How Trust is Defined:
A Qualitative and Quantitative Analysis of Scientific Literature

Completed Research Paper

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Abstract

We are confronted with situations requiring trust not only in business contexts but in our everyday lives. In literature, there is no consensus on a single definition of trust leading to a plethora of definitions. Determining what trust means conceptually, regardless whether adopting the organizational, managerial, psychological, social or cultural perspective, requires great effort. The purpose of this research is not to collect a definite list of trust definitions, but to study their similarities and differences especially within the IS discipline as well as interdisciplinary over a large time span. We feel this objective has been achieved with a total of 121 definitions spanning over 50 years of research. Our results aid researchers in finding and devising a fitting definition of trust for their research, while ensuring that no commonly accepted word clusters are omitted. Furthermore, our research enables practitioners to phrase trust-building statements more efficiently and more holistically.

Keywords

Trust, Definition, Analysis, Qualitative Research, Quantitative Research, Social Construction

Introduction

Our society is strongly characterized by trust. Whether it is in a friendship, where one entrusts secrets to a friend, or during lunch time, where one trusts the producer of the meal that it only contains ingredients that are not expired and included on the label, especially if one suffers from food allergies. Also, trust is a fundamental cornerstone in the business context, e.g., when business partners have to trust each other that the respective partner does not act opportunistically. Trust is of particular significance when companies hand over or outsource processes or data, e.g., in electronic markets, cloud computing, eCommerce, digital life or social networks, to name but a few, and pass responsibilities to other service providers. In the information systems (IS) discipline human computer interaction is predominant (e.g., when ordering online without direct contact to a salesperson). In other words, face-to-face conversations, in which, e.g., facial expressions give information about whether the partner is trustworthy or not, do not prevail in the interactions with various information technologies. Consequently, trust in virtual environments is less tangible than trust which can be established and maintained in personal contact. Indeed, daily news on online frauds, hacker attacks, malicious intrusion, data breaches and also the disclosures of the PRISM program brought issues of risk and trust to the forefront of public interest.

Conceiving examples for trust, not only for our everyday lives but also within the IS discipline, is not difficult. However, determining what trust means conceptually, regardless whether adopting the organizational, managerial, psychological, social or cultural perspective requires great effort. Trust is a complex and elusive concept and it is defined differently depending on the respective approach (Josang et al. 2007; Yamagishi and Yamagishi 1994). In literature, there is no consensus on a definition of trust which leads to a plethora of definitions (Rousseau et al. 1998). E.g., from the perspective of an economist,

trust is rather calculative or institutional, while psychologists focus more on the characteristics and internal cognitions of trustors and trustees. Sociologists in turn are of the opinion that trust is anchored in the social characteristics of interpersonal relationships. Thus, so far, there is no universally accepted definition of trust (Rousseau et al. 1998). Even when considering one single domain, in literature there is no commonly accepted definition. In order to work out the dynamic and multifaceted subtleties of trust, an in-depth analysis at different levels is necessary (Walterbusch et al. 2013). Even with a wide array of trust definitions from various disciplines, several concepts are frequently used in trust definitions. With this in mind, we collected a set of 121 definitions of trust from various disciplines, coded and subsequently analyzed them using quantitative data analysis software.

Our aim is not to provide a new definition, as in our opinion it is not possible to derive a commonly acceptable definition of trust. We rather intend to study the similarities and differences of the various definitions (Dahlsrud 2006) especially within the IS discipline as well as interdisciplinary. The corresponding research questions are:

RQ 1: Which terms are commonly used in trust definitions?
RQ 2: Which word clusters
      a. are most frequently used in trust definitions?
      b. exhibit a high co-occurrence with other word clusters?
RQ 3: Which definition of trust covers the most of all identified word clusters?

To answer these questions, we first present related work from other researchers. Subsequently, the applied research model is outlined and the analyses are performed. Following, we present and discuss the results. Finally, we draw a conclusion and discuss implications as well as limitations.

Related Work

The paper at hand is not the first one investigating various definitions of trust. Only few researchers apply a quantitative approach when discussing trust definitions. Castaldo (2002) for example, collected a total of 72 definitions of trust from various domains and performed a content analysis on them. Although the approach taken in his book is similar to ours, the research presented in our paper offers several added values. First, his book was published in 2002. In the meantime, several further definitions were proposed, which – of course – are not included in his analysis. Second, likely due to a higher sample size, we were able to identify a higher number of clusters while retaining differentiation. Third, although some of the applied methodology is shared, in our research endeavor more in-depth analyses are performed. Fourth, to our knowledge, Costaldo's research is only available in Italian. Although some of his results were translated to English and published by Castelfranchi and Falcone (2010), this greatly limits visibility of his research. Finally, it must be noted that by taking a similar approach, we were able to reproduce many of Castaldo's findings, verifying his research.

McKnight et al. (2002) are concerned with developing trust measures for eCommerce. To do so, they collected 32 papers, identified 15 types of trusting beliefs and subsequently clustered them into the categories *competence*, *benevolence*, *integrity* and *others*. Again, the research was performed more than a decade ago (with the most recent definition being from 1996), so we were able to collect a larger and more recent sample. As the paper is more concerned with developing trust measures for eCommerce, again, our analysis of is more in-depth and broader. Rousseau et al. (1998) discuss an array of definitions of trust to deduce their own definition of trust. Other than the paper at hand, they do not take a quantitative approach on the issue but make use of argumentative-deductive analysis. Also, like the previously discussed papers, it is over a decade old, and therefore does not include more recent developments on the subject.

Still, the aforementioned papers were of great assistance while conducting this research. Not only were these great aids in identifying trust definitions, but also in how the various concepts and terms could be clustered and analyzed. We view Trust as a social construction, as such it is impossible to derive an unbiased definition (Berger and Luckmann 1966; Dahlsrud 2006). Nevertheless, differences and similarities between definitions can be studied. Depending on the depth or the author's point of view different factors are important. In the analyzed literature it is striking that in current publications authors do not try to define trust anew but synthesize complete existing definitions or only pick those parts of existing definitions they find most relevant and applicable for their own research endeavor.

Analysis, Results and Discussion

Method

First, the data to be analyzed had to be obtained. Therefore, we conducted a thorough literature search and applied backward searches to find a total of 121 trust definitions (cf. Appendix) from various domains. Focusing a single domain was not deemed reasonable as we are investigating general definitions of trust, rather than definitions of trust on a very narrow subset of available research (e.g., trust in eCommerce websites). We felt that a broader view on the topic adds to the quality and meaningfulness of the performed analyses. Second, the identified definitions were prepared for the software-aided quantitative analysis. The steps were as follows:

(i)   spell checking: since each word spelled wrong could lead to imprecise or even invalid conclusions, the software-aided quantitative analysis needs every word to be spelled correctly and consistently;
(ii)   removal of hyphenation: the software used in the analysis can be configured to accept compound words with dashes but it cannot differentiate between dashes and hyphens; consequently, a hyphenated word will be treated as two separate words;
(iii) removal of brackets and braces: the software excludes text in braces from the analysis whereas brackets are used to restrict the analysis to specific text segments only.

Third, the definitions were pre-processed in accordance with Sidorova et al. (2008) using the *QDA Miner* and its extension *WordStat* (Provalis Research 2010). The pre-processing was structured as follows:

(i)   lemmatization: all plurals were brought into singular and all verbs were transformed into the present tense;
(ii)   stemming: nouns, verbs, adjectives and adverbs were transformed into their corresponding word stem (e. g., the suffix of the words *collaborate, collaborating, collaboration* and *collaborative* were removed and all words were reduced to the word stem *collabor** (Iscipline et al. 2008)); this step resolved one of the biggest problems concerning quantitative content analysis: the existence of synonyms and identical termini with different spelling (e.g., American and British English) (Freundlieb and Teuteberg 2013);
(iii) removal of stop words: in general stop words are trivial words or phrases which are used frequently and are of minor importance for the content analysis (e.g., *the, as* and *or*).

Fourth, we carried out a word stem frequency analysis, which defines how often an individual word stem appears absolutely and relatively in the analyzed definitions. Fifth, we conducted a qualitative data analysis. Our approach to analyzing the qualitative data was by means of coding the obtained definitions with the various word clusters of trust derived from literature. According to Miles and Huberman (1994), codes are "tags or labels for assigning units of meaning to descriptive or inferential information compiled during a study". In the following, we describe how we followed Ryan's and Bernard's (2000) six fundamental tasks associated with this form of analysis:

(i)   sampling: we used the definitions identified during the thorough literature search;
(ii)   identifying themes and (iii) building codebooks: we consulted Castaldo (2002) and McKnight et al. (2002) for their investigations in trust definitions, which were then enriched with additional ideas from Schoorman et al. (2007); finally, we used the data obtained during the fourth step (word stem frequency analysis) to determine all words used at least five times in our set of definitions and either subsumed them in the existing set of terms developed by Castaldo (2002) or created new terms;
(iv)   marking text: the marking (i.e., process of assigning codes to the definitions) was done using automated procedures in most cases. As some of the identified words have more than one meaning (e.g., *will, subject, one*) and said procedures do not possess the capability to handle this difficulty, some were coded manually. This manual coding was done by a single researcher, therefore, inter-rater reliability is not a concern (Straub et al. 2004);
(v)   constructing models: the description of the construction of the devised model will follow in the next section;
(vi)   testing models: according to Ryan and Bernard (2000) the sixth step involves verifying the model developed in the previous step on a different or wider set of data; however, since our model focuses on the specific topic of trust and since it is based on a sufficient set of trust definitions (n=121), further validation is not deemed necessary.

Sixth, we analyzed the co-occurrence of word clusters, which gives information about the common appearance of two word clusters *A* and *B* (1:1). Based on these co-occurrences a dendrogram can be derived. Dendrograms provide information about how often one merged word cluster (*A*, *B*) is mentioned in connection with another word cluster *C* (1:n). Seventh, we analyzed the total number of citations of each definition as well as the overall temporal distribution. Eighth, all performed analyses had to be evaluated individually, whereas the results had to be interpreted as well as synthesized in order to draw an extensive picture.

Results and Discussion

The first research question asks which terms are commonly used in trust definitions. The used software and steps taken to prepare the data enabled us to quickly gather the information presented in Table 1. It lists the 20 most frequently used terms in all trust definitions. The column *Frequency* lists the absolute number of occurrences of each respective word stem. If a word stem appears twice within the same definition, it is counted twice in this column. The column *No. of Cases* indicates the number of definitions in which each word stem occurs, whereas the column *% of Cases* indicates what percentage of the total set of 121 definitions this represents.

#	Term	Frequency	No. of Cases	% of Cases
1	EXPECT	82	58	47.9%
2	DEFIN	43	41	33.9%
3	PARTY	64	36	29.8%
4	ACTION	47	29	24.0%
5	VULNER	31	28	23.1%
6	BELIEF	33	27	22.3%
7	CONFID	32	27	22.3%
8	BEHAVIOR	25	21	17.4%
9	RISK	25	21	17.4%
10	ACT	22	21	17.4%
11	PARTNER	29	20	16.5%
12	RELI	20	20	16.5%
13	EXCHANG	22	18	14.9%
14	PERSON	32	17	14.0%
15	INDIVIDU	23	14	11.6%
16	SITUAT	17	14	11.6%
17	HOLD	14	14	11.6%
18	INVOLV	14	11	9.1%
19	GROUP	14	9	7.4%
20	GOOD	16	8	6.6%

Table 1: Commonly used Terms in Trust Definitions

Although this is not stated as a research question, we concluded that the results shown in Table 2, which shows the temporal distribution of definitions and their number of citations to date, are nonetheless interesting. As can be seen, little research on trust was performed before 1980. Papers which have to be regarded as influential are Deutsch (1958), Blau (1964), Garfinkel (1967) and Rotter (1967) with 1920, 14744, 2589 and 2347 citations, respectively. Starting with the 1980s, significantly more definitions of trust could be found. The 1990s were a particularly fruitful decade for trust research with many widely referenced publications, such as (Anderson and Narus 1990), Morgan and Hunt (1994), Fukuyama (1995), Mayer et al. (1995) and Uzzi (1997) with 5098, 12958, 12787, 9013 and 6500 citations, respectively. In our analysis we only found two papers from the 2000s with more than 1,000 citations - Sirdeshmukh et al. (2002) and Lane et al. (2001) - and also substantially fewer papers containing trust definitions than in the previous decades. The reason for this is simply, that there was fewer time to cite said papers and that the

more recent a paper is, the less likely it is to emerge in a backward search. Therefore, declining numbers in this table should not be taken as an indication of a decline in trust research as a whole. It must be noted that we do not claim to have compiled a complete list of trust definitions. However, we do feel that the collected sample of 121 definitions spanning more than 50 years of research allows a representative insight into the research in the field and illustrates the variety of views on the topic.

Decade	Definitions	Fraction	Total Cites	Average Cites	Fraction
Before 1960	2	.017	1925	963	.010
1960s	4	.033	19,709	4,927	.105
1970s	6	.050	4,034	672	.022
1980s	21	.174	34,252	1,631	.183
1990s	57	.471	115,161	2,020	.616
2000s	28	.231	11,662	417	.062
2010s	3	.025	75	25	0.00
Total	121	1.000	186,818		1.00

Table 2: Temporal Distribution of Definitions

Next, we investigate the frequency of the previously derived word clusters (cf. steps (iii) and (iv) of the qualitative data analysis in the methodological section). To determine the usage of each cluster, the number of citations – in this case obtained from Google Scholar – of each definition referencing each respective cluster was added up, resulting in a Cluster Score (CS, cf. equation (1)). This CS was then divided by the total number of references of all definitions to obtain a Cluster Ratio (CR, cf. equation (2)) (Dahlsrud 2006). In other words, whereas the CS indicates the number of citations of definitions containing a word from the respective cluster, the CR indicates the relative usage of a cluster among all citations in the analysis.

$$CS_i = \sum_{j=1}^{x} F_{Def_{ji}} \tag{1}$$

$$CR_i = \frac{CS_i}{\sum_{k=1}^{y} F_{Def_k}} \tag{2}$$

where:

CS_i: Cluster Score for word cluster i

CR_i: Cluster Ratio for word cluster i

$F_{Def_{ji}}$:   Frequency count for definition j categorized to word cluster i

F_{Def_k}:   Frequency count for definition k

x: Total number of definitions categorized to word cluster i

y: Total number of definitions in the analysis

Table 3 presents the results from the cluster analysis including the name of the cluster, its associated keywords (an asterisk indicating a wildcard character (e.g., *expect** will include the terms *expects, expectation, expecting, expectancy* and others)), the number of definitions in which this cluster is present, the CS as well as the CR. The results are sorted descending by CR.

Cluster	Keywords	Freq.	CS	CR
subject	A, actor, agent*, another, B, company, companies, communit*, consumer*, customer*, entity, entities, firm*, group*, individual*, it, member*, one, oneself, organization*, organisation*, other*, partner*, party, parties, people, person*, provider, salesperson*, supplier*, target_of_trust, thing*, trustee*, truster*, trustor*, us, who*, X, Y, you	116	176,900	.947
expect	expect*	58	86,547	.463
action	act*, behaviour*, bahavior*, behave*, behaving	58	75,869	.406
exchange	exchange*	18	62,131	.333
will	will	52	59,654	.319
rely	rely, reliable, reliance, relie*, reliability, relying, depend*, dependency	40	59,226	.317
confident	confident, confidence	27	48,416	.259
belief	belief*, believ*, faith*, good-faith*	33	41,940	.224
fulfill	fulfill*, commit*	16	35,108	.188
willingness	willing*	23	33,192	.178
based	based	14	32,707	.175
obligation	obligation*, obligate*, duty, promise*	15	32,188	.172
relationship	relationship*, inter-organizational, inter-organisational, inter-personal, inter-group, interorganizational, interorganisational, interpersonal, intergroup	17	28,636	.153
take	take*, took, taken, taking, accept*	21	27,709	.148
outcome	outcome*, result*, perform*	17	27,510	.147
vulnerable	vulnerable, vulnerability	21	24,883	.133
competent	competen*, capabilit*, abilit*, able, aptitude*	13	21,483	.115
integrity	integrity, moral*, ethical*	7	20,329	.109
time	time*, timing, delay, future, past, temporal, long-term, short-term, term, period, day, week, month, year	15	18,965	.102
exploit	exploit*, violate*, violation*, opportunistic*, opportunism*	19	18,759	.100
control	control*, monitor*	8	17,536	.094
risk	risk*	21	17,454	.093
honest	honest*	5	16,356	.088
word	word*	10	15,996	.086
positive	positive*	13	15,500	.083
would	would	4	15,243	.082
intention	intention*, intent*, intend*, motive*	11	14,504	.078
benevolence	benevolen*, good-will, goodwill, good_will	15	14,491	.078
negative	negative*	9	13,332	.071
held	held*	13	12,622	.068
involve	involve*, involving	11	10,392	.056
assume	assume*, assumption*, assuming	3	9,507	.051
mutual	mutual, mutually, reciprocity, reciprocal	7	6,649	.036
cooperate	cooperate*, cooperation*, coordination*	5	6,353	.034
decide	decide*, decision*	3	6,265	.034
attitude	attitude*	8	6,163	.033

Table 3. Clusters in the Analysis of all Trust Definitions *(n=121)*

Cluster	Keywords	Freq.	CS	CR
situation	situation*	14	5,346	.029
psychological state	psychological_state, psychological_construct	2	4,679	.025
harm	harm	4	2,037	.011
judgment	judgment, judgement, judge*, judging	4	1,345	.007
emotion	emotion*, feel*	2	900	.005

Table 4. Clusters in the Analysis of all Trust Definitions *(n=121)* **(continued)**

Furthermore, we conducted a hierarchical cluster analysis, to be more precisely we calculated Jaccard's coefficient (*J*, cf. equation (3)) for two given clusters *A* and *B*. Jaccard's coefficient is a measure commonly used in information retrieval as measures of association (Salton and McGill 1983). Using this measure, we are able to determine a coefficient of co-occurrence of two clusters or groups of clusters: The higher the coefficient, the more often two clusters appear alongside.

$$J(A,B) = \frac{|A \cap B|}{|A \cup B|} \tag{3}$$

where:

$A \cap B$:   Size of the intersection of two given clusters *A* and *B*

$A \cup B$:   Size of the union of two given clusters *A* and *B*

with:

$J(\emptyset, \emptyset) = 1$ and $0 \leq J(A,B) \leq 1$

The result of the hierarchical cluster analysis can be reviewed in the dendrogram displayed in Figure 1 where Jaccard's coefficient was used as the distance metric. The figure features an agglomerative approach where each observation starts in its own cluster on the left and is merged with others in accordance to the distance metric.

There is a relatively high co-occurrence of the word clusters *action* and *will* as well as the word clusters *expect and subject*. In the second order, the clusters *action/will* and *expect/subject* demonstrate a high co-occurrence as well. This is likely because many definitions state that the trustor [*subject*] expects [*expect*] the trustee [*subject*] to perform an action [*action*] in the future [*will*]. Also, there is a relatively high co-occurrence between *will* and *time* (.200), which is not obvious from the dendrogram. The cluster *will* (which is not to be confused with *willingness*) always describes statements referring to the future, which in turn is a term associated with the cluster *time*. *Time* also includes other aspects (e.g., *timeliness*, *long-* and *short-time relationships*) and therefore has to be acknowledged as a separate cluster.

Although the individual clusters appear relatively rarely, the frequent co-occurrence of the clusters *obligation* and *word* can be explained by the fact that a trusting relationship not only implies obligations (terms of a relationship which are commonly adhered to and can be seen as consensus unless stated otherwise, e.g., being faithful to a spouse), but also obligations which are stated either in verbal communication or written statements (e.g., contracts or service level agreements).

Trustors not only expect the trustee to act in a way that positive effects for the trustor are achieved, but also to prevent possible negative effects. Hence, the co-occurrences of *positive* and *negative* can be explained. Similarly, the trustee's ability or competence (i.e., *competent*) to perform a certain action is influencing the positive or negative *outcome* of said act. Hence, the co-occurrence of the clusters *competent* and *outcome*.

The co-occurrence of *risk*, *situation* and in the second order *involve* stems from the fact that many definitions describe trust in a situation involving risk. The underlying rationale is that if a situation does not involve the risk of a negative or missing a positive outcome, no trust is needed. Also, the cluster *willingness* occurs often alongside the clusters *risk* and/or *vulnerability*. Many definitions acknowledge that the trustor is exposed to the trustee's possible malevolent or opportunistic behavior. Therefore, many state that trust includes the willingness to take risks and to be vulnerable to another subject, whose actions cannot be controlled or monitored.
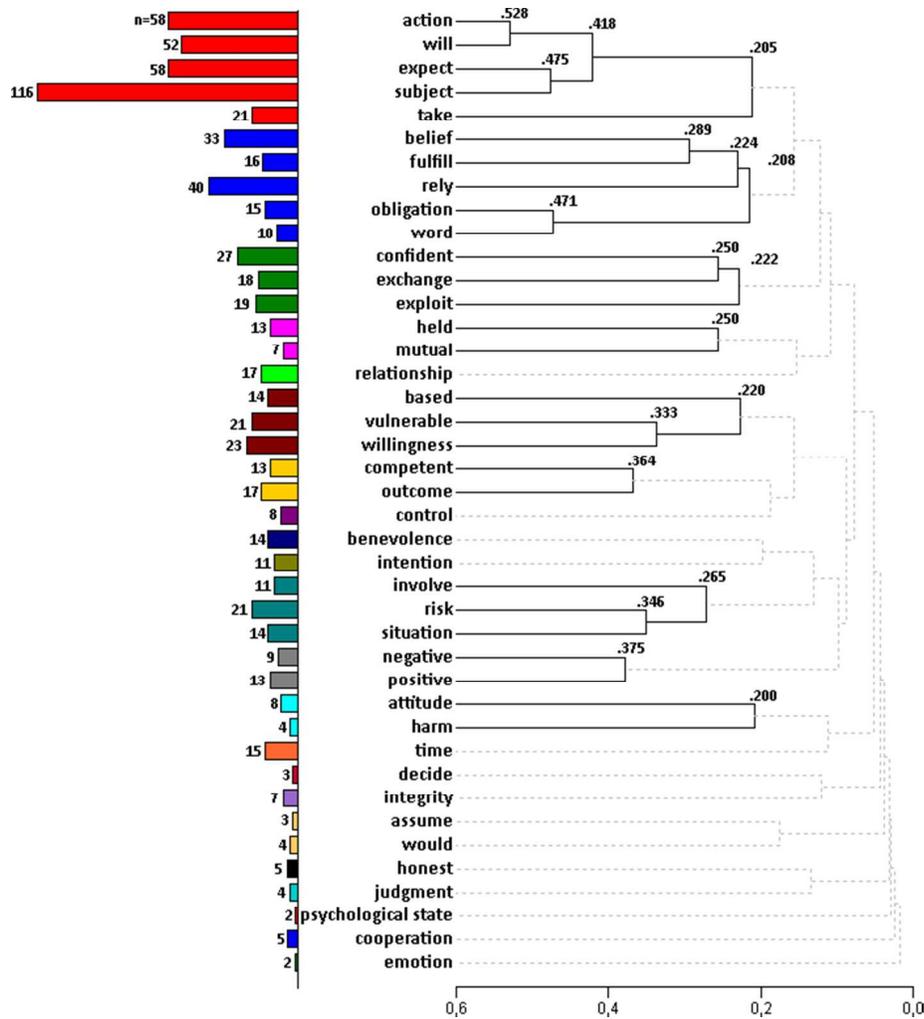
Figure 1. Hierarchical Cluster Analysis *(Jaccard's Coefficient ≥ .2)*

Finally, we determined the definition of trust covering most identified word clusters. According to our analysis this is the definition by Whitener et al. (1998) with a total of 13 clusters (*expect*, *fulfill*, *involve*, *control*, *action*, *belief*, *benevolence*, *vulnerable*, *will*, *willingness*, *outcome*, *rely* and *risk*):

> *"First, trust in another party reflects an expectation or belief that the other party will act benevolently. Second, one cannot control or force the other party to fulfill this expectation - that is, trust involves a willingness to be vulnerable and risk that the other party may not fulfill that expectation. Third, trust involves some level of dependency on the other party so that the outcomes of one individual are influenced by the actions of another."*

Again, we must stress that, although this definition mentions the most clusters, it cannot be regarded as the best of fitting in the most situations. The applied definition of trust is always dependent on the respective researcher's point of view and application domain.

Conclusion and Limitations

As stated and cited over and over not only within the IS literature, even in this paper, there is no commonly accepted definition of trust. Nonetheless, our analysis shows that although there is a plethora of definitions available which all apply different terms and phrases, these definitions are (more or less) making use of the same word clusters, not to say constructs. Consequently, the need for a holistic and interdisciplinary definition of trust has to be put into perspective leading to the question of the necessity of such. In this context it is legitimate to on the one hand define trust separately for each research endeavor or, on the other hand, to fall back on established definitions of trust. In both cases, our research

aids finding and devising a fitting definition of trust, while ensuring that no commonly accepted word clusters are omitted. Our research implies that, e.g., neglecting the word clusters *subject* and *expectations* would not be in line with this and previous research on the topic of trust. Furthermore, from a practical perspective, it is recommended to address the commonly used word clusters in trust definitions in relationships requiring trust. This means that our research enables practitioners to phrase trust-building statements more efficiently and more holistically, e.g., how an IT outsourcing provider should communicate that he will meet the customers' expectations regarding handling the outsourced data or processes.

Not only the recent developments within the field of NeuroIS (Dimoka et al. 2012) may bring changes to how we conceptualize and measure trust. The current approach of operationalizing trust via multi-item scales is subject to many biases and may not be sufficient to identify all dependencies of and influences on the complex construct of trust. Our current view on trust and its comprising constructs may be open to extension, changes or even realignment. The existing definitions try to describe trust, but, as a recommendation, the leading questions on this topic should not be of definitional nature, but should focus more on the background of trust, namely the exploration of the establishment, maintenance and loss of trust.

As any research endeavor, the research presented herein has some limitations. As it has been pointed out, more definitions of trust can likely be gathered. The purpose of this research was not to collect a definite list of trust definitions, but to analyze a representative sample of trust definitions over a large time span. We feel this objective has been achieved with a total of 121 definitions spanning over 50 years of research. However, we encourage the anonymous reviewers and track chairs to submit definitions besides those already included in the analysis (cf. Appendix) for inclusion.

The decision whether to include the *CS* and *CR* into the analyses was thoroughly discussed by the authors. The main points of criticism regarding these are: (a) the fact that Google Scholar, which was used to determine the number of citations of each definition, is not 100% accurate. However, since it was used for the determination of every paper's citations, these indicators can be considered consistent. (b) There is no feasible way to determine whether the papers were cited for their definition of trust or for something else. To truly overcome this limitation every single one of the 186,818 references would have to be checked manually, which can hardly be considered practicable. Again, we used the same approach for every definition, therefore consistency can be assumed. Also, we assume that if a paper cites another paper, it is likely to be in line with the underlying assumptions and views of the referenced papers.

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Appendix

Further information on the analyzed definitions can be found online:
http://www.uwi.uni-osnabrueck.de/Appendix_TrustDefinitions_AMCIS2014.pdf