Wiley
Human Behavior and Emerging Technologies
Volume 2024, Article ID 5595339, 26 pages
https://doi.org/10.1155/2024/5595339

WILEY

Research Article

Motivated by Design: A Codesign Study to Promote Challenging Misinformation on Social Media

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Received 19 March 2024; Revised 6 September 2024; Accepted 20 September 2024

Academic Editor: Alhamzah Alnoor

The spread of misinformation on social media is a critical issue. One potential solution to mitigate the spread is user corrections; however, users often refrain due to various concerns. Leveraging the established influence of user interface design (UID) on how user interact with and respond to misinformation, this study investigates how user interface features can be designed to motivate users to challenge misinformation. It is aimed at gaining insights into users' needs and UID requirements that encourage this behaviour. We conducted four codesign sessions with 18 social media users (age range 20–60 years $M = 39.1$; 10 female and 8 male). We applied the unified theory of acceptance and use of technology (UTAUT) as a theoretical framework and analysed our data based on the core constructs of this framework: performance expectancy, effort expectancy, social influence, and facilitating conditions. Our findings reveal four design considerations: creating secure and supportive environments, facilitating informed discussions through easy confrontation and access to reliable resources, leveraging recognition and social proof, and user support infrastructure. We also identified specific design elements with users, including indirection, semianonymity and privacy, simplicity, one-click challenging, easy access to reliable sources, recognition, displaying social proof, and platform support. These elements are aimed at reducing social discomfort and making the process of correcting misinformation more approachable for users. Our findings offer actionable insights for social media platform designers to reduce the spread of misinformation by creating environments that encourage constructive dialogues and allow users to challenge misinformation without fear of conflict.

Keywords: codesign; correction of misinformation; misinformation; user-centred design

1. Introduction

The spread of misinformation continues to be a critical problem, and the role of social media platforms in tackling this problem is paramount. Empirical research highlights how social media platforms can both facilitate and mitigate the spread of misinformation. For example, Twitter's deplatforming of 70,000 users known for trafficking misinformation significantly reduced its circulation among both the deplatformed individuals and their followers. This intervention also led to other misinformation spreaders leaving Twitter, demonstrating social media platforms' ability to regulate public discourse [1]. Another example is Facebook's system architecture, which fails to prioritise correcting misinformation or limiting its exposure. In fact, even when misinformation content is removed, users can still access it due to the platform's flexibility [2].

Various measures have been taken on social media to combat misinformation including technological measures such as detecting fake news through artificial intelligence

algorithms and machine learning [3–5] and corrective measures such as fact checking, expert corrections, and user corrections [6–8]. In addition to the technological solutions proposed for tackling misinformation, user corrections, where people correct each other on social media, hold promise in combatting the spread of misinformation [6, 9]. When users correct their peers on social media, they influence others and help reduce the spread of misinformation [10]. However, despite the importance of correcting misinformation, people generally do not correct them when they encounter it on social media [7, 11–15].

The reluctance of users to engage in correcting others on social media remains an under-researched area. Several qualitative studies have indicated that the barrier to people correcting each other on platforms like WhatsApp is conflict avoidance [16]. Additionally, other studies have categorised the factors that prevent people from correcting misinformation into four different categories: social concerns, effort/interest considerations, prosocial intents, and content-related factors [17]. Addressing these challenges and fostering an environment where people can correct each other and participate in constructive dialogues on social media necessitates the exploration of potential solutions. Yet, the existing body of literature regarding these solutions seems limited in scope.

Previous research has demonstrated the significant impact of user interface design (UID) on user engagement on social media. It plays a crucial role in facilitating user interaction through elements such as commenting, messaging features, and the "like" feature, which enable users to communicate and connect with others [18]. By fostering these connections, social networking sites (SNS) help maintain relationships and build social capital [19]. These design features influence the prevalence and quality of interpersonal interactions and discussions on social media platforms. One study examines how structured interfaces that prompt users to reflect on their opinions can lead to more thoughtful and less polarised discussions [20]. Another study investigates how specific characteristics of design such as accountability and transparency can facilitate difficult conversations in online spaces [21]. Similarly, research suggests that by implementing design elements that encourage empathy, reflection, and accountability, online platforms can create a more positive and productive environment for users to engage with each other [22]. The study on ChangeMyView subreddit demonstrates how gamification elements like the recognition (e.g., delta mechanism) and leaderboards (e.g., delta boards) can encourage civility and politeness among users [23]. Furthermore, design changes aiming at increasing participants' feelings of accountability and empathy may lead them to take more responsibility for their actions in cases of cyberbullying [24]. Taken together, these studies highlight the critical role of UID in shaping user behaviour regarding interactions and discussions within online environments.

In addition to its established role in shaping discussion environments, UID was also shown to be effective in the context of misinformation. Studies showed that design elements can significantly influence misinformation sharing. For instance, research suggests that users exposed to high engagement metrics, such as the number of likes and shares, are more likely to like or share misinformation without verifying its accuracy [25]. Additionally, presenting misinformation with the source preceding the message decreases users' trust, resulting in lower likelihood of sharing [26]. Moreover, integrating friction into a design, such as asking users to pause and think before sharing information, has been shown to reduce misinformation sharing [27].

Another area where user interface has an impact in the context of misinformation is its influence on individuals' beliefs about misinformation. For instance, Facebook's "related stories" feature affects users' beliefs, such that when related stories correct a post containing misinformation, misperceptions are significantly mitigated [10]. Another study shows that, when people are presented with ratings of the credibility of the source of the article and experts who reviewed the article, these ratings affect users' beliefs regarding misinformation, with low ratings decreasing believability [28]. Building on the established influence of UID on discussion environments and misinformation beliefs, recent research explored that certain interfaces incorporating persuasive techniques could increase users' likelihood to challenge misinformation compared to existing interfaces on platforms like Facebook [29].

In this study, we extend the existing literature by exploring the influence of UID on how users confront and interact with each other on social media. While prior research primarily focused on the influence of UID on the individual-oriented practices such as misinformation sharing or users' beliefs, this qualitative study shifts its focus to understand the influence of UID on the practices where interpersonal dynamics are at play, correcting misinformation. This topic requires a more detailed investigation, as correcting others is a socially embedded phenomenon that includes not just the isolated action of the user but also their social connections and the relational considerations. These considerations include but are not limited to concerns about their image on social media [30], their desire to save their loved ones from embarrassment [14], and the tendency to avoid conflicts and heated discussions on social media [16, 17, 31]. Consequently, there exists a paradox in which challenging misinformation is beneficial for combating the spread of misinformation, but the social discomfort associated with this behaviour hinders its use.

Prior research explored environments that prioritise interpersonal relationships between people. Baughan et al. [21] introduced the concept of "interpersonal design" which entails designing environments that focus on interpersonal relationships and healthy engagement. In line with this concept, instead of using traditional approaches focusing on users' goals in using technology to achieve a task, our primary focus is to support users' goals in their interactions with one another. In essence, we aim to provide user-centred design (UCD) tools and elements that help users to navigate their conversations about addressing misinformation without causing unnecessary conflict or damaging relationships.

Developing a one-size-fits-all approach to encourage confronting misinformation on social media is challenging, as the way people use and engage with social media

platforms is far from simple or uniform. Users have a variety of reasons to use Facebook, such as passing time, seeking information, and communication [32, 33]. Any interventions to address misinformation must consider these diverse motivations and the complex nature of how users interact with the platform's design features. To be effective, solutions must be tailored to address the specific challenges posed by Facebook's design and the complex needs and behaviours of its diverse user base. To achieve this, we aim to deepen our understanding regarding the relationships between design and challenging behaviour on social media platforms with the ultimate goal of cultivating an environment where users feel more encouraged to challenge misinformation.

We follow a similar approach to that described by Kiskola et al. [34] who explored user expectations regarding the online news commenting environment. However, rather than utilising their approach of collecting qualitative answers from a survey, we used an online codesign study (OCD) as a method. Given the need to capture insights into complex interpersonal relationships and users' attitudes towards correcting misinformation to inform the development of effective UID solutions, employing a user-centric codesign methodology offers significant advantages. Codesign is an effective method to give voice to end users in the design process [35] which also allows going beyond purely visual attributes. We also aim to move beyond purely visual attributes, recognising that our goal is not to create the ultimate design but rather to explore the design considerations that encourage and motivate users to challenge misinformation.

In seeking solutions, the Unified Theory of Acceptance and Use of Technology (UTAUT) [36] presents a promising framework for designing user-centric tools and strategies. The UTAUT framework has been widely used and applied to examine technology acceptance in various domains, such as e-commerce and online shopping [37], wearable devices, and the Internet of Things [38] and healthcare technology [39]. However, to the best of our knowledge, this is the first study to apply the UTAUT model in the context of developing tools and approaches to help users correct misinformation. By exploring how the key determinants of the UTAUT model (performance expectancy, effort expectancy, social influence, and facilitating conditions) can be leveraged to design approaches that empower users to correct misinformation, this study provides important insights for the development of effective UID solutions to combat the spread of misinformation.

Our goal is to answer the following:

RQ1: What design features and elements do users anticipate as the most effective in motivating them to challenge those sharing misinformation?

RQ2: What are the key requirements users anticipate from social media platforms to enhance their willingness and confidence in challenging others who share misinformation?

In order to explore these questions, we carried out four codesign sessions with 18 individuals. The purpose was to gain insights into their experiences with challenging misinformation on social media and prompt them to devise new design ideas that would facilitate the process and enhance their willingness. The prototype designs created by the participants are not intended as a novel contribution in this paper as this study pursues a deeper purpose beyond creating a "design." Instead, the designs are intended to invite participants to express and reflect on their experiences, emotions, and perspectives, potentially providing inspiration for designers [40, 41].

Our work offers novel contributions to the existing literature on human–computer interaction and social media. With respect to the design of social media features to facilitate user interactions, our study is one of the first attempts to provide insights into encouraging users to correct misinformation from a user-centric perspective. We identify the specific characteristics that users believe the social media environment should offer to encourage and motivate them to correct misinformation. Our work also offers practical implications by providing insights into the concerns that users have when challenging each other and how design considerations can mitigate these concerns and facilitate the process of challenging misinformation. Understanding the concerns and users' requirements to alleviate them will hopefully empower designers and researchers to create environments that support users in their pursuit of truth, fostering healthier online communication and a more informed online environment.

Section 2 introduces the UTAUT framework, which forms the basis for presenting our findings. Section 3 describes the research methodology and data analysis procedures, while Section 4 details the findings of our study. In Section 5, we discuss these findings, and Section 6 examines the theoretical and practical implications. Section 7 addresses the study's limitations and proposes areas for future research, followed by Section 8, which concludes the paper.

2. Theoretical Framework

2.1. UTAUT. The UTAUT is a theoretical framework that has been developed by reviewing and synthesising eight different models used to understand user acceptance and adoption of new technology [36]. UTAUT's effectiveness in explaining the acceptance and utilization of information technology (IT) has been established through empirical testing [42]. UTAUT theorises that four determinants have a significant direct effect on user acceptance and behaviour: performance expectancy, effort expectancy, social influence, and facilitating conditions. Higher values of the four determinants correspond to increased acceptance and intention to use the technology. UTAUT further proposes that these four constructs can be influenced by moderating factors such as gender, age, experience, and voluntariness of use (Figure 1).

UTAUT has been widely used to study user behaviour and technology adoption in various contexts such as intention to use e-learning [43, 44], mobile health services [45], e-government services [46], and Internet of Things [47]. However, the application of UTAUT in understanding the motivations behind challenging misinformation through design proposals is scarce. Extending its application to a new and complex issue of challenging misinformation on

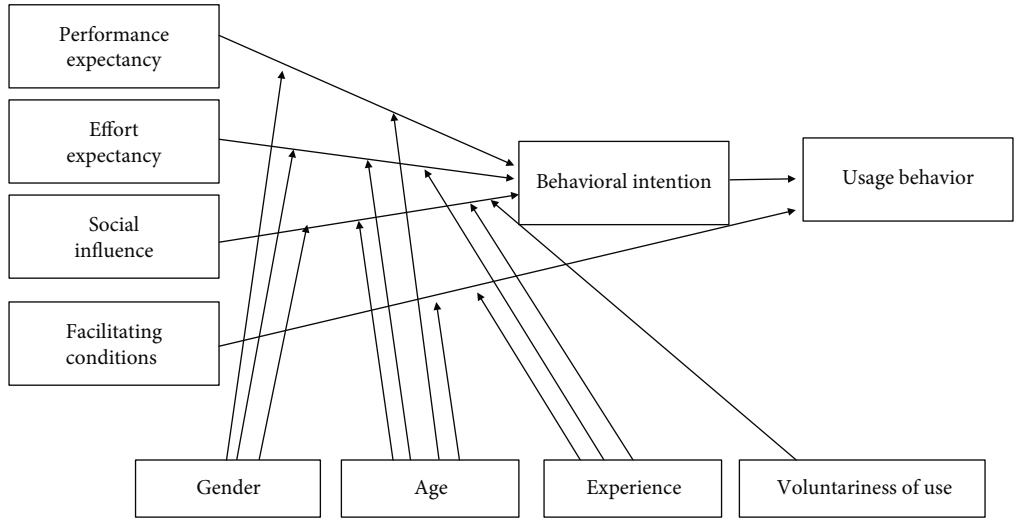

Figure 1: UTAUT model [36].

social media allows us to explore how the core constructs can be adapted to understand user interactions with design features to challenge misinformation.

In this study, we used UTAUT to structure and interpret the qualitative data obtained from codesign sessions. By structuring and categorising the data under the core constructs of UTAUT, such as performance expectancy, effort expectancy, social influence, and facilitating conditions, we aimed to identify patterns and themes that reveal the underlying factors driving users' acceptance and use of these features proposed. For instance, the performance expectancy construct helped categorising data related to users' perceptions of the effectiveness of the features in motivating them to challenge misinformation. The effort expectancy construct helped to understand users' perspectives related to the usability and accessibility of these features. The social influence construct explained the role of social norms and peer pressure in shaping users' perceptions and behaviours. Finally, the facilitating conditions construct provided a foundation for the technical and environmental factors that enable or hinder users' ability to use these features. Since challenging misinformation is a complex issue between technological, social, and individual factors [17], it was hoped that UTAUT would allow for a systematic examination of these complex relationships.

3. Method

Qualitative research was conducted to gain a contextualised understanding [48]. Four online codesign focus group sessions were conducted with 18 participants. Conducting four sessions with a total of 18 participants can be considered an adequate sample size for qualitative research. For homogeneous populations, smaller sample sizes of around 10 participants may suffice to capture the range of perspectives [49]. Additionally, code saturation, where no new codes or themes emerge, can potentially be achieved within four focus groups [50]. Before conducting the research, ethical approval was granted from the research ethics committee. Data collection took place between April 6 and 25, 2023. Participants were provided with an information sheet and an informed consent form to review and sign before the session. Participants were assured of their freedom to withdraw and informed about the recording of the meeting for transcription and the anonymisation and deletion of their data upon project completion. The focus groups followed a semistructured approach, where the moderator employed a protocol consisting of open-ended questions and asked further details when necessary. Focus groups can be challenging as discussions can be influenced by participants' social desirability biases or their tendency to report about themselves in a favourable manner, which can affect the validity of the focus groups [51]. To overcome such bias, the moderator used indirect questioning, asking respondents about what "other people" think or do in hypothetical scenarios [52].

3.1. Participants. In total, 18 participants (age range 20–60 years ($M = 39.1$); 10 female and 8 male) were recruited through Prolific (http://www.prolific.co/), an established platform for online recruitment for research studies. Prolific's screening features allowed us to target participants in a broader range of demographics ensuring representation of individuals from different age groups, educational backgrounds, and cultural backgrounds. Demographics of the participants are listed in Table 1. We aimed to gather diverse perspectives by recruiting participants from various age groups, genders, and educational backgrounds. We recruited participants with a prescreening form along with the information sheet and agreement form. Participants were required to be UK based and 18 years of age or older, daily active users of social media (specifically Facebook) who use their real identities, have encountered misinformation on Facebook at least once, and have confidence in their ability to use an online collaboration software to articulate their

Table 1: List of codesign participants.

Participant	Age	Gender	Education	Country
1	35	Female	University	United Kingdom
2	23	Female	University	United Kingdom
3	57	Male	University	United Kingdom
4	25	Female	Postgraduate	United Kingdom
5	25	Male	Postgraduate	United Kingdom
6	20	Male	College	United Kingdom
7	31	Male	Postgraduate	Turkey
8	59	Male	College	United Kingdom
9	45	Male	University	United Kingdom
10	44	Female	University	United Kingdom
11	26	Female	University	United Kingdom
12	60	Female	University	United Kingdom
13	43	Male	College	United Kingdom
14	45	Female	Vocational training	United Kingdom
15	52	Female	College	United Kingdom
16	35	Female	University	United Kingdom
17	51	Female	University	United Kingdom
18	28	Male	Postgraduate	Malaysia

thoughts. Participants were compensated £15 for their involvement in the study.

The screening ensured that participants were familiar with the tool Miro (http://www.miro.com/), which makes the codesign process easier and more effective. Regarding our participants, we categorised the ages into four groups based on World Health Organization [53, 54]: (20–24), (25–44), and (45–64). In this dataset, there are 2 participants in the 20–24 years group, representing 11% of the total. There are 9 participants in the 25–44 years group, making up 50% of the total; there are 7 in the 45–64 years group, accounting for 38.9%. Having participants from all four groups indicate a broad range of user experiences.

3.2. Pilot Test. To assess the feasibility and effectiveness of the codesign session, a pilot study was conducted with a group of seven university students. The objectives of the pilot study were to assess whether the durations were sufficient to accomplish the intended goals and activities, to evaluate the clarity of the questions posed during the session, and to determine the participants' ability to utilise collaborative software. Based on participants' feedback, modifications were implemented. The clarity of the questions was enhanced, and the duration of each activity was increased. Furthermore, we observed that participants were able to effectively utilise the collaboration tool and express themselves adequately.

3.3. User-Centred Online Codesign Process. UCD or human-centred design (HCD) emphasises the role of the end user in the design process [55]. Codesign or participatory design takes this user-centred approach a little further and involves individuals in the process of designing the ITs that they use [35, 56].

Codesign invites nondesigners to be active participants in the design process, transforming traditional hierarchies and cultivating a sense of ownership among all involved parties [56, 57]. Throughout the evolving process of codesign, design tools such as games and probes (i.e., materials crafted to provoke or elicit response) are used to foster collaborative creation and facilitate the problem-solving process [41, 58]. Participants' perspectives, experiences, and input are central to the codesign study. While self-reported data can be subject to certain biases, it can be valuable to get insights regarding the participants' personal recollections, perceptions, and experiences [59]. The goal of codesign is not necessarily to capture objective truths, but rather to understand and incorporate diverse lived experiences into the design process. Additionally, by incorporating some techniques such as prototyping, we aim to validate self-reported information through active engagement.

As a method, codesign has been applied in various fields to gain insights regarding mobile and online spheres, such as designing a mobile app to improve mental health [60], mobile interventions for substance use [61], and to identify design principles and techniques for explanations that help AI trust calibration [62].

Codesign offers two advantages: First, it empowers users who will use the technology to have an active role in its design, and second, it allows both the designer and user to develop and devise solutions that address specific areas of concern and thereby facilitates the creation of an enhanced future reality [57].

Building upon the idea that codesign offers valuable insights and effectiveness in recognising diverse views [56], we employed an OCD where each focus group consisted of three to five participants aligning with Krueger and Casey's [63] ideal sample size suggestion. Implementing codesign process in an online environment is a relatively new approach that has witnessed a significant increase in its utilization after the COVID-19 pandemic [64]. It provides a flexible way for researchers and participants to overcome challenges, such as geographical distances and time differences [65]. Additionally, since the output will be implemented as an online interface, the online environment enables users to view the designs as they would in the real-world. Using online tools for the codesign process is a flexible, inclusive, and cost-effective way to gain insights from participants regardless of their location [66].

Many UCD methodologies are built upon the foundation of the international standard [67], which includes the following stages: identification of needs, specification of requirements, producing the solution, and evaluation. For example, while some scholars conceptualise this cocreating process as "tell, make and enact" [41, 68], others propose a framework comprising seven phases: resourcing, planning, recruiting, sensitizing, facilitation, reflection, and building for change [69]. The framework we used in this study based on the ISO standards is shown in Figure 2. Codesign sessions were conducted based on this framework, each lasting

Figure 2: User-centred design framework for codesigning interfaces.

approximately 1.5 h. The sessions were video recorded and transcribed.

3.4. Preparation. At the beginning of the codesign session, participants were provided with a comprehensive briefing regarding the study's goals, structure, and requirements. To establish a common understanding of key concepts, such as misinformation and challenging misinformation, the participants were presented with clear definitions. Additionally, participants were introduced to the online collaboration platform, Miro. They were provided with a demonstration and training session to familiarise themselves with its features and functionality. The training session had a duration of approximately 10 min. As being familiar is one of the selection criteria, the duration satisfied the participants. During this time, participants were encouraged to explore and experiment with the tool until they felt confident in using it. They were given the opportunity to ask questions.

3.4.1. Exploration. Consistent with the recommended procedures suggested by Krueger and Casey [63], group discussions began with exploring their views regarding challenging misinformation on social media. We presented participants with a fabricated Facebook post example which was used in a previous study [29]. The content was about an asteroid potentially hitting Earth. This news article appeared on CNN's iReport news hub in 2014[1] as misinformation and was widely shared. Prior to displaying the interfaces, we explicitly informed the respondents that the news was false. It is worth noting that our study was not focused on evaluating users' ability to identify misinformation but rather on exploring their attitudes. Participants were informed that the content was carefully chosen to exclude any political or social issues, as these topics could potentially influence users' tendency to challenge the misinformation [30, 70]. Additionally, we informed participants that the account holder's name was Alex, selected to avoid gender bias by using a gender-neutral name. Facebook was selected as the example as it is the most widely used online social network worldwide [71] across all age groups [72]. After presenting the content, we asked two questions based on hypothetical scenarios to gain insights into their perspectives about why other people may refrain from challenging others and their views and reactions towards being challenged when sharing misinformation. They wrote their answers on Miro before discussions (see Figure 3). After obtaining participants' insights on the reasons, incorporating the previously identified potential reasons from prior research, participants were then asked to categorise these reasons using the card sorting method (See Figure 4). The objective of this part was to familiarise participants with the context and encourage them to think and reflect about the problem and the reasons behind the problem in a wider sense.

3.4.2. Ideation. In the ideation phase, a brainstorming approach was employed to explore participants' ideas regarding the potential design elements and features that could overcome the identified barriers to challenging misinformation. Participants were prompted with questions about design solutions and asked to brainstorm the ideas in small groups. They recorded their thoughts on sticky notes using the Miro collaboration software (see Figure 5). Subsequently, a full group discussion took place where the ideas were shared and collectively discussed. Providing tools and probes inspires creativity and facilitates the codesign process [41, 73], after the brainstorming session participants were presented with design probes that have been used in a previous study [29]. Our approach to use design probes is twofold, firstly, to stimulate the thinking process for the upcoming creative session; and secondly, as an alternative to direct questioning, they initiated the conversation and provided additional contextual information for the research team [74].

3.4.3. Prototyping. Following an exploration of the underlying reasons, discussion ideas, and the presentation of design probes, participants were asked to create prototypes based on their ideas. Participatory prototyping is a specific activity within the design process where the values or principles that guide the design are materialised and transformed into specific requirements and new possibilities [75]. This can lead researchers and participants to think critically and explore alternative and feasible solutions. Participants utilised Miro to create and share their prototypes simultaneously. The research team provided participants with a user interface template, which participants utilised to generate their own concepts for prototyping (see Figure 6). The provided content in the template was the same one that participants encountered during the exploration phase. The purpose of using the same example was to encourage participants to generate their own prototypes while being aware that the goal of this study was not related to the misinformation content, but rather to the level of engagement with it. The aim was to minimise any biases or preconceptions participants might have regarding the importance or relevance of the content. They were presented with various design elements introduced during the idea generation stage for stimulation and used in a study by Gurgun et al. [29]. Examples of the

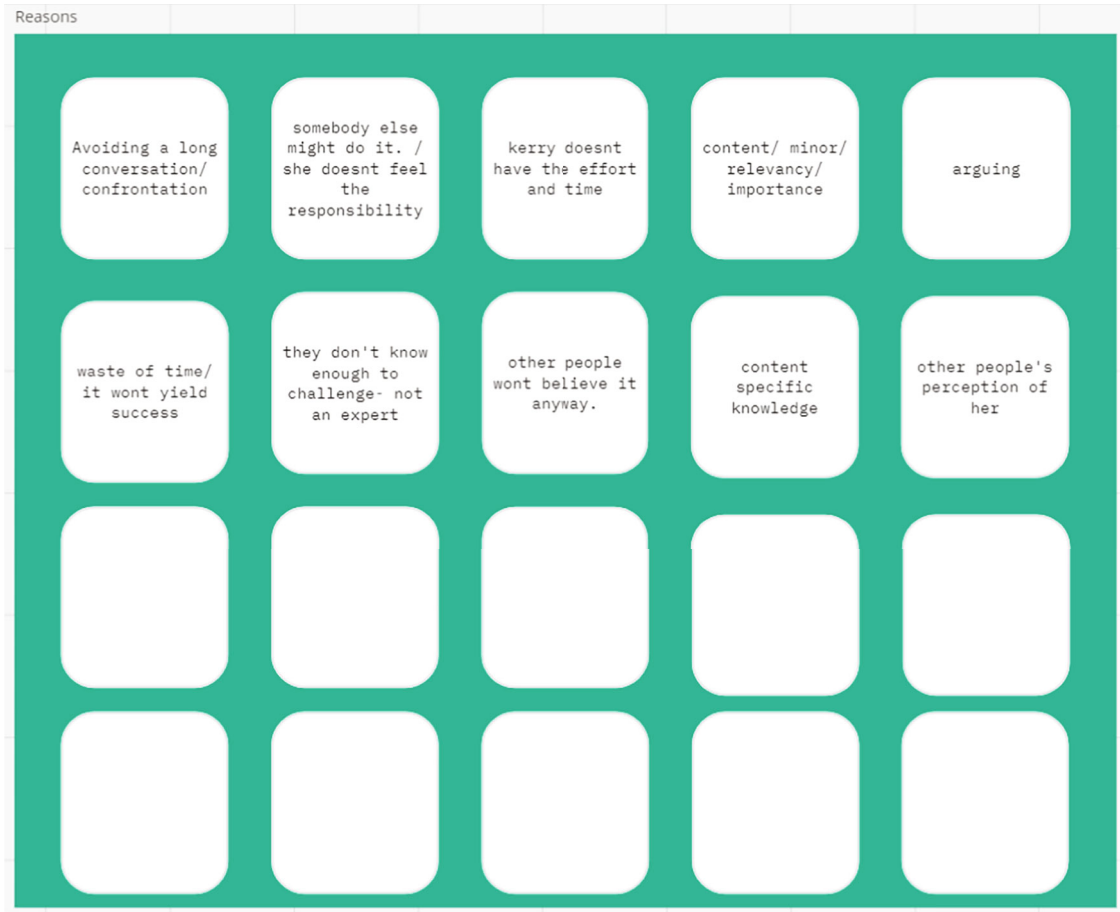

FIGURE 3: Miro interface for participants' reasons.

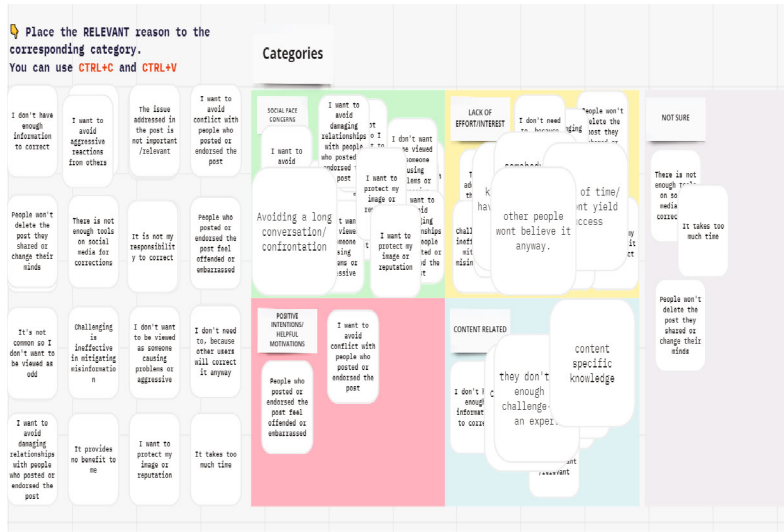

FIGURE 4: Card-sorting activity.

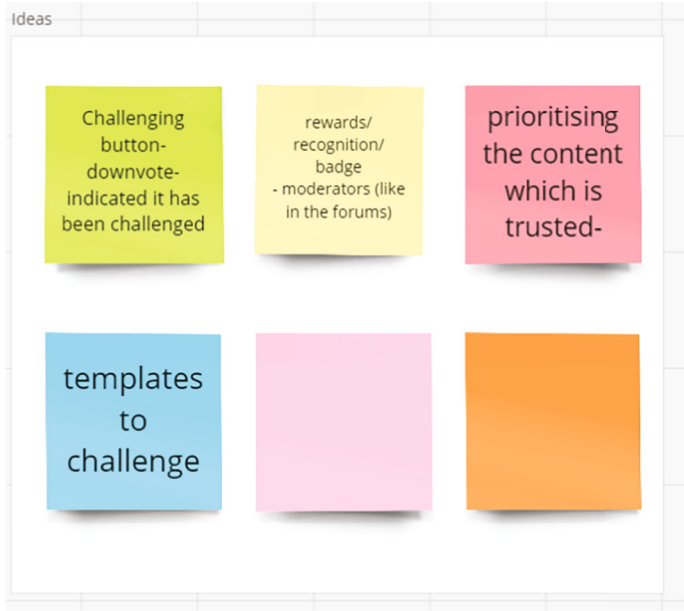

FIGURE 5: Miro interface for participants' ideas.

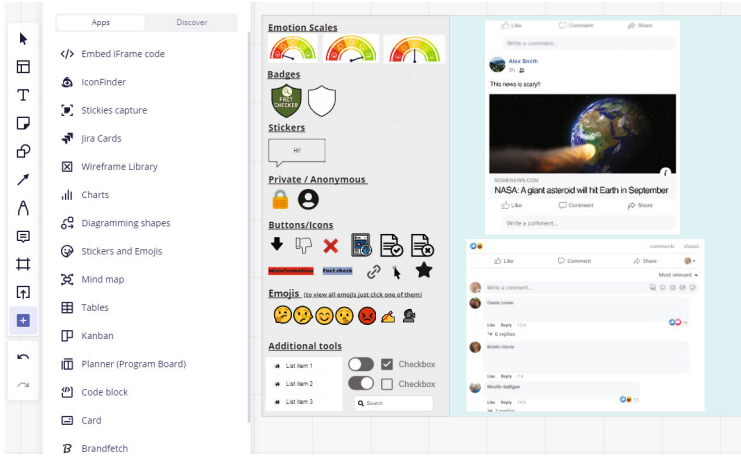

FIGURE 6: Prototype template on Miro.

designs presented included a fact checker badge, awarded to users who occasionally correct misinformation, and a tone detector which allows users to visualise how their comments are likely to sound to others. Rather than assuming that non-designer participants have artistic creativity and can apply it within Miro, we provided them with tools designed to facilitate self-expression, and they employed various features and design elements, both provided by the platform and by the researcher [61]. The objective of this process is to gather insights from participants on how they believe individuals could be better encouraged to challenge misinformation through specific design features and to see their creation of preliminary version or representation of the user interfaces.

3.4.4. Refining. After the prototyping phase, the moderator and the participants carefully reviewed the designs and discussed and refined them together. Participants engaged in critical reflection on their own designs, offering insights for overcoming the barriers that have been discussed throughout the session. The designs were evaluated based on their usability and effectiveness. In other words, participants shared their thoughts on what could enhance their motivation to challenge misinformation and provided feedback about their anticipated user experience. They also expressed their concerns about the preliminary nature of the prototypes, acknowledging the need to enhance the overall quality of the designs.

3.4.5. Evaluation. At the end of each codesign session, the unique ideas created in each session were collated, and they were presented back to participants in a follow-up survey. This survey consisted of presenting created prototypes and

Table 2: Codesign activities.

Stage no.	Phase name	Description	Duration
1	Preparation	Researcher briefs the participants about the study goals and structure.	20 min
2	Exploration	Participants are asked to evaluate existing social media design in terms of challenging misinformation and their experiences and opinions regarding the problem.	10 min
3	Ideation	Participants are asked to generate ideas regarding design-based solutions to promote challenging misinformation.	25 min
4	Prototyping	Participants are asked to sketch their generated ideas on Miro.	30 min
5	Refining	Participants are asked to evaluate the generated prototypes. This section is for a cognitive walkthrough of the prototypes for the future scenarios.	15 min
6	Evaluation	Participants are sent a survey to get an initial validation of the responses.	10 min

Table 3: Coding scheme used for organising the qualitative data.

UTAUT constructs	Definition	Adapted definition relevant to our user Interface
Performance expectancy	The extent to which using a technology is believed to provide advantages when doing specific tasks [36].	The degree to which a person believes that using a particular feature or design element helps them effectively challenge misinformation.
Effort expectancy	The perceived ease of use of technology [36].	The degree of ease associated with the use of a particular feature or design element for the purposes of challenging misinformation.
Social influence	The extent to which individuals believe that significant others think they should use a certain technology [36].	The degree to which an individual perceives direct or indirect social influence regarding their usage of a particular feature or design element to challenge misinformation.
Facilitating and impeding conditions	Individuals' perceptions of the technical and organisational assistance and support available to complete a behaviour [36].	The degree to which an individual believes that there is enough technical support and resources to encourage the use of the social and particular features or design elements to challenge misinformation.

asking participants to evaluate them in terms of perceived ease of use and perceived usefulness using items based on the technology acceptance model (TAM) [76]. The aim of this survey was to get an initial respondent validation to assess the accuracy of the data collected [77].

For a summarised overview of the codesign sessions, please refer to Table 2.

3.5. Data Analysis. Thematic analysis was used to investigate the patterns within the collected data. NVIVO 12 software was used for the analysis. We inductively analysed respondents' responses to identify recurring themes and patterns that emerged across the focus groups [78].

The total duration of the video-recorded interviews was approximately 6 h. The interviews were transcribed and coded following Braun and Clarke's [79] six-step framework, data familiarization, coding, theme identification, review, and definition, concluding with report generation. Given the absence of pre-existing research or theories related to the topic and the necessity of objective reflection of the data, the thematic analysis was carried out using a semantic approach [80]. The authors initiated the open-coding process where initial codes emerged. We identified 64 codes from all the interviews regarding participants' attitudes, reasons for not challenging misinformation, and their ideas and prototypes regarding the solutions (Appendix A for the prototype examples). Initially, the primary author reviewed and analysed the data from the first session. Subsequently, all coauthors engaged in thorough discussions to establish a shared and comprehensive understanding of the data. An initial codebook was created with the collective endeavour. The first author then proceeded to conduct a detailed thematic analysis where the codes were clustered into themes and linked to the constructs in the theoretical framework in accordance with this codebook. This analysis was audited by the coauthors to ensure the robustness of the coding,

Themes were analysed based on the coding scheme in Table 3, following a similar approach employed by Bixter et al. [81]. The coding scheme comprised four constructs from the UTAUT model [36] that influence the adaptation and use of technology: performance expectancy, effort expectancy, social influence, and facilitating conditions (see Appendix B for the quotes from the participants regarding the design recommendations).

4. Findings

We explored two main areas: the reasons behind users' reluctance to challenge misinformation on social media and potential interface design strategies to encourage users

to challenge misinformation. These findings provide information on both the barriers to combat misinformation and the potential technological interventions that could foster a more critical and engaged online community.

4.1. Barriers to Challenging Misinformation. During the exploration phase, we discussed participants' experiences when they encounter misinformation on social media and the challenges they faced. While prior research investigated the barriers to challenging misinformation [82], it is important to gain a better understanding of users' real-world experiences, opinions, and motivations as these barriers are rooted in users' interactions with others. These conversations provided an opportunity to explore personal barriers with contextual insights and explore solutions that could address these barriers.

We categorised the barriers into seven themes: social and relational considerations, content and platform characteristics, lack of self-confidence in personal knowledge and understanding, fear of negative reactions, cost-benefit assessment, concerns for emotional and social impacts on others, and perceiving manipulative intent. Table 4 summarises an overview of the recurring themes, corresponding codes, and relevant quotations associated with each code. For a more detailed explanation of these barriers, please refer to Appendix C.

4.2. Requirements and Design Considerations. Requirements and design considerations are explored using UTAUT [36] as it provides a structured and well-established framework to analyse and interpret interview data. UTAUT has four predictors of intention to use and technology use: performance expectation, social influence, facilitating environment, and technology support. Using these constructs, we identified four design considerations around encouraging users to challenge misinformation on social media: creating secure and supportive environments, facilitating informed discussions through easy confrontation and access to reliable resources, leveraging recognition of social proof, and user support infrastructure. Within these considerations, we proposed several components, design elements, and features including indirection, semianonymity and privacy, simplicity, one-click challenging, easy access to reliable sources, recognition, displaying social proof, and platform support (see Figure 7).

4.3. Performance Expectancy: Creating Secure and Supportive Environments. Performance expectancy refers to the extent to which an individual believes that using a system will lead to improvements in their job performance [36]. This construct encompasses users' beliefs about the system's usefulness, its potential to accomplish tasks more quickly, its role in enhancing productivity, and its contribution to the successful completion of a task.

There are three key design concepts that relate to performance expectancy, indirection, anonymity/privacy, and simplicity. Participants emphasised that, in order to feel more encouraged to challenge misinformation, it is important for them to be provided with tools that enable indirect, private, anonymous interactions in a simple way.

In our research, a "secure" environment refers to minimising individuals' concerns about damaging their relationships and reputations, as well as avoiding attacks while confronting, allowing users to feel safe. The strategies proposed related to this construct can be turned into tools and features that motivate individuals to challenge while maintaining their sense of safety.

4.3.1. Indirection. We framed certain strategies as "indirection," specifically those that participants prefer to use as subtle methods. Participants believe that confronting others indirectly is more convenient and less confrontational than direct confrontation. They choose to use indirect communication when challenging misinformation to maintain social harmony, avoid confrontation, or reduce the risk of backlash. Therefore, the solutions they provided were aimed at expressing their disagreements indirectly while maintaining a certain level of social harmony without the perceived risks of direct confrontations. Indirection gave the participants a sense of safety and therefore increased the performance expectancy which is their likelihood to challenge misinformation.

Participants provided ideas that allow challenging misinformation in a subtle way, such as using tools like buttons, emojis (Figure 8), or stickers (Figure 9). According to the participants, these tools do not directly confront the person but still convey disagreement or challenges. They also mentioned that they would feel more comfortable if there were a separate area on the interface for them to challenge the article itself, rather than the person, as they were concerned that people might take it personally. This indirect approach shifts the focus away from personal confrontation. Instead of addressing the person who shared the article, the disagreement is directed at the content itself.

4.3.2. Semianonymity and Privacy. Anonymity in computer-mediated communication is often regarded as a contributing factor to the online disinhibition effect, in which people exhibit more intensely and less restrained behaviours online compared to their in-person interactions [83–85]. While anonymity is sometimes viewed negatively due to its potential to encourage such behaviours, our findings suggest that it increases participants' likelihood of challenge misinformation. Anonymity increases participants' likelihood of challenging misinformation. The desire to protect one's image is a primary motivation for advocating anonymity as a solution.

Participants were already aware of the potential negative outcomes associated with anonymity. As expressed by Participant 17, "it then gives people license to see very unkind things." Therefore, they proposed ideas that neither entirely eliminate the anonymity, nor fully incorporate. Instead, they integrate anonymity to a certain degree which we refer to as "semianonymity" (Figure 10). Semianonymity, as described by the participants, refers to the situation in which the poster can see who challenges the post, but this information is not visible to other users. Thereby, users can shield themselves

Table 4: Recurring themes regarding the barriers to challenging misinformation.

Theme	Code	Example quote
Fear of negative reactions	Fear of attention/attack	When someone shares something, they often do so among like-minded people. It becomes an echo chamber. So if you challenge it, it becomes less of a discussion between you and the poster. You become the target which is unpleasant, and it can be quite vicious. (Participant 3)
	Unknown repercussions	I think you could always give yourself the more benefit of doubt when you are putting yourself in that position, whereas you do not necessarily always know how other people are going to react to negative comments. (Participant 4)
	Fear of embarrassment	If I challenge and say, "you are wrong" and then everybody comes back and says "no you are wrong", I'd be very embarrassed, socially embarrassed and I think it is socially awkward. (Participant 6)
	Conflict avoidance	So if I see misinformation now, I do tend to scroll past it because I do not. I do not like to get into the post wars, you know, cause you all people are different, and they like to have an opinion, do not they? (Participant 12)
Assessment of costs and benefits	Effort-outcome evaluation	I think, it (challenging misinformation) is like picking your battles. Do you really care about that? (Participant 2)
	Perceived futility	I've certainly experienced that…I read something, challenged it, and the content was still there like days later. (Participant 9)
	Time-effort consideration	If you decide to get involved, it might take a lot of time, and that might put you off. It's time-consuming. (Participant 8)
Concern for others	Concern for embarrassing others	And also you would not want to embarrass that person, because if it's, if it's a colleague, and you know it might be someone you have got to go to work with the next day and then you call them out on a bit of mis misinformation. (Participant 12)
	Concern for upsetting others	And I think the other thing is that there is a danger that you could upset people. If they are quite convinced that they are correct, you could quite easily upset people (Participant 8)
	Concern for offending others	And you know they might offend the person, or make the person look stupid. (Participant 10)
Lack of information and understanding	Confidence in having information	Also, if it's not, if it's not a subject someone's particularly familiar with, that they might think it's supposed to not be confident enough to say it's not correct. (Participant 16)
	Fact-opinion confusion	That's always bothered me as well, is how the lines of blurred between different between what's opinion and what's quantifiable fact which. And sometimes opinion is presented as fact when it was just an opinion, an interpretation of fact; and I think that if there was something that could be flagged up in something that say, this is an opinion, perhaps it would take some of the heat out of some of the debates as well, rather than you know.(Participant 3)
Social and relational considerations	Self- presentation concerns	My problem would be like kind of not wanting to come across as confrontational or not one thing to come across as like a know it all kind of. (Participant 5)
	Relational dynamics	I think if it's someone you do not know, you are more likely to be willing to discuss something. But I think where it's an acquaintance. If you get into a confrontation, or you have any negative interaction with that person, it can then steep into the job. (Participant 1)
	Privacy preference	Maybe I'd be more inclined to have that conversation with someone. I could have it privately. (Participant 4)
Platform and Content Characteristics	Content importance	As I say it would depend on the content of the post… Well, maybe is it worth getting into an argument about it? (Participant 15)
	Content relevancy	The thing with any of these posts, is it relevant to you? Is it relevant to your life? And it's the same with anything in life. (Participant 15)
	Sensitive topic	So the person who challenged it or sent a message under extremist topic can also be considered a member of that group. Police can think about it like that, and then you find yourself in a police station. So not to be involved in these kinds of situations is better. (Participant 7)
	Platform influence	Instagram and Facebook, and they were completely different, completely different environments that foster completely different types of discussions on the place that people do tend to be more argumentative. (Participant 1)
	Perceived audience awareness	She just think other people might not be naive enough to get tricked by the whatever news that is. (Participant 18)
Manipulative Intent	Engagement seeking	I think lots of people use it as a tactic for growing social media accounts and getting engagement. (Participant 6)

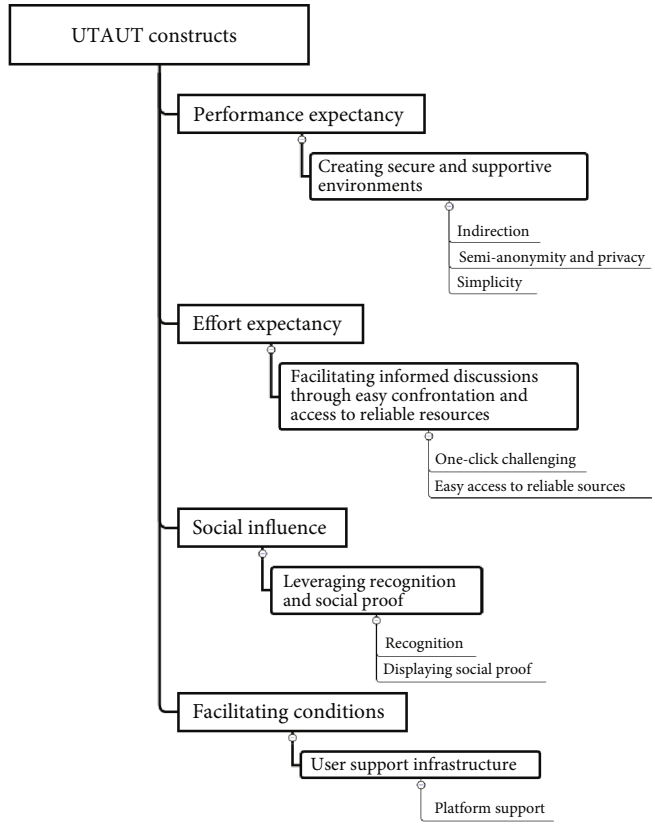

Figure 7: Mapping UTAUT constructs to design concepts.

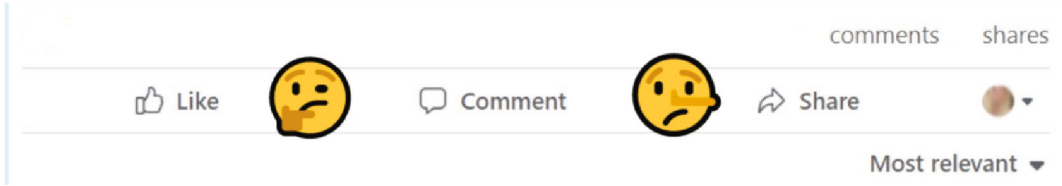

Figure 8: Emoji example.

Figure 9: Sticker example.

Figure 10: Semianonymous and private comment examples.

from negative reactions of others while responding directly to the poster.

While discussing anonymity, participants expressed concerns regarding the public nature of the confrontations. When their identities are known, they prefer to challenge people privately, often through methods like direct messages or direct commenting (Figure 11). Users were hesitant to challenge misinformation due to concerns about preserving their self-image, their intention to avoid causing harm, such as offense or ridicule to others, and their desire to avoid potential conflicts. When users want to engage in controversial discussions, they search for platforms that offer more privacy, and when they are aware that they are being watched, they refrain from participating in such conversations [21].

Previous research showed the power of "observational corrections" in online environments. This phenomenon occurs when users modify their own beliefs and opinions after observing others being corrected for sharing misinformation [9, 10]. Consequently, these corrections affect not only the poster but also other users who observe the interaction. Taking this into consideration, we informed participants during the exploration process about the positive impact of making corrections visible to all users rather than keeping them private. Therefore, when participants proposed solutions, they crafted creative alternatives which are not entirely private and anonymous.

4.3.3. Simplicity. While presenting their prototypes, participants consistently highlighted the importance of a straightforward and uncomplicated design. They mentioned a relationship between simplicity and enhanced usability and performance. They expressed the belief that a simpler design improves user engagement by making features more accessible for a wider audience. This resonates with established research in the field, where simplicity has been recognised as an important factor for improving usability experience [86, 87]. Simplicity is a key factor in UID, as increasing complexity often results in clutter that can make users feel uncomfortable [87]. It has also been argued that simplicity is not only tied to functionality but also carries an aesthetic value, which further increases design quality [88].

4.4. Effort Expectancy: Facilitating Informed Discussions Through Easy Confrontation and Access to Reliable Resources. Effort expectancy refers to the level of ease while using the system. This concept is formed by three constructs from the existing models: perceived ease of use, complexity, and ease of use [36]. If a system is perceived as easy to use, users are more likely to have a positive attitude towards adopting and using that system [89]. Our participants also highlighted the importance of effort. The solutions they recommended regarding effort expectancy included enabling quick and easy challenging (e.g., ready sentences), quick and easy accessibility to credible sources, and simplicity.

4.4.1. One-Click Challenging. When users find an interface effortless to navigate, they are more likely to adopt and use the technology [89, 90]. This becomes especially important

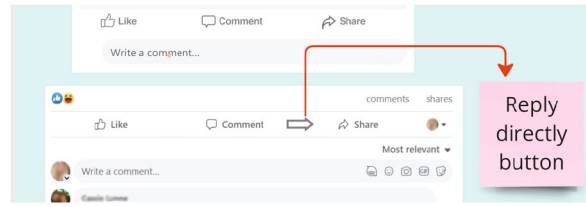

Figure 11: Reply directly button example.

when considering the challenging nature of confronting others. Participants mentioned that in such confrontations, providing simpler methods that require minimal cognitive or physical effort can make it more effective for them to challenge misinformation.

The concept of "ease of use" has been consistently proven to benefit both the functionality and the adaptability of a product or system [76, 89, 90]. However, for our participants, the concept of "ease of use" does not solely refer to functional effectiveness. For them, in addition to its timesaving aspect, ease of use also encompasses their personal experience and comfort level during confrontation. In other words, if a feature allows them to challenge misinformation while maintaining emotional or social distance from the interaction, they consider it "easy to use." In this context, it suggests that a feature's success in being user-friendly is not only tied to its ease of functioning but also to how comfortable users feel during their interaction with it. For example, rather than composing a sentence that might induce stress, a single button to challenge others can be preferred. This is because participants perceive that using a button requires less direct engagement or active participation on their part, which, in turn, helps them avoid potential embarrassment or negative consequences associated with confrontations. Users often refer to these types of features and design elements as easy and quick (Figure 12).

4.4.2. Easy Access to Reliable Sources. One of the most frequently mentioned reasons that participants cited for not challenging misinformation was their lack of self-confidence. They indicated the importance of having enough and accurate information before challenging someone. Even though they were aware of the option to fact-check information on the Internet, in their prototypes, they provided more straightforward and easier solutions to do so.

Participants mentioned that it is important for them to determine the reliability of the source of information. They indicated that when they are provided tools that make them easily verify the information, they tend to be more inclined to actively challenge misinformation. Participant 15 stated, "If you're fighting a battle, you have to make sure you've got the evidence to prove that battle to win it."

When participants provided solutions, their goal was to facilitate easy access to credible information. One solution provided to address this issue is to guide users towards reputable resources by incorporating a clickable button. When clicked, this button would lead users to verified and credible sources of information. This approach will make the process

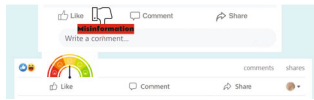

Figure 12: Buttons for challenging examples.

easier for users as it eliminates the need to leave the platform to verify information (Figure 13).

4.5. Social Influence: Leveraging Recognition and Social Proof. Venkatesh et al. [36] formulated the social influence construct based on three root constructs: social perceptions, interpersonal agreements, and the desire for social status on the behaviour. At its core, this construct suggests that social factors, such as peer pressure and social norms, have an impact on people's decision to adopt and use technology.

During our codesign sessions, when participants were asked about potential solutions, they mentioned the significance of social influence. They stated that their intention to challenge misinformation using a feature is influenced by others' perceptions about using that feature. They suggested two solutions related to social influence. The first solution recognises that users are more likely to adopt a feature when they observe others being rewarded or acknowledged for using it. This form of social recognition acts as a powerful motivator by encouraging users to engage with the feature to receive similar rewards. Secondly, participants expressed concerns regarding the number of users using a feature to challenge misinformation. They indicated that their willingness to challenge would increase if they observed many others doing so.

4.5.1. Recognition. Research showed that recognition has a positive influence on user motivation, encouraging increased engagement in activities like tweeting and generating unique tweets [91]. Recognition can serve as a type of social validation that has a positive impact on motivation [92]. Our insights align with these perspectives.

When participants are rewarded with a badge or a rating (Figures 14 and 15) for challenging misinformation, this serves as an incentive, encouraging them to challenge as they perceive their actions as socially acknowledged and valued. Furthermore, they believed that recognition can enhance their image and make them feel that their efforts are worthwhile.

4.5.2. Displaying Social Proof. Participants emphasised the importance of the prevalence of the challenging behaviour. When users observe that a large number of users have already challenged a particular piece of content, it can influence their decision to challenge that information. This collective information, known as "social proof" [93], creates a sense of legitimacy and credibility about the act of challenging misinformation. It motivates users to evaluate the information critically and potentially make the effort to challenge it further. These insights are consistent with findings from prior research suggesting that perceived norms—how much

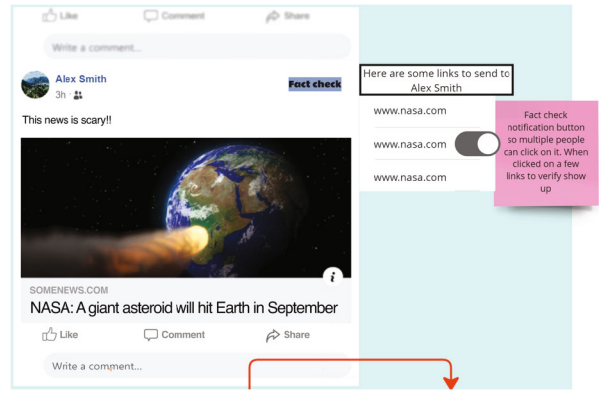

Figure 13: Directing trusted resources example.

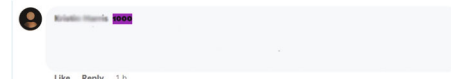

Figure 14: Credibility rating example.

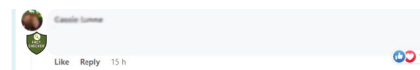

Figure 15: Badge example.

people believe others engage in misinformation correction—are associated with people's intention to correct [94].

Some participants provided a feature called "challenge counter" (Figure 16) which displays the number of users who have confronted the information. This feature made them feel more encouraged to participate in fact checking by fostering a sense of being part of a collective effort. By showing the numbers of confronters, the feature serves as a validation for the behaviour and also provides a clear indication of what is considered appropriate conduct within the platform.

4.6. Facilitating Conditions: User Support Infrastructure. Facilitating conditions refer to an individual's perception of the organisational and technical infrastructure available to support their use of the system [36]. This infrastructure includes various elements of the technological and organisational environment designed to eliminate or minimise barriers to usage, such as technical assistance, guidelines, and training programs.

4.6.1. Platform Support. There is an ongoing debate surrounding Facebook's role in creating filter bubbles and polarisation. On one side, Facebook's executives deny any responsibility for these issues; on the other side, critics argue that Facebook not only benefits from polarisation but also contributes to the spread of misinformation, supports bullies, reflects political biases, and disrupts civil conversations due to its business model that focuses on profit from engagement and virality [95]. All of this raises questions

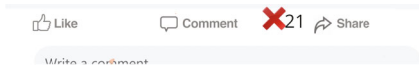

Figure 16: Challenge counterexample.

about whether Facebook is committed to reducing polarisation and combatting misinformation. Given its size, reach, and impact, Facebook is influential and has a responsibility to prioritise its users' safety and privacy and make sure public conversations are honest and respectful.

Participants emphasised the pivotal role played by the platform's support mechanism. One key aspect of empowering users to challenge misinformation is to promote reliable resources. They highlighted the necessity for platforms to support the norm of correcting behaviour. To facilitate this and foster a civil environment, participants proposed some solutions for platforms such as prioritising constructive comments that contribute to discussions and hiding troll comments. When users see that the constructive contributions are valued, this, in turn, can encourage them to engage in meaningful and respectful conversations.

5. Discussion

Research revealed a significant paradox: Although individuals value correcting misinformation and believe it is something that everybody should do [12], they avoid doing so due to different reasons [13, 14, 16]. This avoidance behaviour has multifaceted reasons, suggesting there is no simple, one-size-fits-all solution. During our discussions, by allowing participants to propose their own solutions, we sought to get insights into how UID can influence users' likelihood to challenge misinformation.

Drawing upon user insights, we investigated the desired characteristics of user interfaces that would empower individuals to correct misinformation. Unlike prior research that has primarily focused on individual-level practices, our work emphasises the socially embedded nature of challenging misinformation. This shift in focus allows us to propose more effective design solutions that consider the complex interpersonal dynamics at play on social media platforms.

Prior research suggests that UID can significantly influence user interactions and discussions in online environments [20, 21]. By adopting a user-centred approach, our research informs the design of social media environments that more effectively encourage the correction of misinformation.

One of the key insights that emerged from our research was that participants offered some design suggestions that are already in use on Facebook, such as reporting mechanisms, and the "related articles" feature. This indicated a lack of awareness regarding the existence of these features. This awareness gap between the design solutions that users propose and the reality of what already exists suggests that social media platforms still have the potential for growth in prioritising features aimed at combating the spread of misinformation. Platforms need to focus their efforts on improving user awareness, visibility, and user education around these features.

Through our conversations, we discussed the barriers influencing users' reluctance to challenge misinformation and identified features and design elements needed to overcome these barriers. While the design solutions proposed during our codesign sessions are not final, they served as tools to understand participants' needs, and they facilitate more effective communication. Using design solutions as tools to gain insights is a well-established approach used in codesign studies [41, 73].

We addressed two primary research questions to gain insights for the development of effective solutions to tackle the spread of misinformation. To answer these questions, we used the UTAUT. According to this framework, higher degrees of user acceptance of these constructs correlate with a greater likelihood of adoption and usage of technology. Consequently, we believe these aspects provide a valuable contribution for designers and researchers in future endeavours regarding how users might adopt and use design features to challenge misinformation on social media. We focused on its four constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. These constructs were interpreted as follows: Performance expectancy was related to how users perceive the effectiveness of features that help them challenge misinformation. If users believe that these features will effectively help them address misinformation, they are more likely to use them. Effort expectancy was linked to the ease of using the features designed to challenge misinformation. If the features are easy to use, users are more likely to engage with them. Social influence was associated with the perceived social pressure or encouragement to challenge misinformation. If users feel that their peers or the community support challenging behaviour, they are more likely to participate. Facilitating conditions referred to the technical and organisational infrastructure that supports the use of these features. If users believe that the platform provides adequate support and resources, they are more likely to engage in challenging misinformation.

The first research question (RQ1) focused on identifying the design features and elements that users anticipate as the most effective in motivating them to challenge misinformation. Through our findings, we identified several key features that users' favour and recommended. These include indirect communication tools, semianonymity and privacy, simplicity in design, one-click challenging, easy access to reliable sources, recognition, displaying social proof, and platform support. For the second research question (RQ2), several key requirements for social media platforms were identified based on the features participants recommended and the barriers they mentioned. These requirements are aimed at enhancing users' willingness and confidence in challenging misinformation. These requirements include secure and supportive environments, facilitating informed discussions, leveraging social influence, and user support infrastructure.

Under the category of "performance expectancy," which refers to the belief that using a system will enhance job performance [36], we emphasised the importance of creating a

"secure" environment for users. This is because, in our study, participants who felt safe, secure, and supported while using a feature to correct misinformation were more likely to engage with it. The perception of a secure environment enhances users' confidence in the feature's effectiveness, thereby increasing their likelihood of using it to challenge misinformation.

Creating "secure" environments aligns with the concept of "interpersonal design," which recognises the importance of interactions and relationships, not just individual user experiences [21]. Accordingly, the proposed strategies underline the value of maintaining relationships while challenging misinformation. Participants favoured indirect methods like emojis and designated areas for challenging content, as these allowed them to disagree without risking social backlash, thereby increasing their likelihood of engaging. As research on cyberbullying demonstrated how bullies use features of social media, such as private tools (e.g., direct message) or anonymised accounts, to hide their actions from the public and avoid repercussions [96, 97], participants' suggestions around anonymised accounts and private messaging were not necessarily the intended objectives of this study. However, participants came up with more creative ideas regarding anonymity, and they proposed semianonymity. According to them, this can protect users' identities from public exposure, thereby reducing the fear of conflict while allowing direct engagement with the original poster. Lastly, simplicity in design was emphasised, with participants noting that clear and user-friendly interfaces encourage greater participation. This aligns with prior research showing that simplicity enhances performance, fluency, and understanding [98].

In "effort expectancy," which refers to the ease of using a system and how it can positively influence its adoption and use [36], our findings highlighted the importance of minimising the barriers and difficulties associated with challenging misinformation. Participants highlighted the importance of minimal effort in both confronting misinformation and accessing credible sources. Features like one-click challenging allow users to avoid stress and discomfort, making the process of confrontation more manageable. Additionally, providing quick access to reliable sources boosts users' confidence in challenging misinformation, as they can easily verify facts without leaving the platform. This is particularly important in the context of how these platforms are predominantly used. Research indicates that social media users, especially those seeking entertainment rather than information, are more likely to skip misinformation when they encounter it [99]. This aligns with broader insights about the motivations behind social media usage, which tends to be focused on social interactions and entertainment rather than intellectual debates [100]. Given this user behaviour and mindset, providing seamless, on-platform access to verification resources becomes a critical design consideration. If users can easily validate questionable content without interrupting their social media activities, they may be more inclined to engage with the fact-checking process and challenge it rather than just ignoring or avoiding misinformation.

"Social influence" construct highlights the power of social factors in motivating users to challenge misinformation. It aligns closely with previous research, which has shown the strong impact of social influence on user motivation and engagement [101, 102]. Participants indicated that their willingness to engage with a feature depends significantly on how it is perceived by others. They mentioned the positive impact of recognition and display of social proof on their willingness to challenge, as these factors serve as indicators that show challenging misinformation, which is not only acceptable but also encouraged. Recognition, such as badges or credibility ratings, serves as a key motivator, encouraging users to challenge misinformation by validating their actions and enhancing their social image. Additionally, social proof—observing others challenging misinformation—was found to be a strong influence. Features like a challenge counter create a sense of collective action, reinforcing the legitimacy of the behaviour and motivating users to participate in correcting misinformation. When challenging misinformation is recognised and backed by social proof, people are more likely to perceive this action as aligned with social norms and therefore feel more comfortable and motivated to engage in it themselves.

"Facilitating conditions" refers to how users perceive the organisational and technical infrastructure that supports their use of the system [36]. Participants emphasised the need for platforms, such as Facebook, to play a proactive role by supporting users with reliable resources and fostering a civil environment. They proposed solutions like prioritising constructive comments and hiding troll comments to promote healthier discussions. By offering better support infrastructure, platforms can empower users to engage confidently and effectively in correcting misinformation. Our findings emphasise that platforms have a responsibility to design their systems in a way that enables and empowers users.

The four design considerations that emerged from our study (creating secure and supportive environments, facilitating informed discussions through easy confrontation and access to reliable resources, leveraging recognition and social proof, and user support infrastructure) align with and expand upon prior research in human–computer interaction. For example, our emphasis on creating secure environments resonates with findings that social concerns and conflict avoidance are significant barriers to correcting misinformation [13, 16]. Similarly, the emphasis on perceived ease of use in effort expectancy is consistent with previous research on UID. Studies recognised ease of use as an important design criterion for fostering engagement on various digital platforms, such as social media [103], banking applications [104], and online communities [105]. The findings regarding recognition and social proof also align with the research in persuasive design, where these strategies have been shown to be effective in influencing user behaviour [106]. Finally, our focus on platform-level support echoes the growing body of research highlighting the critical role that social media platforms play in shaping online discourse and information dissemination [1]. Our findings not only draw from existing human–computer

Table 5: Proposed design solutions and designer guidance.

Design proposal	Design concept	Examples	Designer guidance
Indirection	Subtle confrontation	Use of buttons, emojis, and stickers to convey disagreement indirectly and dedicated area for discussion.	Develop features that allow users to subtly express disagreement. Ensure these tools are intuitive and easy to navigate, but without distracting the user from their primary objectives. Incorporate subtle interaction methods that maintain social harmony and reduce the risk of backlash. Provide a separate interface space for users to challenge the content itself, rather than directly confronting the person who posted it.
Semianonymity and privacy	Semianonymous interactions	Semianonymous comments and private messages	Implementing mechanisms to protect users from harassment or negative reactions while still allowing direct response to the poster, such as features that allow user identity visibility in a limited way, for example, only to the person who posted. Integrate direct messaging options for private corrections.
Simplicity	Simple and intuitive design	Uncluttered UI and straightforward navigation	Prioritise simplicity in design, making it easy for users to navigate and understand the interface. Use clear and concise language for all interface elements. Avoid unnecessary clutter and complexity.
One-Click challenging	Effortless interaction	Buttons for quick corrections	Implement intuitive and easy one-click options to challenge misinformation with minimal effort to reduce cognitive load and increase usability.
Easy access to reliable sources	Quick verification tools	Buttons leading to credible sources	Integrate features that direct users to verified sources of information. Ensure these features allow users to easily verify information without leaving the platform. Provide tools that simplify the fact-checking process, enhancing user confidence in challenging misinformation.
Recognition	Social validation mechanisms	Credibility ratings, badges	Implement recognition systems that reward users for challenging misinformation. Consider public displays of recognition to encourage others to participate.
Displaying social proof	Display of collective action	Counters for the corrections	Display counters showing the number of users who have challenged the content. Ensure these counters are visible and easily understood. Use visual cues to highlight posts that have been challenged by multiple users. Leverage social proof to create a sense of legitimacy and encourage collective behaviour.
Platform support	Encouragement of constructive engagement	Prioritising constructive comments, hiding troll comments	Platforms should actively support correcting behaviour by promoting constructive discussions and minimising disruptive content. Highlight positive contributions and provide clear guidelines for respectful interactions.

interaction research but also contribute new insights to the field.

6. Theoretical and Practical Implications

This study contributes to the theoretical understanding of how UID can influence interpersonal dynamics on social media, particularly in the context of challenging misinformation. It extends the application of the UTAUT framework [36] to the context of misinformation correction on social media. By examining how the core UTAUT determinants (performance expectancy, effort expectancy, social influence, and facilitating conditions) influence the adoption and use of tools proposed to encourage users and help overcome barriers, we provide a deeper and structured understanding of technology acceptance in the context of misinformation correction. Our research contributes to the emerging field of interpersonal design [21], emphasising the importance of designing environments that prioritise healthy engagement and interpersonal relationships. By focusing on user interactions and social dynamics, we highlight the importance of designing environments that consider not only individual

actions but also socially embedded practices. This perspective shifts the focus from individual user goals to the broader social context, offering a new dimension. Our study suggests that UID's impact on user behaviour extends beyond individual cognitive processes to include social and relational dimensions. This perspective aligns with the broader discussions on social media's role in shaping user interactions and behaviours, as evidenced by studies on structured interfaces and gamification elements fostering civility and accountability [22, 23].

Our findings offer several actionable insights for social media platform designers aiming to reduce the spread of misinformation. By prioritising these design considerations, platforms can create environments that encourage challenging misinformation without fear of conflict and reduce the spread of misinformation. Features such as semianonymous posting, easy access to credible sources, recognition systems, and robust platform support can enhance users' willingness and confidence to engage in corrective behaviours. For platforms like Facebook, our study provides evidence-based guidelines to address users' concerns and facilitate the process of challenging misinformation. Our study provides actionable insights for social media platforms and designers. The design proposals and designer guidance are summarised in Table 5.

These findings from the study are not limited to misinformation but can also be extended to situations where individuals are hesitant to speak up about issues like racism, sexism, or harassment in an online context [107–109].

7. Limitations and Future Work

This study has limitations that must be acknowledged when considering our results' implications for research and practice. The first part of the focus groups may have introduced biases such as social desirability where participants may have had the tendency to respond in a way that is socially acceptable to others, potentially impacting the authenticity of responses [51]. To overcome such bias, the moderator asked respondents indirect questions [52] about hypothetical scenarios. This involved creating fictional personas and asking participants to imagine and speculate on what those characters would do in the given situation, rather than directly asking about their own actions. The majority of the participants are from the UK which primarily represents individualistic cultures [110]. Therefore, the findings of this study would benefit data from more collectivistic cultures that typically handle conflicts through avoidance [111]. The representation of diversity is important in qualitative research. However, achieving adequate representation can be challenging due to the small sample sizes typical of qualitative studies. To address this limitation, the better approach is to conduct additional qualitative studies, rather than mandating that each individual study's sample must reflect the full diversity of the population [112]. Future research should aim at replicating this study in various contexts to enhance diversity and broaden the representation. By having a proliferation of qualitative studies across different contexts and populations, the findings of qualitative research can capture diverse perspectives and experiences. Furthermore, future research could explore the influence of personality traits on technology adoption, as individual characteristics play a significant role in users' willingness to adopt new technologies [113, 114].

The scope of our designs centred around motivating participants to challenge misinformation. However, designs focused on other aspects, such as structured dialogue, might provide different outcomes. Although participants provided their designs before they were exposed to our design probes, the designs presented them to stimulate their idea generation might influence their subsequent design concepts. Given that these design ideas are in a preliminary, draft form, future work should focus on professionally developing them and testing their impact on users' willingness to challenge.

The application of design solutions may differ across platforms due to their unique interfaces and user demographics and individual usage patterns. However, the human-centric insights stemming from this research can guide future design considerations universally. For example, the insights gained into users' motivations for engaging with or refraining from challenging misinformation, such as their tendency to avoid conflict, their desire to preserve their online image, and their preference for a degree of anonymity when engaging in discussions, could be applied more broadly. While design elements like buttons, colours, and layout may need to be tailored to suit platform-specific aesthetics and functionalities, the underlying principles derived from an understanding of users' motivations and behaviours remain broadly applicable. Future work should explore how these insights can be translated and adapted across diverse social media and content-sharing platforms to develop more effective interventions for addressing the challenge of misinformation.

8. Conclusion

In conclusion, our study offers novel insights into the role of UID in promoting and correcting misinformation on social media. By linking our findings to existing literature, elaborating on the implications, and outlining the theoretical and practical contributions, the research provides valuable guidance for future design interventions aimed at combating misinformation. The key findings highlight the importance of adopting UCD principles and focusing on the relational aspects of user interactions to encourage more active engagement in correcting misinformation. Platforms have a responsibility to architect their systems in a way that enables and empowers users to challenge misinformation, ultimately fostering a healthier and more informed online environment. Our research contributes actionable insights for social media platforms and designers, offering evidence-based guidelines to address users' concerns and facilitate the process of challenging misinformation. While design elements may need to be tailored to specific platforms, the underlying human-centric principles derived from this study can guide future interventions across diverse online spaces.

Appendix A: Prototype Examples

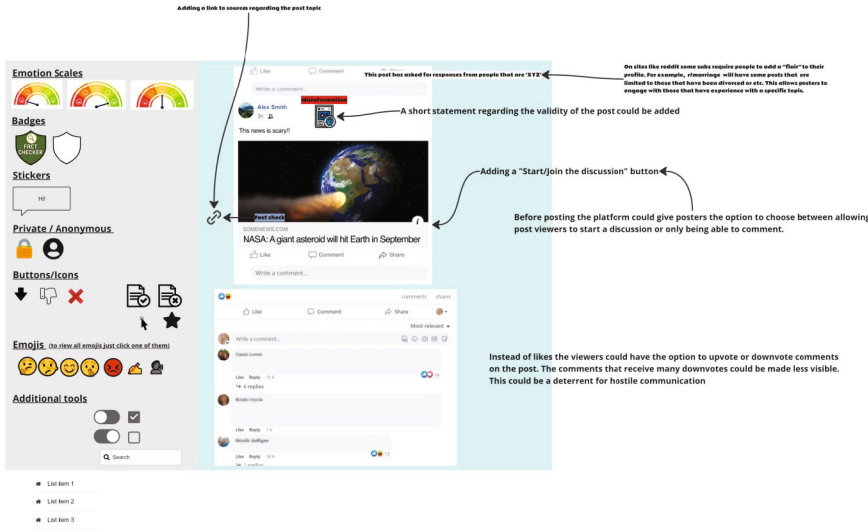

FIGURE A1: Prototype Example 1.

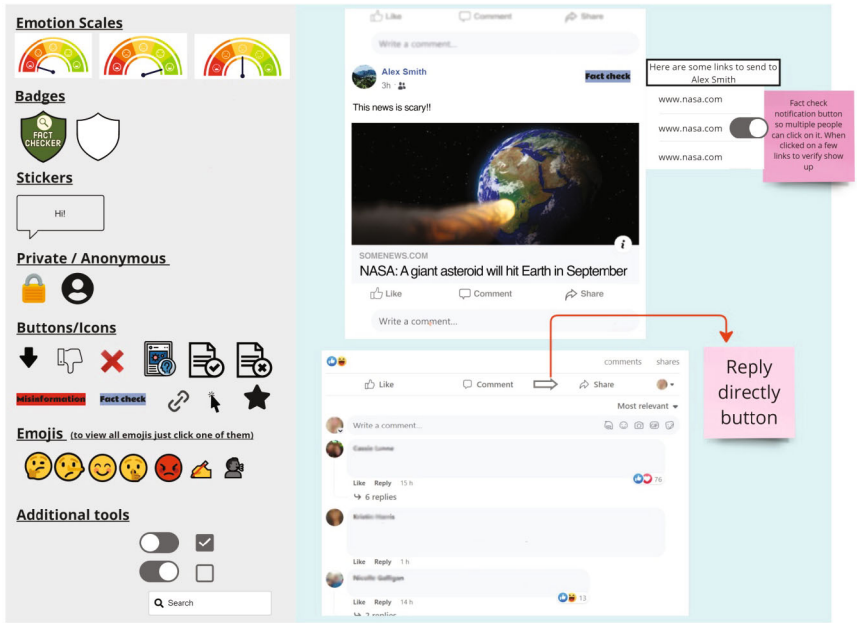

FIGURE A2: Prototype Example 2.

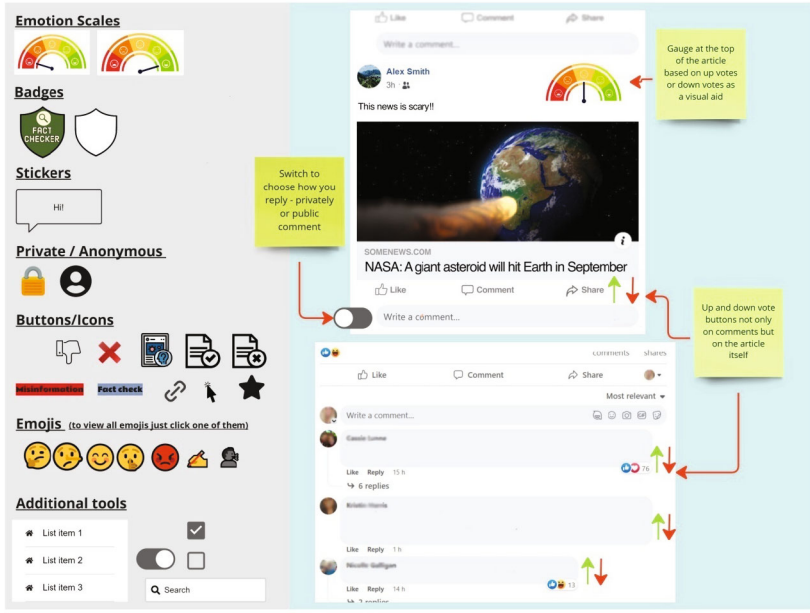

Figure A3: Prototype Example 3.

Appendix B

Table A1: Quotes About the Design Recommendations.

Construct	Design recommendations	Example quote
Performance expectancy: creating secure and supportive environments	Indirection	"The person who posted could click on this graph and see that someone fact-checked it for them, and then it would give them the opportunity not to be embarrassed. They could update their post. They could say, "Sorry folks, I got that one wrong, thanks to this." I mean we British people are very, very, very much like that. We do not like confrontation. I think "sorry" is the most used word in a language. We even use it when we mean "thank you". We do not like confrontation." (Participant 12)
		"I think it's less offensive than commenting on the post and saying, "Oh, I think this is false. I think you should fact-check yourself". I think I would possibly feel more comfortable just clicking on the emoji to show that I'm a bit like I'm speculating whether or not this is true or not. So, I think that's quite a fun or like a less brutal way of like telling someone "I do not think this is true". So that's why I used that emoji." (Participant 11)
	Semianonymity	"You can have an anonymous comment, but your identity would only be seen by the person who posted. Other people can only see the comment. So, I think that way you are more likely to speak up because sometimes you might want to say something, but you are like "Do I really want 500 people seeing me commenting on this?". I do not want to be that guy. Maybe, having that option of some anonymity… It's important to have not full anonymity, because then you can be a troll." (Participant 5)

Table A1: Continued.

Construct	Design recommendations	Example quote
	Privacy	"My problem would be not wanting to come across as confrontational or to come across as like a smartass or anything like that. So, I thought maybe you can have the ability to write a private comment. So you can write a comment rather than having to message someone privately which might feel a bit more like effort and confrontational. You can just write a comment that only they can see." (Participant 5)
		"… You would not want to embarrass that person, especially, if it's a colleague. It might be someone you have got to go to work with the next day and then you call them out on a bit of mis misinformation. I would do it with a private message and say "Perhaps you better fact-check." (Participant 12)
		"Then, I put like a little switch on the side where you write your comments. (With this switch) you can choose how you reply, whether you write a private comment that only the user can see or a public comment that everybody can see. If you only want to reply to that person, you can without worrying other people jumping in or anything like that. But if you are that brave person, you are happy to say your comment out loud, then." (Participant 2)
	Simplicity	"I thought, the simpler you keep it the easier it is for people to use." (Participant 2)
		"I thought to keep it fairly simple. I think if you have too many things, it might be a little bit complicated and put people off." (Participant 8)
Effort expectancy: facilitating in formed discussions through easy confrontation and access to reliable resources	One-click challenging	".. This will make it easy. You can just click on that button, so it will be timesaving. So, it minimizes the reluctance." (Participant 7)
		"It would be really quick, and it would mitigate you having to get involved too deeply. Just voting really, it'd be something like a quick solution." (Participant 8)
	Easy access to reliable sources	"I included a button probably somewhere like next to the share button. When you click on it, it will give you suggestions of other sources. So, then instead of having to Google something, you can see right here on the post. So I think more people will be likely to do it if they do not have to go to a different window and do it outside of the social media. So, if you can do within the social media a lot more people will do it." (Participant 5)
		"This button will tell you that it's from a reputable source. You know whatever mechanism that is behind that. If you have got a simple button that you can just press, that says "Yes, this is from a reputable source", it's just something you can believe, and then you can interact with it. (Participant 9)"
Social influence: leveraging recognition and social proof	Recognition	"Yeah, we also talked about this with Participant 8, so there should be a rewarding system. This system can encourage people to challenge. Because some people can be reluctant, and may ask, "Why do I need to get involved in this?" So, in order to get some reward, you need to challenge." (Participant 7)
		"I quite like the idea of having a badge for people who challenge, whether or not it is true…It's quite nice to give people almost like incentive to challenge post that are probably fake." (Participant 11)
		"People would be more likely to challenge this if other people have the same opinions of them." (Participant 2)
	Displaying social proof	"I think it would be like a "like" button, and the more people that would challenge the information, the count goes up. So, you might have 1,000 challenges to the post, and that would maybe indicate to the next viewer that perhaps the information is incorrect. Therefore, the more of them that you have, the more likely, maybe, that the information is incorrect and challenged by others." (Participant 8)

Table A1: Continued.

Construct	Design recommendations	Example quote
Facilitating conditions: user support infrastructure	Platform support	"I think just simply, like, Facebook should promote reliable sources, so they should prioritize content with verified sources, from organizations, verified academic institutions, subject matter experts, and people like that." (Participant 6)
		"Instead of "likes", the viewers could have the option to upvote or downvote comments on the post. The comments that receive many downvotes could be made less visible. This could be a deterrent for hostile communication." (Participant 2)

Appendix C: Barriers to Challenging Misinformation

During the exploration phase, we discussed with participants their experiences when they encounter misinformation on social media and the challenges they have. Prior research investigated the barriers [82]; however, since these barriers are rooted in users' real experiences and interactions with others, it is important to gain a better understanding about their experiences, opinions, and motivations. These interviews provided an opportunity to explore their personal reasons with contextual insights. Engaging in conversations regarding the barriers was crucial as our aim was to explore solutions that could address these barriers.

Social and Relational Considerations. Among the identified reasons, social and relational considerations emerged as one of the prominent factors influencing participants' decision-making process. Participants expressed concerns about challenging misinformation due to potential effects on their relationships within their social circles. They stated that, when they say that the information is false, this disagreement could ruin their relationships with the people in their social network. This concern stemmed from a desire to maintain harmonious relationships and avoid potential social repercussions. They were cautious about how they would be perceived when engaging in such conversations, particularly to avoid being seen as "know-it-all." As a result, participants mentioned a preference for private communication when addressing misinformation, as it allowed them to navigate these situations while maintaining their social relationships.

Content and Platform Characteristics. The second prominent factor influencing participants' tendency to challenge misinformation is the content and platform characteristics. Participants shared their opinions regarding the topic, taking into account its relevance, importance, and sensitivity. They indicated that when a topic held personal relevance or importance to them, they were more likely to say something. However, participants also expressed concerns regarding sensitive topics. They mentioned that certain subjects might be uncomfortable to discuss or engaging with them could potentially lead to adverse consequences (e.g., unwanted attention from authorities). In addition to the topic, the perception of the platform and audience also play an important role in their decision to challenge misinformation. They believe that each social media platform has its unique dynamics. Some platforms are more conducive to fostering discussions. In such platforms, they preferred not to be a part of the discussion.

Self-Confidence in Personal Knowledge and Understanding. One of the most frequently mentioned factors that make people hesitant to counteract misinformation is their lack of self-confidence in their knowledge about the topic before speaking up. Participants believed that challenging misinformation necessitates a solid information about the content, and they expressed a reluctance to engage in discussions where they lacked confidence in their knowledge. This self-efficacy requirement highlights the importance of being well-informed and feeling adequately prepared to counteract misinformation effectively. Participants also highlighted the importance of differentiating between factual information and opinions. They expressed that when the content is labelled as either a fact or an opinion, it becomes easier for them to engage in discussions.

Fear of Negative Reactions. Participants expressed their concerns of the potential consequences they might face after challenging misinformation. One major concern was the risk of becoming the target of attacks when challenging misinformation. Another aspect that people were afraid of was the uncertainty surrounding how others would react when they are corrected. The fear of embarrassment was also prevalent, as participants were worried about the social consequences of being proven wrong after challenging misinformation. Additionally, conflict avoidance was another reason, as participants acknowledged their tendency to skip past misinformation to avoid engaging in "postwars" and conflict with others who hold different opinions.

Cost-Benefit Assessment. The theme of cost-benefit assessment refers to participants' evaluation of the potential advantages and disadvantages of challenging misinformation. Participants highlighted the importance of considering whether it was worth the effort to challenge misinformation. One participant shared their experience noting that they saw no impact of challenging misinformation. Participants also mentioned that challenging misinformation is a time-consuming act, particularly engaging in discussions, which could potentially discourage their active involvement.

Concerns for Emotional and Social Impacts on Others. Participants expressed their concerns about how challenging misinformation may affect the people involved. One participant mentioned that they hesitate to point out misinformation, particularly when it involves people they interact with in professional settings due to the fear of causing embarrassment. They believe that challenging misinformation could upset individuals who have strong beliefs. They also mentioned about the risk of offending others or making them feel "stupid" when confronting misinformation.

Perceiving Manipulative Intent. This theme refers to the participants' recognition of the presence of manipulative motives behind misinformation. Participants expressed that sometimes people utilise misinformation as a tactic to boost their social media accounts and generate engagement. As participants were aware of the manipulative motives behind misinformation, they were hesitant to participate in discussions or engage with people who used such tactics.

Data Availability Statement

The data that support the findings of this study are openly available in OSF at https://osf.io/7n5um/.

Disclosure

The findings herein reflect the work and are solely the responsibility of the authors.

Conflicts of Interest

The authors declare no conflicts of interest.

Funding

This work has been supported by the OpenBright Foundation through an OpenBright Award and NPRP 14C-0916-210015 from the Qatar National Research Fund (a member of Qatar Foundation). Open Access funding is provided by the Qatar National Library.

Acknowledgments

This work has been supported by the OpenBright Foundation through an OpenBright Award and NPRP 14C-0916-210015 from the Qatar National Research Fund (a member of Qatar Foundation). Open Access funding is provided by the Qatar National Library.

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