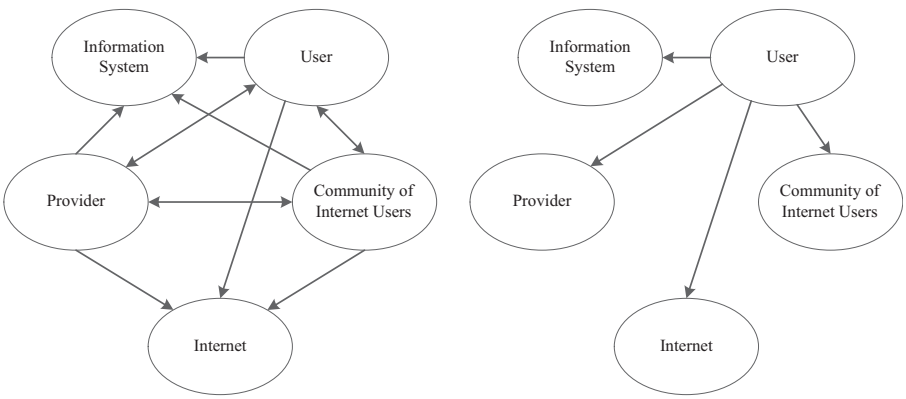

Figure 1 Complete network of trust (left) and prevalent trust targets from a user's point of view (right).

Hypotheses development

In order to answer our research questions regarding the impact of the single targets of trust on each other, and on dependent constructs known from technology acceptance research, we embed the four different targets of trust in Gefen *et al*'s (2003b) Trust-TAM that extends Davis *et al*'s (1989) TAM by adding trust as an additional construct. Trust-TAM was later adopted by Wang & Benbasat (2005) to study the importance of trust in the context of online recommendation agents. We use the Trust-TAM as a foundation for our research, but taking different targets of trust into account (see Table 1 for a comparison of our study and prior Trust-TAM studies).

Therefore, the relationships in our research model can be divided into two categories: the relationships known from previous Trust-TAM research and the new relationships we derived based on the different targets of trust. Since the Trust-TAM relationships are well established in the literature, our hypotheses focus on the new structural relationships (see Figure 2).

To develop our research model, we need to embed the targets of trust into the Trust-TAM. We start with the construct *trust in the Internet*. The essence of sociologists' argumentation on institution-based trust in general and McKnight *et al*'s (2002a, b) adaption to the Internet environment (see previous section) is that people will be more likely to trust other parties if they act in an environment they perceive as being trustworthy. We follow this argumentation, leading to three hypotheses, each reflecting the effect of trust in the Internet on one of the three other parties of the trust network:

H1: *The users' trust in the Internet will positively affect their trust in the community of Internet users.*

H2: *The users' trust in the Internet will positively affect their trust in an information system.*

H3: *The users' trust in the Internet will positively affect their trust in the provider.*

We continue with embedding the construct *trust in the community of Internet users*. As already argued in the previous section, many IS rely on services or content provided by members of the community of Internet users, such as recommendations (Benlian *et al,* 2012). We thus expect that users' trust in a specific IS will increase, along with their trust in the community of Internet users. As a result, we derive a further hypothesis:

H4: *The users' trust in the community of Internet users will positively affect their trust in an information system.*

Finally, we need to embed our construct *trust in the provider*. This construct has hardly been studied in IS research that focuses on the adoption of new IS (one of the few exceptions is the paper of Teo *et al,* 2008 addressing the relationship between trust in the government as a driver of trust in government websites). However, comparable constructs have been included in other trust studies where the relationships between trust in a brand or company and the brand loyalty – resembling the willingness to buy other products of the same brand or company – have been investigated (see previous section). Transferring this implication to IS use, users' trust in the provider should positively affect their trust in an IS of this provider. As a result, we derive another hypothesis:

H5: *The users' trust in the provider will positively affect their trust in an information system.*

We argued that trust in the provider should positively affect users' trust in a specific IS. Taking this a step further, we now argue that this is not the only construct affected by the users' trust in the provider. In addition to showing the effects of brand trust on loyalty and market share, the literature on brand trust also points out how brand trust forms. The perceived differences of one brand compared to those of other brands are a major driver of brand trust. These perceived differences cover key performance-related attributes such as quality and reliability (Chaudhuri & Holbrook, 2002).

Regarding IS use, this implies that the users' perception of a provider will impact the perception of key performance-related attributes of an IS provided by this provider. Two of these key performance-related attributes of technology acceptance are: perceived usefulness and perceived ease of use. Consequently, if users experience an IS they

Table 1 Differences and similarities between our study and selected previous Trust-TAM studies (based on Wang & Benbasat, 2005)

	Gefen et al (2003b)	*Wang & Benbasat (2005)*	*Our study*
Domain	E-shopping websites	Online recommendation agents	Information systems
Behavioural Intentions	Intentions to use a website and purchase on the website	Intentions to adopt agent to get shopping advice	Intention to use a system
PU and PEOU Targets	Website	Recommendation agent	Information system
Targets of Trust	E-vendor	Recommendation agent	Information system + *Provider* + *Internet* + *Community of Internet users*

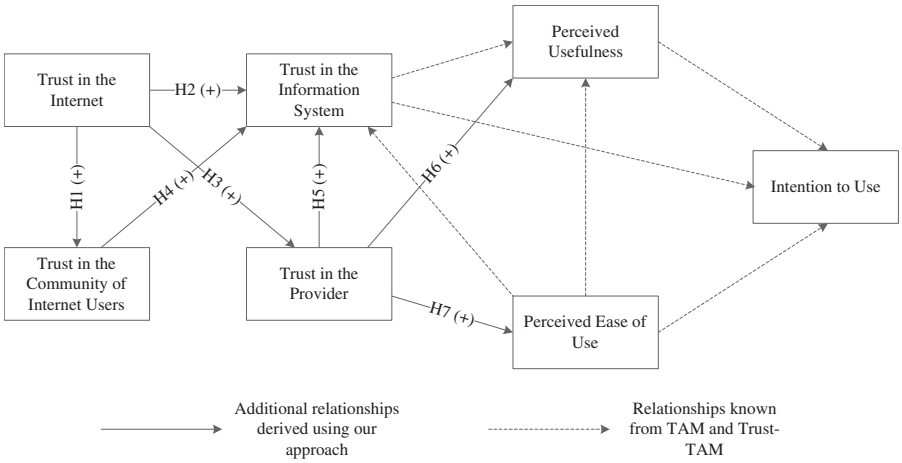

Figure 2 Research model of our study.

are using to have high perceived usefulness and perceived ease of use, they will expect future systems of the same provider to have comparable perceived usefulness and perceived ease of use. Regarding the trust in a new IS, this implies that the users' trust in the provider will positively affect their perceived usefulness and perceived ease of use. Based on this argumentation, we derive our last two hypotheses:

H6: *The users' trust in the provider will positively affect their perceived usefulness of an information system.*

H7: *The users' trust in the provider will positively affect their perceived ease of use of an information system.*

Research method

Free simulation experiment

To evaluate our research model, we used a free simulation experiment (moderated by the first author). Whereas standard laboratory experiments rely on a treatment to vary one or more independent variables, free simulation experiments (Fromkin & Streufert, 1976; Jenkins, 1985; Gefen, 2000; Gefen *et al,* 2003a; Vance *et al,* 2008) expose the participants to a number of realistic events – for example, by completing specific tasks – during a specified amount of time. One core feature of free simulation experiments is that the realistic events are designed by the experimenter, but due to the feature that the participants are free to behave in certain boundaries, they can create additional realistic events on their own (Fromkin & Streufert, 1976). This procedure ensures that (1) by completing the predefined tasks of the experimenter and (2) by naturally exploring a system in addition, the participants can form meaningful perceptions before answering related questions (Fromkin & Streufert, 1976; Gefen *et al,* 2003a). Furthermore, this type of experiment still allows us to control for several factors, such as ruling out effects caused by different mobile devices or familiarity with an existing system (which would be problematic for studying initial trust), which could not have been done in a field setting.

The experiment was divided into sessions of 25 students at most. Eight experimental sessions with 15–25 students were conducted. In total, 173 undergraduate students of Economics and Management at Kassel (average age of the participants was 23.75 years, 88 were females) participated in the experiment.

The participants used a prototype of an IS, called Meet-U, that was developed within a multi-disciplinary research project (see Online Appendix A for a more detailed description of Meet-U). This information was also given to the participants, and thus, in effect, we took on the role of the provider in our experiment. The aim of Meet-U is to support users in organizing and arranging meetings and events with their friends. Within the free simulation experiment, the students received a 15 min presentation on the idea of the application, how it worked, and how to interact with it. Afterwards, the students were asked to complete four predefined tasks that cover the core functionalities of Meet-U.

Task 1: They had to create a profile and enter all of the required information.

Task 2: They had to add three to four other students in their group as their friends.

Task 3: They had to create a private event entering all possible information and invite some of their friends.

Task 4: They had to participate (confirm their participation and navigate to the event, see Online Appendix A.3 for the GUI of the simulated indoor navigation) in one of three predefined public events that were recommended to them.

It took the participants about 25 min to complete all tasks. The following sections provide information regarding our data collection and analysis techniques, as well as measurement instruments.

Data collection and analysis techniques

After the participants completed their tasks, they were asked to fill out a questionnaire. All responses were

recorded on a bipolar 9-point Likert response format, with the endpoints labelled as 'extremely disagree' and 'extremely agree,' and the midpoint labelled as 'partly'. All 173 possible data sets were included in the analysis. We used the PLS approach (Chin, 1998) to analyse our data. This decision was based on the fact that the PLS algorithm is better suited to analyse models including formative constructs (Chin & Newsted, 1999; Gefen *et al,* 2011). We used SmartPLS 2.0 M3 (Ringle *et al,* 2005) and SPSS 20 as tools for our analysis. We relied on the guidance of Hair *et al* (2012, 2013) and Gefen *et al* (2011) to conduct our PLS analysis and to report the important results. We furthermore implemented several procedural remedies to avoid common method bias, and conducted statistical tests to assess whether common method bias was a problem in our study (Podsakoff *et al,* 2003; Sharma *et al,* 2009). On the basis of our analysis, we can conclude that common method bias is unlikely to be a serious issue in our study (see Online Appendix B for further details on how we addressed common method bias in our study).

Measurement instruments

To avoid measurement model mis-specification (Petter *et al,* 2007; Söllner & Leimeister, 2013), we use only indicators which fulfilled Jarvis *et al*'s (2003) four guidelines for correct formative and reflective indicators. This led to the use of formative measurement models for operationalizing our four constructs resembling the different targets of trust. For measuring the constructs' perceived usefulness, perceived ease of use and intention to use, we followed a reflective measurement approach (see Online Appendix C for further details on the indicators used in our study).

Results

Measurement models

Because of the fact that we used reflective and formative measurement models, and that both needed to be evaluated using different quality criteria (Chin, 1998), we separately assessed the quality of the reflective and formative measurement models. Beginning with the evaluation of the reflective measurement models, the loading of each indicator is higher than 0.8 (should be above 0.707), and every indicator has the highest loading on its desired construct. Additionally, the composite reliability for all constructs is higher than 0.89 (should be above 0.707). Since the AVE for all constructs is higher than 0.7 (should be above 0.5), and the square root of the AVE is higher than any correlation with another construct, the reflective measurement models fulfil the desired quality criteria (Chin, 1998, see Online Appendices D.1 and D.2 for further details on the quality criteria for reflective measurement models).

The evaluation of the formative measurement models shows that the guidelines of Cenfetelli & Bassellier (2009) are fulfilled (see Online Appendix D.3 for further details on the evaluation of the formative measurement models). Only the indicator *comm_ability* is problematic since it shows: (1) a negative, (2) non-significant weight and (3) a low loading. However, we followed the recommendation of Cenfetelli & Bassellier (2009) to not drop this indicator because its inclusion is well-grounded in trust theory (see, e.g., Mayer *et al,* 1995; McKnight *et al,* 2002b). However, if subsequent studies observe similar issues with this indicator, the theoretical foundation should be questioned.

In summary, the evaluation of our reflective and formative measurement models shows that they fulfil the desired quality criteria. Thus, we can now confidently move on to the evaluation of the structural model.

Structural model

Regarding the evaluation of the structural model, we follow the guidelines of Hair *et al* (2013). Since the highest VIF value (1.918) is below the limit of 3.33 (Diamantopoulos & Siguaw, 2006), multicollinearity among the predictors of the endogenous constructs is not an issue in this study (see Online Appendix D.4 for further details on the multicollinearity among the predictors of endogenous constructs).

Figure 3 summarizes the results of the structural model relationships, the R^2 of the endogenous constructs, and the Q^2 of the reflectively measured endogenous constructs.

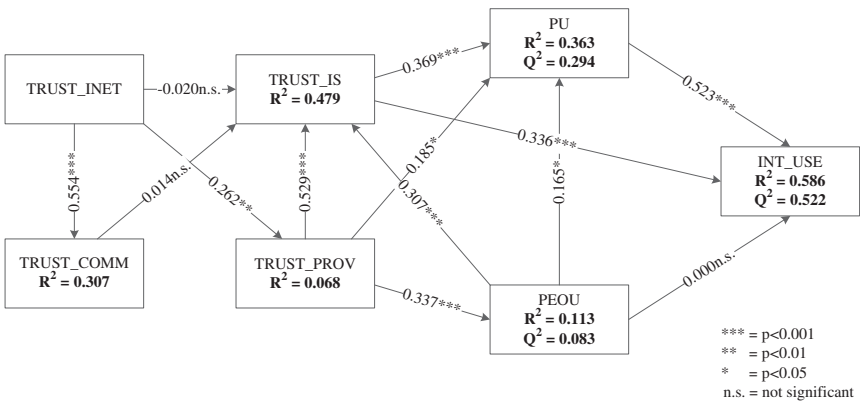

Figure 3 Evaluated research model.

Table 2 Total effects for the structural model

Relationship	*Direct effect*	*Indirect effect*	*Total effect*	*t-value*
Impact of trust constructs on other trust constructs				
TRUST_INET→TRUST_IS	–0.020	0.173	0.153n.s.	1.778
TRUST_INET→TRUST_PROV	0.262		0.262***	3.313
TRUST_INET→TRUST_COMM	0.554		0.554***	8.798
TRUST_COMM→TRUST_IS	0.014		0.014n.s.	0.195
TRUST_PROV→TRUST_IS	0.529	0.103	0.632***	11.685
Impact of trust constructs on PEOU, PU and INT_USE				
TRUST_INET→PU		0.120	0.120*	2.333
TRUST_INET→PEOU		0.088	0.088*	2.504
TRUST_INET→INT_USE		0.114	0.114*	2.086
TRUST_COMM→PU		0.005	0.005n.s.	0.181
TRUST_COMM→INT_USE		0.007	0.007n.s.	0.191
TRUST_IS→PU	0.369		0.369***	4.019
TRUST_IS→INT_USE	0.336	0.193	0.529***	7.228
TRUST_PROV→PU	0.185	0.289	0.474***	7.032
TRUST_PROV→PEOU	0.337		0.337***	4.222
TRUST_PROV→INT_USE		0.460	0.460***	9.299

*: $P<0.05$; **: $P<0.01$; ***: $P<0.001$; n.s.: not significant

Regarding the structural relationships known from prior Trust-TAM research, we observed results comparable to other Trust-TAM studies. The relationship between *perceived ease of use (PEOU)* and *intention to use (INT_USE)*, for example, was also found not to be significant in Wang & Benbasat's (2005) study.

Furthermore, we found support for five of our seven hypotheses. We did not find a significant relationship (–0.020, n.s.) between *trust in the Internet (TRUST_INET)* and *trust in the IS (TRUST_IS)* and between *trust in the community of Internet users (TRUST_COMM)* and *trust in the IS* (0.014, n.s.). Thus, H2 and H4 are not supported by our data.

Because of the fact that significance alone is not an indicator of importance (Ringle *et al*, 2012), we next assess the effect size f^2 of each relationship. Using this measure, we can grasp the impact of omitting one predicator of an endogenous construct in terms of the change in the R^2 value of the construct. In addition, Hair *et al* (2013) recommend assessing the q^2 effect size of each relationship to compare the predictive relevance of the single relationships. Values of 0.02, 0.15 and 0.35 resemble a small, medium or large f^2 or q^2 effect size, respectively. The results show that we found at least small f^2 effects for all significant relationships (see Online Appendix D.5 for further details on the f^2 and q^2 effect sizes). The largest effects (all large) were observed for the relationships between *perceived usefulness (PU)* and *intention to use (f^2 effect size = 0.433), trust in the Internet* and *trust in the community of Internet users (0.444)* and *trust in the provider (TRUST_PROV)* and *trust in the IS (0.444)*, as well as (all medium effects) *trust in the IS* and *intention to use (0.162)*, and *perceived ease of use* and *trust in the IS (0.157)*.

The path coefficients' significances, as well as the f^2 and q^2 effect sizes, focus on the direct effects between two constructs. For answering our research question on the impact of the different targets of trust on each other, and on *perceived ease of use, perceived usefulness* and *intention to use,* we also need to take the indirect effects into account. Considering our construct *trust in the provider*, for example, this construct has significant direct effects on all three predictors of *intention to use*, but is not theorized to have a direct effect on *intention to use* (in fact, the saturated model in Online Appendix D.6 shows that there is also no empirical support for this relationship). However, it would be wrong to conclude that *trust in the provider* has no effect on *intention to use* without investigating the indirect effects via the three predictors of *intention to use*. Table 2 summarizes the results regarding the total effects (direct+indirect effects).

The results presented in Table 2 provide insights into the accumulated impact of the different targets of trust on each other, as well as on *perceived ease of use, perceived usefulness* and *intention to use*. Regarding the impact of the different targets of trust, we observe no significant difference when taking indirect effects into account compared to solely focusing on direct effects. However, regarding the impact of the different targets on the other constructs, taking the indirect effects into account enriches the analysis of the direct effects. We observe significant total effects ($P<0.05$) between *trust in the Internet* and *perceived ease of use, perceived usefulness* as well as *intention to use*. Furthermore, we observe a highly significant total effect ($P<0.001$) between *trust in the provider* and *intention to use*.

Discussion

Theoretical implications

To design IS in such a way that they are more readily accepted by potential users, we need to understand why users decide to use such systems or refuse to do so. Trust has been shown to be a major factor in technology acceptance research, and recent trends seem to make trust even more important, calling for an approach taking multiple targets of trust into account. As a result, the goal of this paper was to answer two research questions: (1) What impact does a single target of trust have on other targets? (2) What impact does a single target of trust have on dependent constructs known from technology acceptance research?

As a foundation for our work, we introduced Muir's (1994) approach of building a network of trust to IS research and applied it to identify four targets of trust a user considers when deciding whether or not to use an IS: *the IS itself, the provider of the IS, the community of Internet users* and the *Internet*. We also highlighted that the network of trust might vary across different situations, since trust is a situational construct. However, these four targets are likely to hold for a large number of different IS, since many current IS rely on content generated by other Internet users, and the Internet environment.

Considering our research question on the impact of a single target of trust on other targets, we found, for example, that *trust in the Internet* has a positive impact on *trust in the provider*, and *trust in the provider* has a strong positive impact on *trust in the IS*. Thus, we found evidence that the different targets of trust are important for understanding why users trust a particular IS or not.

However, we could not find support for two of our hypotheses related to relationships between the different targets of trust. Regarding H2, we did not observe a relationship between users' *trust in the Internet* and their *trust in the IS* in our data. This observation is interesting, since the other two related hypotheses (regarding a positive impact of *trust in the Internet* on *trust in the community of Internet users* (H1), as well as on *trust in the provider* (H3)) were supported by our data. We believe that a reasonable explanation for this observation is that the statement that people tend to trust other actors of a trusted environment more readily than actors of a non-trusted environment only holds true for human actors of a trusted environment but not for technology available in the environment.

In fact, the original literature on institution-based trust (see, e.g., Lewis & Weigert, 1985; Zucker, 1986) addresses only trust relationships between people, groups of people or organizations, and was adapted by McKnight *et al* (2002a, b) for studying comparable IT-mediated trust relationships. If we analyse the trust relationships underlying the hypotheses, we can see that the two supported hypotheses address trust relationships between people or groups of people that are mediated by IT, whereas the hypothesis that is not supported relates to a trust relationship between a user and technology. Thus, it seems that an adoption of this theoretical foundation for trust relationships between users and technology is not suitable. This observation supports argumentations by, for example, Gefen *et al* (2008), McKnight *et al* (2011) and Söllner *et al* (2012), questioning the suitability of relying on theoretical insights on trust relationships between people, groups of people or organizations when studying trust relationships between users and technology. Assuming that the current trend towards increasingly automated and ubiquitous IS will continue (Lee & See, 2004; Vodanovich *et al*, 2010), it is important to determine the degree to which existing insights on interpersonal trust can be adopted for studying trust relationships between users and technology. This analysis will allow us to identify areas calling for additional theoretical insights.

The observation that our data do not support H4, proposing a positive impact of users' *trust in the community of Internet users* and their *trust in an IS*, is surprising, since recent surveys show that people value anonymous user ratings on the Internet (Forrester Research, 2009; Nielsen, 2009). Our explanation for this observation is that relying on ratings or information provided by other users has become normality for most Internet users, and thus does not play an important role when deciding whether or not to use a specific application. This explanation can be seen with regard to Gefen's (2000) description of the interplay of familiarity and trust. Both are mechanisms to reduce social or technical complexity – meaning, if familiarity or trust are in place, we are able to suppress all possible unfavourable behaviours other people show – thus allowing us to depend on other people in uncertain situations (Luhmann, 1979; Gefen, 2000). In our case, we would argue that users are familiar enough with relying on ratings or information from other Internet users when making decisions regarding, for example, which film to watch or restaurant to visit, causing familiarity alone to reduce enough of the existing complexity, and thus making trust a minor factor in this particular context.

Regarding our research question on the impact of a single target of trust on dependent constructs known from technology acceptance research, we found that three targets of trust have a significant impact on different TAM constructs: *trust in the IS, trust in the Internet* and *trust in the provider*. Regarding the impact of *trust in the IS*, we confirm the results of prior research that this construct is important in the context of IS use. Trust in the IS has high and significant direct as well as total effects, and small to medium f^2 and q^2 effects on both, *perceived usefulness* and *intention to use*. Consequently, according to our results, *trust in the IS* is a major driver of IS use.

The importance of the second target, *trust in the Internet*, was not expected initially, since this kind of institution-based trust is usually supposed to influence trust in single actors in an environment. However, our analysis of the total effects on *perceived usefulness, perceived ease of use* and *intention to use* shows that *trust in the Internet* indirectly influences these constructs through the other targets of trust. This observation highlights that the users' trust in the environment – in the case of the Internet even after

more than a decade – still has an impact on their decision on whether to use an IS or not. An explanation for this importance might be the complexity of the Internet and the interconnectivity of the different IS relying on the Internet. This also leads to questions regarding access rights to user data, such as credit card information and location data. Because of the fact that this complexity can hardly be removed in the near future, it is likely that trust in the Internet will continue to play an important role.

Our observations regarding the third target, *trust in the provider*, further confirms our argumentation that multiple targets of trust need to be considered in the context of IS use. We observed that *trust in the provider* has a significant direct and small f^2 and q^2 effects on both *perceived usefulness* and *perceived ease of use*. When only considering these values, we conclude that *trust in the IS* clearly outweighs *trust in the provider* in terms of importance in the context of IS use, since it has higher direct effects on both *perceived usefulness* and *intention to use*. However, when taking the indirect effects into account, the picture changes: *Trust in the provider* has high and highly significant total effects on all three original TAM constructs (see Online Appendix D.7 for further details on the comparison of the effects of trust in the IS and trust in the provider). Consequently, both targets of trust are major drivers of IS use. These observations highlight the importance of assessing different targets of trust to correctly understand not only how trust in a particular IS is built, but also why, or why not, users decide to use it. Therefore, we enrich the existing results by showing that users' *trust in the provider* plays an equally important role like trust in the information system in terms of impact on core TAM constructs such as *perceived usefulness* and *intention to use*. Comparable to research on e-marketplace, users need trust in both parties, the system itself and the provider, as the buyers on the marketplace need trust, both the actual seller and the intermediary hosting the marketplace (Pavlou & Gefen, 2004). Consequently, future research should focus on how trust in this target can be built to further strengthen our insights on IS use.

This study contributes to IS research on trust by showing that different targets of trust exist and have distinct impacts in the context of IS use. Consequently, we recommend to other researchers interested in trust in general to identify the different targets of trust relevant in their field, and to assess their impact. We furthermore contribute to IS research on trust by introducing Muir's (1994) approach of developing a network of trust, and by applying it for developing a network of trust in IS, and, respectively, four targets of trust from a user's point of view. Since the network of trust might change across different contexts, we recommend interested researchers to follow this logic when aiming to assess the importance of different targets of trust in their field of interest. The targets found most important should afterwards be studied simultaneously to ensure the interplay of these targets of trust, and their distinct impact on important dependent variables is understood in greater detail. Our study further contributes to IS research on trust by showing that especially *trust in the IS* and *trust in the provider* should be studied simultaneously to overcome shortcomings in the current knowledge base. Future research should further explore the distinct impact of *trust in the IS* and *trust in the provider* on important dependent variables in the context of IS use. A user's *trust in the IS* could, for example, play a vital part when deciding to *use or continue using a specific IS*, where his or her *trust in the provider* of the IS could be more important when deciding whether to *buy or adopt a new IS from the same provider or from a competitor*. Consequently, both targets would be of major importance for the long-term economic success of an IS provider. Furthermore, it should be analysed what effect the numerous antecedents of trust found in the literature (see, e.g., Söllner & Leimeister, 2013) have on the different targets of trust, to foster our understanding on how *trust in the IS, trust in the provider* or other targets of trust can be built. Our study further contributes to IS research in general by recommending that in the case of studying relational constructs such as trust, researchers should aim at identifying and considering all relevant relationships. We were able to show the value of this approach in the context of trust, but in related disciplines, this approach has also been valuable for studying constructs such as justice (Liao & Rupp, 2005).

Practical implications

Providers should focus on building two different types of trust when aiming to develop systems that are more readily used by their intended users: *trust in the system* and *trust in the provider*. Regarding *trust in the system*, prior research has generated numerous insights on how to increase the users' trust in an IS (see, e.g., Wang & Benbasat, 2005; Komiak & Benbasat, 2006; Wang & Benbasat, 2007; Wang & Benbasat, 2009). Since we used a formative measurement model of *trust in the provider*, we can zoom into the formation of this construct (Söllner *et al,* 2012) and give some initial advice to practitioners. Our results show that the provider's *ability, benevolence* and *integrity* do all have a significant impact on *trust in the provider*, with *benevolence* having the highest impact, followed by *integrity* and *ability*. Consequently, we recommend taking measures related to these three characteristics that would signal that users can trust them, thus increasing the chance that their systems will be used by the intended users. Examples could be the presentation of references of successful prior systems (related to *ability*), communicating statements on how user data are managed and indicating how they will be protected (related to *benevolence*) as well as showing the provider is really behaving in line with these statements (related to *integrity*).

However, the question of what information should exactly be provided cannot be answered thoroughly as yet. Future research should investigate how trust in the provider can be built in order to better understand this phenomenon and provide valuable information to practitioners, allowing them to systematically show potential users of their IS how trustworthy they are, thus increasing the chance of their IS being used.

Limitations

This study is not without limitations, which also provide opportunities for future research. First of all, this study is one among only a few to use a formative measurement approach for the different kinds of trust. There have been other studies following a formative measurement approach (see, e.g., Lowry *et al,* 2008 and Vance *et al,* 2008). However, since these papers were published before the most recent guidelines for evaluating formative measurement models (Cenfetelli & Bassellier, 2009), they did not report the quality criteria necessary for a comparison. Consequently, we cannot compare our quality criteria, such as indicator weights and VIF, to their results. However, we used the suggested quality criteria to evaluate our formative measurement models. Future research should try to evaluate the construct portability of our formatively measured constructs to further assess their validity and reliability (Cenfetelli & Bassellier, 2009; Ringle *et al,* 2012).

Furthermore, we did not study any interaction effects of constructs such as perceived effectiveness of institutional structures (Gefen & Pavlou, 2012) or Internet users' information privacy concerns (Malhotra *et al,* 2004). These and comparable constructs could influence the relationship between two variables, such as our constructs *trust in the Internet* and *trust in the IS* or *trust in the provider* and *trust in the IS*. Thus future research should investigate the existence of such interaction effects and their impact.

In addition, to the best of our knowledge, this is the first study systematically identifying different targets of trust in technology adoption. We used a network of trust to identify the different targets of trust used in our study. Despite believing that a network of trust is, in general, a helpful tool to identify the prevalent trust targets in a specific situation, our network cannot be generalized to all kinds of IS due to the context-sensitivity of trust (Abdul-Rahman & Hailes, 2000). For ERP systems within companies, and inter-organizational systems exchanging data between organizations, for example, trust in the community of Internet users or even trust in the Internet might be negligible. Similarly, it might be that a specific target important for another research area is missing in our trust network. Consequently, the trust network needs to be adapted to the specific context under investigation in order to ensure that all relevant trust targets have been considered.

Furthermore, we mentioned at the beginning that our study focuses on initial trust in the context of IS use. However, trust is a dynamic construct (Lewicki & Bunker, 1996; Kim *et al,* 2004), and technology acceptance is a dynamic process since successful adoption does not end with the initial adoption but the acceptance of a system in terms of continuous use. Consequently, future research should address the importance of trust in later phases of the IS use process, for example, investigating the importance of trust for continuous IT use (Limayem *et al,* 2007; Ortiz de Guinea & Markus, 2009; Benlian *et al,* 2011).

In addition, there are some limitations related to the participants that took part in our free simulation experiment. The generalizability of results obtained using undergraduate students as subjects is often questioned, since students might make different decision compared to work professional, for example, due to limited financial means. Gordon *et al* (1986) argue, however, that the results will hold across a more general population, based on the extent to which undergraduate business students are typical users of the studied applications. Since our participants are comparable to the targeted user group of the application used in our study and comparable applications in general, we argue that our participants are a reasonable reflection of the population. Furthermore, since we used the PLS approach, our factor weights could be slightly inflated (Cenfetelli & Bassellier, 2009). However, future research should address these limitations to further assess the generalizability of our results across different cultures and groups of users.

Last, some limitations arise based on our choice of evaluation method. In addition to the advantages of free simulation experiment – for example, the ability to use a laboratory setting to control for external factors, such as different usage behaviours or different mobile devices – this choice could threaten the external validity of the study. Specifically, we used one particular mobile, context-adaptive application and one usage setting – our predefined tasks – to collect our data. After reviewing other papers, we observed that such an approach is common practice. Nevertheless, it remains to be confirmed that the results hold across different kinds of technology, different laboratory settings, as well as other types of studies (e.g., field studies).

Conclusion

The aim of this study was to assess the importance of different targets of trust in the context of IS use. We first built a network of trust in IS indicating that four different targets of trust are prevalent from a users' point of view when deciding whether or not to use a new IS: *trust in the IS, trust in the provider, trust in the Internet* and *trust in the community of Internet users*. On the basis of these four targets, we derived four distinct trust constructs and developed a research model in order to evaluate their impact on each other and on constructs such as perceived usefulness, perceived ease of use and intention to use. Afterwards, we used a free simulation experiment to evaluate our hypotheses. The results indicate that multiple targets of trust are important when researching IS use.

The results have several theoretical and practical implications. Our contributes to IS research on trust by providing empirical support for the decision of previous research to focus on understanding the impact and formation of the user's *trust in the IS*, since it is a major driver of IS use. In addition, according to our results, a second target of trust, the provider, is of comparable importance. This should motivate future research aiming to understand the formation of the user's *trust in the provider*. In addition, our results show a significant indirect effect of *trust in the Internet* on *perceived usefulness, perceived ease of use* as well as *intention to use*. As a result, our study contributes to IS

research on trust by showing that taking different targets of trust into account provides more detailed insights into the nature and formation of trust in a particular context. These observations could serve as motivation for IS trust researchers to evaluate the suitability of following a similar approach in related fields of interest, for example, open source communities (Benlian, 2011). Since following such an approach could be fruitful for every relational construct, it could also serve as motivation for IS researchers interested in other relational constructs to evaluate whether following an approach taking different targets into account would enrich their research.

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