

Designing and Evaluating for Trust: A Perspective from the New Practitioners

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Abstract. Trust as a factor in the design of interactive technologies is a relatively new research subject, and this paper provides the perspective from new interaction designers and developers on their views and experience with the use of trust in the design and evaluation of technology. A survey was sent out and answered by participants in their early careers and education as interaction designers and developers about designing and evaluating trust in technology. The results show that overall, the new practitioners queried believed that designing for trust is important, but in their experience it is not accounted for adequately in practice. The survey also showed that qualitative methods were the most popular to identify trust issues in new technology, but perhaps the concept of trust as used for the design of interactive systems is still very new.

1 Introduction

There is an emerging trend in Human Computer Interaction (HCI) and Human Factors Engineering (HFE) research to accept that new complex systems will never be perfect. In the HCI community, researchers such as Stewart and Williams [1] believe that the trend towards domestication and user-led creation of technologies originates from the unlikelihood that designers can entirely match user needs. In addition, new technologies are becoming more complex in the HFE domain, not allowing for comprehensive testing of all components particularly for finding interaction issues according to Parasuraman [2]. Although designers can strive for perfection and engineers try to design for complete reliability, “there will always be a set of conditions under which the automation will reach an incorrect decision” [2, p. 293]. Trust in technology is important not only for system efficiency and user experience, but designing for trust comes with ethical concerns for designers as well.

These are important considerations for the design of interactive systems, regardless of the type of system. According to Lee and See, trust has been linked to people’s reliance and adoption of technology and “trust plays a critical role in people’s ability to accommodate the cognitive complexity and uncertainty that accompanies the move away from highly structured organizations and simple technology” [3, p. 52].

As the study of trust in relation to technology is a new trend, it is of interest to see how new practitioners of interaction design view the importance of user trust in interactive technology and how they evaluate for trust issues with technology. This paper gives background on the research involving trust in technology, details the survey filled out by new practitioners, presents the results and analysis of the responses, and provides some discussion around trust in interactive technology design.

2 Background

In the HFE domain, Lee and See's [3] oft cited "Trust in Automation: Designing for Appropriate Reliance" presents substantial evidence pointing to the connection between trust and people's reliance on technology. They also suggest the similarities between the factors that influence both human-human and human-automation relationships, and they define trust, a social psychological concept, as an attitude that an agent will help achieve a person's goals, and that agent could be the automation. It is a very important concept when related to automation as it influences their adoption and reliance on it: "people tend to rely on automation they trust and tend to reject automation they do not" [3, p. 51]. Corritore [4] argues that in order to be trusted, computers or technology do not need to be shown as moral agents capable of acting with reference to right and wrong, but rather being portrayed as social actors will suffice. People can enter into relationships with technology and respond to them according to rules that apply in trusting social relationships, as technology has a social presence.

In the HCI domain, Experience-Oriented and Value Sensitive Design are emerging trends. To design for experience is important for the success of the design, as it needs to be useful in a person's life and McCarthy and Wright [5] stress that feelings, cultures and values must be designed for. This view aligns with Value Sensitive Design, a framework where the resulting technology accounts for human values in a principled and comprehensive manner [7]. Friedman, Kahn, and Borning [6] in their VSD overview conclude trust "refers to expectations that exist between people who can experience good will, extend good will toward others, feel vulnerable, and experience betrayal" [p. 17]. The methodology for exploring human values such as trust through VSD consists of conceptual, empirical, and technical investigations that are performed iteratively and integrated throughout the design process. Friedman, Kahn, and Borning caution the ethics involved in this type of design because "unlike with people with whom we can disagree about values, we cannot easily negotiate with the technology. Although inattention to moral values in any enterprise is disturbing, it is particularly so in the design of computer technology" [p. 21].

Beyond HCI and HFE, research on trust can be found in a variety of literature, spanning the fields of philosophy, sociology, psychology, management, marketing, ergonomics, industrial psychology and electronic commerce [4]. Looking at the variety of fields, it is no surprise that "as a result of both the range of disciplinary lenses used to study trust and the inherent ambiguity of the trust construct, there is currently a confusing assortment of conceptual perspectives on trust" [8, p. 143]. In

summary, trust involves aspects of expectation, vulnerability, and risk regarding the likelihood of a favourable response, but this is not easily articulated. Trust is an attitude towards something and that experience is something that can be hard to describe, let alone design for.

Although definitions of trust can vary significantly between disciplines, and between people in general, the emerging trends in HCI and HFE research show the importance of trust in technology and this research should influence the new generation of interaction designers and developers. Given these new trends in trust research from the HCI and HFE domains, it is of interest to see how new practitioners view the importance of trust in the design of technology and how they identify trust issues through different evaluation strategies.

2 Method

A Google Docs form was piloted with 6 test users before the link to the survey was sent through Facebook to 57 personal contacts known to have experience in the HFE or HCI domain in Canada, Sweden, and the Netherlands. The message introduced the survey as a way to gain perspective on design practices around trust, and invited those who had experience as interaction designers or developers to fill it out and spread it to their respective interaction design networks. Although the use of personal contacts and introducing the survey as a means to investigate designing for trust introduced bias into the results as personal relationships and intrinsic interest in the topic of trust would effect response rate, the survey was merely a means of probing practices of new HCI and HFE practitioners so the results were not meant to be statistically significant.

The aim of the survey was to compare new practitioners' perceived importance of trust versus their actual experience of accounting for trust in interaction design, and also to compare the popularity of different evaluation techniques for finding trust issues. The first two statements aim to shed light on if the participants have found trust issues to be important in their past work experience and if they believe that user trust is important. The third and fourth statements aim to shed light on if trust issues have been raised in their design experience and if they believe that trust should be brought into the design process. The last three questions aim to shed light on which evaluation methodologies are the most popular for finding trust issues. These statements were piloted with 6 participants and the language was modified slightly before the survey was sent to the large sample.

The first seven statements were based on participants' level of agreement on a seven point Likert scale which ranged from low agreement 1 ('not at all') to high agreement 7 ('very much'). The last item was an open ended question which welcomed general comments on the design and evaluation of trust.

In addition, further statements on the connections between affective experience and trust were queried, but the above statements on designing and evaluating for trust are the focus of this paper.

4 Results and Analysis

Of the 57 new practitioners contacted and not including the six test pilots of the survey, 20 participants (14 male) responded. As listed in Table 1 below, the average age was just under 26.5 (median = 26, mode = 26) with respondents ranging from 24 to 32 and their self-identified nationalities showed 11 of the participants identified themselves as from Europe, 5 were from Asia, and 3 were from North America. With regards to education, 7 had achieved their Bachelor's degree, 10 had received a Master's degree, and 3 were at a Post-Graduate level. Regarding work experience, the average experience obtained was just over 3.2 years (median = 3, mode = 3). Although they split on whether they considered themselves a technical designer (9 participants) or an interaction designer (10 participants) with one business analyst, their descriptions of a typical role they would play in a project showed that most had experience in various aspects of technology design. When asked about a typical design projects they were involved in, Human Factors Engineering and Human Computer Interaction domains were mentioned with roles ranging from interaction design research to nuclear safety consulting.

Table 1. Demographic information for the surveyed participants

	Gender	Age	Nationality	Education	Experience
P1	Male	27	German	Bachelor	Interaction Design
P2	Female	25	Kosovar Albanian	Master	Technical Design
P3	Male	24	Pakistani	Master	Interaction Design
P4	Male	28	Mexican	Master	Technical Design
P5	Female	24	U.S.	Bachelor	Interaction Design
P6	Male	26	Greek	Bachelor	Technical Design
P7	Male	25	Italian	Master	Technical Design
P8	Female	28	Iranian	Master	Interaction Design
P9	Female	26	Greek	Master	Technical Design
P10	Female	28	Korean	Bachelor	Interaction Design
P11	Male	26	Canadian	Bachelor	Technical Design
P12	Male	32	Swedish	Master	Technical Design
P13	Male	25	Bulgarian	Master	Technical Design
P14	Male	25	Turkish	Master	Technical Design
P15	Male	26	Greek	Bachelor	Interaction Design
P16	Male	25	Belgian	Master	Interaction Design
P17	Female	28	Nepalese	Post-Grad	Interaction Design
P18	Male	28	Greek	Post-Grad	Interaction Design
P19	Male	26	Canadian-Chinese	Bachelor	Business Analyst
P20	Male	27	Spanish	Post-Grad	Interaction Design

Although statistical analysis of a small sample size with a biased response rate will not be very accurate, Wilcoxon Signed-Rank Tests were conducted to show any statistical differences between the statements. This analysis showed significant statistical differences between S1 and S2 ($Z=-3.220$, $P=0.001$), between S3 and S4 ($Z=-3.845$, $P=0.000$), between S5 and S6 ($Z=-2.506$, $P=0.012$), and between S6 and S7 ($Z=-2.209$, $P=0.027$).

Table 2. Statement agreement averages and standard deviations

Statement	Mean	Std Dev
S1. In my past work experience, user trust issues have influenced user acceptance of the design.	4.85	1.496
S2. I believe user trust in the system is a crucial part of its acceptance.	6.00	1.076
S3. In my past work experience, user trust is discussed and accounted for in the design process.	3.90	1.373
S4. Ideally, user trust in the system should be discussed and accounted for during the design process.	6.10	0.788
S5. In my past work experience, personally testing the system or having the design team test the system has pinpointed issues with trust in the design.	4.55	1.468
S6. In my past work experience, having users test the system and conducting interviews, observations, and other qualitative measures have pinpointed issues with trust in the design.	5.55	1.638
S7. In my past work experience, having users test the system and collecting error rates, questionnaires, and other quantitative measures have pinpointed issues with trust in the design.	4.70	1.625

The first four statements' averages point to the differences between the participants' opinions on the importance of trust in the design of interactive systems versus their past work experience as interaction designers and developers. Although these new practitioners believe user trust is a crucial part of interactive technology's acceptance (S2), fewer have seen the result of this in practice (S1). Also, the participants believed that user trust ideally should be accounted for and discussed (S4), but found that in their past work experience it was not as highly regarded during the design process (S3). P12 works in software design and implementation and explains that "Trust' has never been explicitly addressed in any work I've done before, neither by me or others". P7 explains his experience in web design as such: "In my experience there hasn't been as much attention on user's trust as on user's satisfaction [...] More attention and stress on trust might and should be put in other areas, which for instance require a more complicated and [thorough] design process, or a closer user interaction, etc". There is a high positive correlation (0.683) between the participants who agreed with the two belief questions (S2 and S4) about trust's importance in user acceptance of technology and its importance in the design process for interactive technology.

The statements about evaluation methods used in the participants' design experiences (S5, S6, and S7) did not show strong results, but did point to qualitative methods as being the most popular to test trust issues. P5 mentions that she tends to use qualitative methods, but "Theoretically, I think experts can do a decent job of finding trust issues if they have a lot of experience in designing certain systems. Choice of users is also very influential, because some are more adept with technology than others. (So a perceptive expert review could give more than a tech-savvy user.)". Many participants chose the neutral level of agreement, indicating no agreement nor disagreement. This could be caused by the lack of attention on trust during the design process mentioned above, and therefore they did not have experience with using any evaluation methods for finding trust issues.

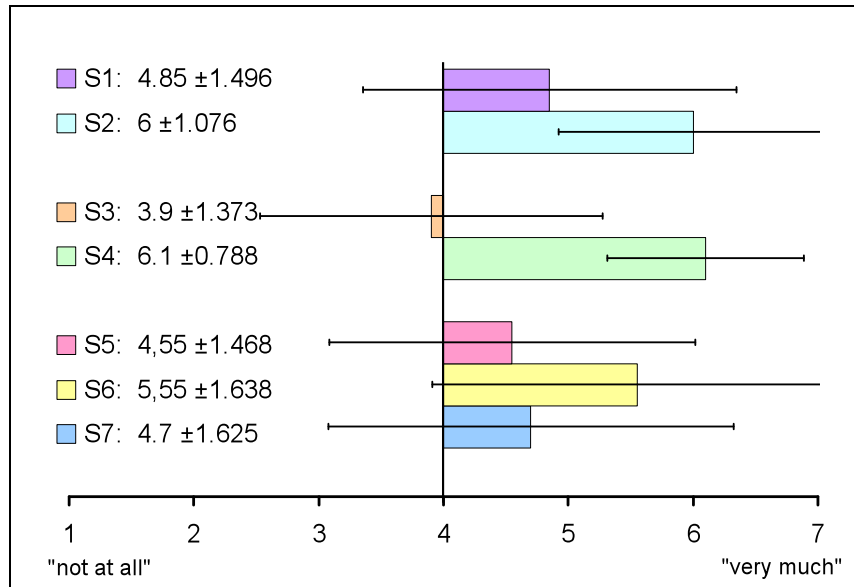


Fig. 1. Statement averages shown graphically with error bars representing standard deviation.

The neutral level of agreement to the survey statements by participants may have also been caused by the ambiguity of the trust construct itself. In the design of this survey, no definitions of trust were made nor was there any reference to trust literature for participants that have not been exposed to this research. P12 made reference to this lack of direction in the survey: “Before taking this [survey], there should probably have been a definition of what 'trust' and 'user trust' etc is, my feeling for what it is doesn't really feel like it fits in the questions above”. P13 also suggested that the design of the survey should have included definitions of trust.

5 Discussion

Despite the lack of experience in designing for trust, participants generally agreed that trust is an important concept in interaction design and development. Although many of the participants may not have thought about trust as related to the way users accept the technology they design, they have a general concept that it should be accounted for in the design process. These results perhaps do not point to HCI and HFE trust literature filtering down to the new practitioners, but could point to a general understanding of trust as a social issue that effects technology that has a social presence, as per Corritore [4] mentioned above. The participants could have been keeping the “enduring human value of trust” [7, p. 40] in their minds during the design processes that they have been involved with without explicitly mentioning the term trust: essentially conducting value conscious design, without knowing or using the framework of Value Sensitive Design to describe their activities.

The lack of experience evaluating for trust is clear from the results of this survey. But even with the very neutral results of the evaluation statements, the participants still indicated that qualitative methods of user evaluation were the most popular for potentially identifying trust issues with the design. Perhaps because of the lack of experience with using the word trust explicitly during their experiences in design, they may have been evaluating for issues with user trust in their system without actually calling it such. Much like evaluation follows design in the interactive technology design process, perhaps evaluating for trust will follow a trend towards designing for trust.

The word trust is something that is basically understood by anyone, but is very hard to define for everyone. Trust is a hard concept to define and definitions not only vary between disciplines, but also between people. This is apparent in the results of this survey about designing and evaluating for trust in the interaction design process through the neutral results as well as feedback about the survey. This perhaps points to trust not being brought up in these new practitioners' education or practical experience. This might be the result of the recent trust research in the HCI and HFE disciplines not reaching them yet in education or experience, or perhaps designing for trust has not been prioritized.

6 Conclusion

The results of this survey show that new practitioners of interaction design and development believe that user trust is an important concept to discuss and include in the design process, but they have not seen this type of focus on user trust in their experience. The neutral answers to questions point to this lack of experience in designing and evaluating for trust, and therefore lack of focus on designing for trust in their education and professional experience. Their neutral answers also show the new practitioners were unsure of what was meant by "trust" or "user trust", perhaps because they have never experienced these words being linked to design or technology, but rather human relationships. Although this survey shows that there is not a lot of familiarity with designing and evaluating for trust among the new practitioners, the results show the potential for a shift towards accounting for trust in future design processes of interactive systems.

As technologies become more and more complex, the relationships between these technologies and their users will change. The complexities seen in autonomous and adaptive systems will push our relationships with these technologies closer to social human-human relationships, and just as human relationships are not perfect, technology will not be perfect. It is up to designers from all fields to account for user trust in an ethical manner, balancing designing to promote trust without engendering over trust in a system.

Trust is an important concept when it comes to the adoption and reliance on technology, and even one breach of trust can highly influence user perception of that technology. It will become increasingly important to account for trust in the design process of interactive systems and this is seen in recent research in both the HCI and HFE domains. As this survey shows, the existing research on trust from both the HCI

and HFE fields trickling down to interaction design education and professional practice is too slow. Design for trust should be emphasized in interaction designers' education and work experience, and frameworks such as Value Sensitive Design and other methods that take trust into account should be further disseminated in both the HCI and HFE communities.

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