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Trust at a Distance—Trust in Online Communication in Environmental and Global Health Research Projects

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Abstract: Online collaboration to deal with (global) environmental and public health problems continues to grow as the quality of technology for communication improves. In these collaborations, trust is seen as important for sustainable collaborations and organizations. However, face-to-face communication, which is often lacking in these contexts, is seen as a pre-requisite for trust development. Therefore, this paper aims to explore empirically which factors influence the emergence of trust in the early stages of online collaboration. Using the relevant literature, we conducted a series of interviews around projects in the field of public health and the environment on the interface between science and practice. The results show that trust does develop between participants. This trust is strongly influenced by perceived ability and integrity, fostered by reputation, third-party perceptions, and project structure. In these contexts, these types of trust facilitate collaboration but are also influenced by a wider set of aspects such as power, expectations, and uncertainty. However, from the results we also conclude that online collaboration does not create benevolence and a shared identity, thereby limiting further trust development and leading to less strong relations. Strong relations, however, are deemed important to reach creative and innovative solutions and long-term sustainable collaboration and organizations.

Keywords: trust; collaboration; virtual teams; integrity; ability; online

1. Introduction

Many of the world's most challenging environmental and public health problems (such as climate change, loss of biodiversity, and the invasion of pests) cross national borders and disciplinary divisions and require experts from both practice and science [1–3]. Because of this international, interdisciplinary, and transdisciplinary character, (global) public health and environmental problems are transboundary in nature and thus complex to deal with, as they challenge organizations and institutions to work with people who are best suited for the job irrespective of their geographical location [4]. To facilitate collaboration between partners in geographically dispersed settings, online collaboration is seen as vital [5].

These developments take place in the broader development of an increasing role for online communication for environmental conservation and improving public health, such as digital conservation, Nature 2.0, and e-health [6,7]. There is a trend whereby people increasingly rely on new ways of communication to coordinate tasks and build relations within and between organizations of all sizes and natures, often in different physical locations and time zones with diminishing physical

interaction [8]. Existing and emerging new technologies like smartphones, e-mail, video conferencing, FaceTime, or Skype all enable communication at a distance [9], thereby solving the (potential) logistical problem of meeting physically and reducing the travel time otherwise required. As the quality of technology for communication improves, online collaboration continues to grow [10]. In the literature, these types of collaboration are referred to as online collaboration, virtual teams, or collaborations with limited physical interactions. In the remainder of this paper, we use the term online collaboration for this, by which we mean any communication online in text, visual or vocal.

However, collaborating with and in such geographically and professionally diverse groups is also challenging. Group members often hold strongly diverging perspectives on the issues at stake, the future solutions, their own role, and the roles of other group members [11]. Long-term sustainable collaboration is therefore complex and uncertain [12]. To deal with this complexity and uncertainty, trust is crucial for online collaboration.

Trust as a foundation for collaboration and broader social order spans many intellectual disciplines and levels of analysis [13–15], such as social psychology [16–18], sociology [19], political science [20], economy [21], anthropology [22], and organizational behaviour [23]. Notwithstanding the differences between the fields and various ways of conceptualizing trust, all scholars emphasise the key role played by trust as a foundation for sustainable organizations and collaboration [24,25]. More specifically, in all social domains, trust in the relations between parties is considered critical for sustainable collaboration for dealing with complex problems [26]. It is indicated that trust needs face-to-face interaction, also referred to as 'touch' [27]. But it is exactly this 'touch' that is often lacking in computer mediated communication (CMC) and online collaboration. Consequently, the literature on trust in CMC shows diverging and sometimes contradictory results [28–30]. Therefore, our main research question is: What factors influence the emergence of trust in early stages of online collaboration?

In studies on the growing importance of online collaboration and interaction for dealing with (global) environmental and health issues, trust is regularly mentioned as an important concept [31]. Trust aspects mentioned include, for instance, the importance of mutual interpersonal trust in cases of extreme events like earthquakes [32] or in relation to the data shared [33,34]. In addition, others mention trust while focusing on social relations and, for instance, social capital [35]. Despite this attention, empirical studies focusing in-depth on the role of trust in such contexts are lacking. With this in mind, we analyse the type of trust between individuals in organizational settings that can develop in such collaborations. Then we analyse the way in which this type of trust can develop. Our argument is situated within recent directions in communication research that attempt to gain insight into online collaboration for sustainable collaboration and organization [36]. Our brief outline of the theoretical premises of trust explains trust from a dynamic perspective. Reviewing literature across communication research and other disciplines, we discuss our dynamic trust perspective in relation to collaboration and uncertainty. Advancing our argument, we explore trust in virtual collaboration settings in practice and discuss the further implications for trust research and sustainable collaboration and organization.

2. Theoretical Framework

2.1. Collaboration and Uncertainty

Collaboration is the process of individual entities acting together for mutual benefit, often (but not necessarily always) achieving a partially shared goal or common goals, as opposed to working alone or in competition with each other [37]. Collaboration through computer mediated communication (CMC) complicates this process due to a number of disruptive effects [36]. Disruptions on the one hand relate to the geographical dispersion of team members which can result in differences in common knowledge, specifically related to the situational and contextual factors that impact colleagues [38]. This may lead to misunderstandings and unexpected responses. On the other hand, disruption in CMC based collaboration can relate to interpersonal relations (such as affect and cohesion) and the

end products aimed for in terms of quality and form [39]. In addition, it may impact the way social and task orientation may be interpreted [36]. As such it is argued that interpersonal relations develop slowly in these contexts [40], as collaboration through CMC is accompanied by uncertainties and risks.

Uncertainty and risks in collaborations can on the one hand be caused by contextual factors such as political change, economic development, social and natural changes at global, national, and local level [41]. On the other hand, interpersonal factors such as perceptions about one's ability to perform a task, one's integrity, and more relational aspects such as affection and benevolence may lead to uncertainty [42], especially as these aspects may all foster diverging perspectives on the problems at hand and acceptable solutions. Another possible cause of uncertainty in collaborations on the interpersonal level is the tension between self-interest and collective interest [12]. Participants who collaborate often have a mutual interest in achieving the collective objectives of the collaboration. Yet in many cases, there is also tension between collective interest and individual interest. An individual may be tempted to act in a way that benefits him/herself or his/her position, and this action can harm others in the collaboration. These conflicts of interest may encourage opportunistic behaviours when combined with a lack of internal control, such as a sense of morality, or a lack of external control, such as monitoring, threat, or punishment [43]. This then may threaten the sustainability of the collaboration and lead to unreliable and unpredictable actions by others, thereby intensifying uncertainty [44]. This is especially the case in contexts of collaboration through CMC as day-to-day and face-to-face interactions are absent, thereby limiting the opportunities to deal with these dynamics. To deal with this multifaceted uncertainty, trust is often mentioned as a mediating concept [45].

2.2. Trust and Trustworthiness

Many theories of trust emphasise that trust is most relevant to behaviour in situations with high uncertainty and conflicts of interest [46]. In these contexts, trust encourages the initiation of mutually collaborative relationships [47,48] and brings greater relationship commitment and satisfaction [49,50]. Most scholars agree that trust is needed to cope with uncertainty in situations where parties are (inter)dependent on others. In other words, trust is seen as a foundation for collaboration and essential to initiate, establish, and maintain social relationships [18].

Underlying these positive statements about trust are a wide range of studies across disciplines that have generated many insights into the functions of trust and various related conceptualizations. These conceptualizations all have different, sometimes conflicting, underlying assumptions about what type of construct trust is [15,51–53]. Despite these debates, a general distinction can be made between theories referring to trust as a behavioural intention—associating trust with choices made (e.g., [47,54,55])—and trust as a psychological state—associating trust with aspects like expectations, affect, and intentions [56–59]. Although these studies give interesting insights into trust, they pay limited attention to the evolution of trust through and in interaction [60–62]. Consequently, these studies fail to take into account the dynamics that play an inevitable role in collaboration settings.

From a dynamic perspective, trust can be conceptualised as individuals' expectations about the thoughts, behaviour, and decisions of other people. These expectations are constantly balanced by past experiences and what one knows about the other [61,63,64]. The image of the other is constructed on the basis of accumulating events and the interpretations of these events, mutually influencing one another [65]. Given this image and its relation to present-day events, individuals may experience uncertainty, risks, control, and vulnerability. These experiences influence not only the perspective on the past, but also expectations about future events, actions, and decisions in relation to the particular trust situation. In this process, the collective or common history and interactions that build upon one another over time strongly influence trust development.

Central to our conceptualization of trust dynamics is the image that the trustor has of the trustee. On other words, does the trustor find the trustee trustworthy. It is often argued that trustworthiness precedes trust [15,66]. In relation to this, Mayer et al. [15] argue that trustworthiness can be analysed by looking at the attributes of the trustee. If we look more specifically at these attributes in trust

research, three core characteristics have been identified that influence trustworthiness and further trust development, namely: ability, integrity, and benevolence [15,67–70]. Following Mayer et al. [15], the aspect of ability indicates the competence of collaborating partners to perform their tasks and role, and relates to knowledge, skills, and expertise. Integrity focuses on a general feeling of the reliability of the collaborating partners about agreements, for example, to deliver results on time and up to standard despite the differences in cultural or organizational background. The benevolence of collaborating partners indicates the aspect of resisting the temptation to engage in opportunistic behaviour and harm the interests of the collaboration and/or other collaborating participants for personal gains—aspects that might become particularly evident in situations where conflicts of interest are at stake.

Ability, integrity, and benevolence are important attributes of trustworthiness, influencing the direction and character of further trust development, and each may vary independent of the other. However, despite the fact that the different attributes are separable, they are strongly interrelated. In trust dynamics, these different attributes may possibly thus all play a role, resulting in the development of different types of trust (e.g., being to a greater or lesser extent based on integrity, ability, or benevolence). Through trustworthiness and consequent trust development, these attributes influence future collaboration, perceived trustworthiness, and trust. Consequently, studying the role of trust in online collaboration should focus on trustworthiness, the underlying attributes, and further trust development.

Starting from our main question: which factors influence the development of trust in early stages of online collaborations? We can now add three research questions based on our theoretical framework for further empirical investigation:

1. What are the experiences with perceived trustworthiness, and underlying attributes?
2. How did perceived trustworthiness influence trust development?
3. How did these experiences influence collaboration?

3. Materials and Methods

This research aims to investigate how trust helps to cope with (inter)dependence and uncertainty in online collaboration. The intersubjective meaning of trust, interdependence, and uncertainty are starting points and require a qualitative-interpretive approach [71]. Moreover, because of the limited existing knowledge on the factors influencing the emergence of trust, a more exploratory approach was deemed suitable [72]. For our study, we selected research projects in the field of environment and health, on the interface between policy and science. We selected these settings as they are comprised of participants from various interdisciplinary backgrounds, leading to complexity and uncertainty in collaboration, and in which online collaboration was the main modus operandi. Interviewees were selected on the basis of long-term experience with projects in collaborations with online collaboration. They were therefore able to reflect on experiences from several projects. Another criterion for the selection of the interviewees was their experience with participation in projects that heavily relied upon communication technologies. Additionally, participants were selected through snowball sampling.

The data were collected through semi-structured interviews with 18 participants. The interviews were semi-structured along a list of questions and topics. This set-up was chosen to allow interviewees to share their own perspective on collaboration and the role of trust [73]. The interview topics were based upon theoretical exploration and focused on: (1) experiences with trustworthiness and underlying attributes; (2) influence on trust development; (3) influence on collaboration. In addition, interviewees were asked to share insights or information that they thought were relevant for the research. The projects under study were all government (including universities), or semi-government led projects. The participants, therefore, were researchers, policy advisors, and project managers working for a semi-governmental research institute (9), university (6), or local or national government (3), and had managerial positions in research-focused projects (11) or in policy development and implementation-oriented projects (7). The interviewees were all based in the Netherlands, and 10

were male and 8 female. The interviews were conducted in Dutch, took about an hour, and were audiotaped and transcribed. Afterwards, the transcribed interviews were sent to the interviewees for verification. The number of interviewees was based upon data saturation: we stopped interviewing once we noticed that no new codes could be added to the raw data [74].

The interview data were analysed according to the inductive codes-to-theory model described by Saldana [75], supported by the qualitative data analysis software Atlas.ti. In a first round of coding, we assessed whether interviewees mentioned types of trust, trust development, and aspects influencing trust (ability, benevolence, integrity). Through category building, we then grouped the initial codes into themes and concepts that related to ideas of trust development in online settings. Finally, we examined how the themes and concepts interrelated and allowed us to inductively identify different mechanisms through which trust emerged and developed in these online settings.

This interpretative methodology [71,76] provides insight into the multiple meanings of trust in different unique settings. Our point of departure was that meanings and interactions are context specific. Thus, the paper does not aim to establish causal relations or quantitative generalizability. Rather, this paper shows the "how" of trust emergence and development in online settings—insights that can be used to explain other cases and analyses of trust development in online collaboration settings, by focusing on both differences and similarities.

4. Results

In this section, we discuss the results in relation to the collaboration process. The first section of the results explores how collaboration in these professional settings started and how the interviewees dealt with various uncertainties that come with collaboration. The second section focuses on the process of collaboration and how collaboration developed over time.

4.1. Starting Collaborations

At the start of collaborations, interviewees expressed a strong general trust basis for collaboration. One of the interviewees explained about starting a new public health study: "*I am someone who is quite fast to start with a 9, that is how I usually begin, I think. Very trusting, probably naïve. That is how I begin, and it must take a lot, almost, to think: Ho . . . something is not right.*" Another stated: "*I assume that everyone gets out of bed in the morning and thinks: 'I will act conscientiously...' well maybe not consciously thinking that but . . . I don't assume people get up in the morning and think: 'look who I can deceive (today)'.*" These quotes reveal the general feeling of trustworthiness towards the collaboration partners that we encountered among the participants at the beginning of projects. Looking more closely we see that, from the start, this feeling is influenced by the structure and content of the project.

A closer look at the structure revealed that interviewees were of the view that, at the beginning, a clear and familiar structure defined the initial collaboration and created initial trust, especially as people had to get to know one another, had to discuss future tasks and planning. In addition, it was mentioned by several interviewees that the structure of the collaboration helped to deal with the other important aspect, the content. Particularly as the content of a project could be new to some members, it was felt that clearly structured projects could help to deal with content-related uncertainties. Or as one project coordinator on a project about air quality in urban areas stated: "*The structure of the project but also the content, it's very important. It's about the predictability, you know what you can expect from others.*" A clear structure and related expectations, it is argued, defines the further development of the collaboration.

Through the structure, tasks, roles, and responsibilities could be negotiated. In many projects, a virtual consultation was specifically set up by the different participants to get a clear picture of the various tasks. The virtual consultation had an additional function, as one of the interviewees from the public health sector stated: "*It helps to inform everyone about the direction (of the collaboration), but not only that, on one side people feel the need to contribute (to decision making in the collaboration), but the consultation also focuses on the time schedule and tasks, a kind of a back-up. It is clear, and it is agreed upon,*

and it helps that everyone knows about the whole picture." This quote illustrates that the consultation round clarified the contribution and commitment of all members. "*You know what you can expect from others, if they can deliver, instead of wasting time to double check, and flogging a dead horse.*" Thus, tasks and responsibilities are discussed, and this helps participants to judge people's ability, thereby helping to create a feeling of trustworthiness. In addition, the consultation round was experienced as a transparent, clear set-up to start the collaboration; this is seen as highly relevant as it helps to facilitate initial trust. Some participants expressed this need for trust at the initial stage of the collaboration to kick start the process: "*You can feel the energy, that helps to have the trust at the very beginning, it's really necessary to have that 'click' that we are all going for it, that we can achieve it.*" All in all, the structure not only clarified tasks, roles, and responsibilities, but also strengthened the trustworthiness and trust development that smooths collaboration.

The second important aspect at the beginning of working together is the content. All our interviewees were focused on projects on the interface between science and practice in the fields of public health and environmental management. In terms of content, many interviewees considered their experience in online collaborations to be very expertise and knowledge driven. All the projects in which the interviewees had participated so far had utilised up-to-date scientific knowledge to develop and implement health and environmental policies or issues, often in collaboration with local and/or central governments and other knowledge institutes. One of the project managers from an environmental science department explained his work: "*We work at the interface between policymakers and scientists ... I translate questions into concrete research projects and translate knowledge into answers.*" This focus on content formed a first basis for collaboration. This was made clear by the interviewees as, despite the different backgrounds, the focus on content and the related expertise were stated to be a basis for trustworthiness: "*Sure, people have the expertise, the papers so I trust them for it.*" And, if this is the case: "*you notice quickly, are people content driven or just interested in being with the group... these leave quickly.*" The focus on content therefore works as a social control mechanism, limits possibilities for free-riders, and thus supports trustworthiness through focusing on ability and integrity.

So, our findings show that, by focusing on structure and content, collaborations start with trustworthiness based on integrity and ability and not too many uncertainties, fostering further trust development.

4.2. On the Way—The Collaboration Develops

After the initial stage was set, other factors started to play a role in the projects, influencing trust. Reflecting on the process of different projects, interviewees discussed their perception of low power inequality and hierarchy. These dimensions created situations in which it was possible to discuss openly and express uncertainties, making collaboration easier and contributing to trust development. As one of the interviewees from the national health organisation stated: "*I personally have no one using their rank on me, . . . yes of course someone will make the final decision . . . it's all done with consultation and accepted by others. I guess it's the kind of organization we have here, it could be different in other places, I am not sure.*" In other words, agreement and equal relations seem to be part of the working culture, a culture that is partly shaped by the fact that the participants know one another already from earlier projects and have positive experiences regarding their expertise and collaboration style. This contributes to positive expectations and therefore trust development.

More specifically, interviewees mentioned the competence of others in the collaborating networks as a dimension of trust, as illustrated by the following quote from a research institute employee: "*Of course it is relevant, it's about investment, you invest your time and energy in it (the collaboration), and you need to know who are these people, of course they are selected for their competence first, what you don't want is someone just freeriding on the rest.*" This shows not only the importance of perceived competence in these types of projects, but also more specifically that competence is a prerequisite for collaboration and trust. The competence of others is also expressed in other parts of the interviews. Many interviewees expressed trust in the ability of other participants who possess the knowledge to contribute to the

collaboration as an expert or specialist. This feeling of trust developed more strongly during the process based on positive experiences, a municipal health officer reported: "*I get (scientific information) . . . most often from my colleagues here, but sometimes from people outside our organization, ones who are specialised in that field. Working with these people for a longer time helps me, you know what to expect.*"

When questioned about how this trust in the ability of others was obtained, interviewees from a health and environmental knowledge platform frequently mentioned, in addition to experience, general trust in colleagues or people from familiar professions (health and environmental scientists), or their reputation within the respective profession or organization: "*Yes, there were these board members in a project I last did, you don't have to worry about them not keeping their word [..] From previous experiences, I know they simply deliver, you tell them that things need to happen before a certain time, and you can count on them that they will deliver on time.*" However, this did not mean that everything had to be executed according to plan for trust to develop. "*Yeah, you talk about the tasks you intended to fulfil, but also the tasks you could not fulfil, you have to communicate clearly about . . . it's also about being honest and transparent in the way you work. That I find very important to be able to work together.*" This shows that trust is perceived as a combination of delivering what is agreed upon, showing integrity through communicating, being honest and transparent about what one is doing so others can adjust their expectations throughout the project.

In relation to transparency, many interviewees indicated that there is a mechanism of 'reputation' in their professional circle. People may know one another, and a bad reputation for opportunistic behaviour may be harmful in the future for individuals who have displayed such behaviour. It was therefore perceived to be in everyone's own interest to display collaborative behaviour in projects to contribute to the projects' objectives. One of the civil servants working on health policies even explained that he uses his reputation for working in projects as a means to gather a team: "*I make sure that I can get the people involved that have the same goals as the project, but you can hear from others if they are competent or not, or have the time to invest (here in this project), I would still like to know more about that, you go around asking if anyone can recommend someone who is good, someone you trust.*" This shows again that reputation functions as a type of social contract, as a back-up for not abusing the trust of others. This means that, even without much face-to-face contact, the interviewees tend to judge their partners positively because of common characteristics and interests in relation to the content and taking third-party judgements into account. In many cases, these judgements were re-emphasised by personal positive experiences, contributing to trust development.

Furthermore, many interviewees identified the perceived absence of conflicts of interest among participants as a relevant factor in trust development. This was underpinned with the argument that interviewees considered other participants as experts who enjoyed their work of producing and contributing their knowledge to the project. As a project manager from a research institute stated: "*You notice it very quickly, are people here just to be interested in being with the group? And further . . . not doing anything, that happens too but not often, but they go quickly too because . . . people notice. But all in all, most people are there because they want to, they all find it interesting to be part of this . . . and that creates confidence.*" This quote shows that participants are part of the collaboration mainly because they want to participate in collaboration relating to their own interest or expertise. This does not mean that there were no tensions at all, or that the perceived absence of conflicts of interest did not change during the collaboration. Various interviewees articulated the importance of trust in dealing with possible conflicts of interest, as illustrated in the following quote from a research institute employee: "*It's . . . you don't want to let people down, and you don't want them to think you have some secret agenda . . . that I was using them, but yeah, of course the best way is to talk it out, make it explicit.*" Here, the trust people placed in the interviewee quoted made the interviewee perform his task, made him communicate and start a conversation.

All in all, the interviewees were rather positive about the relation developed through collaborating online. However, this does not mean that face-to-face interaction did not play a role at all. In cases where a misunderstanding or a possible conflict was emerging, face-to-face interaction was deemed

important. For instance, in a project between the public health organization and an environmental research institute, a possible conflict emerged over a misunderstanding of data: "*But there are situations, you know. You can't do that on the phone. That is the case then with trust ... they know I am not like that.*" And the interviewee explained further: "*It was that time I had a project (with an institute for environmental science), it felt so strange to email and call back and forth, and it only got worse. I decided, talked to my supervisor, I said I needed to go there, the headquarters to sort it out. That was the only way . . . but fortunately, I don't have to do that too often.*" So, although not often needed, physical interaction in the form of a meeting or conversation is seen as important. It also shows a willingness to put effort into the project and personal relations.

In addition, many interviewees argued that face-to-face interaction is useful for facilitating further technology-aided communication, by lowering the perceived threshold to contact each other: "*Once you met someone, you know their style. Is he more formal or more informal, does he have the same type of humour? You can adjust your communication, and you have more confidence that you are doing it the right way. I don't know, maybe it's just me. I feel like it's easier for me to contact them if I know them personally.*" In other words, face-to-face interaction helps people to get to know each other better, get more personal insights, and it is sign of investment of time and effort, helping to find the right style and form of communication, creating a basis for further trust development at a distance.

5. Discussion

Starting from the notion that the relation between trust and different forms of interaction seems to have become even more relevant with the current and emerging communication technologies [8,77], we turned away from (semi-)experimental settings because we aimed to explore empirically the emergence of trust in online collaborations. Following this aim, we posed the question: which factors influence the development of trust in early stages of online collaboration? Exploring this question through in-depth interviews, discussing the experiences of our interviewees in projects we found several interesting insights for analytical discussion and future studies both more in-depth as well as studies allowing for empirical generalization.

The results from this explorative study show that experiences of perceived trustworthiness are especially fostered by integrity and ability, and less by benevolence. These experiences foster further trust dynamics that are strongly influenced by reputation and earlier experiences and are characterised by trusting the other to perform the job within the project. In addition, the strong focus on performing tasks, reputation, and the underlying ability and integrity experiences strongly influenced the online collaboration. In online contexts, the results show a particularly strong focus on: (1) the structure of the cooperation to bridge the differences between the stakeholders involved; (2) the process to deal with the technical and practical complexities that come with collaborating in online contexts; and (3) the content as shared elements that bind the stakeholders together in which reputation plays a vital role. The focus on these factors and the strong role of ability and integrity mutually reinforced each other as the collaboration continued, fostering a more functional form of trust and limiting the development of trust based on benevolence and identity.

The role of trust in online collaborations has been the topic of studies before, ranging from studies in virtual teams [8] to CMC [36]. These lines of inquiry have a strong experimental character or only mention trust as one of the many important factors playing a role in social relations. To contribute a clear added value to these studies, we stepped away from top-down interventions and experimental methods and explored in-depth the emergence of trust in real-life interactions. In line with earlier studies, we expected to find insights relating to cultural backgrounds that characterise real-life interactions between geographically dispersed stakeholders [38]. However, in our case, the cultural background hardly played a role in trust development and online collaboration. What did play a role was the professional and organizational reputation of involved stakeholders. The strong role of reputation could, on the one hand, be explained by the professional character of the collaboration in which scientific reputation within a certain domain or profession was found to be key [78]. This shows

that the type or character of the cooperation can have a strong influence on the type of trust developed, taking shape in the strong influence of integrity and ability on the character of trust developed. In the field of CMC and online collaboration, there is, thus, a need to move beyond discussing trust in general terms and to be specific about: (1) the character of trust; and (2) the type or character of the collaboration. Increased precision is highly relevant to elucidate further the role of trust in online collaboration and CMC [28,36], especially as in real-life settings, as opposed to controlled (semi-)experiments, different online platforms are used interchangeably and the character of collaborations may vary over time. From these results, we propose that future research should focus on the interrelation between types of collaboration and the character of trust in these contexts.

Looking more closely at the role of structure, process, and content, we see that these helped to facilitate trust development through the perceived trustworthiness of other participants, based on their professional track record, personal past experiences, and third-party experiences. In these experiences, ability and integrity to fulfil tasks on time and up to standard particularly tend to play an important role. The role of these three factors is very interesting, as the development of trust is often viewed as incremental over time, beginning at a low level at the start of collaborations (but high enough to be able to initiate the collaboration) when there are many unknown factors and, therefore, a relatively high level of uncertainty [16,55,57]. Our research thus shows that in online contexts trust development is not so straightforward and might develop differently than in face-to-face contexts in relation to a clear collaboration context. Future research should elucidate this further, by taking a longitudinal perspective focusing specifically on trust development and related dynamics.

The existence of this strong role of ability and integrity is seen as relevant for the initial stage in order to kick start the collaboration, especially as this helps in the reflexive iterative process of displaying actions that confirm expectations, helping further trust to develop. The kick-start function of trust for further collaboration is seen as important because of the absence of benevolence in trust development. Following Mayer et al. [15], the absence of stronger trust relations could be explained in terms of benevolence possibly requiring more time, being more intense, and needing frequent interaction to emerge in collaboration. In addition, benevolence is estimated to be less needed when the level of conflicts of interest is low [44], as was the case in our online collaboration cases. Despite the fact that other elements like openness and expectations started to play a role and influenced trust dynamics, this did not lead to stronger trust relations. Scholars focusing on trust development in professional environments suggest that benevolence is often absent, as this requires participants to have a collective identity, to commit to shared values, and to work in the same location or neighbourhood [79]. These, and our, findings are contrary to studies focusing on online communities that show that these groups have a strong basis of shared identity, commitment, and related mutual trust [80]. Combining insights from both worlds would be an interesting future line of inquiry as, in our explorative case, it could be seen that, in situations where conflicts emerged, such values were highly relevant and face-to-face contact was needed to strengthen relations.

In relation to dealing with global environmental and public health problems, trust is seen as vital [81–83], especially as environmental and public health problems are often regarded as wicked problems requiring collective action by a diverse group of stakeholders but lacking clear-cut solutions from which all could benefit [84]. To foster trust development, face-to-face interaction is seen as a prerequisite in these contexts. With the emergence of online collaboration and developments such as digital conservation and e-health, the reality is that face-to-face interactions are often replaced by online interactions [7]. Our results show that in these contexts trustworthiness and trust development are much more ability and integrity driven, and elements such as identity, affection, and benevolence play a less clear role. Potentially, this limits the ability to deal with complex problems and come to innovative solutions, as this requires strong relational ties between involved stakeholders [85,86]. However, to get more insight into how different trust types in online collaboration influence the solvability of global environmental and public health problems and wicked problems remains unclear and is a topic for further research and debate.

The aim of this study was to gain a better understanding of trust emergence and development in online collaborations for dealing with global environmental and health problems. Our study shows that trust development in these contexts is characterised by the type of collaboration and is strongly influenced by aspects of integrity and ability. For professionals in these settings, this means that familiarity still plays an important role, also in online settings. We trust people we know or who we have been told are trustworthy by familiar others.

In online collaboration projects, our study shows that this means subsequently managing these relations by focusing on structure, process, and content. Moreover, it shows that professional networks and reputations are key to facilitating trust in these contexts. However, if collaboration requires stronger trust relations, innovative solutions, or conflict resolution, online collaboration could benefit from strengthening relations through face-to-face contacts and strategies aimed at creating shared identities. Future research is needed to understand collaborations that are a mix of online and offline interactions. Studying trust in such processes would be highly relevant.

6. Conclusions

Dealing with global environmental and public health problems is a complex undertaking in which a wide range of actors are involved. Negotiations over the issues at stake and related solutions are more and more fostered by online means of collaboration, in which trust plays a vital role. Following these notions, we conducted an explorative study focused on the question: Which factors influence trust development in the early stages of online collaborations? Overlooking our findings we have to take into account the explorative character of this study, the limited number of interviewees included and projects reflected upon in this study. Based on this work, we can conclude that in the specific contexts under study trust started from a general trustworthiness towards the partners and developed over time. The perceived mutual trustworthiness increased through initial interactions that were facilitated by clear structures and processes. The structures created transparency and also helped people involved to deal with the often-complex content through which new positive experiences emerged that facilitated initial trust dynamics. In the continuing process, the low power inequality experienced and competence of actors gave rise to further trust development. Consequently, trust development was experienced as strongly based on professional reputation and antecedents such as integrity and ability, whereas shared identities and aspects of benevolence were lacking and needed face-to-face interactions. All in all, we can conclude that in our case of online collaborations, structure, content, and process played major roles in trust development. We can also conclude that, in these specific contexts, trust was experienced as strongly characterised by aspects of ability and integrity. In addition, we conclude that in the projects under study the focus on structure, content, and process limited further and stronger trust development based upon shared identity and aspects of benevolence, needing more face-to-face interactions to develop.

Exploring the role of trust in online contexts of (international) collaboration, our study showed interesting insights. However, due to the nature of our study no empirical generalizations can be made, but are analytical by nature [87]. Therefore, the results of our study should be seen as first insights, that are promising analytical threads for future large n-studies. Such studies are highly relevant in order to come to generalizations that foster further insights in the role of trust and the sustainability of online collaborations dealing with global environmental and public health issues.

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