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Trusting me, Trusting you – Trusting Technology? A Multidisciplinary Analysis to Uncover the Status Quo of Research on Trust in Technology

Bettina Distel, Katherine M. Engelke, Sydney Querfurth

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1   Introduction

The past years have seen rapid ubiquitous societal changes, many of which have been and are driven by (digital) technologies. Early on, researchers pointed to substantial risks that are associated with modernity in general (e.g. Rotter, 1971). Technologies in particular are very complex and many users perceive them as a kind of black box about which they understand only little (e.g. Söllner et al., 2016b). Thus, dealing with technology means dealing with risks (e.g. McKnight et al., 2011). To handle risks associated with modernity, Luhmann (1979) proposes trust as a central mechanism. In his conceptualisation, trust is functional in that it reduces social complexity and makes individuals capable of acting. With the proliferation of technologies and fundamental changes associated with this, researchers started to study technology-induced changes in interpersonal trust relationships (e.g. Corritore et al., 2003; Jarvenpaa et al., 2017). The rapid technological changes witnessed in the past few years have laid the path for a new line of research that deals with trust between a human entity and technology itself (Gulati et al., 2017). While previous research mostly dealt with the question of how the trust relationship between two human entities changes through the use of technology (trust mediated through technology), this more recent field of inquiry deals with the trust relationship between a human and technology itself (trust in technology) (including, for example, the authors' own work dealing with trust in technology to a greater or lesser extent in their individual disciplines: Distel, 2018, Engelke, 2018; Querfurth-Böhnlein, 2018). Current debates revolve in particular around the question of whether the concept of interpersonal trust can be applied to a human-computer relationship. Some researchers, especially in the early debates, have argued that interpersonal trust concepts may not be applied to human-computer interactions, as technologies are not able to act on moral grounds (e.g. Friedman et al., 2000). However, empirical works show that humans treat technologies like real persons and as such also express trust towards these technologies (Reeves and Nass, 1996). Works in this line of research mostly deal with the perceived reliability of Information Technology (IT) and Information Systems (IS), and factors of perceived trustworthiness of these systems, especially in terms of IS design (Söllner et al., 2016a).

Due to this expansion of research on trust in the context of technologies, we find it worthwhile to pause and structure the knowledge that has been accumulated so far. The purpose of this article is to uncover the status quo of research on trust and distrust in technology. Therefore, this article a) provides a comprehensive description of current research on trust in the context of technologies using a text modelling analysis (study 1) and b) filters out and analyses publications uncovered in study 1 that deal with trust in technology (study 2). Thus, while in the first study, research both on trust mediated through technology and trust in technology is considered, the second study focuses only on trust in technology. We deliberately apply a multidisciplinary perspective in order to better capture the entire range of research.

The two-step procedure was chosen for several reasons. First, while research on trust has been reviewed before (e.g. Fulmer and Gelfand, 2012; McEvily and Tortoriello, 2011), a comprehensive review of research on trust in the context of technologies is so far missing. This article's division into two studies was undertaken to contrast research on trust in technologies (study 2) with research on trust in the context of technologies (study 1), thereby better illustrating the specific characteristics of the former. Only a comparative view of the more general and the more specific strands of trust research can provide interesting perspectives for future research. Finally, methodological considerations moved us to conduct a preparatory study (study 1 on trust and

technologies) before undertaking an in-depth analysis (study 2 on trust in technologies): Research on trust in technology exists in many different disciplines and refers to a wide variety of trust objects (e.g. specific websites, avatars etc.). In order to do the diversity and multidisciplinary nature of this research justice, we decided against the manual identification of contributions, for example by combing specific journals using a predefined set of search terms, and instead opted for an automated analysis that captures most of the existing research and enables us to provide an overview of about 20,000 publications that deal with trust in the context of technologies. While this approach involves a substantial reduction of the sample from study 1 to study 2, it allows the inclusion of, for example, both major and minor journals as well as of both larger and smaller conferences from a multitude of disciplines, thus widening the overall scope of the in-depth analysis.

2 Research Background

2.1 Defining Trust: What Exactly Are We Talking About?

Trust research is an inherently multidisciplinary research field (Li, 2007). Especially research on trust in the context of technologies is multidisciplinary in nature as it combines insights from different disciplines. Differentiating trust from other concepts raises the question of what trust actually is. Following an overview article by Schoorman et al. (2015), the meanings and implications of trust vary across disciplines and research contexts. Despite the continuing differences, a broad consensus has emerged in the socio-psychological perspective on trust: trust occurs in relationships when a subject (the one who trusts, i.e. the trustor) is willing to interact with another entity (the one who is trusted, i.e. the trustee) based on positive expectations, all the while being unable to control the actions of this other party and thus, making itself vulnerable to these actions and their respective outcomes (Mayer et al., 1995; Rousseau et al., 1998). This conceptualisation of trust shows that it is of major importance to specify the object of trust and the situation in which trust could occur.

2.2 Trust Relationships: Who Trusts Whom?

Trust has been examined in the context of interpersonal relations, e.g. trust between individuals or groups of individuals, or in the context of organisations, e.g. trust in or between organisations (e.g. Currall and Inkpen, 2006; Fulmer and Gelfand, 2012; see McEvily and Tortoriello, 2011 for a review). When discussing trust that is mediated through a technology, the trustor and the trustee are both human entities, groups of human entities or organisations whose interactions are mediated through a technology, such as e-mails, instant messengers or social media (Öksüz et al., 2016). Recently, researchers have started to investigate the applicability of interpersonal trust concepts to the relationship between individuals and technologies. In this context, Söllner et al. (2016b) propose to distinguish four different objects of an individual's trust. In their conceptualisation, a technology user can a) trust other users, mediated through technologies such as e-mail, b) can trust the provider of a service, c) can trust the technology underlying interactions, i.e. the Internet, and finally d) can trust the information system used for an interaction. In this article, only the two latter forms of trust (c and d) are considered to be trust in a technology, whereas the first two forms (a and b) of trust are considered to be trust mediated through a technology. Although technologies become more and more human-like, for example through the use of avatars, the question arises as to what extent theories of interpersonal trust are applicable to the relationship between a human trustor and an artificial trustee (relationship c and d, according to Söllner et al. (2016b)).

Many studies in the first two areas (trust mediated through technologies) are concerned with changes in the trust relationship that are due to the increased use of technologies. Trust mediated through technologies has been an object of research in many disciplines. This field examines, for example, how trust in a team changes through the use of communication technologies such as e-mail or instant messengers (Jarvenpaa and Leidner, 1999). This research focuses not only on changes in existing trust relationships, but also on the question of how interpersonal trust can develop at all if the relationship is mediated entirely by technology, as is the case in social networks for example (e.g. Canfora and Visaggio, 2012; Lankton and McKnight, 2011). Also,

technology-induced changes in the relationship of trust between individuals and companies (e.g. Cyr, 2013; Wang and Benbasat, 2008; Wang and Emurian, 2005) are examined. All these research directions have in common that they investigate trust between two entities and conceptualise the technology as a mediator that can strengthen and weaken trust between these parties, and that can even make the formation of trust possible or prevent it.

Only recently has the notion emerged that individuals, groups or organisations can trust technologies (Gulati et al., 2017; McKnight et al., 2011), for example when citizens trust e-government (Horsburgh et al., 2011; Horst et al., 2007) or when customers trust online banking (Benamati and Serva, 2007). With the rise of more human-like and automated systems and the increased prevalence of artificial intelligence, researchers have raised the question as to whether and to what extent the concept of trust may be applied to the interaction of humans and technologies (e.g. Gulati et al., 2017). In this line of research, technology is no longer understood only as a mediator of the relationship between persons or organisations, but itself becomes a part of the trust relationship. When discussing trust in technology, the trustor is still human or an organisation, but the object of trust, i.e. the trustee, is a technological artefact such as a website. Lankton and McKnight (2011, p. 49), for example, study users' trust in Facebook and come to the conclusion that users '[…] trust the website as both a technology and a quasi-person.' Others, for example, have studied trust in cloud computing (e.g. Liang et al., 2017), trust in automated vehicles (e.g. Broström et al., 2019), and trust and distrust in online banking (e.g. Benamati and Serva, 2007). Lately, trust has been studied from a neurobiological perspective and researchers show, for example, that Parkinson patients trust avatars (artificial representations of humans) more than actual humans (Javor et al., 2016).

2.3   Trust and Distrust: Linked Concepts

In the same way that trust is understood as a willingness to interact with others, distrust can be understood as an unwillingness to interact with another entity based on negative expectations the subject has regarding the object's behaviour while being unable to control or actually predict the actions of this other party (Lewicki et al., 1998; McKnight and Chervany, 2001a; Schoorman et al., 2015). While there are different understandings on how trust and distrust relate to each other (see Engelke et al., 2019 for a brief overview; and Guo et al., 2017 for an in-depth analysis), it is commonly assumed that trust and distrust are linked to each other. Capturing research on trust in the context of technology would therefore be incomplete without also including distrust in the context of technologies.

Specifically, three different understandings have emerged on the relationship of trust and distrust. These perspectives have been summarised by Guo et al. (2017) and are briefly discussed here. The most common conceptualisation understands trust and distrust as opposite ends on the same continuum; distrust is the opposite of trust and equals low degrees of trust (Guo et al., 2017). The second understanding of the trust-distrust relationship varies from the first in that it assumes a neutral state located between trust and distrust. This neutral state implies that low trust cannot necessarily be equated to high distrust and vice versa. Rather, trust occurs when the trustor believes that the trustee will act in a way that benefits the trustor, whereas distrust occurs when the trustor believes that the trustee will act in a way that harms the trustor (Guo et al., 2017). The third conceptualisation considers trust and distrust to be separate concepts, which implies that trust and distrust have different antecedents. Here, trust and distrust are positioned on separate

continuums, ranging from low to high trust and low distrust to high distrust. Both dimensions are, however, linked (Lewicki et al., 2006).

The relationship between trust and distrust is as much contested as the definition of trust and, thus, we are interested not only in research on trust but also on distrust. This seems especially relevant in light of current wide-spread scepticism towards technologies such as automated driving or Facebook's news feed algorithms. Therefore, this article does not study the relationship between the two concepts itself but is rather conceived as an in-depth description of research on trust in the context of technologies, which is understood to include research on distrust as well.

2.4   Focus of the Two Studies

Against the background of the changes in trust relationships that occurred through the proliferation of more and more human-like technologies, our two studies have different foci but are nevertheless connected: While our first study deals with research on trust and technologies – encompassing both trust in and trust through technologies – our second study deals specifically and solely with trust in technologies. In doing so, we provide a comprehensive overview of current trust research and link both lines of research. The first study serves as a solid basis for drawing a meaningful sample of publications concerned with trust in technologies for the second study. By not specifying technologies or disciplines within the database search (study 1), the results of study 2 are not limited to specific technologies or to specific disciplines.

3 Study 1: Uncovering the Status Quo with a Topic Modelling Approach

3.1 Method of Study 1

For study 1, we put forward RQ 1: How do research interests on trust in the context of technologies evolve over time and which specific topics are covered within this research domain?

In order to receive the most comprehensive overview of how trust in the context of technologies is researched across disciplines, we conducted a database search in the multidisciplinary database SCOPUS with as few restrictions as possible. We only confined our search to English language scientific publications, specifically the following document types: articles (published and in press), conference articles, book chapters, and books. We refer to all document types summarily as 'publications'. Using the following search string, the search was conducted in August 2017 on title, abstract, and keywords, as we would expect the topic (trust and technology) to be sufficiently mentioned in these parts: (("trust" OR "distrust" OR "mistrust") AND ("technolog*" OR "digit*" OR "internet" OR "online")). Mistrust was included in the search string as it is sometimes used as a synonym to distrust (McKnight and Chervany, 2001a). Trust is studied under a multitude of labels such as credibility (see Engelke et al., 2019; Kohring and Matthes, 2007), predictability or confidence (see Mayer et al., 1995; Schoorman et al., 2015). We decided not to include any such further search terms beyond trust (and distrust/mistrust) in our search string in order to avoid artificial inflation of the data set, the reason being that these terms are mostly conceptualised as antecedents to trustworthiness or are neighbouring concepts but not equivalents to trust (Engelke et al., 2019; Schoorman et al., 2015).

The search yielded 22,887 publications. After deleting all records that featured neither an abstract nor a title, 22,481 publications remained in the data set. In order to gain insights into this amount of data, we used the free text mining-tool minemytext.com to analyse the titles and abstracts of all identified publications. This tool was developed by a group of IS researchers and has proven useful for analysing large amounts of text in a convenient yet scientific manner (e.g. Dreesen and Diegmann, 2017; Matthies, 2017; Ogonek, 2017). The tool uses the latent Dirichlet allocation (LDA) algorithm for topic modelling. This algorithm is able to detect topics within a set of documents based on the probabilities of words or of sets of words co-occurring in the documents (Müller et al., 2016). This method was chosen in a first step to define the topics within a broad range of publications. An automated approach like this far exceeds the possibilities of manual analyses, since it enables a quick and efficient identification of topics in big data sets such as ours (Müller et al., 2016). The method is therefore particularly suitable for exploratory endeavours (Maier et al., 2018). Moreover, we are also able to uncover gaps in research, and to determine how research in this field has changed over time.

The used tool required some settings prior to running the analysis. To identify custom stop-words, i.e. a word that is not part of the topic modelling, word frequency lists were analysed (e.g. Debortoli et al., 2016). 'Trust' was defined as a stop word, as it appears, on average, two times in every publication's abstract and/or title (>40,000 mentions in total) and it can be assumed that it will not provide additional information on which topics are researched. All other words were used far less often, with the second most often used word being 'use'. With regard to n-grams, the

recommendations of Debortoli et al. (2016) were followed, and n-grams of n=3 were identified. This allowed us to group together phrases such as 'social networking sites' or 'technology adoption'. Further, the tool lemmatised words and reduced them to their stem.

The underlying algorithm cannot define an optimal number of topics. Rather, the tool requires the researcher to define the number of topics to be analysed. While extracting too many topics leads to only minimally distinct topics, extracting too few leads to artificially constraining the exploratory potential of the topic solution and to topics that cannot be meaningfully distinguished (Debortoli et al., 2016). Additionally, it is important to consider the goal of the topic modelling. As our goal was to find a solution that human researchers could manually interpret, we started with 75 and 100 topics to explore the potential range of interpretable topics. However, a first exploratory analysis of the resulting topics revealed that they were not distinctive enough, wherefore we decided to reduce the number of topics. In the next step, we systematically reduced the number of topics and compared different solutions to one another with regard to the degree of specificity and clarity of each topic. The process started with a comparison of 25, 35, and 50 topics. Four researchers independently interpreted all three solutions and decided on whether the topics were distinctive enough and which solution they deemed the most appropriate. We then discarded two solutions and compared the left third solution with two new ones, as described below.

In order to label and compare topics, word distributions produced by the tool were considered. In those cases in which the top 10 words could not be interpreted unanimously, the abstracts and, if necessary, entire publications with the highest probabilities were consulted and included in the interpretation of the topics. This procedure finally let to the extraction of 35 topics. The solution with 50 (and more) topics turned out to be too fine-grained, eclipsing differences between each topic and making interpretations difficult. The smallest solution with 25 topics however, was deemed too undifferentiated. We discovered that topics apparently had been summarised that are worthwhile to study separately. The solution with 35 topics was easy to interpret and the topics could be clearly distinguished from each other. To ensure the validity of this solution, we compared 37 and 33 topics to this solution to see whether adding two topics or deducting two topics would yield a considerably different and better (or worse) solution. Again, all topics were interpreted and compared against each other within and across the three solutions. In a final step, 34 and 36 topics were extracted and compared with the 35-topic solution, which finally led to the extraction of 35 topics (see Table 1).

3.2   Results of Study 1

Table 1 depicts which words were associated with each topic (column 2) and how these words were interpreted, i.e. the topic label (column 3). After labelling the topics, a more in-depth analysis of the resulting topic solution revealed that five topics had to be deleted. The titles and abstracts of the publications in topic 32 and topic 5 dealt neither with trust nor with trust and technologies but were grouped together because they contained words like 'trust fund'. Topic 13, 14 and 19 had to be excluded from further analysis because the titles and abstracts of publications of this topic did not co-occur together due to similar themes but because of similar structures and similar language use. Thus, these five topics have been coloured grey and 19,235 publications remain in the data set for further analyses.

As can be seen in Table 1, the topics in the field of trust and technologies cover both a wide range of issues and a broad range of disciplines, which were deduced from the abstracts and titles. The topics are not equally large, indicating a different intensity of research among the topics. For example, the largest topic (n=1,409) is topic 16 on consumer behaviour in online environments (see Table 1) and research on this topic starts nearly at the same time as research on the smallest topic (topic 24; n=243) on multimedia data storage. However, the number of publications per topic does not necessarily provide reliable information on the research interest in these topics – let alone their scientific relevance – since some topics are examined over a much longer time period, while others have only recently been included in the research agenda. For example, topic 22 on data security and management in the context of cloud computing (n=564) has a similar size as topic 10 on online buyer-seller transactions (n=551), but the latter has been investigated since the end of the 1990s and has been researched less and less since about 2010 (see Figure 1). On the other hand, interest in topic 22 has only noticeably increased from around 2007 onwards and continues to date. In addition, the focus is on illustrating the thematic status quo, which also includes smaller and more recent topics, rather than quantifying the significance of topics.

#	Top 10 words	Topic label	No. of publications
1	cost, energi, increas, market, econom, invest, financi, technolog, reduc, industri	Finance and energy	316
2	servic, system, secur, manag, model, provid, framework, polici, web_servic, archtitectur	Management of service systems	1,311
3	reput, user, peer, system, reputation_system, attack, p2p, feedback, detect, manag	Management of reputation and peer-to-peer reputation systems	428
4	user, social_network, recommend, social, network, inform, model, algortihm, method, relationship	User recommendations in social networks	987
5	food_scienc, effect, product, increas, high, process, valu, temperatur, sampl, concentr	Product research in food science	-
6	govern, citizen, egovern, servic, public, transpar, ict, internet, vote	E-Government	399
7	patient, health, medi, hospit, care healthcar, clinic, physician, servic, nurs	Health care from the patient perspective	822
8	busi, innov, compani, firm, technolog, manag, relationship, market, industri, network	Innovation in business segments and branches of industry	1,046
9	inform, internet, sourc, websit, webm, onlin, credibl, search, site, user	Online information sources	437
10	ecommerc, onlin, transact, market, seller, internet, consum, buyer, custom, busi	Online buyer-seller transactions	551
11	adopt, model, factor, intent, technolog, influenc, user, accept, research, studi	Models of technology adoption	1,063
12	risk, public, technolog, scienc, food, communic, scientif, polici, benefit, safeti	Man-made public risks	451
13	effect, studi, percept, differ, level, survey, hugh, result, influenc, perceiv	Studies on online behaviour perception	-
14	research, find, studi, limit, barrier, identifi, practic, purpos, factor, designmethodologyapproach	Research	-
15	organ, team, manag, work, collabor, communic, employe, organiz, effect, technolog	Digital collaboration within organizations	487

#	Top 10 words	Topic label	No. of publications
16	consum, onlin, custom, websit, effect, brand, influenc, satisfact, model, product	Consumer behaviour in online environments	1,409
17	local, develop, region, nation, communiti, water, countri, farmer, manag, area	Natural resources on various levels	380
18	design, user, system, inform, tool, decis, process, usabl, interact, develop	User-centric design of systems	376
19	develop, technolog, project, research, system, process, implement, manag, requir, challeng	Development and design of systems	-
20	measur, evalu, qualiti, trustworthi, assess, method, valu, valid, result, criterion	Measurement of trustworthiness	262
21	secur, authent, protocol, system, scheme, certif, provid, user, implement, applic	Implementation of security systems	1,324
22	data, cloud, secur, cloud_comput, servic, provid, user, storag, comput, cloud_servic	Data security and management in the context of cloud computing	564
23	particip, woman, parent, child, health, intervent, result, vaccin, experi, method	Attitudes on health/medical topics from different patient perspectives	560
24	medium, digit, content, video, librari, news, imag, document, record, publish	Multimedia data storage	243
25	student, learn, educ, univers, school, tracher, cours, onlin, teach, train	Learning and education	360
26	technolog, ethic, social, polit, chang, make societi, law, public, human	Ethics and politics	970
27	privaci, secur, inform, user, data, protect, internet, risk, privacy_concern, ident	Management of data privacy on the internet	562
28	reserach, technolog, social, inform, context rile, theori, concept, understand, develop	Sociological research on technology and trust	769
29	network, node, secur, attack, rout, protocol, communic, scheme, propos, internet	Technological network security and defence mechanisms	828
30	system, control, oper, technolog, autom, monitor, safeti, inform, perform, vehicl	Control and operation of automated systems	417
31	model, agent, evalu, dynam, behavior, comput, system, propos, mechan, reput	Models and evaluations of trust	689
32	data, method, result, imag, analys, algorithm, model, techniqu, problem, detect	Physics, biology, chemistry	-
33	onlin, social_media, social, communic, sn, facebook, interact, user, relationship, particip	Communication in social networks	412
34	communiti, group, social, share, member, knowledg, social_capit, knowledge_shar, onlin, particip	Knowledge sharing in online communities	327
35	mobil, servic, device, internet, user, applic, technolog, network, iot, secur	Mobile devices	485
Total			19,235

Table 1. Topics resulting from the topic modelling as applied to titles and abstracts

The timeline in Figure 1 is reduced to the time frame from 1990 to 2016. In 1990, the number of publications per year exceeds the median (=25) for the first time. 2016 is the last year fully captured as the analysis was run in August 2017. Thus, in 2017 and 2018, the number of publications is considerably lower than in the other preceding years. The sample also included

publications published in 2018 since some journals offer an 'online first' option or allow authors to distribute accepted manuscripts before the articles are published officially by the journal.

The first publication within the 30 assessed topics was published in 1959. In this article, the author associates the need for mutual international trust with an increase in international cooperation and trade, which are the result of an increased use of 'modern technology' (Fleming, 1959). Only very few publications were published in the following years, until the mid-1990s. This indicates that research on trust and technology is a rather young field of inquiry. Until 1990, only 147 publications were published on trust and technology. After 1990, the number of publications starts to increase, but it is only at the beginning of the millennium that scholars considerably increase their research interest in trust and technology (see Figure 1).
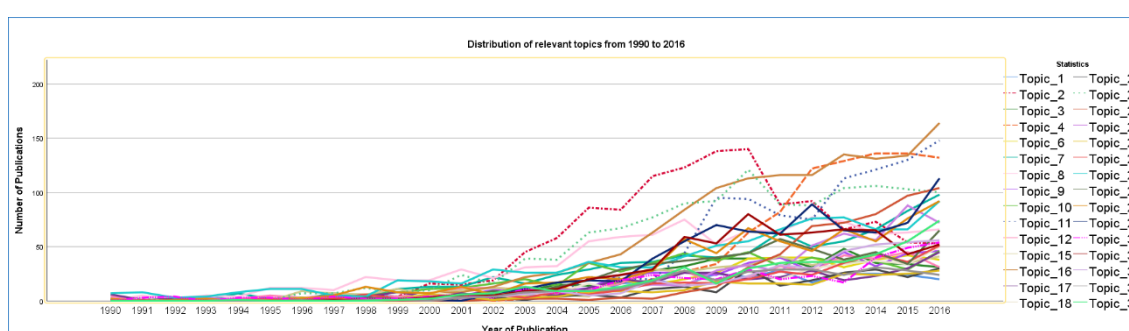

Figure 1. Distribution of relevant topics from 1990 to 2016

As can be seen in Table 1, topic 2 on the management of service systems is one of the largest topics. While the number of publications per topic gradually increases for most of the topics, the publication rate for the second topic is considerably higher than the rate for all other topics at the beginning of the millennium and already starts to decrease in 2010, which contrasts with the overall trend of increasing numbers of publications. A similar trend can only be observed for topic 21 on the implementation of security systems. Topic 4 (user recommendations in social networks) contains very few citations at the beginning, whereas the number of publications rapidly increases from 2009 onwards. Similarly, research on models of technology adoption (topic 11) only increases after 2008, with a short decline in 2011 and 2012. Although research on technology adoption has a far longer tradition with one of the earliest and most influential models dating back to the 1980s (Davis, 1985, 1989), it seems that scholars have only recently started to systematically include trust into models of technology adoption.

3.3   Discussion of Study 1

With over 19,000 publications in our sample and the earliest publication dating back to the 1950s, we consider research on trust and technologies to be an established field of inquiry. Yet, the field is still developing, considering that the number of publications has been steadily increasing since the beginning of the millennium.

It is noteworthy that most topics are related to disciplines such as Management, Computer Science, Information Systems, and Organisational Psychology. Only few topics consider the interplay of trust and technology from the perspective of Social Science or Communication Science. For example, no topic covers the area of trust in the context of online journalism or in the context of electronic participation and democracy, although research on trust in these areas

exists (e.g. Goldfinch et al., 2009; Grosser, 2016). For disciplines such as Communication Science, this observation might be due to the fact that research on trust was often conducted under the label of credibility (e.g. Kohring and Matthes, 2007). Other disciplines such as Sociology presumably consider societal processes and dynamics that influence or are influenced by trust and distrust, rather than studying trust between specific entities such as users in social networks or within virtual teams.

Not only are certain topics one might have expected to emerge completely missing, but the analysis also shows that some topics are studied more often than others. In particular, it is interesting to see that topic 30 (control and operation of automated systems) is one of the smallest topics, although autonomous driving is currently one of the most important digital trends (McKinsey & Company, 2016). Although the research interest in this topic clearly increases in 2013, it increases only slowly in the following years. This development might be due to the fact that scientific articles commonly take several months or even years to be published in leading journals, which is why we observe a 'time gap' between developments in the real world and their scientific treatment. In addition to this, it might also be that publications on autonomously operating systems are included in other topics, such as topic 26 on ethics and politics or in topic 8 on business innovations.

While some of the topics were surprisingly small, the larger topics were as expected. For example, topic 16 on consumer behaviour in online environments is the largest topic with 1,409 publications related to it. This seems plausible since this topic is also the one from which research on trust through and in technologies has emerged (e.g. Gefen et al., 2003; Gefen and Straub, 2003; Wang and Benbasat, 2005). With new technologies entering the market constantly, for example cloud computing, this topic remains relevant and accordingly contains a large number of publications.

Moreover, four of the 30 analysed topics stand out: Topics 11 (models of technology adoption), 20 (measurement of trustworthiness), 28 (sociological research on technology and trust), and 31 (models and evaluations of trust) are not concerned with specific technologies or contexts. Instead, these topics cover conceptualisations and measurements of trust. This dearth of conceptual topics is especially remarkable considering that a clear understanding of what trust actually is and of whether or not humans can trust technologies is currently still missing. Instead, the vast majority of topics – and, therefore, of publications – focuses on specific technologies and settings. To what degree this might cause a problem for research on trust in technologies can only be answered through an in-depth analysis of publications associated with each topic (see study 2). Furthermore, the topic modelling reveals that distrust is of minor interest for scholars so far. None of the analysed topics was modelled with 'distrust' or 'mistrust' as a defining word. Although distrust is of increasing interest among scholars on a theoretical level (Guo et al., 2017), apparently it is so far hardly studied in conjunction with technologies. It can be tentatively concluded from this finding that, currently, the first position on the relationship between trust and distrust is the most prevalent within trust research, i.e. trust and distrust are understood as the opposite ends of the same continuum. If distrust is conceptualised as a lack of trust, it might not be explicitly named in the titles and abstracts of the analysed publications and thus, not emerge as a topic of its own.

With regard to RQ 1, which asked "How do research interests on trust and technologies evolve over time and which specific topics are covered within this research domain?", the evolution of

topics over time and the overall size of the topics indicate a) that research on trust and technologies is a still developing field, as publication rates only started to increase with the beginning of the millennium; b) that research on trust in the context of technologies is focused on few disciplines, despite the fact that trust in general has been researched in wider range of disciplines; c) that certain topics (e.g. trust and online journalism) are not revealed through the topic modelling at all or have so far been studied to a lesser extent than expected (e.g. trust and automated systems); and d) that conceptual work is undertaken to a far lesser degree than studies on trust in the specific contexts.

4 Study 2: Literature Review on Trust in Technology Research

4.1 Method of Study 2

Based on the findings of study 1, an exploratory literature review was conducted to address RQ 2: Which research practices on trust in technology can be identified regarding the methodological approach (used method), the theoretical approach, the conceptual approach (used model), and the specific technologies focused on? To our knowledge, this is one of the first studies to investigate research on trust in technology in-depth, which is why it is exploratory in nature. Thus, our results are generalizable in that we derive propositions from our observations that add to the existing body of knowledge (Lee and Baskerville, 2003).

In order to explore how trust in technology is investigated across the 30 relevant topics identified in study 1, we analysed the first 50 publications in each topic, which are ranked by their probability of being associated to this topic. We decided to use this procedure as opposed to drawing a weighted sample (e.g. the first 10% of each topic) because the size of the topics does not necessarily reflect their overall significance for research, as discussed regarding study 1. Such a procedure would have allowed us to gain only reduced insights into the smaller topics. As it is, all topics can be analysed equally.

The applied procedure resulted in 1,500 potential publications. In a next step, we manually examined the titles and abstracts of these publications to discern whether they actually deal with trust (including distrust) in technology. This step resulted in 206 potentially relevant publications of which five publications were not accessible and therefore discarded. Before the remaining publications could be analysed, a coding matrix was created. This matrix included the following sections: 1) general metadata including the discipline, journal and year of publication, 2) data pertaining to the used methods, 3) data pertaining to the theoretical understanding of trust, 4) data pertaining to the conceptual approach including both models used and trustors and trustees focused on, and finally 5) the specific technology dealt with. The disciplines listed under 1) were coded based on the subject areas as used in the SCImago Journal & Country Rank (SCImago, n.d.) for journals and listed conference proceedings. For books, book chapters, and not-listed conference proceedings, we based the coding decision on the publication's own descriptions and their match with the SCImago subject areas. While the variables in section 1 were coded on the publication level, all variables in sections 2 through 4 were coded on the study level, as one publication can contain several studies, i.e. the publication is based on more than one data set. As methods, theoretical understandings and conceptualisations or models of trust can differ across studies in one and the same publication, each study was coded independently. Before the analysis, a pre-test was conducted with 25 publications: Four researchers read ten publications completely, with five being read by all researchers and five by only one researcher (=25 publications in total). This way, we could agree upon a strategy on how to analyse the publications as well as refine and clarify the matrix where necessary. Following the pre-test, all sampled publications were read and coded.

The analysis of the publications' content led to the exclusion of another 130 publications. Most of these publications had to be excluded due to one of the following reasons: A lot of publications

failed to make clear who the trustor and who (or what) the trustee is, i.e. it was ambiguous what trust is related to. Thus, the publications could not be included as it remained unclear whether they dealt with trust in technologies or not (e.g. Aljaafreh et al., 2014). Although some publications dealt with trust as a central subject of interest, they had to be excluded as they did not conceptualise a technology as the trustee of a relationship. Based on our analysis, we find that most of the research on trust in the context of technology does not deal with trust in technology, but with trust through technology in organisations or other actors. Further studies were excluded because they dealt with so-called trusted systems, trust negotiations, trust technologies or trust programs, i.e. these publications took a technical perspective on trust, for example in terms of trust certificates or calculable levels of security in interactions and not, as defined in the background section, a sociological and psychological perspective (e.g. Benevenuto et al., 2012). The final sample of publications contains 71 different publications, which encompass 77 studies.

4.2   Results of Study 2

The distribution of these publications (n=71) over time is depicted in Figure 2. As can be seen, the earliest publication in the sample was published in 2003. Similar to the overall distribution of publications on trust and technology over time, the publication rate increases slowly until 2009, where it drops only to remarkably increase in 2010. After 2010, it decreases again and ranges between four to eight publications per year and, thus, deviates from the trend of steadily increasing research interest recorded in the first study.
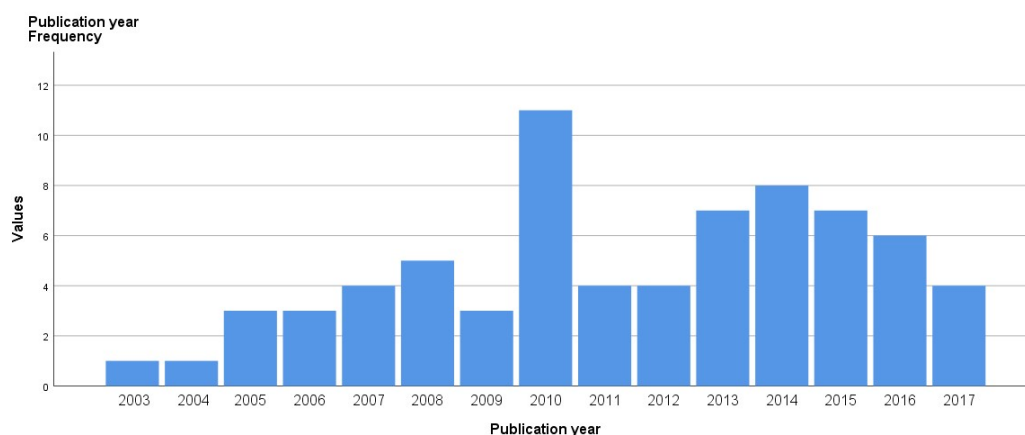

Figure 2. Distribution of publications (n=71) over time

Regarding the content, it is noteworthy that only 17 topics are included in the final sample. Most of the publications are associated with topic 11 (models of technology adoption; one of the largest topics in study 1) and topic 6 (e-government; one of the smaller topics in study 1). Of those publications that deal with trust in technologies, most stem from Computer Science (50 associations across all publications; each publication could be associated with up to four disciplines). Fewer publications are associated with Social Sciences (17 associations), Business, Management and Accounting (15 associations), and with Engineering (15 associations). Other disciplines, such as Psychology, Mathematics, and Environmental Sciences, are concerned with trust in technologies to a far lesser degree (seven and less associations). The fact that only few disciplines investigate technologies as the trustee in a trust relationship is also mirrored in the distribution of trustors and trustees across the studies. Most of the research focuses on

relationships that are common subjects of interest in Business, Management and Accounting, as will be illustrated below.

We also analysed how the scholars conducted their research. For three publications, the type of conducted research could not be defined. For the other publications, the vast majority feature empirical work. Only 11 publications feature no empirical work, while the remaining 57 publications encompass 63 empirical studies. Of those studies, again the majority (55) used quantitative methods to collect data. Qualitative methods are applied only in seven studies and one study employed a mixed-method design. Also, the methods to collect data are quite one-sided. 42 studies used surveys to collect data and for seven studies, data was collected through experiments. Other forms of data collection were used to a far lesser degree.

Regarding the content of the studies, our analysis uncovers a plethora of theoretical foundations. Only two definitions of trust were employed in at least three different studies, while all other definitions employed were cited in only one or two studies (see Table 2). Although a multitude of definitions of trust exist, the authors propose their own definitions of trust in 20 studies, whereas no definition at all was given in 30 studies. With regard to distrust, the literature review (similar to the results of our topic modelling analysis) indicates that it is not a significant part of the research agenda so far. Only four out of the 77 analysed studies deal with distrust in technologies and of these four studies, only one employs a definition of distrust. Despite the ongoing theoretical discussions regarding the relationship of trust and distrust, the latter has so far not been studied extensively in the context of technologies.

In contrast to the finding that a plethora of trust definitions is used, the models applied in the studies do reflect a common conceptual basis (see Table 2). In total, 28 different models are used. Most of the models relate to technology acceptance, e.g. the technology acceptance model (TAM, Davis, 1989), the unified theory of acceptance and use of technology (UTAUT, Venkatesh et al., 2003; UTAUT2, Venkatesh et al., 2012). Furthermore, the table reveals that although models of different authors were used, these models themselves are extensions of TAM. Apparently, trust in technologies is most often studied in conjunction with research on technology acceptance. This focus can be explained by the fact that while trust and acceptance need to be distinguished, they are nevertheless connected: Acceptance or adoption of technologies has been defined as '[…] a decision to make full use of an innovation as the best course of action available […]' (Rogers, 2003, p. 37). Following the conceptualisation of trust by Mayer et al. (1995), trust is understood as a state of mind and is, as such, an antecedent to behaviour. Thus, and in accordance with prior research, we can conceptualise trust as an antecedent to technology adoption or acceptance (Gefen et al., 2003).

A closer examination of Table 2 furthermore reveals that both trust definitions and models with trust date back to the turn of the millennium; there are only very few more recent definitions or models. Many of these referenced models and definitions apply a socio-psychological or behaviouristic perspective; only few studies take a different perspective on the matter. For example, Schaefer and Scribner (2015) conceptualise trust as a mechanism to regulate stress and do not focus so much on the relationship between trust and individual behaviour.

Sources of Trust Definitions	n	Sources of Models Using Trust as a Component	n
Pavlou (2003)	3	Davis (1989)	8
McKnight and Chervany (2001b)	3	Extensions of TAM	4
Chopra and Wallace (2003)	2	Bandura (1986)	3
Gefen et al. (2003)	2	Authors not stated	3
Mayer et al. (1995)	2	Venkatesh et al. (2003)	2
Rotter (1971)	2	Venkatesh et al. (2012)	2
Joubert and van Belle (2013)	1	Arbore et al. (2014)	2
Hancock et al. (2011)	1	Rogers (1995)	2
Bélanger and Carter (2008)	1	Bandura (1997)	2
Gustavsson and Johansson (2006)	1	Chandra et al. (2010)	1
Carter and Bélanger (2005)	1	Martins et al. (2014)	1
Ruohomaa and Kutvonen (2005)	1	Carter et al. (2011)	1
Corritore et al. (2003)	1	Lee et al. (2011)	1
Belanger et al. (2002)	1	AbuShanab and Pearson (2007)	1
Rousseau et al. (1998)	1	Hsu et al. (2007)	1
Kini and Choobineh (1998)	1	Hung et al. (2003)	1
Department of Defense Standard (1985)	1	Gefen et al. (2003)	1
Gu et al. (2009)	1	Lee and Turban (2001)	1
McKnight (2005)	1	Taylor and Todd (1995)	1
Own definition employed	*20*	DeLone and McLean (1992, 2003)	1
Total	*47*	Fishbein and Ajzen (1975)	1
No definition given	*30*	Rotter (1971)	1
		McKnight et al. (2002)	1
		Ying-feng and Pei-ji (2006)	1
		Nysveen et al. (2005)	1
		Bhattacherjee (2001)	1
		Gefen and Straub (2003)	1
		Westbrook (1987)	1
		Own model used	*12*
		Total	*59**
		No model used	*45*

* some authors in our sample referred to more than one conceptual model in their studies

Table 2. Sources of Trust Definitions and Trust Models as employed in the studies (n=77)

Most frequently, the analysed studies (n=77) investigate relationships of trust in technologies in the context of internet banking and e-commerce, closely followed by studies investigating trust in e-government. Specific technologies dealt with in these articles are, for example, internet banking websites, auction websites, and taxation systems. The trustor in this relationship is commonly a human being, most often referred to simply as 'user' (of a system). In correspondence to the topics of the analysed studies and the trustees, further trustors are bank customers, citizens, and consumers.

4.3   Discussion of Study 2

The second research questions asked "Which research practices on trust in technology can be identified regarding the methodological approach (used method), the theoretical approach, the conceptual approach (used model), and the specific technologies focused on?"

The rather small sample size of our second study – as compared to the 1,500 abstracts investigated at first – indicates that most of the research in the field relates to trust mediated

through technologies rather than trust in a technology. Although a reduction of the sample size was to be expected, the strength of this reduction is noteworthy. The considerable reduction of 1,500 publications as a starting sample for the second study to 201 potentially relevant publications suggests that trust in technology has – so far – hardly been studied. When investigating the full publications, the sample is further reduced to 71 publications dealing with trust in technology, showing that many researchers do not sufficiently differentiate trust through and trust in technologies. In this context, it should be noted that, for example, only one study deals with trust in social networking sites such as Facebook and Twitter – although three topics (3, 33, 34) in study 1 explicitly deal with social networks. This rather astonishing low number is due to the fact that in studies that were concerned with trust in the context of social media or social networking sites, the trustees were most often conceptualised as either the company or other users. Nonetheless, authors would refer to their object of study as, for example, trust in Facebook or trust in Twitter. Only one study actually treated the technology as the trustee. Apparently, research on trust in technologies is a rather small subfield in the area of research on trust in the context of technologies.

In general, trust in technologies is researched mostly with empirical studies. Regarding the applied methods, the review revealed that the majority of studies was of quantitative nature and that within this set most of the data sets were gathered through survey research. More theoretical contributions on, for example, legal, ethical or societal consequences of trust in technologies are not subject of research at all. We also find that conceptual approaches are predominantly limited to models of technology acceptance. Even though different models are used, they all refer to or are extensions of TAM and UTAUT. This may be due to the fact that these acceptance models are parsimonious, yet easily adaptable to different contexts in which technologies are used. The integration of trust as an antecedent to technology adoption proved to be reasonable (e.g. Gefen et al., 2003). Accordingly, the strong emphasis on these models can be explained by the integration of technology trust as antecedent to usage behaviour. However, this strong focus on established acceptance models is surprising. The earliest publication on trust in technologies is from 2003, whereas the models and theories date back to the late 1980s and early 1990s. Despite the fact that especially the TAM is a rather old and, as some researches notice, outdated approach (Bagozzi, 2007), they are still applied to a rather young and growing field of inquiry.

In relation to this aspect, the analysis reveals that many of the definitions and models are based on the argument that risk requires trust and trust, in turn, enables actions. At the same time, current developments spawn autonomously acting systems that increasingly make decisions for humans. Against this background, risks associated with these decisions and technology use in general might become less and less tangible. Thus, an approach that focuses on trust not as enabling behaviour but influencing an individual's well-being, for example as proposed by Schaefer and Scribner (2015), appear to be promising avenues for future study.

Overall, while trust research in general focuses on a variety of different aspects of human interactions and is not bound to one research interest (Blöbaum, 2016), research on trust in technologies seems to be so far limited to very few objects and also to few research methods. Mixed methods-studies or studies with longitudinal or experimental designs often come with greater efforts, whereas especially surveys guarantee access to larger sample sizes and meaningful data with lesser efforts, e.g. when surveys are conducted online. This trend observed

in our second study is a general trend, acknowledged – and criticised – by researchers from various disciplines (e.g. Trumbo, 2004; Venkatesh et al., 2013).

Regarding the theoretical foundations, research on trust in technologies resembles trust research in general in the sense that there seems to be a lot of theoretical variation. There is not one definition (or even a series of definitions) that is most often drawn upon. The research field here is still being established and has not yet been consolidated. This can also be seen regarding the models: Although most models relate to technology acceptance, many authors develop their own models instead of using established ones. This may be because there are no established and widely recognised models of trust in technology. Furthermore, many studies do not implement a definition of trust at all, nor do they clearly operationalise who the trustee is. Especially within the field of research on trust in the context of technology, it is paramount to clearly describe whether trust in technology is examined, or else trust through technology. When merely discussing trust and e-commerce, it remains unclear whether trust in the internet in general, the online store, the payment and transaction software, the company behind the website, or the people running the website is being examined.

Although all areas of life are influenced by the ubiquitous process of digitalisation (Gulati et al., 2017), only few disciplines are currently concerned with trust in technologies. Blöbaum (2016, p. 4) notes that 'Today, trust is not just a factor among individuals; it supports the operations of companies and institutions as well as the functioning of major social subsystems, such as politics, health care, the economy, sport, science, and the media.' Thus, we would have expected more disciplines to be involved in the research of trust in technologies. Not only is the number of disciplines involved low, but also the number of publications dealing with technology trust is rather low. Concerning ever more sophisticated, human-like, and autonomously acting technologies, the notion of trust in technologies becomes more important. However, the literature review reveals that only few studies are undertaken and, moreover, that the number of studies has been on nearly the same level throughout the past few years.

5   Overall Discussion

In this section, the most interesting insights from both studies are summarised and propositions for future research are derived.

First, this article reveals that the overall research interest has increased over the past 15 to 20 years. This increase may be ascribed to the greater importance of technologies in everyday life. Research interest in trust in technology is increasing as well, although the publication rate in the past few years has stagnated. The analysis of both studies reveals that the increase in publication rates on trust in the context of technologies and on trust in technologies are due to an increased research interest in only few disciplines, while both topics are of lesser relevance in other disciplines. Trust in technologies is only studied from 2003 onwards and can, thus, be described as an emerging trend in research. The general trend (as revealed by the text mining analysis) shows an overwhelming focus on the Management, Computer Science, Organisational Psychology, and Information Systems perspective on trust in the context of technologies. This finding is replicated in the literature review, which indicates that Computer Science is the discipline mostly involved in research specifically on trust in technologies. Other disciplines are concerned to a far lesser degree. Hence, our first proposition is to undertake more multidisciplinary research. Against the background of the enormous importance technologies have in everyday life, it is reasonable to include different disciplines in research endeavours concerned with trust in technologies. The calls for more interdisciplinary trust research (e.g. Li, 2007) are reinforced with this paper. Specifically with regard to technology trust, more research is needed.

Second, as indicated by the topic modelling analysis and confirmed with the literature review, research on trust in the context of technologies focuses mostly on acceptance and usability aspects. Although all areas of life are affected by the growing importance of (digital) technologies, scholars mostly take into consideration the role of trust within the process of accepting and, eventually, using new technologies (e.g. Carter and Bélanger, 2005). In addition, most of the research of our studied sample in the literature review investigates trust in technologies empirically and on the level of individuals, whereas aggregated consequences of trust on higher levels, e.g. the societal level, are neglected. In this context, the literature review also reveals that by focusing on the adoption of technology many studies take a behaviouristic perspective on the effect of trust in the human-computer relationship. Thus, our second proposition is to widen the scope of research on, for example, societal or political aspects of trust in technologies.

Third, we find a lack of theoretical integrability as many studies employ their own (new) definition of trust instead of building on previous work and thus seeking theoretical consolidation. Moreover, research that is built on previous work employs a plethora of definitions and theoretical constructs, which are only infrequently linked to each other. Although scholars have debated whether trust research should be integrated (e.g. Li, 2007) or not (e.g. Bigley and Pearce, 1998), from our perspective a better linkage of research attempts is imperative. Hence, we thirdly propose that in order to come to a better understanding of how trust and technologies relate to each other and to understand how and whether human trust in technologies can be conceptualised, scholars should more extensively refer to each other and work towards theoretical consolidation. In a first step, trust researchers should try to discern commonalities largely agreed upon in this field to help better systemise pertinent research. Furthermore, already existing conceptualisations should be carefully evaluated for their fit to one's own research domain, before either developing completely

new concepts or applying established concepts to new phenomena. This also includes a call for more conceptual and theoretical work instead of empirical research. The literature review revealed that only few publications study trust in technologies on a conceptual level. However, most of these publications do not advance the theoretical discussion of trust in technologies but are mostly concepts for a technical realisation of trustworthy digital or online environments (e.g. Bertino et al., 2004).

Fourth, our analysis of the second study reveals a lack of theoretical rigour regarding the differentiation between trust through and trust in technologies. As the considerable reduction in the sample size from 201 to 71 publications shows, a lot of research apparently labelled as trust in technologies actually deals with trust through technologies. Most research is still concerned with changes in interpersonal or interorganisational relationships rather than with human-computer interactions. Furthermore, in study 2 we only register very few attempts to conceptualise trust in technologies detached from interpersonal models and definitions of trust. Hence, in addition to a call for more theoretical work in this field of inquiry, our fourth proposition is to better delineate and differentiate trust through and trust in technologies.

Fifth, neither the topic modelling nor the literature review revealed a heightened research interest in distrust in the context of technologies. Apparently, distrust in technologies has so far received minimal attention. However, conceptual works indicate that a) distrust and trust are not merely opposites of each other and, in order to understand human behaviour, b) distrust needs to be studied in-depth (Guo et al., 2017). Thus, our fifth proposition is to explicitly include distrust in technologies and its effects on human behaviour in the research agenda.

6   Conclusion

As far as we are aware, this study is one of the first to give a comprehensive overview of research on trust in the context of technology. It thus goes beyond previous studies that examine trust in the context of specific technologies in that it uncovers and structures the status quo of scientific research in this area, with a special focus on trust in technologies. Furthermore, this article contributes to current research by deriving five fundamental propositions for future research. The added value of this study lies in the derivation of propositions that not only consider topics for future research as often done in literature reviews, but also with regard to methods, applied theories, and necessary conceptual considerations. Thus, this article is research-oriented and its practical added value arises within the scientific discourse.

Despite its contributions, the study is, of course, not without its drawbacks, as both the topic modelling (study 1) and the literature review (study 2) have their own inherent limitations: For the topic modelling, the labelling process proved to be quite complex. It showed that simply labelling the topics based on the top ten words can lead to unfitting topic labels and thus should be regarded as insufficient when mining longer texts. Manually reviewing publications in the topic may be more time consuming, but at the same time, this approach led to more fitting and precise labels. A more extensive review of the publications may have led to even more accurate labels in our first study, which is why we recommend future studies that conduct topic modelling to take the time to review publications into account and to base their labelling on a wider set of publications. Regarding the second study, our focus on trust in technology instead of the broader field of trust and technology can be regarded as a limitation. Future research could conduct a similar literature review and compare the two areas in the field of research on trust in the context of technology – namely trust in and trust through technology. Moreover, we focused solely on the publications' research practices and thus are unable to make any statements on specific results of the examined empirical studies. Future research could conduct a systematic meta-analysis in order to uncover whether and to what extent technology is actually trusted, which specific factors influence this trust and what impact, in turn, this trust has.

We believe that our mixed-methods approach helps alleviate the described limitations and thus strengthens the insights gained in this study: We were able to compare the possibly slightly inaccurate topic labels garnered in study 1 to the results uncovered in study 2 and thus confirm our interpretations. Although our focus was on trust in technology, as investigated in study 2, and although study 1 served as a preparatory study for this, we were able to contrast the results of the narrower study 2 with the results of the broader study 1 to gain further interesting insights. Based on a mixed-method approach, this paper reveals that trust in technologies is only a sub-field of research on trust in the context of technologies, that distrust in technologies plays an only marginal role, and that research on trust in technologies lacks a common theoretical and conceptual foundation. More broadly, we were able to show that while research on trust and technology is increasing, it is limited to a small number of disciplines, most prominently Computer Science, and to topics focusing mostly on aspects of acceptance and usability. We derived five propositions for future research, identifying a general need for consolidation in this research field and specific gaps to be filled by future research. This study thus contributes to research on trust in the context of technology both in that it provides an overview of the status quo of pertinent scientific research and in that it can thus serve as a basis for future scientific endeavours in this area.

Acknowledgements

References

AbuShanab, E. and Pearson, J.M. (2007), "Internet banking in Jordan: The unified theory of acceptance and use of technology (UTAUT) perspective.", Journal of Systems and Information Technology, Vol. 9 No. 1, pp. 78–97.

Aljaafreh, A., Gill, A.Q. and Ani, A.A. (2014), "Towards the Development of an Initial Trust Model for the Adoption of Internet Banking Services in Jordan.", paper presented at Pacific Asia Conference on Information Systems (PACIS), Chengdu, China.

Arbore, A., Soscia, I. and Bagozzi, R.P. (2014), "The role of signaling identity in the adoption of personal technologies.", Journal of the Association for Information Systems, Vol. 15 No. 2, pp. 86–110.

Bagozzi, R.P. (2007), "The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift", Journal of the Association for Information Systems, Vol. 8 No. 4, pp. 244–254.

Bandura, A. (1986), Social foundations of thought and action: A social cognitive theory, Prentice-Hall Inc., Englewood Cliffs, NJ.

Bandura, A. (1997), Self-efficacy: The exercise of control, W.H. Freeman and Company, New York.

Belanger, F., Hiller, J.S. and Smith, W.J. (2002), "Trustworthiness in electronic commerce: the role of privacy, security, and site attributes", The Journal of Strategic Information Systems, Vol. 11 No. 3-4, pp. 245–270.

Bélanger, F. and Carter, L. (2008), "Trust and risk in e-government adoption", The Journal of Strategic Information Systems, Vol. 17 No. 2, pp. 165–176.

Benamati, J. and Serva, M.A. (2007), "Trust and Distrust in Online Banking: Their Role in Developing Countries.", Information Technology for Development, Vol. 13 No. 2, pp. 161–175.

Benevenuto, F., Rodrigues, T., Veloso, A., Almeida, J., Gonçalves, M. and Almeida, V. (2012), "Practical Detection of Spammers and Content Promoters in Online Video Sharing Systems.", IEEE transactions on systems, man, and cybernetics. Part B, Cybernetics a publication of the IEEE Systems, Man, and Cybernetics Society, Vol. 42 No. 3, pp. 688–701.

Bertino, E., Ferrari, E. and Squicciarini, A.C. (2004), "Trust-X: A Peer-to-Peer Framework for Trust Establishment", IEEE Transactions on Knowledge and Data Engineering, Vol. 16 No. 7, pp. 827–842.

Bhattacherjee, A. (2001), "Understanding Information Systems Continuance: An Expectation-Confirmation Model", MIS Quarterly, Vol. 25 No. 3, pp. 351–370.

Bigley, G.A. and Pearce, J.L. (1998), "Straining for Shared Meaning in Organization Science: Problems of Trust and Distrust.", The Academy of Management Review, Vol. 23 No. 3, pp. 405–421.

Blöbaum, B. (2016), "Key Factors in the Process of Trust. On the Analysis of Trust under Digital Conditions.", in Blöbaum, B. (Ed.), Trust and Communication in a Digitized World., Springer International Publishing, Cham, pp. 3–25.

Broström, R., Rydström, A. and Kopp, C. (2019), "Drivers Quickly Trust Autonomous Cars", in Ahram, T. and Falcao, C. (Eds.), Advances in Usability, User Experience and Assistive Technologey. AHFE 2018., Advances in Intelligent Systems and Computing, Springer, Cham, pp. 699–705.

Canfora, G. and Visaggio, C.A. (2012), "Managing Trust in Social Networks", Information Security Journal: A Global Perspective, Vol. 21 No. 4, pp. 206–215.

Carter, L. and Bélanger, F. (2005), "The utilization of e-government services: citizen trust, innovation and acceptance factors", Information Systems Journal, Vol. 15 No. 1, pp. 5–25.

Carter, L., Schaupp, L.C. and McBride, M.E. (2011), "The U.S. e-File Initiative: An Investigation of the Antecedents to Adoption from the Individual Taxpayers' Perspective.", e-Service Journal, Vol. 7 No. 3, pp. 2–19.

Chandra, S., Srivastava, S.C. and Theng, Y.-L. (2010), "Evaluating the Role of Trust in Consumer Adoption of Mobile Payment Systems: An Empirical Analysis.", Communications of the Association for Information Systems, Vol. 27 No. 1, pp. 561–588.

Chopra, K. and Wallace, W.A. (2003), "Trust in Electronic Environments", paper presented at Hawaii International Conference on System Sciences (HICSS), Big Island, Hawaii, USA.

Corritore, C.L., Kracher, B. and Wiedenbeck, S. (2003), "On-line trust: concepts, evolving themes, a model", International Journal of Human-Computer Studies, Vol. 58 No. 6, pp. 737–758.

Currall, S.C. and Inkpen, A.C. (2006), "On the complexity of organizational trust: a multi-level co-evolutionary perspective and guidelines for future research.", in Bachmann, R. and Zaheer, A. (Eds.), Handbook of trust research., Elgar original reference, Elgar, Cheltenham, pp. 235–246.

Cyr, D. (2013), "Website design, trust and culture: An eight country investigation", Electronic Commerce Research and Applications, Vol. 12 No. 6, pp. 373–385.

Davis, F.D. (1985), A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results., Massachusetts Institute of Technology, Cambridge.

Davis, F.D. (1989), "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology.", MIS Quarterly, Vol. 13 No. 3, pp. 319–340.

Debortoli, S., Müller, O., Junglas, I. and Vom Brocke, J. (2016), "Text Mining for Information Systems Researchers: An Annotated Topic Modeling Tutorial.", Communications of the Association for Information Systems, Vol. 39, pp. 110–135.

DeLone, W.H. and McLean, E.R. (1992), "Information Systems Success: The Quest for the Dependent Variable", Information Systems Research, Vol. 3 No. 1, pp. 60–95.

DeLone, W.H. and McLean, E.R. (2003), "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update", Journal of Management Information Systems, Vol. 19 No. 4, pp. 9–30.

Department of Defense Standard (1985), "Department of Defense trusted computer system evaluation critia.", available at: http://www.iwar.org.uk/comsec/resources/standards/rainbow/5200.28-STD.html (accessed 29 August 2018).

Distel, B. (2018), Explaining Citizens' Non-Adoption and Adoption of E-Government in Germany. University of Münster.

Dreesen, T. and Diegmann, P. (2017), "Journey Towards Agility: Where Are We Now And Where Are We Heading?", paper presented at ICIS, Seoul, South Korea.

Engelke, K.M. (2018), Die journalistische Darstellung von Vertrauen, Misstrauen und Vertrauensproblemen im Kontext der Digitalisierung. Theoretische Entwicklung und empirische Erfassung von Vertrauensdimensions-Frames. [The Media's Depiction of Trust, Distrust, and Trust Problems within the Context of Digitalization. Theoretical Development and Empirical Analysis of Trust Dimension Frames.]. Baden-Baden: Nomos.

Engelke, K.M., Hase, V. and Wintterlin, F. (2019), "On measuring trust and distrust in journalism: Reflection of the status quo and suggestions for the road ahead", Journal of Trust Research, Vol. 9 No. 1, pp. 66–86.

Fishbein, M. and Ajzen, I. (1975), Belief, attitude, intention, and behavior. An introduction to theory and research., Addison-Wesley series in social psychology, Addison-Wesley, Reading.

Fleming, D.F. (1959), "Beyond the Cold War.", The Annals of the American Academy of Political and Social Science, Vol. 324, pp. 111–126.

Friedman, B., Khan, P.H. and Howe, D.C. (2000), "Trust online", Communications of the ACM, Vol. 43 No. 12, pp. 34–40.

Fulmer, C.A. and Gelfand, M.J. (2012), "At What Level (and in Whom) We Trust: Trust Across Multiple Organizational Levels.", Journal of Management, Vol. 38 No. 4, pp. 1167–1230.

Gefen, D., Karahanna, E. and Straub, D.W. (2003), "Trust and TAM in Online Shopping: An Integrated Model.", MIS Quarterly, Vol. 27 No. 1, pp. 51–90.

Gefen, D. and Straub, D.W. (2003), "Managing User Trust in B2C e-Services", e-Service Journal, Vol. 2 No. 2, pp. 7–24.

Goldfinch, S., Gauld, R. and Herbison, P. (2009), "The Participation Divide? Political Participation, Trust in Government, and E-government in Australia and New Zealand.", Australian Journal of Public Administration, Vol. 68 No. 3, pp. 333–350.

Grosser, K.M. (2016), "Trust in Online Journalism. A conceptual model of risk-based trust in the online context", Digital Journalism, Vol. 4 No. 8, pp. 1036–1057.

Gu, J.-C., Lee, S.-C. and Suh, Y.-H. (2009), "Determinants of behavioral intention to mobile banking", Expert Systems with Applications, Vol. 36 No. 9, pp. 11605–11616.

Gulati, S., Sousa, S. and Lamas, D. (2017), "Modelling Trust: An Empirical Assessment.", in Bernhaupt, R., Dalvi, G., Joshi, A., K. Balkrishan, D., O'Neill, J. and Winckler, M. (Eds.), Human-Computer Interaction – INTERACT 2017., Vol. 10516, Springer International Publishing, Cham, pp. 40–61.

Guo, S.-L., Lumineau, F. and Lewicki, R.J. (2017), "Revisiting the Foundations of Organizational Distrust.", Foundations and Trends® in Management, Vol. 1 No. 1, pp. 1–88.

Gustavsson, M. and Johansson, A.-M. (2006), "Consumer Trust in E-comerce.", available at: http://www.diva-portal.org/smash/get/diva2:230780/FULLTEXT01.pdf (accessed 29 August 2018).

Hancock, P.A., Billings, D.R., Schaefer, K.E., Chen, J.Y.C., Visser, E.J. de and Parasuraman, R. (2011), "A meta-analysis of factors affecting trust in human-robot interaction", Human factors, Vol. 53 No. 5, pp. 517–527.

Horsburgh, S., Goldfinch, S. and Gauld, R. (2011), "Is Public Trust in Government Associated With Trust in E-Government?", Social Science Computer Review, Vol. 29 No. 2, pp. 232–241.

Horst, M., Kuttschreuter, M. and Gutteling, J.M. (2007), "Perceived usefulness, personal experiences, risk perception and trust as determinants of adoption of e-government services in The Netherlands.", Computers in Human Behavior, Vol. 23 No. 4, pp. 1838–1852.

Hsu, C.-L., Lu, H.-P. and Hsu, H.-H. (2007), "Adoption of the mobile Internet: An empirical study of multimedia message service (MMS).", Omega, Vol. 35 No. 6, pp. 715–726.

Hung, S.-Y., Ku, C.-Y. and Chang, C.-M. (2003), "Critical factors of WAP services adoption: an empirical study.", Electronic Commerce Research and Applications, Vol. 2 No. 1, pp. 42–60.

Jarvenpaa, S., Cantu, C. and Lim, S.Y. (2017), "Trust in virtual online environments", in Hertel, G., Stone, D.L., Johnson, R.D. and PAssmore, J. (Eds.), The Wiley Blackwell Handbook of the Psychology of the Internet at Work, John Wiley & Sons, pp. 103–130.

Jarvenpaa, S. and Leidner, D.E. (1999), "Communication and trust in global virutal teams", Organization Science, Vol. 10 No. 6, pp. 791–815.

Javor, A., Ransmayr, G., Struhal, W. and Riedl, R. (2016), "Parkinson Patients' Initial Trust in Avatars: Theory and Evidence", PloS one, Vol. 11 No. 11, 1-21.

Joubert, J. and van Belle, J.-P. (2013), "The Role of Trust and Risk in Mobile Commerce Adoption within South Africa.", International Journal of Business, Humanities and Technology, Vol. 3 No. 2, pp. 27–38.

Kini, A. and Choobineh, J. (1998), "Trust in electronic commerce: definition and theoretical considerations.", paper presented at 31st Hawaii International Conference on System Sciences (HICSS), Kohala Coast, Hawaii.

Kohring, M. and Matthes, J. (2007), "Trust in news media: Development and validation of a multidimensional scale", Communication Research, Vol. 34 No. 2, pp. 231–252.

Lankton, N.K. and McKnight, D.H. (2011), "What Does it Mean to Trust Facebook? Examining Technology and Interpersonal Trust Beliefs", The Data Base for Advances in Information Systems, Vol. 42 No. 2, pp. 32–54.

Lee, A.S. and Baskerville, R.L. (2003), "Generalizing Generalizability in Information Systems Research", Information Systems Research, Vol. 14 No. 3, pp. 221–243.

Lee, K.-W., Tsai, M.-T. and Lanting, M.C.L. (2011), "From marketplace to marketspace: Investigating the consumer switch to online banking.", Electronic Commerce Research and Applications, Vol. 10 No. 1, pp. 115–125.

Lee, M.K.O. and Turban, E. (2001), "A Trust Model for Consumer Internet Shopping", International Journal of Electronic Commerce, Vol. 6 No. 1, pp. 75–91.

Lewicki, R.J., McAllister, D.J. and Bies, R.J. (1998), "Trust and Distrust: New Relationships and Realities.", The Academy of Management Review, Vol. 23 No. 3, pp. 438–458.

Lewicki, R.J., Tomlinson, E.C. and Gillespie, N. (2006), "Models of Interpersonal Trust Development: Theoretical Approaches, Empirical Evidence, and Future Directions.", Journal of Management, Vol. 32 No. 6, pp. 991–1022.

Li, P.P. (2007), "Towards an Interdisciplinary Conceptualization of Trust: A Typological Approach.", Management and Organization Review, Vol. 3 No. 3, pp. 421–445.

Liang, Y., Qi, G., Wei, K. and Chen, J. (2017), "Exploring the determinant and influence mechanism of e-Government cloud adoption in government agencies in China", Government Information Quarterly, Vol. 34 No. 3, pp. 481–495.

Luhmann, N. (1979), Trust and Power: Two Works by Niklas Luhmann, John Wiley & Sons, Chichester.

Maier, D., Waldherr, A., Miltner, P., Wiedemann, G., Niekler, A., Keinert, A., Pfetsch, B., Heyer, G., Reber, U., Häussler, T., Schmid-Petri, H. and Adam, S. (2018), "Applying LDA Topic modeling in communication research: Toward a valid and reliable methodology.", Communication Methods and Measures, Vol. 12 No. 2-3, pp. 93–118.

Martins, C., Oliveira, T. and Popovič, A. (2014), "Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application.", International Journal of Information Management, Vol. 34 No. 1, pp. 1–13.

Matthies, B. (2017), "A text mining approach for extracting lessons learned from project documentation: An illustrative case study", International Journal of Management, Knowledge and Learning, No. 2, pp. 153–174.

Mayer, R.C., Davis, J.H. and Schoorman, F.D. (1995), "An Integrative Model of Organizational Trust.", The Academy of Management Review, Vol. 20 No. 3, pp. 709–734.

McEvily, B. and Tortoriello, M. (2011), "Measuring trust in organisational research: Review and recommendations.", Journal of Trust Research, Vol. 1 No. 1, pp. 23–63.

McKinsey & Company (2016), "Automotive revolution – perspective towards 2030.", available at: https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/disruptive-trends-that-will-transform-the-auto-industry/de-de (accessed 29 August 2018).

McKnight, D.H. (2005), "Trust in information technology", The Blackwell Encyclopedia of management, Vol. 7, pp. 329–331.

McKnight, D.H., Choudhury, V. and Kacmar, C. (2002), "Developing and Validating Trust Measures for e-Commerce: An Integrative Typology.", Information Systems Research, Vol. 13 No. 3, pp. 334–359.

McKnight, H., Carter, M., Thatcher, J.B. and Clay, P.F. (2011), "Trust in a Specific Technology: An Investigation of Ita Components and Measures.", ACM Transactions on Management Information Systems, Vol. 2 No. 2, pp. 1–25.

McKnight, H. and Chervany, N.L. (2001a), "Trust and Distrust Definitions: One Bite at a Time.", in Falcone, R., Singh, M. and Tan, Y.-H. (Eds.), Trust in Cyber-societies. Integrating the Human and Artificial Perspectives., Lecture Notes in Computer Science, Vol. 2246, Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 27–54.

McKnight, H. and Chervany, N.L. (2001b), "What Trust Means in E-Commerce Customer Relationships: An Interdisciplinary Conceptual Typology", International Journal of Electronic Commerce, Vol. 6 No. 2, pp. 35–59.

Müller, O., Junglas, I., Vom Brocke, J. and Debortoli, S. (2016), "Utilizing big data analytics for information systems research: challenges, promises and guidelines.", European Journal of Information Systems, Vol. 25 No. 4, pp. 289–302.

Nysveen, H., Pedersen, P.E., Thorbjørnsen, H. and Berthon, P. (2005), "Mobilizing the Brand. The Effects of Mobile Service on Brand Relationships and Main Channel Use", Journal of Service Research, Vol. 7 No. 3, pp. 257–276.

Ogonek, N. (2017), "The Tale of e-Government: A Review of the Stories that Have Been Told So Far and What is Yet to Come", Proceedings of the 50th Hawaii International Conference on System Sciences (HICSS). 2017.

Öksüz, A., Walter, N., Distel, B., Räckers, M., and Becker, J. (2016), "Trust in the Information Systems Discipline," in Trust and Communication in a Digitized World: Models and Concepts of Trust Research, B. Blöbaum (ed.), Springer-Verlag New York Inc, pp. 205-223.

Pavlou, P.A. (2003), "Consumer Acceptance of Electronic Commerce: Integrating Trust and Risk with the Technology Acceptance Model.", International Journal of Electronic Commerce, Vol. 7 No. 3, pp. 101–134.

Querfurth-Böhnlein, S.C. (2018), Trust in the coach-athlete relationship through digital communication. University of Münster.

Reeves, B. and Nass, C.I. (1996), The media equation: How people treat computers, television, and new media like real people and places, Cmbridge University Press, Cambridge.

Rogers, E.M. (2003), Diffusion of innovations, 5th ed., Free Press, New York.

Rotter, J.B. (1971), "Generalized expectancies for interpersonal trust.", American Psychologist, Vol. 26 No. 5, pp. 443–452.

Rousseau, D.M., Sitkin, S.B., Burt, R.S. and Camerer, C. (1998), "Not so Different after All: A Cross-Discipline View of Trust.", Academy of Management Review, Vol. 23 No. 3, pp. 393–404.

Ruohomaa, S. and Kutvonen, L. (2005), "Trust Management Survey.", paper presented at Proceedings of the 3rd International Conference (iTrust), Paris, France.

Schaefer, K.E. and Scribner, D.R. (2015), "individual Differences, Trust, and Vehicle Autonomy: A pilot study", Proceedings of the Human Factors and Ergonomics Society 59th Annual Meeting, pp. 786–790.

Schoorman, F.D., Wood, M.M. and Breuer, C. (2015), "Would Trust by Any Other Name Smell as Sweet? Reflections on the Meanings and Uses of Trust Across Disciplines and Context.", in Bornstein, B.H. and Tomkins, A.J. (Eds.), Motivating cooperation and compliance with authority. The role of institutional trust., Nebraska Symposium on Motivation, Vol. 62, Springer, Heidelberg, pp. 13–35.

SCImago, (n.d.), SJR — SCImago Journal & Country Rank [Portal]. Last accessed *05.02.2021*, from http://www.scimagojr.com

Söllner, M., Benbasat, I., Gefen, D., Leimeister, J.M. and Pavlou, P.A. (2016a), "Trust", in Bush, A. and Rai, A. (Eds.), MIS Quarterly Research Curations.

Söllner, M., Hoffmann, A. and Leimeister, J.M. (2016b), "Why different trust relationships matter for information systems users.", European Journal of Information Systems, Vol. 25 No. 3, pp. 274–287.

Taylor, S. and Todd, P.A. (1995), "Understanding Information Technology Usage: A Test of Competing Models.", Information Systems Research, Vol. 6 No. 2, pp. 144–176.

Trumbo, C.W. (2004), "Research Methods in Mass Communication Research: A Census of Eight Journals 1990–2000", Journalism & Mass Communication Quarterly, Vol. 81 No. 2, pp. 417–436.

Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. (2003), "User Acceptance of Information Technology: Toward a Unified View.", MIS Quarterly, Vol. 27 No. 3, pp. 425–478.

Venkatesh, V., Thong, J.Y.L. and Xu, X. (2012), "Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology", MIS Quarterly, Vol. 36 No. 1, pp. 157–178.

Venkatesh, V., Brown, S. A., Bala, H. (2013), "Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in Information Systems", MIS Quarterly, Vol. 37, No.1, pp. 21–54.

Wang, W. and Benbasat, I. (2005), "Trust in and Adoption of Online Recommendation Agents", Journal of the Association for Information Systems, Vol. 6 No. 3, pp. 72–101.

Wang, W. and Benbasat, I. (2008), "Attributions of trust in decision support technologies: A study of recommendation agents for e-commerce", Journal of Management Information Systems, Vol. 24 No. 4, pp. 249–273.

Wang, Y.D. and Emurian, H.H. (2005), "An overview of online trust. Concepts, elements, and implications.", Computers in Human Behavior, Vol. 21 No. 1, pp. 105–125.

Westbrook, R.A. (1987), "Product/Consumption-Based Affective Responses and Postpurchase Processes", Journal of Marketing Research, Vol. 24 No. 3, pp. 258–270.

Ying-feng, Z. and Pei-ji, S. (2006), "The Model for Consumer Trust in C2C Online Auction", in Lan, H. (Ed.), Proceedings of 2006 International Conference on Management Science & Engineering, Lille, France, IEEE, pp. 125–129.

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