

Explainable Persuasion in Interactive Design

Deniz Cemiloglu
Faculty of Science and Technology
Bournemouth University
Bournemouth, UK
dcemiloglu@bournemouth.ac.uk

Maris Catania
Kindred Group
Sliema, Malta
maris.bonello@kindredgroup.com

Raian Ali
College of Science and Engineering
Hamad Bin Khalifa University
Doha, Qatar
raali2@hbku.edu.qa

Abstract—Persuasive technology refers to the use of digital means to influence attitude, behaviour, and decisions. While a professional design of persuasive interfaces shall consider user interests and freedom of choice as a primary requirement, principles, and methods to achieve it are yet to be introduced. In the design of persuasive interfaces, fulfilling conditions of informed consent can help establish transparency and resolve such ethical issues. This paper introduces the concept of explainable persuasion as a way to address informed consent within persuasive interfaces. We provide a definition for explainable persuasion, highlight the need for it, discuss the design approach and underline the challenges to be addressed when designing explainable persuasive interfaces.

Keywords—explainability, persuasive systems, ethical design, informed consent

I. INTRODUCTION

Persuasive interfaces, whether designed for self-directed behaviour change or for enhancing user involvement in systems, are generally aligned with user interest. However, because such interfaces persuade users by influencing and shaping their behaviour, ethical concerns may arise [1]. This can be the case, especially in instances where persuasion is not self-directed but instead designed to influence the users [2]. Examples of such practice could be seen within interactive online platforms that aim to maximise user engagement through persuasive techniques, such as rewards or social influence. In this context, some ethical concerns need to be addressed. While engaging with persuasive interfaces, the user may be unaware of being influenced, and this can hinder their ability to evaluate the persuasion attempt and to reflect on their behaviour [3]. Moreover, persuasive interfaces designed to maximise user engagement may in some cases trigger or reinforce usage that is addictive in the sense of being obsessive, hasty, and associated with harm. Some elements can trigger irresistible urge and increase perceived urgency and pressure [4-6]. For example, the use of rewards on digital platforms may encourage people to place more importance on the positive experience felt at the moment and make it hard to reflect on negative consequences that they may face in the future regarding excessive use [7].

While different approaches were taken to discuss the role of ethics in persuasive technology, transparency and user voluntariness were suggested to be important factors in building ethical persuasive interfaces [3, 8-10]. This view resonates with the informed consent theory proposed in bioethics literature [11]. The authors in [11] define informed consent as an ethical requirement in which the subject needs to understand the nature of the intervention and the possible outcomes linked with it before accepting to receive the intervention. Similarly, ethical persuasive interfaces can fulfil conditions for informed consent by informing users about the persuasion intentions of the system and persuasion techniques used so they can consent to being subject to it. This approach is in line with the concept of “libertarian paternalism” which postulates that designers may influence how the users interact with the system, but freedom of choice belongs to the user [12]. To date, the concept of transparent persuasive technology mostly remained as philosophical discussions within academia [3, 8-10]. They have not dealt with how to design ethical persuasive interfaces, e.g., in terms of graphical and informational content, delivery methods, personalisation, and timing.

In designing ethical persuasive systems, explainable persuasion can be a solution to address informed consent within persuasive interfaces. Explainable persuasion can be a way to address issues related to system transparency, ethics, and user-control, particularly within persuasive interfaces where emotions can bias decision making such as in the case of gambling platforms [13]. The existing body of research on guidelines for the design, implementation, and evaluation of explainable systems [14-18] and information systems transparency [19] could provide a foundation for designing explainable persuasive interfaces. In this position paper, we discuss the concept of explainable persuasion when building persuasive interfaces. We first give an overview of persuasive design in Section 2. In Section 3, we introduce and define explainable persuasion, highlight the need for it, discuss the design approach and underline the challenges related to designing explainable persuasion. We conclude the paper and present possible future work directions in Section 4.

II. PERSUASIVE DESIGN

To introduce the concept of explainable persuasion, it is important first to review the core factors relating to persuasive system design. This will provide a basis to discuss how these factors may impact the design of explainable persuasion.

Within the digital environment, persuasive systems are defined as “computerised software or information systems designed to reinforce, change or shape attitudes or behaviours or both without using coercion or deception” [20]. The design itself is suggested to be a persuasive act by definition as the way the designer structures the digital realm defines how the user will interact with it [21]. Accordingly, persuasion by design could be accomplished through elements that make up the system, such as the visual and aesthetic cues and /or persuasive strategies and technologies adopted in the system [22].

A. Persuasion Techniques

With their persuasive system design (PSD) model, Oinas-Kukkonen and Harjuma [20] define four groups of design principles that can help build persuasive systems at an operational level; (i) primary task support, (ii) dialogue support, (iii) social support, and (iv) system credibility. For example, within dialogue support, the use of rewards in the form of likes, mentions, or earned points within interactive platforms may maximise user engagement by further reinforcing the target behaviour. Cialdini’s principles of persuasion, consisting of reciprocity, scarcity, commitment, and consistency [23], is another reference model for designing persuasive techniques in interactive platforms.

B. System-User Interaction

Interactive design plays a significant role when building persuasive systems because persuasion requires effective communication between the system and the user. It is suggested that the usability of the interactive system is a defining factor determining the quality of the communication between the user and system [24]. While definitions of usability vary [25], in ISO 9241-11, it refers to “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.” Accordingly, it is important to design persuasive interfaces to be useful, easy to use, and attractive to foster a positive user experience. In other words, a system that is not usable would not provide a viable medium for persuasion. From a broader perspective, the relationship between usability and persuasion can be intertwined. For persuasion to occur, it is essential to create grounds for an effective user experience. At the same time, effective user experience can be supported by persuasion techniques such as attractiveness, personalisation, and reciprocity.

III. EXPLAINABLE PERSUASION

In this section, we define explainable persuasion, argue why it is necessary, discuss the design approach and highlight the challenges that could be faced when designing explainable persuasive interfaces.

Within explainable AI literature, explainability refers to helping users understand why and how an intelligent system has behaved in a certain way or made a recommendation [26].

Studies on human-agent systems show that providing explanations on algorithmic decisions or outputs or on their properties, e.g., confidence level, sample size, and training period, helps users better understand the workings of the system and this, in turn, facilitates informed user decisions [15, 27]. Also, explaining persuasion may have similarities to Explainable Artificial Intelligence (XAI) as Artificial Intelligence (AI) shares similarities with persuasion, e.g., in personalising recommendations and tailoring steps for users based on data reflecting their personal, physical, or social context [28]. However, persuasive interfaces base on other elements that are not primarily based on AI but rather on other disciplines, including linguistics, games, and interaction design. For example, utilising the concept of tunnelling (i.e., guiding the user through a predetermined course of action in a step by step format) and exploiting humans’ tendency to complete tasks may lead to loss of control in online spaces and entering to the flow state (i.e., causing full immersion with the activity) [29]. Thus, explainable persuasion would also need to include information about interactive design. Accordingly, in this section we introduce the concept of explainable persuasion with reference to XAI, transparency of information system, and interactive design.

A. What is Explainable Persuasion?

We define the concept of *explainable persuasion* as

the system’s transparency about its persuasion attempts so that users can choose to be conscious of how the design may alter their attention or behaviour towards certain content or actions and can consent to be subject to it.

The goal of explainable persuasion is to disclose information about the use of persuasive design techniques to help establish necessary conditions for informed consent when users interact with persuasive interfaces. From a business and usability perspective, it is valuable for explainable persuasive interfaces to preserve the legitimate purpose of persuasion, and this poses challenges to the design of both the persuasion interfaces and their explanatory counterpart.

1) *Content of explainable persuasion:* To define the content of explainable persuasion, we suggest that the persuasion knowledge model [30] can be used as a reference. According to the persuasion knowledge model [30], in the face of a persuasion attempt, people make use of their persuasion knowledge. Persuasion knowledge is suggested to consist of information relating to the persuasion agent and information relating to the persuasion target. Information relating to the persuasion agent consists of i) information about the persuasion agent’s intention, ii) information about the persuasion agent’s tactics, iii) information about psychological mediators that the persuasion agent uses, and iv) belief about the effectiveness and appropriateness of persuasion agent’s tactics. Information relating to the persuasion target consists of i) information about the persuasion target’s coping goals and ii) information about the persuasion target’s coping tactics. The model postulates that when individuals have information on both the persuasion agent and self (the persuasion target), they can better analyse the persuasion attempt and decide either to be persuaded or not.

While people typically have some knowledge about traditional forms of persuasion, such as those used in advertising and marketing, their knowledge about the new range of digital

TABLE I. EXPLAINABLE PERSUASION: AN EXAMPLE OF AUTO-SPIN ONLINE GAMBLING FEATURE

Components of Explanation	Content of Explanation
<i>Persuasion agent's tactic</i>	The content will explain that the game uses the persuasive design technique of reduction (reducing user effort to take action) through the auto-spin function.
<i>Persuasion agent intention</i>	The content will explain that the intent of persuasion is to ease play for the user.
<i>Psychological mediator that the persuasion agent uses</i>	The content will explain that auto-spin relates to self-regulation mechanisms and may interfere with impulse control and decision-making.
<i>Persuasion target coping goal</i>	The content on target coping goal will be on having more control over the gambling time and amount.
<i>Persuasion target coping tactics</i>	The content will explain that the user can disable the auto-spin function or limit the time they play with the auto-spin function.

forms of persuasive techniques could be limited, which can affect how they cope with the persuasion attempt [31]. In the context of persuasive interfaces, information relating to persuasion knowledge could be used as a guide to help establish necessary conditions for informed consent. The example given in Table 1 demonstrates the potential content of explainable persuasion in the context of online gambling. Here the persuasive technique to be explained is the Auto-spin function at an online slot machine. A variant of that can also be the option for an auto-refresh of social media pages and the auto-play feature in sites like YouTube and Netflix.

2) *Explainable persuasion and interactive design*: While designing the content and delivery method of explainable persuasion, the designer needs to understand the context of use, task, user profile and user emotions to optimise interaction. Regarding content design, the depth to which information should be provided may be a significant factor that can influence usability. According to the usability principle of aesthetic and minimalist design, interactive interfaces should avoid the use of redundant information [32]. Consequently, the content depth of explainable persuasion may be required to vary according to the type of persuasive interface, user cognitive ability, and user motivation. For example, providing information about a persuasion target's coping goals and tactics might be more relevant within persuasive interfaces that may trigger addictive usage. However, such information may be seen as redundant within self-directed behaviour change support systems, e.g., systems promoting a healthy lifestyle through setting limits and goals and tracking them.

With analogy to XAI [17, 26], explainable persuasion can be delivered to users in multiple ways: at initial exposure to the persuasive interface, along with the persuasive interface at all times, on demand when the user wants to access explanations or through context aware systems. These explanations can be

delivered through textualisation, visualisation, or a mixture of the two, as demonstrated within the XAI field [14]. The format of the explanation can be related to whether the explanation would target an intuitive or rational route of information processing [33].

In terms of presenting and delivering explainable persuasion, the usability heuristic adaptability [34] may be of value in designing usable explainable persuasive interfaces. The delivery of explainable persuasion may need to adapt to the needs and preferences of users as a way to respect user autonomy. Hence, users could be allowed to customise the explainable persuasive interface by selecting which persuasive techniques they wish to receive explanations for, choosing the depth of information they would like to receive, and choosing when they would like to receive explanations. Providing user control over explainable persuasion interfaces can help users who would like to use such explanations as preventive measures when interacting with immersive technology. Similar to gaming, adapting interfaces to user emotions could further foster user engagement [35, 36]. In the case of explainable persuasion, the content and delivery method of an explanation could be adapted to fit user emotions. The delivery of explainable persuasion may also need to adapt to the context of use to increase explanation effectiveness and decrease harm to user experience. Kairos, which is defined as the right moment of intervention [37], may impact the effectiveness of the explanation. Building on the example in Table 1, explaining the persuasive nature of the auto-spin when the user exceeds a certain playtime or amount of money using this function at a suitable timing may make the user see them as relevant and acceptable. Timing can be in real-time, i.e. during the behaviour. It can also be after the behaviour to help the user reflect more on the link between their behaviour and the persuasive element. Also, interruption caused by explainable persuasion in certain situations may harm user experience and even put the user in danger; thus, context sensitivity may be needed. For example, when someone is driving and being persuaded to slow down through a persuasive system, this may not be the right moment to disclose information relating to the persuasion attempt as studies show that cognitive involvement during driving causes distraction and influences vehicle control [38].

B. Why is Explainable Persuasion Needed?

In this section, we discuss the need for explainable persuasion through both moral and business lenses.

From a moral perspective, the use of explainable persuasion can help designers take responsibility in protecting user's right to know that they are being exposed to persuasion, especially when tailored to them based on their profile and behaviour data. Such an approach is in line with the European Union's new General Data Protection Regulation, which argues for the right to an explanation of an algorithmic decision that was made about the user [39]. A similar approach is also evident within the advertising industry. The guidelines proposed by the Federal Trade Commission state that native advertisements at online platforms should be labelled as sponsored content to help users know they are interacting with adverts [40].

From a business perspective employing explainable persuasion may contribute to businesses in two different ways.

Studies conducted within the field of system explainability show that explainability is an important factor in building a trusting relationship between the user and the system and increasing user satisfaction [15, 27]. Providing information about the use of persuasive techniques can increase user perception of fairness with respect to persuasive systems. Such information can lessen the feeling of being “tricked” by the system and give a sense of control to the users. Secondly, employing explainable persuasion, especially within technology that can be highly immersive, can work as a proactive strategy and help users reflect on their behaviour while interacting with persuasive interfaces. For example, explainable persuasion could inform the user about which persuasive technique contributes to their excessive usage the most. This could, in turn, help business sustainability, as users would not need to take extreme measures such as self-exclusion and the need to boycott technology all at once [41].

C. What Could be the Design Approach?

A user-centred approach can be taken to identify explainable persuasion requirements. Taking a user-centred approach can help designers elicit requirements that match user needs, expectations and specific usage context [42]. While explainability requirement elicitation in the domain of XAI is relatively new, several studies suggested the use of explainability scenarios to identify what users need to understand to act on AI outputs [42-43]. A similar approach can be taken in identifying user requirements for explainable persuasion. Building on the auto-spin example, a scenario similar to the one presented in Table 2 can be used as a basis to elicit user requirements. Users can be asked questions similar to the following regarding this scenario:

- What level of information should be given to Alex to inform about the persuasive techniques used and their potential impact?
- At what point in a gambling session do you think delivering such explanations to Alex would be most helpful?
- Where in the website should these explanations be placed to increase Alex’s engagement in them?
- What factors could get in the way of Alex when interacting with these explanations?
- What design features could be added to motivate Alex to engage with these explanations?

Another user-centred approach to elicit explainability requirements could be the use of personas [16]. Using personas to represent different user groups can help identify and define each group’s particular needs with respect to explanations. For example, the level of content depth can relate to user profiles such as their level of the need for cognition [44], whether they are motivated to engage with explanations [45], and, possibly, their personality traits such as conscientiousness and agreeableness [46]. Accordingly, designers can create personas to identify what needs to be explained to different user groups.

D. How Challenging is the Design of Explainable Persuasive Interfaces?

Designers may not favour the concept of transparent persuasion since disclosing persuasion attempts made by the system may decrease the efficiency of such techniques [47, 48]. Also, in designing explainable persuasive interfaces, caution needs to be given to the information's depth. As mentioned before, disclosing too much information about persuasion mechanics in some cases may lead to information overload, frustrate users, and hinder user experience, as observed within the XAI field [16]. Moreover, with an analogy to XAI [50], users may simply ignore the explanations, or they may lose interest once they perceive themselves to be knowledgeable enough about them. A significant challenge is designing explainable persuasion usable and contextual enough not to impair user experience but disruptive enough to catch user attention and foster critical thinking. Therefore, the main challenge is designing engaging explainable persuasive interfaces that assist both informed consent and positive user experiences and are neutral in the sense of affecting the user’s decision.

TABLE II. SCENARIO-BASED REQUIREMENT ELICITATION EXAMPLE

<p>Alex enjoys online gambling on Friday nights after a busy week. They occasionally use auto-spin while playing slot games, as this makes gaming convenient. Also, Alex believes that using auto-spin increases their chance to win a jackpot. In one session 1 hour into the game using auto-spin, Alex realises losing £300, which is five times more than their average loss per night. Alex finds it difficult to disable auto-spin function and quit the game as the result of the next spin makes them want to play again, and Alex believes the game is due to pay-out after a long string of losses.</p>

IV. CONCLUSION

In this position paper, we introduced the concept of explainable persuasion when building persuasive interfaces. Overall, we suggested that providing information about the persuasive design techniques embedded within interactive platforms is essential for fulfilling conditions for informed consent. Future work can investigate methods that enable a systematic investigation of whether there is a need for explainable persuasion and in which domains, identify user requirements relating to explainable persuasion, and analyse trade-offs between explanation and other design qualities. There is a need to assess whether structuring explanation around the persuasion knowledge model [30] is suitable and effective. Other models would include the argumentation model [51] and the use of interactive explainability. Future work can also examine what constitutes an informed consent regarding the use of persuasive techniques. Given that transparency and user voluntariness are important factors in building ethical persuasive interfaces, one needs to examine whether transparency about persuasion on its own (i.e., informing the user about persuasion) is sufficient to obtain an informed consent or whether users need to actively accept being subject to persuasion to fulfil conditions for informed consent.

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