Methodological and Practical Challenges of Interdisciplinary Trust Research

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Abstract Trust plays a pivotal role in many different contexts and thus has been investigated by researchers in a variety of disciplines. In this chapter, we provide a comprehensive overview of methodological approaches to investigating trust and its antecedents. We explain how quantitative methods may be used to measure expectations about a trustee or instances of communication about trust efficiently, and we explain how using qualitative measures may be beneficial to researching trust in less explored contexts and for further theory development. We further point out that mixed methods research (uniting both quantitative and qualitative approaches) may be able to grasp the full complexity of trust. Finally, we introduce how agent-based modeling may be used to simulate and predict complex trust relationships on different levels of analysis. We elaborate on challenges and advantages of all these different methodological approaches to researching trust and conclude with recommendations to guide trust researchers in their planning of future investigations on both situational trust and long-term developments of trust in different contexts, and we emphasize why we believe that such undertakings will benefit from interdisciplinary approaches.

Keywords Trust · Measurement of trust · Quantitative research · Qualitative research · Mixed methods research · Agent-based modeling

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1 Introduction

Trust plays a role in many different fields, and it is often unavoidable. One of the most cited definitions of trust states that "trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviors of another" (Rousseau et al. 1998, p. 395). The extraordinary role of trust in our modern and digitized societies can be exemplified with the global pandemic caused by the virus SARS-CoV-2 in 2020 (that occurred while this chapter was being written). Citizens must not only trust that their governments will decide on effective measures in order stop the virus from spreading, that scientists will produce reliable and informative research about the virus and measures to contain it, and that journalists will adequately inform them about both political decision making and scientific findings. With the recommendation that people should work from home where possible, team leaders have to trust that co-workers reliably pursue their jobs, while workers in turn must trust that team leaders would advise them well on the new (mostly digital) workflow. Besides digital technology for team collaboration being used, cell phone apps for keeping track of the spread of the virus were developed, resulting in debates about the apps' trustworthiness and data security.

What do these different examples of trust have in common, and how could trust be captured by measurement in each of these cases? The examples above share central features of trust (even though there is no definition of trust yet that is accepted by researchers of all disciplines, see Rompf 2015). Instances in which trust is required are characterized by vulnerability or risk, in spite of which the trustor relies on the trustee or surrenders control, which is only possible by the trustor forming positive expectations about the trustee – the object of trust (Rompf 2015). However, the examples also show that trust may be directed at different "objects." Following micro, meso, and macro levels of analysis, trust can be directed at people, people as role holders, organizations, institutions, or social systems (Blöbaum 2016; Endreß 2002). First, trust may be directed at people one knows or communicates with in person, in our example, co-workers. Second, especially in digital settings, one often must trust people as role holders, in our example politicians, scientists, and journalists who report on the issue. Third, objects of trust could be organizations (e.g., the trustor's employing company) or institutions (e.g., health care, scientific institutions). Fourth, the trustor might also trust that reliable systems are in place to control for risks, i.e., that the government makes well-informed decisions, and that other citizens abide by the new-established rules. In this chapter, we also argue for adding technology to the list of trust objects (see Sect. 2.1.3). For example, a person may place trust in technology when she downloads and uses the app (Oldeweme et al., 2021). Finally, trust in various objects may also be the topic of conversations or communication (such as journalistic news coverage).

In the following sections, we will briefly summarize methods of measuring and researching trust in all these different instances. In doing so, we will refer to the interdisciplinary background of the Research Training Group "*Trust and Communication in a Digitized World*," which collects researchers from Communication

Science, Psychology, Information Systems, Business Economics, and Sports Sciences[1]. In Sect. 2, we summarize quantitative approaches for measuring trust. Besides introducing psychometric approaches for measuring trust in people (as role holders) and technology, we briefly refer to implicit and behavioral measurement. Also, we describe the quantitative measurement of mediated trust in journalistic news coverage via content analysis in Sect. 2.3. In Sect. 3, we describe qualitative approaches to measuring trust, e.g., gathering data via interviews and analyzing data using content analyses, followed by approaches that mix qualitative and quantitative measurement (Sect. 4). In Sect. 5, we report how computer simulations and agent-based modeling (ABM) in particular contribute to trust research. Finally, advantages and challenges—and resulting implications—for the interdisciplinary conceptualization and measurement of trust are summarized in Sect. 6.

2 Quantitative Measurement of Trust: Advantages and Challenges

Quantitative measurement has developed as a result of the philosophical notion that concepts in the social sciences and psychology could be assessed in a systematic manner, namely using *scientific* methods (Kline 1998), and thus are measurable via numerical quantification.

First, in psychology, attitudes have long been measured using psychometric assessment. Items are used which require subjects to give ratings on a scale. Several items comprise an instrument, because a certain number of items is required to assess the complexity of a concept and possibly identify sub-scales (we provide an example of a psychometric measurement in Sect. 2.1.2). Using psychometric instruments to survey a large sample of individuals allows researchers to estimate the extent of the manifestation of a concept in a population and to compare between samples by statistical testing (e.g., how much German vs. British people trust the government), or to other psychological concepts (e.g., how people's trust in the government relates to political literacy). Further, it allows for experimental testing of variables that may influence trust. Possible (significant) differences between or within groups may then be quantified as effect sizes. Overall, this permits verification of results.

Second, quantitative measurement also allows systematic examination of communication. Quantitative content analysis may be used to assess collected data in such a way that instances of communication are assigned numerical values, which allows for statistical testing in similar ways as those that were described for psychometric measurement. For example, one could assess the quantity of certain trust frames in news coverage (for further elaboration, see Sect. 2.3) or in social media

[1]Other overviews of the measurement of and research on trust (in different disciplinary contexts) can be found elsewhere (e.g. trust and distrust in journalism: Engelke et al. 2019; trust in organizational settings: Lyon et al. 2015; McEvily and Tortoriello 2011).

entries. In some disciplines or contexts, quantitative content analyses are also used for systematic analysis of data collected by researchers in interviews or focus groups (similarities and differences between quantitative and qualitative content analysis will be briefly elaborated on in Sect. 3).

Quantitative measurement enables researchers to repeat and thus replicate other's studies, and it allows for meta-analysis to estimate the size of an effect over a number of investigations. Further, quantitative measures can be tested for reliability (the consistency of the measure) and validity (the correspondence of the measure with the real-word concepts it aims to grasp). However, while psychometric measurement enables the researcher to make comparisons across time and individuals, or across instances of communication, some level of inter-individual difference might not be uncovered (for example, an individual understanding of the term "trust," see Sects. 3 and 4). Scientific uncertainty due to (among other reasons) lack of reliability and validity of measurement will always go along with empirical research (see Walker 1990). This is one limitation that can only be reduced, not eliminated.

2.1 Psychometric Measurement

In the following section, we review the quantitative measurement of trust, by referring to the model by Mayer et al. (1995), which highly influenced later conceptualizations of trust, e.g., Rousseau et al. 1998). They defined trust as the willingness of the trustor to be vulnerable to another entity (the trustee), based on the trustor's own propensity to trust (Sect. 2.1.1) and the positive expectations about the trustworthiness of the trustee (Sects. 2.1.2 and 2.1.3). After briefly explaining the implicit measurement of trust (Sect. 2.1.4), we give examples on measuring trust as behavior (Sect. 2.2).

2.1.1 Characteristics of the Trustor

Besides socio-demographics, most researchers consider trust propensity and risk propensity as important antecedents of trust that pertain to the trustor (Blöbaum 2016). A trustor's propensity to trust (implying a person's general willingness to trust others) might influence both the *intention to trust in* and *expectations about* the trustee (Mayer et al. 1995). The measurement of a trustor's trust propensity has largely relied on the work of Rotter (1967), but improved measures have since been created (e.g., Ashleigh et al. 2012; Frazier et al. 2013). Risk propensity is considered "an individual's general willingness to take risk" (Das and Teng 2004, p. 108), and there are few instruments for its measurement (for one example see, Meertens and Lion 2008). Depending on the disciplinary context, further characteristics of the trustor may be considered relevant for establishing trust in another entity.

2.1.2 Trust in People (as Role Holders)

In the literature of research on trust, trustworthiness of the trustee is likely the most studied concept, but with mixed terminology (e.g., speaker credibility, trustworthiness beliefs, trusting intentions, and trusting behaviors). Preceding (and largely inspiring) the trustworthiness definition by Mayer et al. (1995), there has been a longstanding research tradition asking what makes speakers trustworthy, and thus convincing ("speaker credibility," e.g., Hovland et al. 1953; for a review of scales, see Pornpitakpan 2004).

Based on an extensive literature review taking into account these and other scales measuring speaker credibility, trustworthiness, and related concepts, Mayer et al. (1995) define ability, benevolence, and integrity (ABI) as dimensions of the perceived trustworthiness of a trustee. Ability comprises the trustee's knowledge and skills in a specific area, integrity the trustee adhering to a set of acceptable standards or principles, and benevolence the goodwill of the trustee and an absence of egocentric profit motives. Mayer and Davis (1999) developed their own questionnaire, in which five to six items for each of the ABI dimensions have to be rated on a 5-point Likert scale (from 1 "Disagree strongly" to 5 "Agree strongly"), which was later re-validated for other domains of interest as well (e.g., for the domain of sports; Dreiskämper et al. 2016). A number of questionnaires have since been developed measuring perceptions of trustworthiness in organizational settings, for example, the trustworthiness of leaders or team members (for a review, see McEvily and Tortoriello 2011).

While previous scales—both on speaker credibility and trustworthiness—were mostly optimized for face-to-face situations in which a trustor can directly assess the trustworthiness of speakers, Hendriks et al. (2015) developed an instrument applicable to digital settings in the context of experts' communication of science, extending previous definitions and operationalizations of trust to a conceptualization of *epistemic* trust (Hendriks et al. 2016a). Epistemic trust directly follows laypeople's bounded understanding of science (Bromme and Goldman 2014), which makes deference to expert knowledge necessary. In order to decide whether to believe the claims experts make, assessing the experts' trustworthiness is a feasible and rational strategy to minimize the risk of being misinformed (Bromme and Gierth in press).

The Muenster Epistemic Trustworthiness Inventory (METI; Hendriks et al. 2015) measures laypeople's ascription of epistemic trustworthiness to an expert and (similar to ABI, see Mayer et al. 1995) comprises the three dimensions expertise (e.g., competent–incompetent), benevolence (e.g., responsible–irresponsible), and integrity (e.g., honest–dishonest). It uses semantic differential-type scales (Döring and Bortz 2016) with antonymous adjectives, which are presented on each side of a scale (from 1 to 7). The three-dimensional factor structure of the METI was developed with exploratory and confirmatory factor analysis, and adequate differentiation between factors was shown (Hendriks et al. 2015). The inventory since has been re-evaluated in further studies, where model fit and reliability replicated well (e.g., Merk and Rosman 2019), and has been used to investigate several questions in the

context of online science communication. For example, the METI has been employed to investigate whether laypeople adapt their trustworthiness ratings about scientist blog authors who disclose ethical aspects related to their field of study (Hendriks et al. 2016b), who use technical language (Thon and Jucks 2017; Zimmermann and Jucks 2018), who use aggressive language (König and Jucks 2019), or who are attacked in social media (Gierth and Bromme 2020).

2.1.3 Trust in (the Context of) Technology

As digitization has increasingly entered into almost all domains of life, the relevance of trust in technology has also increased considerably. Jarvenpaa et al. (1998) were among the first to introduce the concept of trust to the technological context. First studies investigated interpersonal trust relationships in contexts determined by the use of technology, such as virtual teams (Jarvenpaa et al. 1998) or trust in online vendors (Gefen et al. 2003). Here, the measurement of trust corresponds to the interpersonal trust measurement described in the previous sections. In the technology context, not only individuals and organizations can serve as trustees, but also the technology itself or technological artifacts such as e-commerce websites (Ponte et al. 2015; Wei et al. 2009), e-government systems (Distel 2020), robo-advisory services in the financial sector (Bruckes et al. 2019), or security technology (Jalali et al. 2020). These dimensions differ in terms of the characteristics of the trustee. While interpersonal trust is directed towards a "moral and volitional agent" (McKnight et al. 2011, p. 5), trust in a specific technology is placed into a human-made artifact with limited functionality and without will, respectively, moral agency (see for an overview on trust in technology, see Öksüz et al. (2016)). Based on this fundamental distinction, McKnight et al. (2011) concluded that trust in technology "reflects beliefs that a specific technology has the attributes necessary to perform as expected in a given situation in which negative consequences are possible" (McKnight et al. 2011, p. 7). Beyond that, dimensions of trusting beliefs (i.e., trustworthiness) differ in trusting a technology from trusting people (Mayer et al. 1995; McKnight et al. 2011). As trusting beliefs in interpersonal trust involve moral capability—which technologies lack—Mayer et al.'s (1995) ABI dimensions fall short in this context. As such, trusting beliefs in a specific technology are based on the three characteristics: Functionality, helpfulness, and reliability (McKnight et al. 2011).

Although trust in technology and interpersonal trust comprise different dimensions, they are related to each other. In online environments, people usually lack direct interaction with people (i.e., vendors) and thus need to base their decision whether to trust a vendor or not on their beliefs about the technology (Li et al. 2012). Conversely, there can also be transfer effects when an established vendor introduces a new technology. For example, it has been shown that trust in a bank as an organization has a positive effect on the initial trust in the offered robo-advisory service (Bruckes et al. 2019). When conducting studies in the technology context, it should therefore be considered whether interpersonal, respectively, inter-organizational trust or trust in technology is relevant or whether even the different

dimensions of trust should be considered simultaneously in order to account for transfer effects.

2.1.4 Measurement of Trust as an Implicit Attitude

A trustor's ascriptions of trustworthiness to a trustee might not only be grounded on extensive reasoning, but may also form heuristically (Kruglanski et al. 2005). Hence, there have been approaches to measure trust similar to the measurement of implicit attitudes or stereotypes (for an example, see, Burns and Conchie 2012). The theoretical idea behind implicit measurement of trust is that attitudinal information is stored in close association with a related object. Therefore, reaction times (e.g., of category sorting) should be facilitated when the trust object in question is congruent with the attitude (e.g., trust) but be impeded when it is not (e.g., distrust). Source credibility has been shown to influence both explicit and implicit evaluations of a product, however, the latter counterintuitively only under high elaboration conditions (Smith et al. 2013). As such—and taking into consideration that implicit measurement may have low reliability (Burns and Conchie 2012)—it is unclear how much additional information is gained with the implicit measurement of trust.

2.2 Measurement of Trust as Behavior

One aspect of the theoretical framework that Mayer et al. (1995) provided has been neglected as of yet, namely the behavioral manifestation of trust (originally "risk taking in a relationship"). As providing a full list of possible trust actions is probably impossible, we provide a few illustrative examples in the following paragraphs.

In organizational settings, trust can be measured as cooperative behavior (Lewicki et al. 2006), for example, in a "Trust Game" (Berg et al. 1995). In such a game, one player is given money, which she can decide to share with a second player (fully or partially). In the event that she sends any amount of money (she can also decide against sharing) to another player, this amount is tripled by the experimenter. However, the other player is not obliged to return any sum of money of the amount received. That is, if the first player decides to send money, this behavior includes risk and thus indicates trust behavior.

In developmental psychology, epistemic trust has been investigated with children as young as three years of age (for a review, see Harris et al. 2018). In the selective trust paradigm two speakers (e.g., confederates or puppets) provide information. In some experiments, speaker characteristics are varied by providing the child with information about a speaker (e.g., "is a liar"), in others, speakers behave a certain way. For example, one speaker may use wrong names for familiar objects several times (e.g., saying "spoon," when a cup is presented), while the other speaker names all objects correctly (the knowledgeable informant). When unfamiliar objects are subsequently presented, they are labeled differently by the two speakers. Selective

trust following inferences about speaker expertise is implied when a child uses the knowledgeable informant's label when it is asked to name the unfamiliar object.

Focusing on trust in information, Westphal and Blöbaum (2016) have argued that trust as a behavior may be an exception in digital settings; measuring it might thus be a difficult endeavor. However, there are instances of risk taking in online settings based on positive expectations about others. For example, trust in virtual interlocutors could be indicated when the trustor opts to self-disclose personal information (Jucks et al. 2016; Moll et al. 2014; Thon and Jucks 2014). Investigating this and similar behavior involved in situations that imply risk taking might be a promising way to further investigate trust in digital settings.

2.3 Measurement of Trust as Depicted in Journalistic News Coverage

Trust relationships are not always based on direct experience, but rather on intermediaries: By depicting trust in their journalistic news coverage, the media as one of the most important intermediaries in society can raise public awareness of trust and thus contribute to its emergence (Blöbaum 2014). Understanding how trust is transported through journalistic news coverage requires knowledge on how trust is depicted, which can be investigated via quantitative content analysis (see Sect. 3 for qualitative content analysis).

Quantitative content analysis is a central method within communication research but can be applied in other disciplines as well (Coe and Scacco 2017; Lacy et al. 2015). In this method, features of communication—most often of texts—are categorized systematically by assigning them numerical codes with the purpose of conducting statistical analyses to describe trends and patterns regarding the features (Coe and Scacco 2017; Lacy et al. 2015). This categorization—referred to as the process of coding—is guided by a codebook and can be conducted manually (i.e., by humans) or automatically (i.e., by computers), with each involving its own advantages and disadvantages and combinations of both approaches being possible as well (Coe and Scacco 2017; Lacy et al. 2015; Scharkow 2017; Zamith and Lewis 2015).

One concept that is drawn upon to capture the depiction of trust in news coverage is that of public trust (Bentele 1994; Bentele 2008; Bentele and Seidenglanz 2008), which is understood as "the attribution of different degrees of trust or distrust in publicly visible individuals, organizations, thus in actors and social systems" (Bentele and Seidenglanz 2008, p. 56) as the objects of trust. The media—respectively, their news coverage—are one possible trust mediator in that they publicly communicate trust factors in the form of specific characteristics of the objects as well as discrepancies in the objects' communications or actions (Bentele 1994; Bentele 2008; Bentele and Seidenglanz 2008). Studies have drawn upon this concept and used manual quantitative content analysis to investigate discrepancies depicted in

news coverage of DAX 30 companies (Seiffert et al. 2011) or both trust factors and discrepancies dealt with in news coverage of the scandals surrounding Christian Wulff, then President of the Federal Republic of Germany (Grünberg et al. 2015). Another possible way to examine the depiction of trust in news coverage via manual quantitative content analysis is to draw upon the more recently developed concept of trust frames, which are the focus of the remainder of this section[2] (Engelke 2018).

Journalistic framing is the process of giving orientation to recipients on an issue by selecting and highlighting specific aspects of that issue in news content, the product of which is called a news frame (de Vreese 2005; Entman 1993; Entman 2003). The concept of trust frames builds upon the work of Entman (1993, 2003), who defines four frame elements in which the specific aspects are highlighted: (1) The problem definition, which contains the central aspect that is highlighted—i.e., the problem[3]—as well as relevant actors; (2) the causal identification, which identifies one or more causes for the central aspect; (3) the evaluation of both the causal actor and the central aspect, and (4) the treatment recommendation, which encompasses both suggested and already taken measures addressing the central aspect and also predicts the effects of these two types of measures. Together, these four elements create a structure within a news article that—if repeated across several news texts—is understood as a news frame (Matthes 2007; Matthes and Kohring 2008). According to Entman (1993, 2003), not all four but at least two elements must be present to constitute a frame. While Entman does not specify which elements are needed, their description illustrates that the problem definition and causal identification are crucial: Without the problem definition and its central aspect, a frame would not provide orientation, and without the causal identification for the central aspect, no structure would be present. Moreover, these two elements are the reference points for which problems and actors are evaluated and for which causes measures should address.

Trust frames are thus present in news articles when the central aspect of trust is selected and highlighted with regard to an issue. The problem definition features not only trust (see Sect. 2.1 for a definition) but also the trustor and the trustee, which can both appear as individuals, groups of people, or organizations (Fulmer and Gelfand 2012; Rousseau et al. 1998). Moreover, the trustor can also appear as the general public in those cases where no other explicit actor is mentioned, and trust assumedly

[2]The concept of trust frames was previously developed for and applied in Engelke (2018). It is part of the larger concept of trust dimension frames, which additionally encompasses distrust frames and trust problem frames and also includes further actors than those discussed here, namely technologies as objects (see also Sect. 2.1.3) and social systems as both subjects and objects in trust, distrust, or trust problem relationships. The following section is therefore a brief and condensed summary of the more extensive and detailed development, description and application of the concept, which can be found in Engelke (2018).

[3]Entman (1993, p. 52) states that the problem definition "determine[s] what a causal agent is doing with what costs and benefits", which demonstrates that the central aspect is not necessarily negative but can also be positive (see also Matthes 2007). While it would therefore be more precise to speak of the "central aspect definition," we nevertheless use the established term "problem definition."

is of wider public relevance. This is based on the fact that journalism fulfills its function for—and journalistic news coverage therefore is addressed to—society as a whole, including the various actors in it (Mast 2018). The causal identification comprises two aspects: The trustor's propensity to trust as well as antecedents of trustworthiness, which together can lead to trust (Mayer et al. 1995)—i.e., to the central aspect. One or several of the three antecedents—i.e., ability, benevolence, integrity (Mayer et al. 1995)—can be addressed in a news article. The evaluation of the trustee as the causal actor as well as the evaluation of trust itself can be either positive, negative or ambivalent (Matthes and Kohring 2008). The treatment recommendation, finally, encompasses suggested measures to maintain trust and their predicted effects as well as already taken measures to maintain trust and their predicted effects. Maintaining trust can be achieved by enhancing the trustor's perception of the trustee's trustworthiness, specifically by demonstrating the three antecedents (Schoorman et al. 2015). The predictions can again be positive, negative, or ambivalent in that they make statements both about the measures' effects and about whether they should be endorsed or rejected (Entman 1993; Entman 2003; Matthes 2007; Matthes and Kohring 2008). In accordance with the general understanding of news frames, a trust frame can only be identified if at least the first two elements are present and if the ensuing structure is found in more than one news text.

In a manual content analysis (see above), the aspects within the four frame elements can be understood as the features that are coded for analysis. Since there have been repeated calls for more transparency regarding the operationalization of frames (Borah 2011; Matthes 2009), a brief explanation follows on how trust frames are identified. The operationalization of trust frames is divided into two content categories: The frame element category in a first and the trust frame category in a second step. The frame element category contains the variables for all the aspects that can be selected and highlighted within the four frame elements, which are derived deductively from the trust and framing literature. The second content category encompasses two variables: The individual frame and the abstract frame. In the individual frame, the codes for all variables in the frame element category are assembled, resulting in one long numerical code. In the abstract frame, only the codes for the variables of the problem definition and the causal identification as the two crucial frame elements are assembled, resulting in a slightly shorter numerical code. These two variables allow an easy identification and differentiation of repeated structures and of the tendencies within these repeated structures, regardless of their frequency—i.e., which trustors and trustees occur in combination with which antecedents of trustworthiness and (for the individual frames) which evaluations and treatment recommendations are highlighted in combination with the specific problem definition and causal identification. Including the shorter abstract frame allows for more generalized insights, especially when only a small sample of news articles is analyzed and completely repeated structures of all four elements are thus found less often than in larger samples.

This approach thus identifies frames through a manual dimension reducing procedure, which is characterized by a manual coding of individual frame elements

followed by a reduction of the data to frames, mostly via cluster analysis (Matthes 2007; Matthes and Kohring 2008; see Matthes 2007 as well as Matthes and Kohring 2008, for an overview of further methodological approaches to identify frames). However, because the trust frame concept is designed to be applied with regard to different issues and to identify differences in trust frames as precisely as possible, the approach differs from the procedure suggested by Matthes and Kohring in two ways: (1) The different aspects that can be highlighted in the frame elements were not developed inductively for specific issues (Matthes 2007) but deductively and independently of specific issues by conjoining insights from framing and trust literature and (2) frames are not identified via cluster analysis, which groups together similar but nevertheless slightly different structures (Matthes 2007; Matthes and Kohring 2008), but rather by assemblage.

Disclosing trust frames in this manner has several advantages: Coding the aspects within the individual frame elements ensures higher transparency and reliability than coding holistic frames (Matthes 2007; Matthes and Kohring 2008). Moreover, the fact that trust frames can be discerned in different contexts allows comparisons of how trust is used to frame different issues. An application is also possible on news texts from the past to trace the presence of frames over time. Finally, frames have effects on both the individual and societal level (de Vreese 2005; Entman 1993) and discerning how exactly trust is used to frame different issues in the news is therefore a prerequisite to understanding how trust emerges via news as an intermediary.

Despite these advantages, the application of the concept is challenging: The operationalization of the elements is very complex due to the different aspects that can be highlighted in each element. Hence, the codebook must be very detailed and provide precise instructions for a consistent application. Additionally, coders must be schooled extensively in order for the content analysis to be reliable, since deviations in only one of the coded aspects automatically lead to a discrepancy in the assembled frame structure. In general, the coding process faces issues common to quantitative content analysis (see Coe and Scacco 2017; Lacy et al. 2015).

3 Qualitative Measures of Trust

The role of trust for human reasoning and behavior has not been conclusively determined—neither within nor across disciplines and research topics, which is mainly due to the strong context-sensitivity of the construct "trust" (Bachmann 2015). Whereas many instruments have been developed to quantitatively measure trust in various settings (see above), qualitative methods are less commonly used in trust research (Chang et al. 2016). Qualitative methods, in particular, however, are considered to offer deeper insight into especially context-sensitive topics (Bachmann 2015). This section takes a closer look at selected advantages and caveats associated with the qualitative collection and analysis of data and gives some examples of how qualitative instruments can be used in trust research.

3.1 Applications of Qualitative Methods

Qualitative methods are used in trust research in various disciplines, such as Psychology (e.g., Breuer et al. 2020; Schiemann et al. 2019), Information Systems (e.g., Distel 2018; Distel et al. 2021 in this volume), Communication Science (e.g., Schwarzenegger 2020), or Public Management (e.g., Vallentin and Thygesen 2017) and they are applied for various purposes.

1. As mentioned, trust is an elusive construct and although researchers come closer to a shared understanding of its meaning, lay people may interpret and use the term in many different ways and meanings incongruent to what researchers actually want to study (e.g., Ashleigh and Nandhakumar 2007). Here, qualitative methods can be helpful as they offer room for uncovering this understanding without imposing any meaning or definition by the researcher (Bachmann 2015). Ashleigh and Nandhakumar (2007), for example, use a qualitative approach to extract different meanings of trust that team members of two organizations ascribe to the term. They derive 13 different constructs that interviewees associated with their trust in teams, between teams, and in technology. However, for each of the three trust settings, the constructs were attributed varying degrees of importance. Almost incidentally, the authors come to the important conclusion that: "Although researchers try to develop questionnaires to measure concepts such as trust, it is considered that the facets of trust are too ambiguous [. . .]" (Ashleigh and Nandhakumar 2007, p. 614). Using qualitative methods in trust research can help to uncover the nuances of human trust that standardized instruments tend to eclipse, because respondents are given the opportunity to use their own words and experiences to describe what trust means to them.
2. Qualitative methods are especially suited to yield in-depth insights into—typically but not exclusively—less explored topics. The setting of qualitative studies is often only roughly pre-structured by the researcher and its course is adapted to the individual situation. In this way, the study participants can largely decide in which context they address trust, how much attention they give to the topic, and what role they ascribe to trust. For example, in a study by Fuchs (2012), the results of expert interviews question the general notion of trust being an important antecedent to e-government adoption. Another study, also conducted in the context of e-government, draws a more nuanced picture of trust in the context of e-government use than prior research (see Distel et al. 2021, in this volume). Not only does it suggest that citizens' trust in the public administration and in the used technical infrastructure is important, but it also highlights different aspects that make up citizens' trust in the context of e-government, namely: The overall trust level, trust in the service provider, trust in data security and privacy measures, the provider's perceived integrity, and perceived risks associated to the use of public (e-)services.
3. Furthermore, qualitative techniques can be used to complement existing research and to increase the validity of existing (quantitative) measures of trust. This can be either done as part of a research project in which qualitative and quantitative

methods are combined (see Sect. 4 for further details) or as a research project on its own, deepening already accumulated knowledge. Breuer et al. (2020), for example, use a qualitative approach to uncover antecedents to and consequences of trust in virtual teams as compared to face-to-face teams. Using a qualitative approach, they are able to extend the often-cited model by Mayer et al. (1995) with new constructs. In the context of team collaborations, they find that two additional factors of perceived trustworthiness are important, i.e., transparency and predictability. Furthermore, they uncover specific risk-related behaviors that result from team trust, i.e., disclosure, reliance, and contact-seeking.

3.2 Data Collection

Qualitative data can be collected through various means. The most common method used—not only in trust research—are *qualitative interviews* (for an overview see, Kvale 2007, Brinkmann 2013). Using a semi-structured or unstructured guideline with open-ended questions revolving around a central topic, the researcher interviews respondents and mimics a natural conversation and, thereby, leaves it up to the interviewee how much attention is given to certain aspects and how much details are provided (see, for example, Distel 2018). For example, Distel et al. (2021, in this volume) asked citizens for their perceptions of public administrations in general and in relation to the provision of e-services. Many of the respondents started to talk about trust in their answers to these questions, highlighting the importance of trust in the context of e-government and use of public e-service.

Qualitative interviews can be complemented with further techniques such as *thinking aloud* (e.g., Schwarzenegger 2020) and *reconstruction interviews* (e.g., Barnoy and Reich 2020). Breuer et al. (2020), for example, used the *critical incident technique* to extend the trust-model by Mayer et al. (1995). Critical incidents are situations that are important for the interviewee and have a perceived influence on the respondent's behavior. During a qualitative interview, interviewees were asked to "[. . .] think of a situation in which [the respondents] trusted or distrusted [. . .] team members" (Breuer et al. 2020, p. 11). Once respondents had visualized this situation, they were asked to report on their team members' behavior that had impacted their trust or distrust. Depending on the context and aim of a study, qualitative interviews can be combined with many more techniques (see for further examples in trust research Lyon 2015).

Another means to gather qualitative data is the use of *repertory grids*. Ashleigh and Nandhakumar (2007), for example, use this technique to extract the different meanings of trust that team members of two organizations ascribe to the term. The repertory grid technique uses a list of "concrete and discrete representations of the domain one wants to explore, known as elements" (Ashleigh and Meyer 2015). The interviewees are then asked to what extent and why they view two of these elements as similar to each other but different from a third element, yielding constructs underlying these elements (Bachmann 2015). Using this technique, it

becomes possible to extract meanings of words such as "trust" that are so far not covered by research.

When applying qualitative methods to collect data, researchers have to consider a range of aspects in the design of their studies. With regard to trust research, three aspects stand out: Access to critical groups (1), protection of data (2), and subjectivity of data (3).

1. Depending on the context, trust becomes a rather sensitive topic. Thus, researchers might find it difficult to gain access to critical groups of respondents and, once access is gained, to retrieve trust-related information on particularly sensitive topics (Lyon 2015). Lyon et al. (2015) vividly describes how difficult access to critical groups can be, especially when cultural barriers have to be overcome. Researchers have to carefully think about who they want to approach as respondents and how the respondents are approached.
2. Another factor coming into play here is one of data protection. Qualitative studies are built on the insights provided by a few individuals or groups of individuals and sample sizes of 20–30 respondents are not uncommon in some disciplines (Kvale 2007). If a study is conducted within one organization, for example, the researcher has to ensure that by using representative quotes from the study or by describing findings in-depth, other employees or managers are not able to associate these statements with specific individual participants of a qualitative study.
3. Moreover, many qualitative approaches—not only in trust research but in general—rely on subjective evaluations of trust situations (e.g., Distel et al. 2021, in this volume; Breuer et al. 2020). Thus, keeping the interview situation free from imposed meanings and understandings is as important as keeping the analysis and interpretation of material free from imposed meanings. The major asset of qualitative methods can be seen in its focus on the subjective experience which should be reflected in the research results. This subjectivity may, however, create tensions when participants report opposing experiences or perceptions. For example, Distel et al. (2021) report that some of their interviewees trust public administrations and view them as a competent provider of public e-services. Some interviewees, however, state the exact opposite. Thus, researchers have to carefully think about how to handle and interpret these tensions.

At the same time, the results have to be summarized and—to some extent—generalized, wherefore data analysis becomes a crucial part in qualitative research on trust.

3.3 Data Analysis

When the subjectivity of data on the one hand and the need for generalizing gathered data on the other hand have to be balanced, content analysis as proposed by Mayring (2015) might be a fruitful approach. Though not specifically developed for trust research, the approach to qualitative content analysis enables the researcher to "let

the material speak" and to carve out meanings and interpretations of the study's subjects. This is particularly important considering the already mentioned elusiveness of the construct "trust" and its variability across contexts (e.g., Ashleigh and Nandhakumar 2007). Similar to quantitative content analysis, the qualitative approach also systematically categorizes features of communication, such as interview transcripts, journalistic material, lyrics, or diary entries. This, however, is done through the assignment of text (or other communication) fragments to (thematic) categories. The focus is less on the distribution of contents across materials but more on the content itself. There are several approaches to qualitative content analysis (see Mayring 2004 for a detailed overview), the most commonly used, however, are inductive and deductive content analysis (see Mayring 2000). Using the *deductive approach*, the researcher assigns text fragments to theoretically developed categories, whereas *inductive content analysis* develops these categories from the materials. An example of the inductive approach to content analysis in trust research can be found in Distel et al. (2021). In essence, the material—in this case: Transcriptions of qualitative interviews—is first read by the researcher to get a general idea of the contents. Afterwards, a part of the material is analyzed, and preliminary themes or categories are derived. These themes or categories are then applied to new interview material. This coding round may yield new themes or refinements of the previously identified categories that have to be applied to new and already coded interviews. This iterative process is repeated until all interviews are coded and no further categories or themes arise. The process then results in a category scheme containing overarching themes, definitions of these themes, and exemplary quotes from the material. Along such a category scheme the interpretation of the material is undertaken (see Distel et al. 2021 in this volume for an example). This iterative process can be time-consuming, wherefore computer-assisted qualitative data analysis is more and more common. Using special software such as nVivo or MAXQDA, the researcher can easily categorize and analyze the content. Depending on the software, it also enables mixed-method analyses of originally qualitative data.

The application of qualitative methods in trust research is certainly challenging, but also has the potential to deepen our understanding of how trust is built, in which contexts different types of trust are relevant, and which consequences trust between humans, in organizations, and in technology has.

4 Mixed Methods in Trust Research

Mixed methods are trending in methodological publications in social sciences. The number of handbooks (e.g., Creswell and Clark 2017; Kukartz 2014; Tashakkori and Teddlie 2010) is increasing rapidly and in 2007, Abbas Tashakkori and Charles Creswell founded the Journal of Mixed Methods Research. In the broadest sense, mixed methods approaches are defined by the combination of quantitative and qualitative research methods (Kukartz 2014).

Following pragmatist approaches, the application of a method is dependent on how well it is able to answer the research question (Creswell 2003). The use of mixed methods therefore has to be justified by arguing why data from different methods could provide a deeper understanding of a phenomenon. Mixed methods designs try to integrate data from different methods for the purpose of triangulation or complementarity. Triangulation is often used as a substitute for validating findings through different methods (Hammersley 2008); however, the actual strength of combining different methods lies in the complementarity of the findings, which helps to understand different aspects of the research object (e.g., Yauch and Steudel 2003). There are at least three possible ways to make sense of the same phenomenon using different methods:

1. *Data can be collected and analyzed in parallel*. This approach has the advantage that findings from different methods during the same time period can be used to better understand a phenomenon. According to Tashakkori and Teddlie (2010), concurrent and fully integrated mixed designs can be differentiated with the first one describing an approach where the collection and analysis of the data is performed separately, and the results of the different methods are compiled in the end. The second one tries to interactively combine quantitative and qualitative approaches during the research process. For example, Saunders and Thornhill (2011) used parallel card sort and in-depth interviews to examine trust in organizational change processes and Muethel (2012) describes how the "Board Game Method," which combines qualitative and quantitative methods (e.g., both definition and ranking of categories), can be used to study trust in different cultural contexts. A special case of fully integrated mixed designs are approaches which transform qualitative into quantitative data for the analysis (for an example using critical incidents to identify the mediating role of ABI in the model of trust repair, see Zachariat 2018). In trust research, these combinations of quantitative and qualitative elements in the process of data collection have the advantage that different types of data *from the same time point and from the same respondents* can be used to make claims based on multiple datasets. This is especially useful if the researchers study, for example, change processes in organizations where it is crucial to include as many perspectives as possible.
2. *Data can be collected first qualitatively and afterwards quantitatively*. Findings from the qualitative interviews are used to (a) understand the motivations of the respondents and (b) to specify the standardized measurements. Studies on scale development (Kohring and Matthes, 2007) use this approach as well as studies which look at phenomena where previous research on the topic is scarce (Glanz et al. 2013; Wintterlin 2019). Usually, these studies use different samples in the quantitative and qualitative analysis. In the qualitative analysis, experts or typical representatives of the targeted sample are selected. The quantitative sample is oriented towards representativeness. This approach is especially useful if the researchers examine new phenomena where results of other studies are only partly transferable. For example, if trust researchers want to examine whether

trust plays a role at all in a relationship which has not been described with the category of trust before, it is appropriate to use qualitative methods first.

3. *Data can be collected first quantitatively and afterwards qualitatively.* This approach is used to explain the findings gained from standardized surveys or experiments by using in-depth interviews which uncover the mechanisms behind the effects. In trust research, this approach is especially valid for results which contradict previous expectations or to corroborate the quantitative findings (Romeike et al. 2016). The results of qualitative interviews can also bring more depth to quantitative findings and explain the effects found (for an example of trust in journalism, see Wintterlin et al. (2020)).

Mixed methods offer opportunities especially for sensitive research topics such as trust. The combination of qualitative and quantitative methods heightens the possibility to capture the full complexity of trust. It enables researchers to employ a constructivist approach where the perspective of the research object on trust is in the focus. Nevertheless, by the combination with quantitative data, the researcher is also able to make more generalizable claims than with qualitative data alone. However, there are also challenges the researcher has to face which refer to conceptual, methodological, and presentation issues (Teddlie and Tashakkori 2015). Combining quantitative and qualitative methods is often time-consuming and requires forward planning to take advantage of both methods. The presentation of results to editors, conference participants, or colleagues requires more knowledge on the part of the audience and must include a justification of the method with a detailed description of the research process. On the side of the researcher, applying mixed methods is challenging because it requires to be a specialist in both methods and to systematically combine both numeric and text information to answer the research questions (Creswell 2003).

Nonetheless, to study such a complex issue as trust, mixed-method designs are very helpful to overcome the shortcomings of using only one method if the researcher assumes that diverse types of data provide a better understanding of the research problem.

5 Modeling Trust: Simulations and Agent-Based Modeling

When investigating sensitive issues in social sciences, such as trust in certain contexts, there is often the problem that data on the research object are hardly or only indirectly measurable. Simulation methods offer opportunities to overcome limitations of traditional qualitative and quantitative approaches by creating a realistic depiction of a particular phenomenon. Agent-based modeling (ABM) was developed to cope with the increasing complexity of different problems and is increasingly applied in different disciplines such as the social sciences (Macal and North 2009). When ABM is invoked, a system is established that consists of several actors with autonomous decision-making ability and scope for action, the so-called

agents (see Wilensky and Rand 2015). Different characteristics can be attributed to the individual agents or whole groups of agents, whereby heterogeneous behaviors can be depicted. On this basis, each agent evaluates his situation and then makes individual decisions at the micro-level. At the macro-level, the interaction of the various agents results in an emergent system behavior that cannot be directly derived from the decision algorithms of the individual agents. By using ABM, it is possible to determine how a system responds to modifications of different conditions. Due to its specific characteristics, ABM allows for a differentiated social science approach, which can be described as "generative," since both the micro- and macro-levels are addressed (Epstein 1999). Therefore, it is often argued that agent-based modeling "is a third way of science" (Axelrod 1997, p. 21) and could complement traditional deductive (positivism) and inductive (interpretivism) reasoning as methods of discovery (Macal and North 2009).

Before developing a simulation model for modeling trust, researchers should first examine whether the decision-making behavior of individuals in the context at hand is suitable for an agent-based analysis. The "guidelines for rigor" formulated by Rand and Rust (2011) offer a valuable approach here. A total of six guidelines have been defined for this purpose, which in turn are divided into "indicative," "required," or "sufficient." "Indicative" means that the benefit of using ABM is increased if the research problem meets these guidelines. "Required," however, expresses that ABM is not suitable if the research problem does not comply with this guideline. "Sufficient" means that ABM can be considered as one of the few approaches if the research problem meets this guideline.

1. Medium numbers (indicative): There should be as many agents present in the system that no single agent can influence a final result at the macro-level itself.
2. Local and potentially complex interactions (indicative): If local and complex interactions take place within the real overall system, the application of ABM is suitable, for example, to assume experience-dependent actions, the interactions with the surrounding environment resulting from the autonomy of the agents. In doing so, the agents can adapt their properties and behavior based on experience gained.
3. Heterogeneity (indicative): Agent-based models focus on individual agents, which is why each agent can be assigned different characteristics and behaviors. Thus, the groups of agents react differently to the behavior of other actors and to changes in environmental influences, depending on their assignment.
4. Rich environments (indicative): Agent-based models facilitate the representation of a diverse and dynamic environment in which the agents must interact with each other and react to changes. Agents in an agent-based model can be designed to survive in any environment by adapting their behavior.
5. Temporal aspects (required): Since an agent-based model can both model processes and study rapidly changing complex systems, it is necessary to consider temporal aspects and therefore this guideline is required for an agent-based model. In addition, temporal aspects change the decision-making process of an

agent, because he or she can incorporate experience and future expectations into the decision.

6. Adaptive agents (sufficient): By using a computer-based ABM, agents are able to adapt not only their behavior during the simulation, but also their strategies in the short term. If an agent makes a different decision than before based on experience and accordingly changes his or her behavior to achieve its goals, it is referred to as an adaptive agent.

Since ABM allows researchers to create a complex model of reality, social phenomena can be depicted and analyzed which can only be examined to a limited extent (or not at all) in real world settings using the quantitative and qualitative methods described above (Nooteboom 2015). By applying ABM, illegal behavior such as doping abuse of elite athletes can be modeled realistically and the impact of prize money structures on doping behavior can be determined (Westmattelmann et al. 2020). A range of agent-based models has already been developed to analyze trust (Sutcliffe and Wang 2012). For example, Pahl-Wostl and Ebenhöh (2004) use a heuristic approach in their agent-based model by relating attributes like cooperativeness, fairness, risk aversion, negative and positive reciprocity to trustworthiness. However, most models depict trust in specific contexts, such as supply chains (Kim 2009; Meijer and Verwaart 2005; Tykhonov et al. 2008), electronic markets (Breban and Vassileva 2002; Diekmann and Przepiorka 2005), service consumers (Maximilien and Singh 2005), or peer-to-peer networks (Li et al. 2011). The explanatory power of agent-based systems can be significantly increased by integrating qualitative and quantitative findings from empirical studies (Nooteboom 2015). Thus, qualitative studies can provide a sound framework for deriving the underlying processes in the model. Empirical data from quantitative studies can be integrated to calibrate the model in order to achieve more realistic results (Rand and Rust 2011; for a profound guide to the practical implementation of an agent-based simulation model, see Wilensky and Rand 2015).

6 Measurement of Trust: Recommendations for Future Research

This chapter aimed to provide the reader with an overview of different approaches to measuring trust, both in face-to-face and in digital settings (keep in mind our initial examples of trust during a global pandemic). In the following section, we sum up the deliberations by elaborating on some challenges of interdisciplinary trust research.

Most importantly, pertinent and appropriate conceptualization of trust should directly inform its measurement. As we have discussed in the different sections in this chapter, there are numerous definitions, conceptualizations, and models of trust (Rompf 2015), and we have provided some examples. Hence, to approach the measurement of trust in any discipline, one must first reflect on the following four

questions (see also Engelke et al. (2019) for similar conclusions regarding the measurement of trust and distrust in journalism).

1. *Is it trust?* Central features of trust have already been mentioned above: Trust involves the trustor's expectations about the trustee, a reliance, dependence, or lack of control, and vulnerability or risk. However, when choosing a measure, trust has to be differentiated from similar concepts, for example, credibility (Engelke et al. 2019; Rieh and Danielson 2007), confidence and risk (Giddens 1990), or the personal stance on an issue (Hendriks et al. 2016a). Similarly, trust and distrust are defined differently, as they are indicated by other criteria and should thus not be measured by using the same scales or relying solely on reversed items (Engelke et al. 2019). Furthermore, for choosing a measurement approach, researchers should consider whether their study is focused on situational trust or the development of trust over an extended time. We discuss this in more detail below.
2. *Who or what is the trusted entity?* As stated above, trust may be directed at people (as role holders), organizations and institutions, systems or technology. Researchers should be careful not to interchangeably use and even merge trust objects under investigation, such as trust in technology (e.g. websites) and trust in people (e.g., the vendor). Hence, the choice of a measurement should be closely guided by theoretical justification of the definition and level of analysis of the trust object to be studied (see Sect. 2.1.3). In the sections above, we have pointed out trust objects that have often been studied using the described approaches. Researchers might use these examples to guide their own choices of an adequate measurement of trust.
3. *Which features of trust do I aim to measure (validity)?* By precisely defining both trust and the trusted entity, and choosing the right measurement accordingly, a researcher has taken large steps towards the validity of the assessment in a study. However, trust is a concept that may reflect features of the trustor, assessments of the trustee, and short-term and long-term behavioral choices. In the sections above, we have pointed out adequate measurements for each and a combination of trust features. Further, trust in systems relies on the perception that reliable practices are at work (Blöbaum 2016; Kohring 2004). As such, trust in a system might be guided both by expectations about institutions setting reliable standards and practices, and about people who abide by these. Hence, the measure of trust must reflect the level of analysis at hand. Importantly, when aiming to analyze trust directed at several entities that are not on the same level of analysis (e.g., trust in people in a system and trust in systems), the use of mixed methods approaches (Sect. 4) or ABM (Sect. 5) may be advised, which are able to assess trust relationships on several levels of analysis at the same time.
4. *Does the measure of choice allow precise measurement (reliability)?* While rules of reliability are easier to set for quantitative measurement (for example, one could attend to internal consistency of a scale or intercoder reliability in quantitative content analysis), in qualitative measurement and simulations, such rules are harder to establish. However, while literature has addressed many ways to test

and establish reliability in measurement, we advise researchers to consult earlier research on similar questions; to illustrate: Research on speaker credibility inspired Mayer et al.'s (1995) conceptualization of the ABI-model in an organizational setting. We call on researchers to utilize past research not only in their own, but also in other scientific disciplines.

As such, interdisciplinary trust research may be able to tackle the challenges of a trust in digitized settings, if researchers continue to develop their methodological repertoire. Between disciplines, trust objects and levels of analysis will likely vary. Quantitative measures have been developed for measuring trustworthiness in a variety of settings and may be adapted or newly validated for other objects of trust (see Sect. 2.1). Furthermore, quantitative approaches allow for replication of measures in future studies in different fields, as can be nicely illustrated by the example of trust frames. Although the concept of trust frames (see Sect. 2.3) was developed from a Communication Science perspective (Engelke 2018), it can be applied in other disciplines as well: Scholars in the field of Economics, Political Science or Sports Sciences, for example, can use it to discern how trust as the central aspect is used to frame the actions of companies, politicians and parties, or athletes. This, in turn, can help researchers gain a better understanding of how trust emerges in the context of their specific field. Interdisciplinary research in this manner can, of course, pose specific challenges: Since the concept of framing was developed in Psychology and Sociology (Borah 2011) and different understandings of it have emerged in different disciplines, non-communication scholars may have to adapt their own understanding of framing in order to identify trust frames in the manner proposed here. Furthermore, non-communication scholars should familiarize themselves with the use of quantitative content analyses in Communication Science (e.g., Coe and Scacco 2017; Lacy et al. 2015) in order to ensure the proper application of the method. Once these challenges are met, other fields may explore new avenues of research and thus benefit from new insights the concept allows them to gain.

Similar to the application of trust frames, in each single study researchers are advised to consider how quantitative, qualitative, and mixed methods approaches as well as simulations will likely have to be adapted to the specifics of the trustor, the trust object, and the context. However, research in any discipline will benefit from learning about research methods used to investigate trust in any other discipline. Because methodological operationalization within a study must follow its central conceptualization of trust, interdisciplinary exchange and transdisciplinary collaborative research will largely benefit the joint theoretical understanding of trust.

We close this chapter by pointing out two challenges for trust research that also yield implications for future research: First, research methods often address the trustor's situational assessments of trust. However, the development of trust over time has been granted less attention. For example, a trustor's assessment of a person's trustworthiness is most likely situational, but trust in a system may rather develop over time (Reif 2021). Thus, future research should take into account the trust object when choosing a measurement that allows for changes in trust over time. While measurement of situational assessments of the trustworthiness of people

(as role holders) is most efficiently done using quantitative measurement (even though measurement at several points in time is certainly possible), the long-term development of trust in a system may be better reflected by content analysis of trust frames in media coverage on the topic of interest (see Sect. 2.3) and—in more bounded settings, such as an organization—may also be examined via qualitative or mixed methods approaches (see Sects. 3 and 4). Therefore, the development of long-term research programs directed at measuring how trust emerges, develops, and even erodes over time—and, as follows, identification of critical situations that hold the potential for changing trust in a trustor–trustee relationship—is much needed (but often hindered by limited resources).

Second, further research should address how digitization has impacted both the conceptualization and the measurement of trust. This is another reason for the increasing importance of interdisciplinary trust research. As new actors, institutions, and new ways of communication emerge in the digital sphere, questions of trust—whom to trust and on which grounds—gain importance (Blöbaum 2016). Digital settings are characterized by disembedding of social relationships from time and space (Giddens 1990), which results in a new instance of trust, namely one that may shift and develop over time, and which may then manifest again in some instances. For example, Reif (2021) argues that trust in science (as a system) may benefit from participatory online formats, as it provides instances for immediate connections between single scientists (trust in people) and the trustor. Also, other than in face-to-face interactions where trust between actors may continuously build, in digital settings, trust might be formed and informed in a manifold of ways. Hence, the measurement of trust in a digitized world has to be adapted to the complexity within the occurrence and observability of trust. Thus, future interdisciplinary trust research will have to face the increasing relevance of trust in digitized settings.

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