How Ethical are Persuasive Design Practices? A Proposal for Assessment of Ethics in HCI Design[1]

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Abstract. Ever since bounds on human rationality and cognitive biases in decision contexts have been reported, designers have exploited these weaknesses to yield conversion by creating persuasive HCI designs. Such design practices have been widely reported to be effective in influencing user decision making. However, the exploitation of a cognitive bias compromises the cognitive autonomy of an individual. This paper argues for the need of ethical assessment of persuasive design practices which undermine a user's cognitive autonomy. The paper proposes a model for persuasive information design in human computer interaction (HCI PID model) and derives from it a framework to assess the ethics of persuasive design practices. In this framework, five design parameters and their twelve subcomponents have been proposed as measures of an HCI system's conduciveness to autonomous decision making without unduly influencing a user. The paper proposes a scoring methodology to assess design features of HCI systems on the proposed parameters. The proposed assessment framework was used by 20 participants to evaluate five mobile applications on features that are relevant to autonomous decision making. It was observed that the proposed framework has effectively helped the assessors to identify unethically persuasive design features.

Keywords: Human computer interaction · Persuasive design · Ethics · Cognitive autonomy · Decision making · Ethics assessment

1 Introduction

Persuasive HCI technology refers to interactive computing systems designed to change people's attitudes and behaviours [1]. With the growing knowledge of neuroscience and the reducing cost of neuroimaging technologies, commercial interest in persuasion design has risen [2]. In information design literature, some reported examples of persuasive practices include creating the illusion of scarcity of a product to increase its demand, creating price anchors, inconveniencing users to increase the perceived value of an item, foot-in-the-door technique and rhyming jingles in advertisements to increase believability [3-6]. These are general persuasion principles that

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can be used online or offline. In recent years, persuasive design practices have gained traction online with the capability to collect large amounts of user data, which can be harvested for data-driven personalization and targeting to persuade more effectively. Personalization algorithms can target and influence users through believable misinformation and selective filtering on social media platforms [7, 8]. They can also nudge users towards behaviour that they themselves deem to be harmful, such as impulse purchases, unhealthy eating and binge video streaming. Recently, persuasion tactics were claimed to have been used on a large scale to influence voter decision making in the 2016 presidential election in the United States through political advertisements on Facebook which targeted individual psychological vulnerabilities [9].

1.1 Cognitive Autonomy and Cognitive Biases

Cognitive autonomy is defined as the psychological freedom to be the person one wants to be, to pursue one's goals without unjustifiable hindrances or interference, to be self-governing [10]. It refers to an individual's freedom to make their own decisions of their own free will. Autonomy is considered to be a fundamental right in the Universal Declaration of Human Rights adopted by the United Nations [11].

Persuasive information design is effective in influencing user decision making because the human brain is not a rational information processor or decision maker. Simon [12] proposed that the human brain is boundedly rational and routinely takes mental shortcuts to decision making. These mental shortcuts were formalized by Kahneman and Tversky [13] as heuristics of judgment and decision making. Kahneman and Tversky's prospect theory [14] detailed and explained cognitive biases such as the endowment effect, status quo bias and gain-loss asymmetry. Human cognitive biases are irrational by definition, in the sense that they violate the axioms of rationality set forth in economic theory [15]. These cognitive biases are normally useful, making decisions easier and faster than they could be if the decision process involved only rational evaluation. However, the same biases can be exploited by persuasive HCI technology to influence user decision making for the benefit of monetization, making humans vulnerable to an invasion of their cognitive autonomy [16].

The premise of this paper is that humans have a right to self-determination, based on the long-standing philosophical and political importance of autonomy [10, 11]. Therefore, there is a need to ensure that HCI systems are conducive to autonomous decision making by their users, without unjustifiable hindrances or interference. There is a need to understand the lines of divide between ethical and unethical persuasive design practices and to create methods of assessment that can be used by designers, policy makers and users to assess how HCI systems can exert unethical influence on human decision making.

2 Current Research in Ethics of Persuasive Design

In UX Design, the term 'dark patterns' has been coined for unethically persuasive design practices that aim to trick users into behaving in a certain way. Gray et al. [17] decomposed dark pattern design practices into five categories: nagging, obstruction,

sneaking, interface interference and forced action; and argued for the need to integrate ethics into broad HCI design practice. In neuromarketing research, it has been argued that it is unethical to influence human decision making in a covert or hidden manner [2]. A covert influence undermines cognitive autonomy because it is not rationally discernible or attributable as the cause of the decision, sometimes not even in retrospect. Even when the covert influence is beneficial to the user, such as the nudges reported in behavioural economics, they still might undermine users' autonomy because of their paternalistic nature [16, 18]. Paternalistic design is not always unethical, especially when it serves the collective good and is deployed into socio-economic systems through democratic procedures [19], such as traffic systems designed to nudge drivers to drive on the correct side of the road. However, Susser et al. [16] argue that if paternalistic covert persuasion intends to personally benefit the user by nudging them to eat better food, exercise or work harder, such persuasion harms the user by rendering them opaque to themselves. Even if the persuaded user becomes a better individual by any reasonable measure, he is not a product of his own reflection, imagination and powers of discrimination and analysis [20].

In behavioural economics, Thaler and Sunstein [21] have argued that paternalistic nudges are ethical if they do not attempt to make alternate decisions unreasonably difficult. According to this argument, even when alternate decisions are made slightly difficult with some moral rationale, the individual should not be denied the choice of making them. On the commercial technology front, the addressal of the issue of users' autonomy has been largely reactive, that too in response to the imposition of large government fines on various technology companies. This is because despite the ubiquitous presence of persuasive HCI technology, there is little policy regulation to ensure that persuasive influences in the digital world do not undermine users' autonomy.

2.1 Research Gap and Research Goal

The literature on ethics of persuasive design in HCI is quite broad, as outlined in the previous section. However, the philosophical understanding of autonomy is yet to be rigorously formulated within the HCI design context. Therefore, the ethical frameworks pertaining to persuasion design are harm focused [22, 23]. Although a few reports in literature do touch upon aspects of autonomy in emerging persuasive technologies [24], the authors could not find any reported framework for assessment of ethics which explicitly assesses persuasive design from the perspective of user autonomy. Authors were not able to find any HCI information design models either which help formulate the concept of cognitive autonomy within the HCI design context.

The research goal of this paper is to develop a model of persuasive information design within the HCI context, which will help formulate the concept of the user autonomy for persuasive HCI systems. Also, this paper aims to propose and test a framework for assessment of ethics in HCI design from a user autonomy perspective.

3 Proposed Framework for Assessment of Ethics in HCI Design

This section first develops a model for persuasive information design (3.1), then develops a framework for assessment of ethics of HCI design (3.2) and then finally empirically tests the usefulness of the proposed framework (3.3).

3.1 Persuasive Information Design for HCI Systems - HCI PID Model

In Fig. 1, the authors propose a model of persuasive information design for HCI systems (HCI PID model). This model was created by the authors to build a step-by-step overview of the interactions and decisions involved in the process of human computer interaction. The aim of the model is to identify various stages of interaction between the human and the computer and to subsequently identify the persuasive design elements in each stage. By outlining the interaction in stages, it became possible for the authors to identify the prominent threats to user autonomy in each stage separately. The model superimposes on each stage (in italics) the threats to cognitive autonomy due to persuasive design practices. These threats were identified from the surveyed literature and were mapped on the stage of interaction during which they can theoretically occur. The terminology used in the model is defined below:

1. *Solicitation*: Solicitation refers to an interaction initiated by the system for the user, thereby exposing the user to unsought information.
2. *Initiation*: Initiation refers to the user's action to initiate an interaction with the system, either in response to a solicitation or to fulfil an intention.
3. *Knowledge Transfer*: Knowledge transfer refers to the presentation of information by a system to the user.
4. *Personalization*: Personalization refers to categorized or individualized interactions between a system and a user. Personalization typically relies on individual or demographic data to tailor user interactions to maximize a parameter of interest such as revenue, engagement, clicks etc.
5. *Task*: A task refers to an active engagement with the system in which a user follows a series of steps on the system to achieve a goal. A task is inherently mediated by design constraints of a system.
6. *Constraint*: Constraint refers to a limitation on the ways in which a user can interact or engage with a system, communicated to the user through affordances, default settings, restricted access etc.
7. *Disengagement*: Disengagement refers to a user leaving, disconnecting or terminating an interaction with the system, on a temporary or permanent basis.

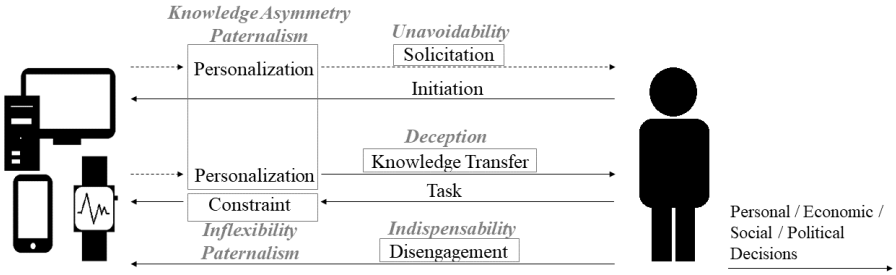

Fig. 1. Proposed HCI Persuasive Information Design (HCI PID) Model

Threats to Cognitive Autonomy of Users in HCI PID Model. It has been argued before that a user's cognitive autonomy is threatened when a design is coercive, manipulative or deceptive [16]. Coercion refers to influencing someone by constraining their options. Deception refers to influencing decision making by planting false beliefs. Manipulation is a form of trickery, often hidden, intended to influence someone through seduction, guilt, temptation, emotions and desires. At each stage of human computer interaction in the HCI PID model, a system can coerce, deceive or manipulate user decision making. In Fig. 1, the authors have mapped (in italics) these autonomy undermining methods onto the HCI PID model:

1. *Unavoidability (Solicitation)*: Unavoidability is defined here as the coercive design of a solicitation, limiting the ways in which a user can avoid engaging with it, both through outright and planned rejection.
2. *Deception (Knowledge Transfer)*: Deception refers to an HCI system dishonestly influencing users' beliefs, through inaccurate information, information misrepresentation, selective exposure to information or hiding information low in the visual hierarchy of the user such that it is not factored in the decision due to inattention.
3. *Knowledge Asymmetry (Personalization)*: Knowledge asymmetry refers to an HCI system having knowledge about the user that the user cannot conceive of or cannot rationally factor in the decision process, such as the information collected through digital surveillance. Knowledge asymmetry can be used to manipulate users by exploiting their vulnerabilities through personalized and targeted information.
4. *Inflexibility (Constraint)*: Inflexibility refers to a coercive limitation on the ways in which a user can interact with a system due to design constraint. For example, forcing the user to accept third-party cookies to browse a website, auto-enabling a subscription after a free trial period of a service, etc.
5. *Paternalism (Personalization and Constraint)*: The threat of paternalism emerges from a system being designed to influence user behaviour in a manner which the system claims is beneficial for or in the best interest of the user, especially without their knowledge or consent to acquire the behaviour desired by the system [18].
6. *Indispensability (Disengagement)*: Indispensability refers to a system's coercive design features that make it difficult by design to quit, leave or disengage with, on a temporary or a permanent basis.

3.2 HCI PID Ethics Assessment Framework

In this section, the HCI PID model was translated into the HCI PID ethics assessment framework, complete with parameters that are indicators of the extent to which an HCI system supports or allows autonomous decision making by its users. The rationale behind this assessment framework lies in the philosophical formulation of autonomy previously adopted by Friedrich et al. [25] in BCI research and Thaler and Sunstein [21] in behavioural economics. Friedrich et al. [25] used a three-component account of mental competence to assess the impact of brain computer interfaces on autonomy. The three components which are the foundation of autonomous decision making are as follows: 1) ability to use information and knowledge to produce reasons, 2) ability to ensure that intended actions are realized effectively (control), and 3) ability to enact intentions within concrete relationships and contexts.

In behavioural economics, Thaler and Sunstein [21] argued that persuasive nudges are ethical when they are beneficial to either the individual being nudged or the society which benefits from the nudge as long as the nudges do not make alternative choices difficult. Nudges advocate for soft or libertarian paternalism. This argument formulates autonomy as an ability to execute alternate decisions as opposed to those intended by the persuader. This argument resonates with the third component of the three-component account used by Friedrich et al. [25], which posits that the ability to execute or enact intentions within the design of the external world is an essential component of autonomous decision making.

The development of the HCI PID assessment framework in this paper follows the argument of Thaler and Sunstein [21] to generate parameters that are relevant to autonomous decision making. This paper argues that persuasive information design is unethical when it makes it difficult for users to exercise their autonomy. Therefore, this paper covers only one aspect of autonomy, which is the aspect of executing or enacting one's intentions within the HCI context (the third component in the three components from Friedrich et al. [25]). Building upon the HCI PID model of Fig. 1, we have derived a framework of five parameters and their twelve subcomponents that are integral to making HCI systems conducive to autonomous decision making (Fig. 2). Each of these parameters was created as a response to the threats to users' autonomy identified in Fig. 1. These parameters indicate the design requirements from HCI systems to allow users to execute or enact certain intentions if they so choose. A high rating on these following parameters by the intended users signifies how difficult HCI systems make it for users to exercise autonomous choice.

1. *Avoidability (Solicitation):* Avoidability is a measure of the ease with which a user can avoid interacting with a solicitation initiated by a system, either through advance planning or outright rejection. Avoidability is proposed as a parameter of cognitive autonomy because a user should not be coerced into engaging with a system. In this parameter, we propose to measure two subcomponents: *ease of planned rejection and ease of outright rejection or reasonable delay.*
2. *Accessibility (Knowledge Transfer):* Accessibility is a measure of the ease with which relevant and accurate information can be accessed on an HCI system. Accessibility is proposed as a parameter of cognitive autonomy because autonomous decision making requires complete and accurate information. We propose two sub-

components of this parameter: *ease of accessing relevant information* and *ease of verifying information accuracy or system credibility*.

3. *Explainability (Personalization):* Explainability is a measure of ease with which a user can understand the dynamics of the infosphere, such as understanding the flow and usage of one's personal information, understanding the nature of the personalization of one's interactions with the system and understanding the differential nature of outcomes for oneself and other users. Explainability is proposed as a parameter of cognitive autonomy because information about the infosphere might be relevant to the user's decision process. In this parameter, we propose to measure three subcomponents: *ease of locating and understanding personal data flows, ease of understanding the role of personal data in personalization* and *ease of understanding the difference between oneself and others as users.*
4. *Alterability (Constraint):* Alterability is a measure of the ease with which a user can circumvent a constraint to reach a desired state of a system, unless there is an explicit understanding and acceptance of the constraint as a part of the transaction. It is argued here that constraints, unless agreed upon, are a form of coercion, especially if there is no rational alternative than to accept them, even if hesitantly or unwillingly. Therefore, alterability outside the bounds of the contractual transaction is a parameter of cognitive autonomy. In this parameter, we propose to measure three subcomponents: *knowledge of the constraint, ease of altering the constraint* and *ease of accessing alternate systems.*
5. *Dispensability (Disengagement)*: Dispensability is a measure of the ease with which the user can disengage with a system without being subject to an undue hindrance. Dispensability is proposed as a parameter of cognitive autonomy because it reflects the freedom to be off from electronic engagement [26]. In this parameter, we propose to measure two subcomponents: *ease of temporary disengagement* and *ease of permanent disengagement*.

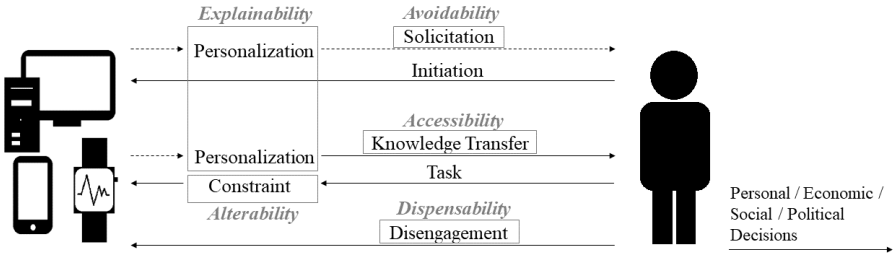

Fig. 2. Proposed HCI PID assessment framework for cognitive autonomy of users

3.3 Empirical Test using HCI PID Assessment Framework

The proposed framework was used to assess design features from five popular mobile applications. Each feature selected for assessment qualified as one stage of human computer interaction in the HCI PID model and was mapped to the corresponding parameter in the HCI PID assessment framework by the authors. Facebook was chosen for all five parameters of assessment to show that the framework can be used for the complete assessment of one single system. For each parameter, the authors also

chose one other mobile application for assessment to show that ethics assessors need not assess each system on all five parameters and that each design feature can be assessed independently based on the stage of human computer interaction it maps to. The following features were arbitrarily selected by the authors for assessment:

1. *Solicitation*: Mobile App Notifications (Facebook and Gmail)
2. *Knowledge Transfer*: News on Social Media (Facebook and Whatsapp)
3. *Personalization:* Interest-Based Recommendations (Facebook and Youtube)
4. *Constraint:* Privacy Default Settings (Facebook and Google)
5. *Disengagement*: Quitting a Mobile Application (Facebook and Whatsapp)

Research Methodology. Each of the five design features selected above were assessed on the corresponding parameter of cognitive autonomy in the HCI PID assessment framework (see Table 1 for mapping). A 12-point questionnaire (Table 1) was formulated in which the questions corresponded to the 12 subcomponents of the five parameters of cognitive autonomy. This questionnaire was filled by 20 participants voluntarily (7 F, 13 M, mean age = 26.7 years). All questions were answered on a 5-point Likert-Type Scale for Level of Difficulty (Very Easy to Very Difficult) [27]. All the participants did the assessment by using their mobile app or mobile website.

Table 1. Ethics Assessment Questionnaire and Results

Scoring Guideline 1 (Very Easy); 2 (Easy); 3 (Neutral); 4 (Difficult); 5 (Very Difficult)		X (No. of users who answered '4' or '5')	
Mobile App Notifications (Solicitation→Avoidability)		*Facebook*	*Gmail*
1. Ease of planned rejection 2. Ease of outright rejection or reasonable delay	1. How easy/difficult is it to customize notifications for this mobile application from app settings? 2. How easy/difficult is it to avoid or delay attending to a notification from this app?	7 **9**	3 **9**
Fake News (Knowledge Transfer→Accessibility)		*Facebook*	*Whatsapp*
3. Ease of accessing relevant information 4. Ease of verifying information accuracy or system credibility	3. How easy/difficult is it to find relevant news on this application? 4. How easy/difficult is it to verify the accuracy of news on this application?	**10** **17**	**17** **17**
Interest-Based Recommendations (Personalization→Explainability)		*Facebook*	*Youtube*
5. Ease of locating and understanding personal data flows 6. Ease of understanding the role of personal data in personalization 7. Ease of understanding the difference between oneself and others as users	5. How easy/difficult is it to locate and understand who has access to what types of your data? 6. How easy/difficult is it to ascertain how your data is used to show you recommendations on this website? 7. How easy/difficult is it to understand why your recommendations are different from other people's?	**14** **12** **9**	**14** 7 4
Privacy Default Settings (Constraint→Alterability)		*Facebook*	*Google*

8. Knowledge of the constraint	8. How easy/difficult is it to know and understand the privacy settings of this website?	**8**	**12**
9. Ease of circumventing the constraint	9. How easy/difficult is it to change the privacy settings of this website?	6	**10**
10. Ease of accessing alternate systems	10. How easy/difficult is it to find alternate websites for this purpose in case you are unable to change the privacy settings as per your preferences?	**11**	**13**
Quitting a Mobile Application (Disengagement→Dispensability)		*Facebook*	*Whatsapp*
11. Ease of temporary disengagement	11. How easy/difficult is it to not check this application or logout of this application for a brief period of time?	3	**17**
12. Ease of permanent disengagement	12. How easy/difficult is it to delete your account on this application?	**13**	5

Analysis. We argued in section 3.2 that if cognitive autonomy is a fundamental right, it is unethical for HCI systems to make it difficult for its users to exercise autonomous choice. Therefore, during analysis of the data, it was decided that the parameter of interest is the fraction of users who scored each question '4' or '5' on the Likert Scale. This means that they had found the design to be infringing on their ability to enact their intentions during application usage. It was decided that fraction of users who rated a '4' or '5' will be taken as a measure of how ethically acceptable or unacceptable the design was. In other words, if a 'large number' of users found it difficult to exercise autonomous choice (means rated '4' or '5'), it would be considered as 'unethical'. For this assessment, the 'large number' was decided to be at least 20% of the user population. Thus, a cutoff of 0.2 was selected. A cutoff of 0.2 signified that, a feature was ethically acceptable if no more than 20% of the user population found it 'difficult' or 'very difficult' to exercise autonomous choice. After the cutoff was selected, the following test procedure was applied:

Participants: N = 20
Test Statistic: X = Number of participants who scored each question '4' or '5'
Null Hypothesis (H_0): The number of participants who found it 'difficult' or 'very difficult' to exercise autonomous choice is $\leq 0.2N$ and the design feature was ethically acceptable.
Rejection Criterion: The null hypothesis is rejected if the empirically observed number of participants who found it 'difficult' or 'very difficult' to exercise autonomous choice exceeded 0.2N with >95% confidence. Using the formula for cumulative binomial probability distribution [28], the rejection criterion for the null hypothesis H_0 was calculated for 20 participants. It was calculated that for $X \geq 8$, the null hypothesis can be rejected with 96.8% confidence.

Results. It was observed that the participants were able to understand and score the questions easily according to the scoring guidelines provided. Table 1 shows the observed values of X (the number of participants who scored each question '4' or '5'), and values of $X \geq 8$ are highlighted in bold. For an ethically acceptable cutoff of 0.2N

for X, this framework identified with >95% confidence the following persuasive design issues as unethical with respect to the users' cognitive autonomy: difficulty of ignoring or delaying a notification on Facebook and Gmail (Q.2), difficulty of finding relevant news on Facebook and Whatsapp (Q.3), difficulty of verifying the accuracy of news on Facebook and Whatsapp (Q.4), difficulty in finding and understanding personal data flows on Facebook and Youtube (Q.5), difficulty in understanding data-driven recommendations on Facebook (Q.6), difficulty in understanding data-driven user differences in Facebook (Q.7), difficulty in knowing and understanding the privacy settings on Facebook and Google (Q.8), difficulty in changing the privacy settings on Google (Q.9), unavailability of alternates to Facebook and Google in case of unacceptability of privacy policies (Q.10), difficulty in temporary engagement from Whatsapp (Q.11) and difficulty in permanently deleting one's account on Facebook (Q.12).

Limitations of this Analysis. The analysis presented here is a preliminary analysis to showcase the use of the framework. Within this assessment framework, the parameter of interest (number of users who answered 4 or 5) as well as the cutoff criteria are not fixed. They are dependent upon the moral rationale behind the persuasive design. The cutoff criteria may be lesser than 0.2 if in a certain context, it is moral for all users to be provided with the option of autonomous choice. The cutoff criteria may be higher than 0.2 if it is morally desirable for only the most skilled users to have the option of autonomous choice. For example, a desktop user may not have the motivation or the ability to make choices about desktop settings and may end up making suboptimal choices if provided with all the options. However, it needs to be considered whether the settings recommended by the manufacturer are truly optimal for users or whether they are optimal for business, making it difficult for users to access the options that meet their intended requirements. This conundrum can be incorporated in the assessment framework through an appropriate formulation of the questions. Because the authors did not argue the moral rationale behind each of the five features that were chosen for assessment, a common cutoff criterion was chosen to showcase the use of the framework. The richness of the 5-point Likert scale was reduced for the same reason, and ethics assessors in practice can use separate cutoff criteria for each score on the Likert scale based on the moral defense of the design feature.

Second, with certain framing of the questions, there is room for ambiguity in their interpretation by the participants. For example, the answers to Q.2 and Q.11 could reflect a psychological 'difficulty' due to self-control issues, instead of a difficulty in 'interface design', even though the framework intends to capture issues of difficulty with persuasive interface design. Therefore, caution is needed while framing the questions to ensure that the participants interpret the questions as intended by the ethics assessor. On the other hand, it is also possible for the ethics assessor to intentionally leave the question ambiguous, or even to explicitly attempt to capture the psychological 'difficulty'. This may be valuable if the motive of assessment is to redesign an HCI system for beneficence instead of determining whether the interface design is ethical or not.

4 Discussion and Conclusions

The main contributions of this research are the HCI PID model and assessment framework. The HCI PID model outlines the stagewise interaction between the human and the computer and provides a systematic way to traverse the decision stages in human computer interaction. The model was instrumental in the identification of the five parameters indicative of autonomous decision making by users in persuasive design, leading to the creation of the HCI PID assessment framework. To the best of our knowledge, this framework has provided one of the first methodologies to quantify the ethical issues with persuasive design pertaining to user autonomy. The framework was able to identify specific violations of persuasion ethics, and therefore, it was observed that this framework can help identify and prioritize redesign requirements to make persuasive design practices ethically acceptable.

The limitations of this framework are the following. By its design, the framework only touches upon one aspect of autonomy, which is the ability to enact or execute one's intentions. It does not speak of the ability to reason or the ability to effectively control one's actions, which are the other two components of autonomous choice. The framework is yet to be validated and checked for reliability. It needs to be used across different HCI systems on larger sample sizes to be established as a method of ethics assessment. In its current form, the framework has not been checked for dependencies between the five parameters and their subcomponents, theoretical or statistical. Another characteristic of the framework is that the identification of ethical issues is dependent on the demographic surveyed, which is to be expected. More skilled users of HCI systems will find it relatively easier to make different choices on the system, and hence will not find it 'difficult' to exercise autonomous choice even when the system is designed to be difficult. Therefore, the framework needs to be tested on the intended user of the HCI system to be able to accurately identify ethical issues.

In conclusion, this paper has argued for the need of ethical assessment of persuasive HCI design practices. Further, this paper has argued that beyond the philosophical conceptualizations of autonomy, there is a need to develop assessment frameworks which designers and policy makers can use to assess the ethics of persuasive HCI systems from the perspective of users' autonomy. Results of the empirical test using the proposed ethics assessment framework suggest that many design features of popular mobile applications may not be conducive to autonomous decision making by their users. In light of the findings, it is argued here that persuasive HCI design practices have become legitimized by virtue of their pervasiveness, omnipresence and a myopic infatuation with technology. Whether such unethical persuasion is intentional or not, it is the moral responsibility of designers to identify these unethically persuasive practices and redesign them in a manner explicitly conducive to autonomous choice. If a designer's interests conflict with users' interests, the framework can help identify design practices that need regulatory or policy intervention. Despite its limitations, the proposed framework is one of the first to our knowledge to provide a methodology to explicitly assess persuasive design practices from the perspective of users' autonomy. We hope that the framework gets used across diverse usage contexts

and evolves through future research contributions to become established in the much-needed ethical assessment space.

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