

Assessing Trustworthiness in Persuasive Prototypes

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Abstract

Trust is a critical factor in the adoption and effectiveness of persuasive technologies, yet many existing systems lack explicit trust-enhancing design features. This study explores how transparency, autonomy, consent, and data privacy influence user trust in persuasive technologies. A focus group of 14 UX/UI experts provided design insights for the ethical design of persuasive technologies, which were implemented into two prototypes—one integrating ethical design principles and the other serving as a control. A user study with 449 participants evaluated trust perceptions using the Human-Computer Trust Scale. Results indicate that transparency significantly enhances trust, while inadequate privacy controls contribute to skepticism. The findings offer actionable insights for designing ethical and trustworthy persuasive systems, emphasizing the need for clear communication, user control, and informed consent mechanisms

Keywords

persuasive design, user interface, trust, ethics

1. Introduction

With the increasing prevalence of personalized systems, persuasive technologies have been widely adopted across various domains, including health, education, and e-commerce, to influence user behavior and encourage positive behavioral change [1]. These technologies leverage user data to tailor interventions, thereby enhancing their effectiveness. However, as persuasive systems become more integrated into daily life, concerns regarding their ethical implications and trustworthiness have emerged, particularly in relation to data collection, processing, and usage for persuasive purposes [2]. A significant proportion of users remain skeptical due to the lack of transparency in data handling, limited user control, and uncertainties surrounding privacy and security. While persuasive technologies are designed to guide behavior in beneficial ways, their ethical considerations must be prioritized to ensure they are perceived as trustworthy rather than manipulative.

Trust plays a crucial role in the adoption and effectiveness of persuasive systems. If users perceive a system's intentions or data practices as untrustworthy, they may disengage or reject it entirely [3]. Therefore, for persuasive technologies to be both effective and ethically sound, they must incorporate key design principles such as transparency, autonomy, informed consent, data privacy, and security—factors that directly shape user perceptions and interactions [4]. Prior research by Rahman et al. [5] has identified autonomy, transparency, consent, and data privacy as critical ethical concerns that contribute to mistrust in technology. Building on this work, the present study conducted a focus group with 14 user experience (UX) researchers and designers (average experience: 3 years) to explore strategies for enhancing trust through improved ethical design in transparency, autonomy, consent, data privacy, and security. This study aims to integrate expert-driven design insights into prototype development and evaluate the effectiveness of these ethical considerations in fostering user trust.

Despite the growing recognition of trust-related concerns in persuasive technologies, many existing systems lack explicit trust-enhancing design features, making it challenging for users to assess their reliability. To address these challenges, this research aims to design and evaluate persuasive prototypes that incorporate varying levels of transparency, autonomy, consent, data privacy, and security. By

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systematically assessing user trust perceptions across different prototypes, this study seeks to establish best practices for the ethical design of persuasive technologies. The findings will contribute to the development of systems that are not only effective in influencing behavior but also respectful of user rights and preferences, ultimately fostering greater trust and acceptance.

2. Related Work

The intersection of trust and persuasive technologies has been a focal area of research, emphasizing how these systems can ethically and effectively influence user behavior. Rahman and Adaji [6] conducted a systematic literature review identifying transparency, user autonomy, and informed consent as critical factors in fostering trust. They highlight risks such as manipulation and privacy invasion, stressing the need for ethical design practices. Ahmad et al. [7] further examined how cognitive and affective trust influence decision-making, finding that users generally exhibit low trust in persuasive systems, necessitating strategies to address this deficit.

Transparency plays a foundational role in trust perceptions of persuasive technologies. Users require clear information on system intent, algorithms, and data practices [8]. Without sufficient disclosure, persuasive technologies risk being perceived as deceptive, leading to skepticism and disengagement [9]. McKnight et al. [3] emphasized transparency, system reliability, and user control as key elements shaping trust. Similarly, Zieglmeier et al. [10] proposed "trustworthy transparency by design," advocating for explicit data usage policies to enhance user confidence.

Autonomy is another essential factor in ethical persuasive design. Users must feel in control rather than coerced [11]. Ethical persuasive systems should provide adjustable settings, opt-out options, and informed decision-making opportunities [12]. However, many interfaces lack autonomy-enhancing mechanisms, raising concerns about unintentional coercion. Research on how varying levels of user control impact trust remains limited.

Informed consent, data privacy, and security are also critical for trust in persuasive systems. Users must be fully aware of and agree to persuasive strategies [13], yet many consent mechanisms lack context-awareness and adaptability. Privacy concerns persist as many persuasive applications collect extensive user data without clear privacy settings or security assurances [14]. Although privacy-by-design principles exist, their effectiveness in UI design remains underexplored.

While existing studies provide valuable insights, systematic evaluations of trust in persuasive prototypes remain limited. Most research conceptualizes trust broadly rather than assessing how specific design features—such as transparency indicators, privacy controls, and consent mechanisms—impact user trustworthiness. Comparative evaluations of trust-focused persuasive prototypes are scarce, leaving gaps in understanding how users perceive and interact with trust-enhancing design elements [15]. Addressing these gaps is essential for ensuring persuasive systems are not only effective but also ethical and user-centered.

3. Methodology

3.1. Design Details

The prototypes were developed using insights from a previous focus group study involving 14 UX/UI experts. The focus group research questions aimed to identify key design considerations for developing ethical and trustworthy persuasive systems. The questions primarily focused on Transparency, Consent, Autonomy, and data privacy and security. Insights from the focus group and expert evaluations were implemented in User Interface A (UI A), which integrated ethical design principles. In contrast, User Interface B (UI B) served as a control, omitting these considerations to assess their impact. In contrast, User Interface (UI B) served as a control, omitting these design considerations to assess their impact. The prototypes were developed using Figma and focused on three domains: health, shopping, and education. Shopping applications were selected due to their widespread popularity among smartphone

users [16]. Meanwhile, user trust was identified as a critical factor in the effectiveness of both health and fitness applications, as well as educational applications [17, 18]. Furthermore, another study [5] identifies that unethical design practices are predominantly prevalent across these domains. Findings from the prior focus group study further reinforced the importance of transparency, user autonomy, and privacy in these domains, shaping the final prototype designs.

3.2. Study Design

For the evaluation of the prototypes, participants were recruited via Amazon MTurk. The study received approval from the Behavioural Research Ethics Board (H24-01325). For the recruitment of the study, participants were filtered in Amazon Mturk to have used persuasive technology before. This was done to ensure the validity of the responses. A Qualtrics survey was distributed, where participants assessed the prototypes using the Human-Computer Trust Scale, a validated measure for evaluating trust in technology [19]. A 7-point Likert scale was used in the scale and for each ethical factor such as transparency, the average of all the statements was computed to characterize the overall trust score. Additionally, participants were asked to indicate which prototype they preferred and perceived as more trustworthy and ethical. Demographic data, including age, gender, and frequency of persuasive technology use, was also collected. Prior to participation, informed consent was obtained from all individuals involved in the study, and participant anonymity was ensured.

3.3. Participants

The study included a total of 449 participants. The majority were male (62.6%), with females making up 37.4% of the sample. Most participants fell within the 25-34 age range (63.5%), followed by the 35-44 age group (26.5%). Only a small fraction (5.9%) were aged 45 or above. Regarding technology expertise, most participants were at an intermediate level (58.6%), while 33.2% identified as experts and 8.2% as novices. In terms of persuasive technology usage, more than half (56.6%) used such technologies daily, 39.9% used them weekly, and a small percentage (3.6%) reported bi-weekly or less frequent usage.

Table 1
Summary of Participants

Category	Variable	Percentage
Gender	Male	62.6%
	Female	37.4%
Age	18-24	4.0%
	25-34	63.5%
	35-44	26.5%
	>45	5.9%
Technology Expertise	Novice	8.2%
	Intermediate	58.6%
	Expert	33.2%
Persuasive Technology Usage	Daily	56.6%
	Weekly	39.9%
	Bi-weekly	2.9%
	Less than twice a month	0.7%

3.4. Data Analysis

The data were analyzed using SPSS due to its robust statistical capabilities for handling survey data, facilitating both descriptive and inferential analyses [20]. SPSS enables efficient data management, allowing for the identification of patterns and relationships in user perceptions of trust in persuasive technologies. The descriptive statistics focus on Transparency, Consent, Autonomy, and Data Privacy

& Security because these factors were considered as they have been consistently identified in prior research as key determinants of trust in persuasive systems [6],[4].

4. Prototypes

4.1. Transparency Design

Figure 1 presents the designed prototypes. In UI A, users can explore how the recommendation was generated. The "Learn More" button offers insights into the algorithm and the rationale behind the book suggestion. Additionally, a feedback option is included, enabling users to share their thoughts on the recommendation system. In contrast, UI B does not provide any means for users to view the reasoning behind the recommendation. This is consistent with previous studies by Zerilli et al. [21] and Cabiddu et al. [22] states that users having the option to learn about the mechanism of the algorithm will trust the systems more.

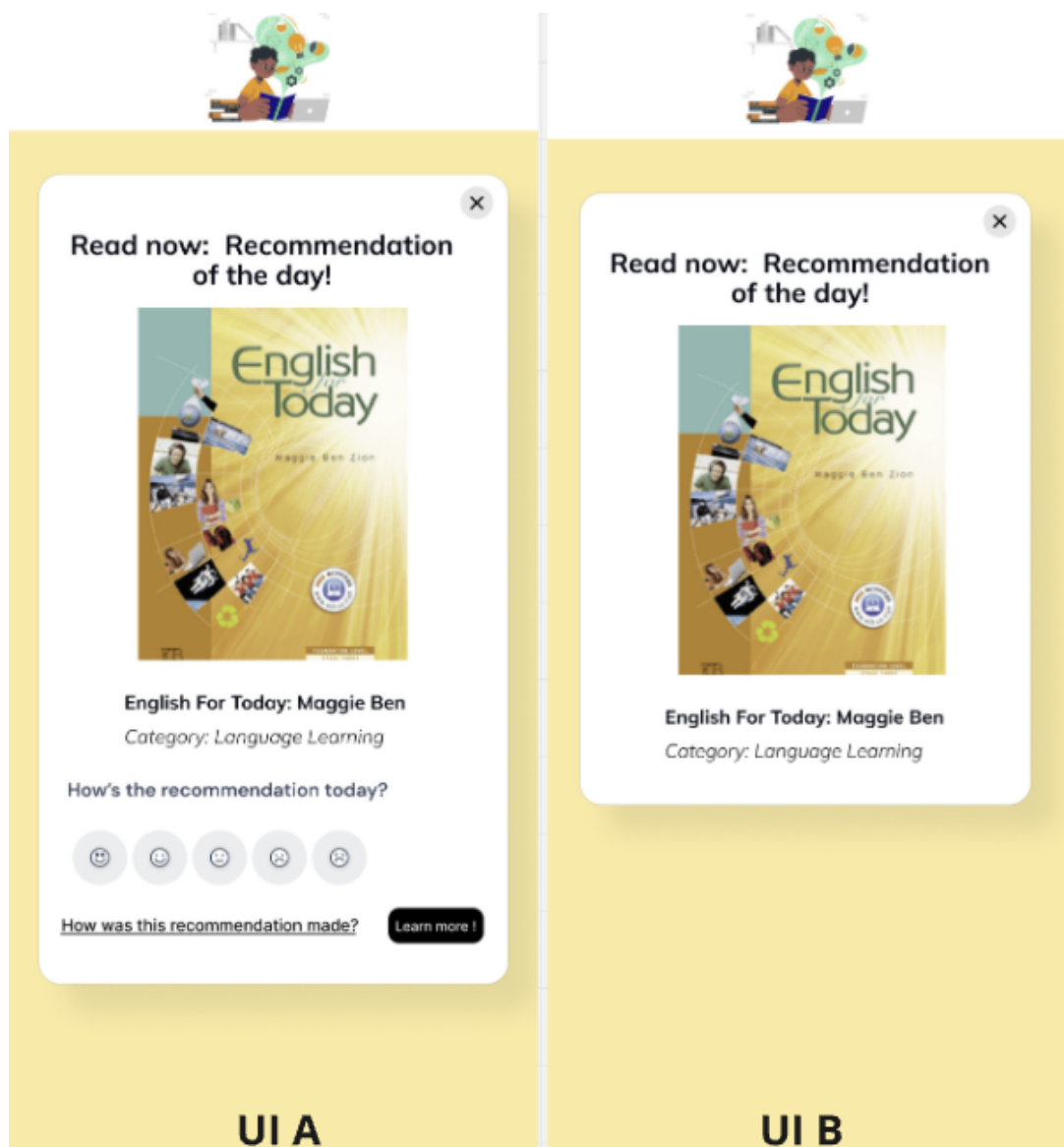


Figure 1: The two user interfaces showcased to users under transparency

4.2. Consent Design

Figure 2 illustrates two approaches to obtaining user consent. UI A presents terms and conditions in a structured format, using bullet points and color-coded keywords to highlight key aspects. A toggle button allows users to selectively grant permissions for specific actions within the app. UI B, on the other hand, follows a traditional long-form approach, displaying a detailed block of text without an option to decline the terms and conditions. Prior studies [23],[24] indicates that lengthy, dense consent forms can lead to consent fatigue, whereas more concise and interactive formats improve user engagement and retention.

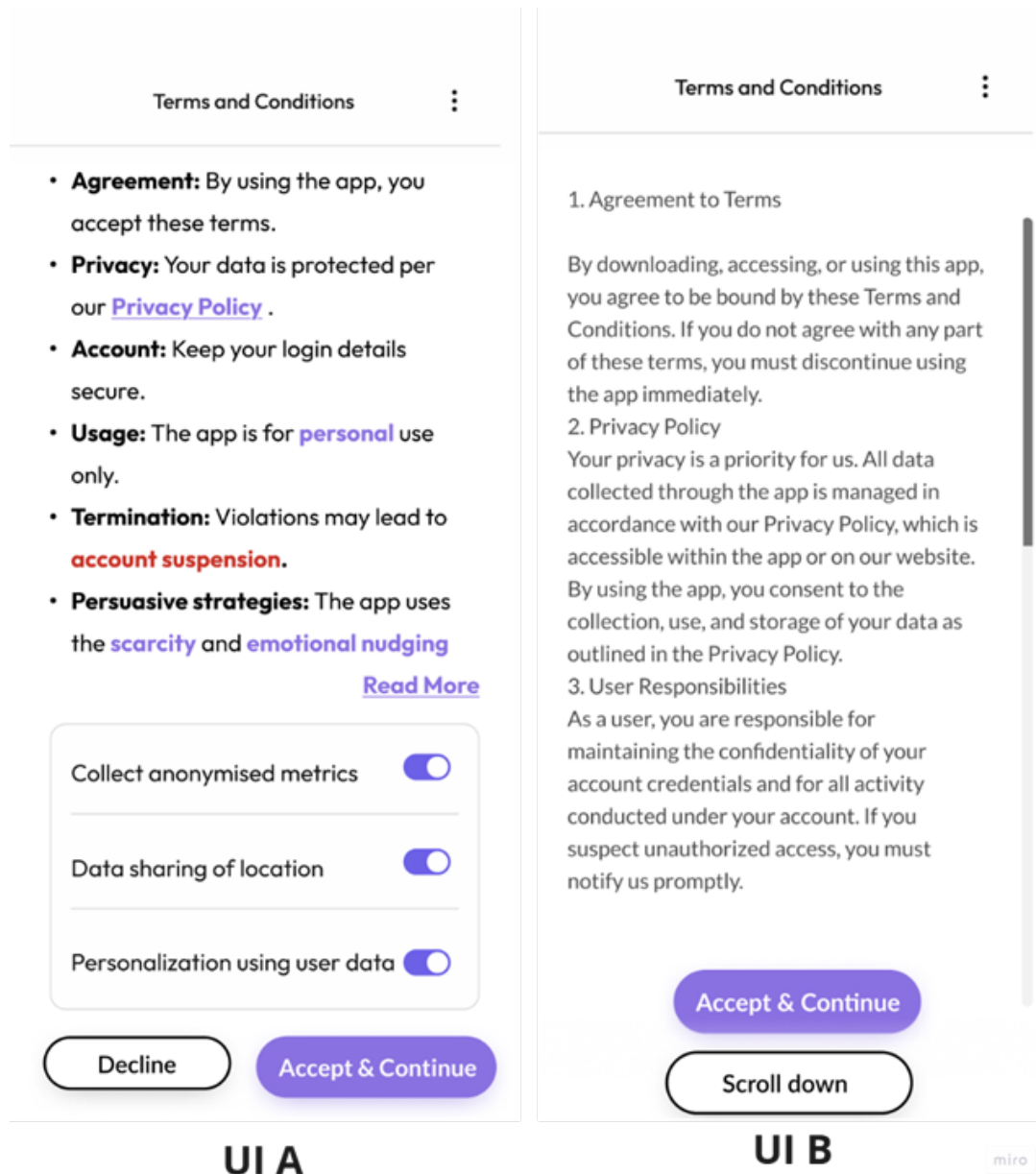


Figure 2: Comparison of user interfaces for obtaining user consent.

4.3. Autonomy Design

Figure 3 presents two user interfaces for subscribing to a premium membership in an e-commerce platform, illustrating varying levels of user autonomy. UI A ensures equal choice burden by presenting subscription options with uniform button colors and providing a clearly visible "Skip" button. The

"Close" button is also highlighted, allowing users to exit without subscribing. Additionally, UI A transparently displays potential savings for users who opt for a yearly subscription. Conversely, UI B prioritizes the monthly subscription by using a more visually prominent color while obscuring the yearly subscription. Furthermore, the "Close" button is smaller and faded, making it less noticeable. Research by Michalski et al. [25] suggests that factors such as color, icon size, and positioning significantly influence users' navigation and decision-making within a system.

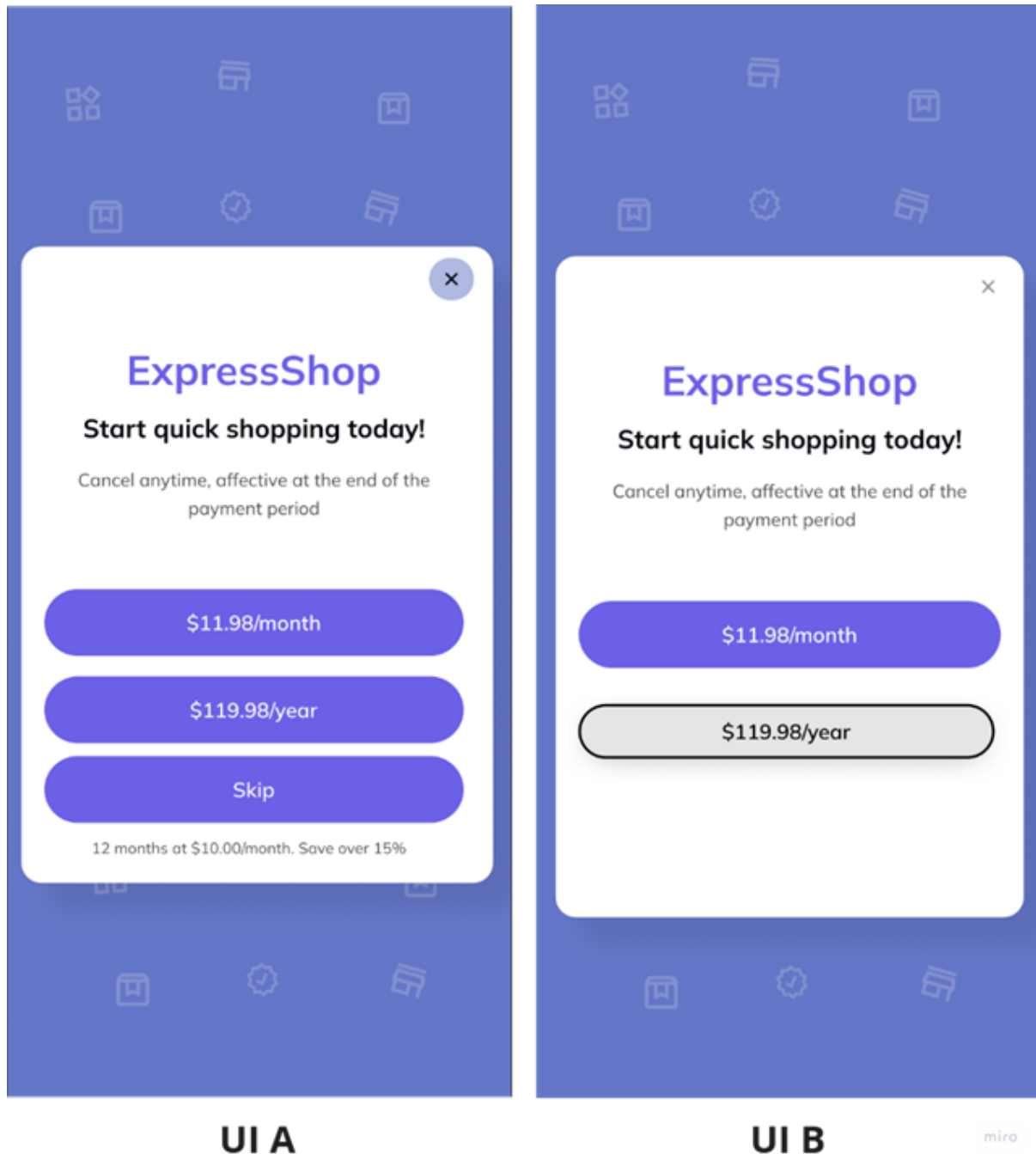


Figure 3: Comparison of user interfaces showcasing varying levels of user autonomy in premium subscription models.

4.4. Data Privacy and Security

Figure 4 illustrates two user interface designs for a persuasive health app that tracks daily water intake, highlighting different approaches to data privacy and security. UI A emphasizes transparency

by informing users about data security protocols through an icon indicating GDPR compliance. Users are also given the option to download and review their shared data, with additional choices to delete or retain their records. Furthermore, UI A incorporates a gamified element, rewarding users with in-app currency for reading more about data regulations, thereby increasing awareness. In contrast, UI B provides only the option to save user data, without any indication of security protocols or privacy safeguards. Users are not prompted to learn more about how their data is handled. Prior research [26] suggests that users who are more informed about an app's data privacy and security policies are more likely to trust the system.

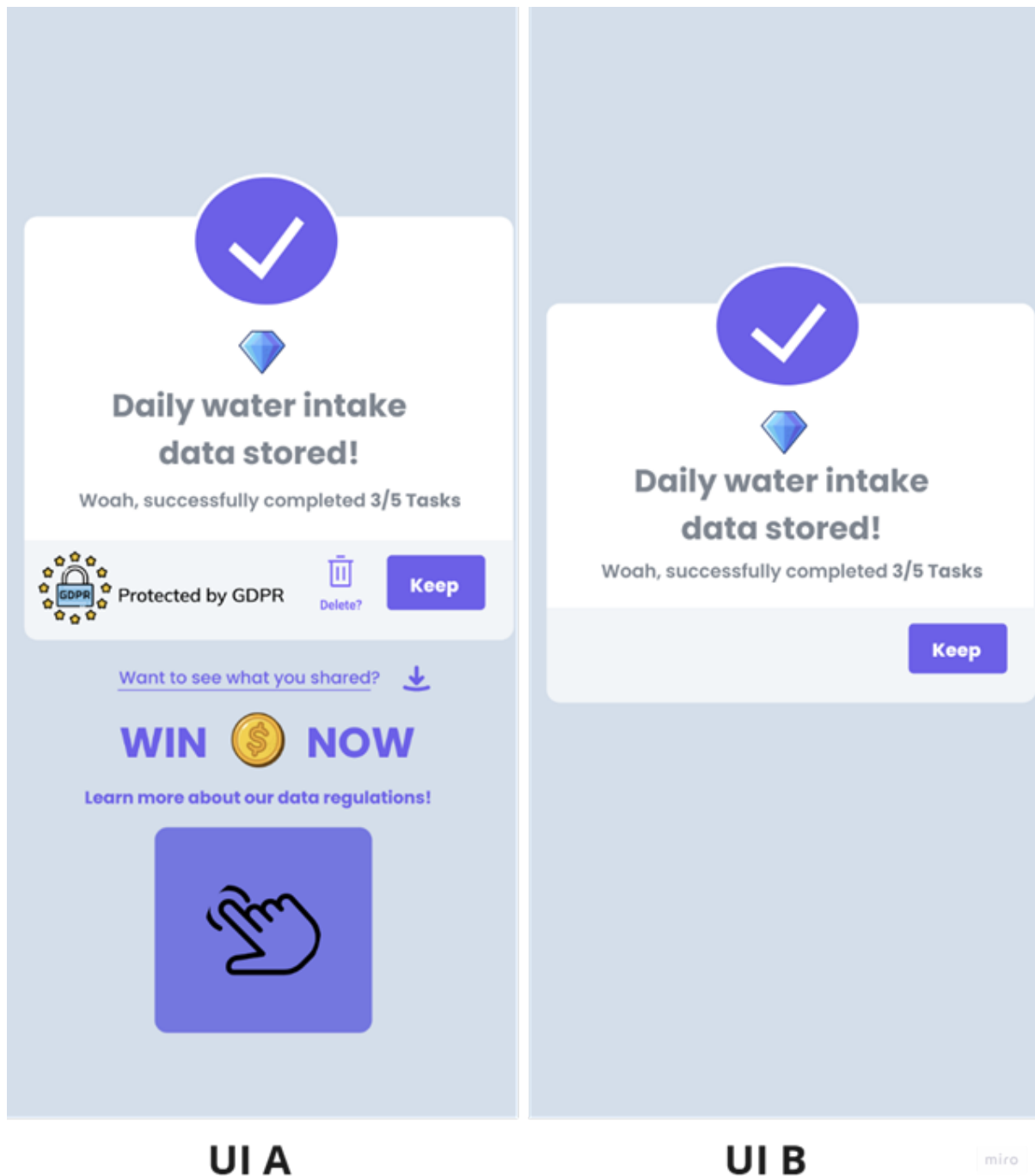


Figure 4: Comparison of user interfaces showcasing different approaches to data privacy and security.

5. Results

5.1. Prototype Evaluations

Table 2 presents the mean scores and standard deviations for the two user interface (UI) prototypes across four key ethical and trust-related dimensions: Transparency, Consent, Autonomy, and Data Privacy and Security. The results indicate that UI A consistently achieved slightly higher mean ratings than UI B across all dimensions, suggesting a small but consistent preference for UI A in terms of user experience. However, the standard deviations indicate some variability in responses, with UI B generally exhibiting higher standard deviation values. This suggests that user opinions about UI B were more varied, whereas UI A's ratings were more stable. As shown in Table 2, users' direct preference

Table 2

Differences in Mean and Standard Deviation for Different Prototypes

Ethical Factor	UI A Mean	UI B Mean	UI A Std Dev	UI B Std Dev
Transparency	5.2	5.1	1.10	1.20
Consent	5.2	5.1	1.11	1.17
Autonomy	5.2	5.0	1.13	1.22
Data Privacy and Security	5.1	5.0	1.12	1.22

between UI A and UI B is illustrated. The users were asked which user interface they preferred and they were provided with the choice of UI A and UI B. A higher proportion of users favored UI A in all four dimensions, with Transparency showing the most notable difference, where 66% of users preferred UI A compared to 34% for UI B. Similarly, Consent (59.5% vs. 40.5%), Autonomy (58.6% vs. 41.4%), and Data Privacy and Security (62.8% vs. 37.2%) all showed a preference for UI A. These results suggest that UI A was perceived as a more user-friendly and effective interface compared to UI B.

Table 3

Preferred User Interfaces

Ethical Factor	UI A Preference Frequency	UI B Preference Frequency
Transparency	66%	34%
Consent	59.5%	40.5%
Autonomy	58.6%	41.4%
Data Privacy and Security	62.8%	37.2%

Table 4 further investigates user perceptions of ethicality and trustworthiness in each UI. The users were asked which interface they believed was more ethical and trustworthy between UI A and UI B. The results align with the previous findings, indicating that UI A was generally considered the more ethical and trustworthy option. Transparency showed the strongest preference for UI A (65.7%), reinforcing the idea that UI A was more effective at communicating information clearly. Additionally, Autonomy (62.6%) and Consent (57.9%) were also perceived as more ethical in UI A. However, for Data Privacy and Security, UI A had a lower margin of preference (56.6%) compared to UI B (43.4%), suggesting that UI B may have had some features that certain users found appealing in terms of privacy.

Table 4

UI Preferences Based on Ethical and Trustworthiness Perception

Ethical Factor	UI A Preference	UI B Preference
Transparency	65.7%	34.3%
Consent	57.9%	42.1%
Autonomy	62.6%	37.4%
Data Privacy and Security	56.6%	43.4%

Overall, the results indicate that UI A was perceived as both the more user-friendly and ethical option, consistently receiving higher mean scores, greater user preference, and stronger perceptions of ethicality and trustworthiness. While UI B did not outperform UI A in any dimension, the narrower gap in Data Privacy and Security perceptions suggests that further refinement in UI A's approach to privacy features could be beneficial.

6. Discussion

This study examined how incorporating ethical design features—specifically transparency, consent, autonomy, and data privacy/security—affects user trust in persuasive prototypes. The findings highlight that prototypes embedding these ethical considerations were consistently rated higher in trustworthiness and ethical perception compared to those lacking such features. Among these factors, transparency emerged as the most influential, with a significant majority of participants favoring interfaces that provided clear explanations for system recommendations. This strong preference underscores the critical role of transparency in fostering trust, as users tend to be more inclined to trust systems that openly communicate their processes, decisions, and intentions.

These results align with existing literature emphasizing transparency and user control as fundamental components of trust in persuasive systems. For instance, Ahmad and Ali [7] found that cognitive trust significantly influences decision-making in persuasive technologies, reinforcing the idea that ethical design elements can measurably enhance trust and user preference. However, while transparency is generally regarded as a trust-enhancing feature, its effects are not universally positive. Some studies suggest that, in certain contexts, increased transparency may paradoxically reduce trust. For example, Springer and Whittaker [27] observed that when system predictions did not align with user expectations, greater transparency sometimes led to decreased confidence. Similarly, Eslami et al. [28] found that algorithmic transparency could polarize users, with some appreciating the additional information while others found it confusing, ultimately leading to a decline in trust. These findings suggest that while transparency is valuable, its implementation must be carefully considered to avoid unintended negative consequences.

Beyond transparency, other factors also influence trust and acceptance. Wanner et al. [29] demonstrated that while transparency enhances cognitive trust, it does not necessarily lead to greater acceptance of intelligent systems. This highlights the importance of additional considerations such as perceived usefulness, user experience, and the level of user control offered. Our study supports this perspective, suggesting that transparency should be balanced with usability to ensure that users feel informed without being overwhelmed. If transparency features are overly complex or burdensome, users may disengage from the system rather than feel reassured. A user-centered approach to transparency, tailored to the context and needs of different user groups, is therefore essential.

The practical implications of these findings are significant for designers and developers of persuasive systems. Transparency features should be presented in a clear and accessible manner, ensuring that users understand how their data is utilized and how system decisions are made. Providing detailed but digestible explanations can foster trust while mitigating the risks of information overload. Additionally, granting users control over their data and implementing real-time consent mechanisms aligns with ethical best practices and reinforces system integrity. These measures not only improve user trust but also enhance engagement and satisfaction, leading to greater adoption of persuasive technologies. However, designers must ensure that transparency is implemented in a way that supports, rather than complicates, user experience.

Despite these insights, this study has certain limitations. The participant pool primarily consisted of individuals aged 25-44, which may limit the generalizability of the findings to other age groups. Moreover, the study did not report any statistical significance, effect sizes, or demographic differences. Future studies should aim to include a broader demographic to explore how trust in persuasive technologies varies across different populations and analyze the data further using statistical tests. Additionally, reliance on self-reported trust measures introduces the potential for response biases. More objective

trust measurements, such as behavioral data or physiological responses, could provide deeper insights into user perceptions.

Further research should also adopt longitudinal designs to assess how trust in persuasive systems evolves over time. Investigating adaptive transparency features—where explanations are adjusted based on user preferences and system interactions—could offer a more refined approach to fostering trust. Additionally, real-time consent mechanisms and personalization in ethical design could further enhance user engagement and confidence in persuasive technologies.

7. Conclusion

This study highlights the importance of ethical design principles—transparency, autonomy, consent, and data privacy—in fostering trust in persuasive technologies. The evaluation of user interfaces demonstrated that incorporating these features enhances user perceptions of trustworthiness and ethicality, with transparency emerging as a key determinant. However, the findings also suggest that poorly implemented transparency may lead to skepticism, reinforcing the need for a balanced and user-centered approach. Future research should investigate adaptive transparency mechanisms and real-time consent features to enhance trust-building strategies in persuasive systems.

Declaration on Generative AI

During the preparation of this work, the author(s) used Chat-GPT-4 and Grammarly in order to: Grammar and spelling check. After using these tool(s)/service(s), the author(s) reviewed and edited the content as needed and take(s) full responsibility for the publication's content.

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