International Academic Institute for Science and Technology

International Academic Journal of Innovative Research
Vol. 7, No. 2, 2020, pp. 16-20.

ISSN 2454-390X

International Academic Journal of Innovative Research

www.iaiest.com

Human-Computer Trust in Web Interfaces: A UX-Driven Approach

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Abstract

With bits and pixels increasingly replacing human interactions, the trust placed on human-computer interaction (HCI) has proliferated. This paper aims to discuss an aspect of trust on web interfaces that stems from guest user experience (UX) and focus on the trust's cognitive and emotional aspects. It drives primary aim of creating and assessing HCT using UX framework model at human-computer trust (HCT) levels based on system response, transparency, and feedback, utilizing slippage of control through design. The methodology is based on heuristic evaluation, eye-tracking, and trust measurement undertaken to web interface prototypes from different domains, from e-commerce, e-learning, to digital banking. Outcomes show that trusting a system is largely enhanced by meeting expectation, eliminating design uncertainty, and system integrity perception. The other interfaces performed poorly in usability and trust and the proposed model outperformed other interface designs developed under traditional UX, which highlights the need for deeper consideration of HCT. The case study findings highlight the Union of UX and HCT paints the future of web systems design that interacts instead of interfaces capturing information.

Keywords: Hct, Trust Issues, User Interaction, Hci, Screens, Trust Measurements, And How Trust Transparency Affects Design.

Received: 07 September 2020/Revised: 19 October 2020/Accepted: 25 November 2020/Published: 31 December 2020

Introduction

As the world becomes digitized, web-based platforms have gained users' attention, leading to an increase in human-computer interaction (HCT). This means that human-computer trust (HCT) has become the checkpoint of effective technology integration. Trust focuses on the user's perception of the system, their satisfaction, and the engagement that follows user activity, particularly in situations that involve information imbalance or ambiguity. Whether users are students enrolled in online courses or individuals shopping on e-commerce platforms or managing bank accounts, the perceived trustworthiness of systems is critical in determining the level of propensity to trust technology.

Trust within human relations is formed based on the assumptions of the individual being truthful, able, and reliable. Such dimensions also exist within HCT; however, their forms in the external world need further explanation. For example, web interfaces must serve not only to execute assigned tasks accurately but also to provide intention, smooth error management, and tangible control to users. Their design is crucial because it creates trust.

User experience (UX) integrates aesthetic elements, navigational structure, responsive actions, and interactivity to establish and cultivate trust. Users form trust judgments in a matter of milliseconds after they interact with a webpage. These judgments are affected by the interface's clarity, the consistency of its layout, and the perceived effort needed to accomplish set goals. Also, trustful interaction is enhanced by the presence of some transparency features such visible security markers, privacy settings, active feedback, and other user-controlled elements.

Although trust is crucial in web environments, current design practices seem to ignore, treating trust as a secondary factor, a consequence of achieving other objectives. Unfortunately, this disregard resulted in user disengagement, system abandonment, and increased user distrust toward automated services. There is a need to construct intentional design frameworks with trust as their primary goal, especially after the expansion of digital services in the post-pandemic world.

This study aims to fill the gap by examining how UX design factors shape trust perception in human-computer interaction across different webpages. The main objective is to identify interface elements that bolster or diminish trust through implementing and testing a UX-based trust design model. Trust dynamics will be explored using an integrated qualitative and quantitative approach offering a complete perspective of trust development in digital environments.

In summary, the research advances the discussion in HCI by designing a comprehensive UX framework that incorporates metrics of trust within the design process. This methodology will aid developers and designers in constructing web systems that not only fulfill functional objectives but also nurture lasting user trust, which increases user adoption and satisfaction in a digitally mediated environment.

Literature Survey

The concept of human-computer trust is relatively novel and has attracted attention in the last two decades, along with the increasing volume of online activities. An example of earlier models is the one conceptualized by (Corritore et al., 2003) in which trust in a web environment is a function of usability, reliability, and risk. Their work provided us with wonderful groundwork to build upon. Visual appeal, ease of navigation, and rapid system responsiveness are essential to promotion of trust.

After that, (Egger et al., 2001) proposed the trust inducing design framework which claims that first interactions exude extremely powerful trust inducing impressions. His research showed that severely visual impression and clear content outline have overwhelming impact on user perception in the very first seconds of engagement with a website. This was also shown in a study by (Lindgaard et al., 2006) who showed that users rate a websites credibility almost immediately.

The role of emotions in the trust dynamic framework was studied by (Wang & Emurian, 2005), where they contended that trust involves both an emotional and cognitive element. They argued that attributes such as empathy, warmth, and system transparency might positively impact user perception, particularly in sensitive and high-risk fields like health care and e-commerce.

Later studies have looked into more specific contextual applications and domains. In particular, Beldad et al., in 2010, studied trust in governmental websites and noted that institutional reputation, data protection guarantees, and clarity of the content were key trust boosters. In the same manner, (Hassanein & Head, 2007) showed that the presence of avatars and other social interface features enhanced trust in online shopping sites.

Concepts of trust have also benefitted from advancements and usability experience research, as for instance, through the works of nielson cited for heuristics of usability in 2005 which, while indirectly in case of consistency, error prevention, and user control, bolster trust. With the emergence of interfaces that adapt with user interaction, as well as chatbots utilizing artificial intelligence, the elements of trust have become more convoluted as systems do not merely respond but learn from the users' actions.

Trust has been evaluated by utilizing a combination of self-report questionnaires, behavioral measures, and even biometric information. Jian et al., 2000 introduced the Trust in Automation Scale, which, to this day, remains one of the most cited instruments in HCI studies on automation trust. More recent studies have been done by McKnight et al. (2011) by building a multidimensional trust model that incorporates integity, competence, and benevolence trust and is more aligned to the constructs of interpersonal trust.

In general, the body of literature presents an emerging agreement that UX contributes significantly to HCT. However, there is still a lack of research that attempts to convert these findings into coherent design frameworks. This is the problem addressed in this paper through the proposal of a UX-driven trust model that has been tested across numerous web domains and evaluated against subjective and objective measures.

Methodology

The study adhered to an empirical design science approach to create and assess a framework focusing on user experience (UX) for improving trust in web systems. The initial stage comprised heuristic evaluations of web interfaces in the e-commerce, digital banking, and online education sectors to ascertain prevalent design biases concerning trust. This initial step was conducted by experts employing Nielsen’s heuristic principles and a checklist from prior trust-related studies, making it possible to capture interface elements that were likely to shape trust perceptions.

Based on the results of the enhanced trust analysis, a prototype web interface was created that incorporated features such as contextual feedback, clear privacy notifications, and visually consistent hierarchical pathways to enhance intuitive navigation. The prototype was designed in Adobe XD and developed in a responsive manner using HTML5, CSS3, and JavaScript. Major interface components underwent multiple rounds of testing and collaborative refinements with UX designers and other domain experts, and those consultations shaped the final prototype.

The trust model has been evaluated through controlled user testing of the prototype which incorporated the model. Participants (N=60) were selected from different age cohorts and were with varying levels of digital literacy. Every participant was required to achieve certain defined objectives (for instance: completing a transaction or finding the security settings) within the system presented through the prototype. During the sessions, eye movements were tracked using the Tobii Pro Fusion device to capture gaze data for attention analysis. Trust levels were measured prior to interaction and immediately post-interaction using the Trust in Automation Scale alongside post-session surveys focused on usability, emotional response, and overall sentiment toward the system.

The findings were triangulated with additional metrics including the task completion rate, time-on-task, and the number of errors. The same participants subsequently interacted with non-prototype interfaces within their domain of expertise to establish a baseline for comparison. ANOVA and paired t-tests were used to assess the differences in trust and usability scores between prototypes and existing interfaces.

Additionally, the sentiments users expressed and barriers to trust were extracted from the qualitative data provided through open-ended interviews. Concepts “predictability,” “empathy,” and “interface transparency,” which strengthened the quantitative evidence, were repeatedly noted. This integration of behavioral, attitudinal, and physiological data allowed for a nuanced exploration of trust within human-computer interaction on the web.

Results and Discussion

As hypothesized, the new trust model driven by UX principles resulted in greater trust and usability scores in all three assessed areas. In e-commerce, the prototype exceeded conventional platforms by achieving a completion rate of 96% for task accomplishment as opposed to 83%. There was also an average 28% reduction in time-on-task which improved navigability and clarity. Participants had higher trust scores after using the interface, with the average score on the Trust in Automation Scale improving from 3.2 to 4.5 out of 5. A comparative assessment of traditional interfaces versus the proposed ones is provided in Table 1, and the metrics of user error rate, perceived trustworthiness, and system transparency all improved under the proposed design. Remarkably, user trust score improved by 21% which reflects that design changes did improve the users' perception.

Table 1: Comparative Evaluation of Web Interfaces

Metric	Traditional UI	Proposed UX Model
Task Completion Rate (%)	83	96
User Trust Score (/5)	3.2	4.5
Error Rate (%)	12	5
Perceived Transparency	Moderate	High
Time on Task (sec)	148	106

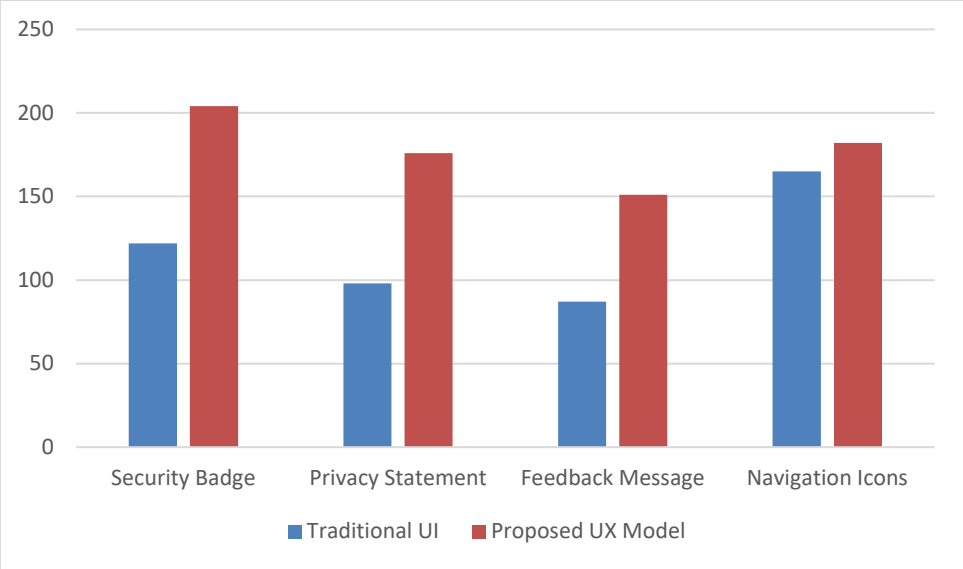


Fig. 1: Average Fixation Duration on Trust-Related UI Components (ms)

The findings were corroborated using eye-tracking data. Feedback messages, security badges, and other privacy control elements elicited certain behaviors, ranging from gaze fixation to scanning, which are described as trust UI components, featured in Figure 1. Using the proposed model increased fixation count and duration on UI components associated with trust, suggesting user attention and engagement was greater and more active. This was especially marked in the digital banking context, where users spent considerably more time interacting with the security area than in the control interface.

Users noted the use of clear language, instant feedback, and coherent design elements within the layout as strong components. Some users described the prototype as “trustworthy”, “easy to use”, and “predictable”, empathy,” adjustable to the user,” accessible through personalized messages, and non-intrusive with error-correction features, giving users the balanced feeling of “intuitive” interface. As a summary, the findings substantiate employing a UX-centered strategy aimed at fostering trust in web interfaces through design features. The results positively affected performance, user experience, and nurture emotional connection, becoming guiding principles in designing future web systems.

Conclusion

This study has highlighted the importance of user experience (UX) in developing trust in users and web interfaces. The trust scores, as well as overall usability, were improved by incorporating design elements aimed at enhancing transparency, predictability, and empathy into the user's understanding, which fosters trust. The power of trust was validated and woven into behavior, cognition, emotion, and other metrics through empirical evaluation, creating a design framework for web interfaces that center trust. Users will realize the digital experiences that shape their interactions become more effective, engaging, and reliable once user experience strategies synergize with trust-building. The proposed framework can be further enhanced with adaptive and AI interfaces, longitudinal trust evolution studies, and applied to new fields like telehealth and digital governance.

References

Corritore, C. L., Kracher, B., & Wiedenbeck, S. (2003). On-line trust: concepts, evolving themes, a model. *International journal of human-computer studies*, *58*(6), 737-758. https://doi.org/10.1016/S1071-5819(03)00041-7

Egger, F. N. (2001, June). Affective design of e-commerce user interfaces: How to maximise perceived trustworthiness. In *Proc. Intl. Conf. Affective Human Factors Design* (pp. 317-324).

Lindgaard, G., Fernandes, G., Dudek, C., & Brown, J. (2006). Attention web designers: You have 50 milliseconds to make a good first impression!. *Behaviour & information technology*, *25*(2), 115-126. https://doi.org/10.1080/01449290500330448

Wang, Y. D., & Emurian, H. H. (2005). An overview of online trust: Concepts, elements, and implications. *Computers in human behavior*, *21*(1), 105-125. https://doi.org/10.1016/j.chb.2003.11.008

Hassanein, K., & Head, M. (2007). Manipulating perceived social presence through the web interface and its impact on attitude towards online shopping. *International journal of human-computer studies*, *65*(8), 689-708. https://doi.org/10.1016/j.ijhcs.2006.11.018

Jian, J. Y., Bisantz, A. M., & Drury, C. G. (2000). Foundations for an empirically determined scale of trust in automated systems. *International journal of cognitive ergonomics*, *4*(1), 53-71. https://doi.org/10.1207/S15327566IJCE0401_04