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Reframing the Narrative of Privacy through System-Thinking Design

Laura Ferrarello[a], Rute Fiadeiro[a,b], Riccardo Mazzon[b], Andrea Cavallaro[b]

[a]Royal College of Art

[b]Centre for Intelligent Sensing, Queen Mary University of London

*Corresponding author e-mail: laura.ferrarello@rca.ac.uk

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Abstract: We present a strategy to privacy aimed at stimulating the adoption of privacy-preserving behaviours when sharing images online, with the intention to overcome the so-called privacy paradox. Through a socio-technical approach to privacy, we use design as an actor of change and privacy enhancing technologies as enablers of change. Building on Gordon Pask's Theory of Conversations, we design an experiential dialogue between people and algorithms to understand what factors impact self efficacy in protecting personal information contained in image data. Through this dialogue we engage participants in thinking abductively to assess their awareness of privacy risks across their past, present and future. Hence, this dialogue becomes a platform to observe participants as a system of reactions to the stimuli developed from conversing with algorithms, and to understand whether these stimuli would trigger any proactive behaviours. Our approach reframes the analysis of human and technology relations through behavioural elements, with the ambition to favour a more inclusive privacy communication.

Keywords: Privacy, Conversations, Profiling Algorithm, Abductive Thinking, Computer Vision, System-Thinking Design

1. Introduction

The privacy paradox describes the inconsistency between the behaviours and attitudes towards the disclosure of private information that people manifest when interacting with online services like social networks (Kokolakis, S. 2017). Why is this paradox important for society? Digital technologies have enabled new forms of communication and have transformed how we engage with family and friends. As a consequence, socialising has

become an activity maintained through various types of information about us; when shared online, some pieces of information are used with our *informed* consent, whereas others are not.

The consequence of disclosing personal information is often unknown to the general public (Sellinger and Saeger, 2012, in Yeung, K. 2017) due to a low literacy of the technologies used to extract personal information for profiling purposes. To engage individuals in appreciating the importance of protecting their privacy, it is key to create awareness of the strategies that encourage the disclosure of personal information via images shared online, and how this personal information is exploited to create digital profiles, which are then used to influence human decisions (e.g. the recommendation of a service, a product or a political party).

The study subject of this paper focuses on leveraging privacy profiling technologies to create a narrative that heuristically engages individuals in protecting their privacy. By integrating knowledge and skills from Design and Computer Vision, this research has aimed to identify any values, attitudes, behaviours and, generally, types of relations that people could engage with to develop their ability to protect personal information when interacting with profiling technologies. We used design as a vector for stimulating interactions in an environment (a set of interrelated and correlated factors) to trigger change (Dorst, K., 2018), cascade effects (Rocha, et al. 2018) and generate a transition fostering more favourable ecosystems (Irwin, T., 2015) (Manzini, E., 2015). We also leveraged the design's capacity to creatively engage with complex systems, through the evaluation of interactions and feedback, (Dorst, K., 2018) to rebalance and redefine the relationships between people and profiling technologies.

2. System Thinking in Design

2.1 System-thinking to design privacy

The rate at which technology changes strains the general public's ability to acquire the necessary literacy to support the protection and control of their personal information. To date no framework offers clarity on how technology may be used to extract and aggregate personal information. We believe this gap can be addressed with a socio-technical model of privacy, as it helps analyse privacy through the variety of interactions that people exchange with social media platforms. Introducing this approach means (1) to use design as an agent that tackles complex issues through the understanding of any social and political interconnection in a given system (Scupelli, P., 2015); (2) to distribute complexity to the different nodes of the system (Manzini, E., 2015); (3) to model any relations across any of the system components as a possible resolutive opportunity. With such a modelling interrelations are as important as the actual components (Norman, D., Stapper, P., 2015), and human and technology hold equal roles, as interactions (and feedback) are core for tackling a problem (Norman, D., Stapper, P., 2015).

Research has evidenced that, when dealing with privacy, people feel helpless, disempowered and unable to protect or control personal information (Emirbayer, M., & Mische, A. 1998). To design an experience capable of safeguarding the integrity of people's digital identity (Privacy International, 2017), we integrated the social context in the investigation of privacy to promote a culture of awareness. This was achieved by using the interactions between human and technology as leverage of change and also as a proposition to foster more inclusive and equitable futures (Irwin, 2015).

We believe that shifting the perspective from components to relations can help frame a strategy that fosters empowerment. Specifically, we implemented this approach by observing people as a system of values, reactions, behaviours and attitudes, which are functional to the technology (Norman, D., Stapper, P., 2015). We wanted to "design a way" for stimulating an increased self-awareness of the consequences of interacting with technology. To this end, we promoted new types of interactions with personal information that could reduce the disempowerment the general public predominantly feels because of the rapid progress of behavioural tracking technology (Yeung, K. 2017)

The above premises motivated our strategy for designing a dialogue between people and profiling algorithms, with the objective of favouring transformation and change of mindset and values (Irwin, T., 2015). We wanted to draw awareness - through reflection - on why personal information is extracted (Dorst, K., 2018) and we used the dialogue as an experiential method to reframe and redefine the relationships between people and technology (Figure 1), as well as increase self-awareness on the consequences of intentional (or unintentional) disclosures of private information through images (Figure 2).

This approach integrates knowledge of the human (Design) and technology (Computer Vision and, specifically Machine Learning applied to visual data) to challenge existing paradigms and draw positive social change (Irwin, T., 2015). Through abductive thinking - i.e., the capacity to explore a problem by assessing the validity of a set of actions implementing related solutions (Dorst, K., 2018) - we adopted an alternative use of profiling technologies to stimulate incremental stages of awareness as guidance of change of mindset towards private information (Irwin, T., 2015). We leveraged the experience of self-assessment, reflection and the propensity/readiness to act to identify what combinations of these factors help reconcile the gap between behaviour and attitude towards privacy (Dorst, K., 2018; Irwin, T., 2015).

We deliberately avoided a human-centred or solution-driven approach, which would have flattened some of the complexities around human behaviour that were necessary to study the problem. We used transitional approaches to foster and support the design of a process that can influence different mindsets towards privacy preserving lifestyles (Manzini, E., 2015). Our goal was to provide participants with a transformational framework that stimulates (1) reflections on the value given to privacy; (2) a strategy they would be keen to endorse (if any); and (3) the propensity to adopt a privacy enhancing solution proposed in the questionnaire (Dorst, K., 2018).

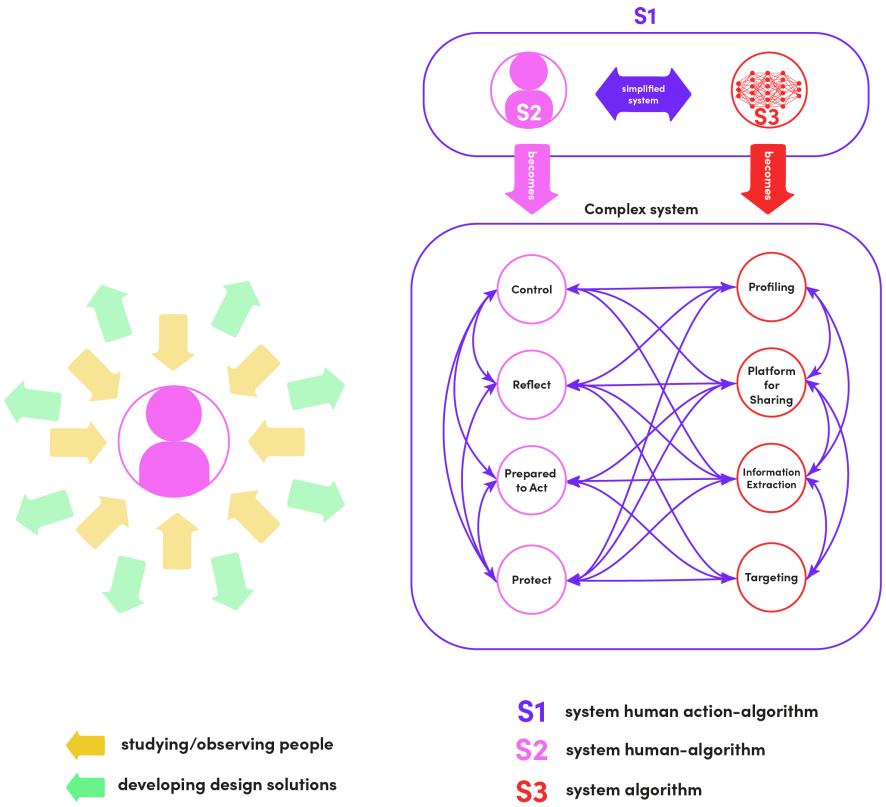

Figure 1 Our strategy of shifting from a human-centred (Norman, D., Stapper, P., 2015) to a system-thinking design.

2.2 Reframing the issues

Our research challenges the present condition of privacy as being inconvenient by design. The experience shaped by companies in response to privacy regulations has created frustrating barriers pushing people away from taking informed decisions on the consequence of disclosing private information.

The opaque treatment of data is recognised as a threat to freedom of expression, as it negatively impacts the development of one's identity (Privacy International, 2017). The enforcement of safeguarding to ensure the identity of an individual is not exploited for purposes for which informed consent was not granted (GDPR, 2018) translated into the implementation of pop-up notices; these are, in practice, a series of barriers blocking access to online content that causes frustration, careless acceptance and a negative (or simplistic) perception of privacy. Thus, protecting privacy has turned into a cumbersome process with inaccessible *legalese* language, which is generally not designed to provide the general public with any clear, tangible and meaningful information on the consequences or impacts of disclosing personal information.

With our research we explored whether a narrative built on a socio-technical and transitional approach could support and stimulate privacy awareness. This narrative stems from the creative (and challenging) conversations that helped interweave knowledge from Design and

Computer Vision (Ferrarello, L., & Dormor, C., 2021); this discursive approach shaped the dynamics of collaboration and, consequently, the informative experience aiming to change the existing culture of privacy (Irwin, T., 2015). Furthermore, considering privacy in the context of a socio-technical system led to the analysis of the human as a system on its own formed by any feelings, reflections and reactions stimulated by an interaction with technology.

To understand values, attitudes, behaviours and, generally, any types of relations between people and technology that can develop awareness, we designed a platform of observation to investigate what parameters can explain the privacy paradox, and stimulate a culture of privacy protection. For this platform to stimulate reflection, criticality and increased self-efficacy, we created a framework where change could be clearly identified, articulated and understood. We looked at agency, i.e. a form of social engagement that gets shaped through the interactions between the past (memories, habits), the future (alternative ways) and the present (ability to contextualise past habits within the contingencies of the present, and therefore imagine alternative possibilities) (Emirbayer, M., & Mische, A. 1998) to design a dialogue with algorithms that could regulate the personal awareness of privacy issues in relation to time. Hence the dialogue between people and algorithms became the application of the framework (Figure 2).

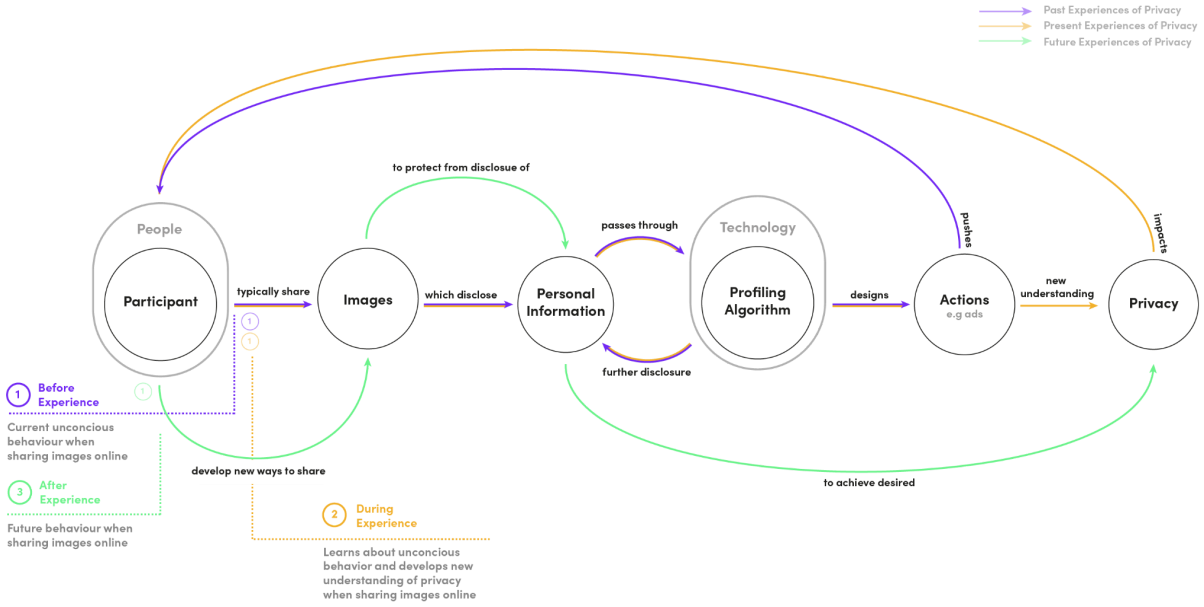

Figure 2 The influence of past, present and future experiences in changing the understanding of the risks of disclosing private information and reframing the relationships with profiling algorithms.

The use of images engaged participants with the conceptualisation and contextualisation of privacy; it also stimulated self-assessment which gauged the existing knowledge of privacy and the ability to use that knowledge to envisage ways to protect personal information (Irwin, T., 2015). Images, as the centre of this framework for the analysis and observation of

privacy, are “tangible” representations of something “owned”, memorable and personal. As images may trigger emotions, which in our research have been used to assess changes in awareness (Mohammad, S. M. 2016) (Figure 3), we channelled these to induce the manifestation of how it feels to be profiled based on (image) content that is intentionally published. This constructed a heuristic appreciation of the risks of disclosing personal information (Figure 2), and stimulated a reflection on the possible actions that could mitigate and prevent these risks. Our approach made an abstract concept like privacy tangible by simulating creative resolutive interpretation of the issue (Scupelli, P., 2015); algorithms, and any associated risks, have been described through personal experiences captured in images. This methodology formalised one’s privacy socio-technical system through the dialogue with algorithms, and expresses our transitional approach that allowed us to analyse and observe the dynamics that shape behaviours and attitudes. The tangibility of privacy supported by this experiential platform was the agent stimulating imagination and confidence for changing the perceived ability to protect private information.

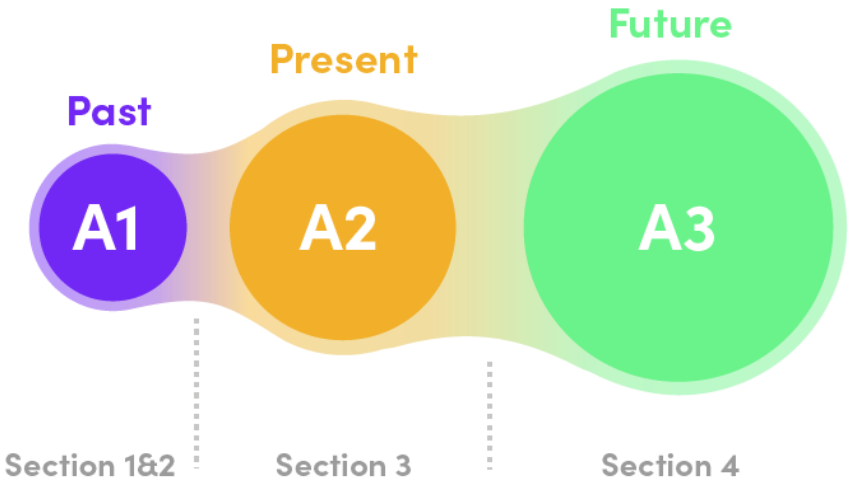

Figure 3 The increase of awareness (A1, A2, A3) across the four sections (Past / Present / Future) of the questionnaire.

Abductive thinking was key to support an explorative analysis of the responses people manifested through the experience (Dorst, K., 2018). Knowledge of privacy enhancing technologies was key for giving everyone a practical and measurable context to assess the awareness of algorithmic profiling, and the level of self-efficacy. The experience delivered by the questionnaire was not designed to ask people to report their behaviour or attitude towards privacy, but to expose them to the complexity of any privacy socio-technical system through the familiar context of images. The development of the experience was guided by Dorst’s (2018) three layers of practice – *Why* (the importance assigned to something), *How* (what strategies align with it) and *What* (the actions that can achieve *Why* through *How)*: we

used a combination of these layers to articulate one's reflection towards the ability to change, which manifested with the awareness of privacy risks.

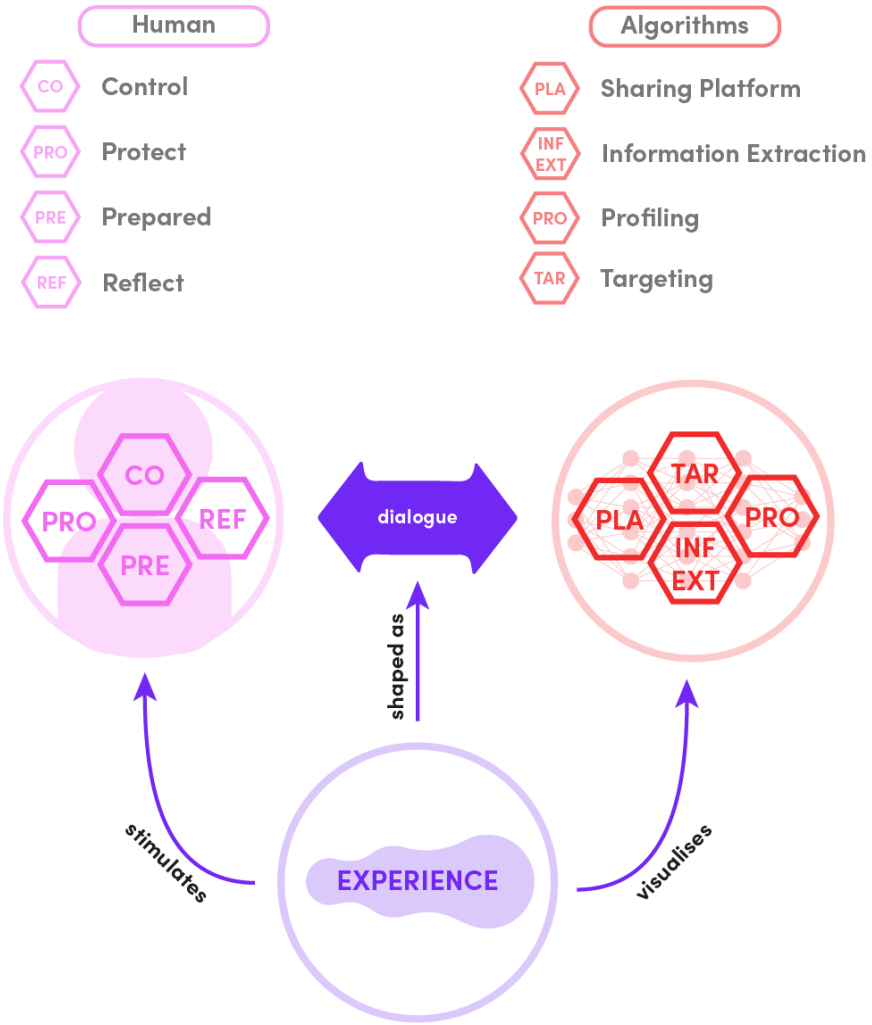

Figure 4 How a transdisciplinary approach structured a dialogue that stimulates people in engaging with privacy protective behaviours.

The focus on the interactions between people and technology aimed at stimulating people's imagination, judgement, creativity and practicality towards privacy protecting behaviours (Valtonen, 2020; Scupelli, P., 2015) (Figure 4); Dorst's *Why*, *How* and *What* fostered people's engagement with the complexity of the issue, and a transition approach to design integrated key social factors (e.g. identity) in the use of privacy enhancing technologies to challenge awareness, and knowledge, of the impacts (Norman, D., Stapper, P., 2015).

If previous research on privacy has catalogued the types of behaviours and attitudes to better understand what causes the privacy paradox, our study aimed to catalyse these as triggers of agency. We reviewed a study (Tufekci, 2008 in Krasnova, H., et al., 2009) analysing the behaviour of a group of college students towards the disclosure of personal information on social networks to understand how knowledge, skills, experience, education, gender and

age influence the ways people engage with responsible attitudes (and behaviours) towards private data (Boerman, et al., 2021).

Furthermore, our research has evidenced that approaching risk through creativity can stimulate a change of behaviour, attitude, values and culture (Ferrarello, L., et al., 2017; Ferrarello, L., et al., 2020; Norman, D., Stapper, P., 2015). This is because abductive thinking does not isolate the components of a system and evaluates them as both limitations and opportunities (Ferrarello, L., Dormor, C., 2021). The abductive approach associated with a transitional and socio-technical attitude to privacy was deployed to help both disciplines think of privacy as a co-evolving collaboration developed through creative system-thinking propositions (Dorst, K., 2018; Irwin, T., 2015). This perspective designed the experience to acquire a perceived ability to protect personal information.

3. Stimulating a Change of (Privacy) Culture through Design

3.1 Using experience to enable privacy awareness

With Dorst's *Why*, *How* and *What* guiding the design of the experience we developed a questionnaire, mixing qualitative and quantitative information to assess if awareness can stimulate change. This included an experiential dialogue that provides people the mental space to express concerns, emotions and, most importantly, the perception of being able to tackle online profiling, whilst interacting with algorithms in digital platforms.

The experience of dialoguing with algorithms was our methodology for triggering change through the participants' engagement and for testing whether privacy enhancing tools would be adopted by a wide, and diverse, segment of the population. Shifting to people, and their perception of privacy, created an understanding of the leverages that can change attitudes, emotions and behaviours (Norman, D, Stapper, P., 2015); the experience of dialoguing with algorithms provided us with the means to understand what people think of privacy and what factors influence (or not) a protecting behaviour (Figure 5). In this scenario design was the factor creating the conditions for change through stimulating imagination towards different, and effective, solutions.

Furthemore, the design of the experience leveraged our and the participants' mindsets. For us the need to develop a collaborative and co-evolving collaboration enforced self-reflection throughout the process, thus the ability to see opportunities. This open "posture" (Irwin, T., 2015: Manzini, E., 2015) improved our ability to listen, learn from each other and review our assumptions; it informed our mutual understanding of how we could design change. The dynamics of collaboration positioning Design as agent of change and Computer Vision as enabler of change clarified how we could transcend the respective disciplines to tackle such a complex system to foster (personal) transformation and learning (Irwin, T., 2015; Manzini, E., 2015).

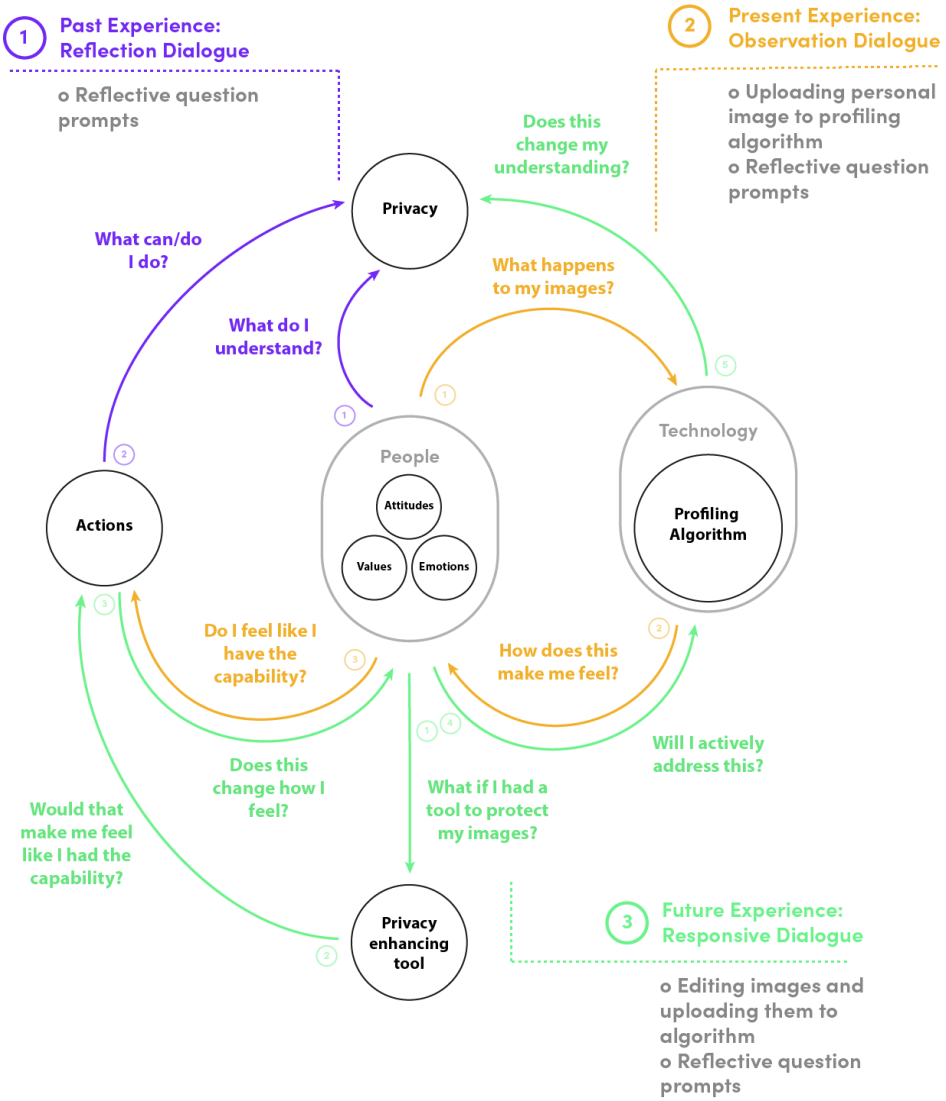

Figure 5 Experiential dialogue between people and technology through assessing their self-efficacy, understanding of privacy and use of privacy enhancing tools.

For the participants the experience channelled self-reflection to relate any existing (past), potential (present) and new (future) knowledge of privacy. Self-reflection stimulated changes of awareness and steered participants towards acknowledging possible means to protect private information. The tone of the questions was informal and represented a reality - and behaviours - most people are familiar with when socialising online through images.

3.2 The design strategy to stimulate change through conversations

The strategy we used to design the experience of the questionnaire used an abductive evaluation of the system interactions and feedback to stimulate change (Dorst, K., 2018) and any factor instantiating more favourable conditions (Manzini, E., 2015). Having identified the

dialogue as a key leverage for changing awareness and self-efficacy, we designed it as a platform to observe and analyse interactions. As a methodological framework we adopted Gordon Pask's "Theory of Conversations", for which dialogue is a loop between two or more conversants who transfer and exchange knowledge through reflection and negotiation. According to Pask, a conversation loop can shift intellectual positions, thus increasing knowledge that reduces uncertainty and fosters a higher level of self-efficacy (Bandura, 1982). Feedback is what triggers the shift (Pangaro, 2017).

Pask's theory classifies conversations in two categories: *descriptive*, when giving information that describes the subject of conversation; and *prescriptive,* when providing instructions stimulating action (Pangaro, 2017). The conversation between participants and profiling algorithms has elements of both categories: *descriptive*, the dialogue between the algorithm and the human that illustrates the consequences of disclosing private information; and *prescriptive*, the dialogue between participants and their self-assessment. The latter helps a person structure the process of self-reflection by facilitating the conversation between one's (existing and new) knowledge of privacy and one's imagination of using this to protect private information. The *prescriptive* element of the dialogue facilitates the evaluation of what can be done to change this by imagining possible actions (Dubberly, Pangaro, 2009). The *descriptive* element provides acknowledgement of the need for change because of the acquired awareness of the potential consequences of disclosing personal information.

The experiential dialogue was designed to provoke a cascade effect from *descriptive* to *prescriptive* to stimulate an increase of awareness. The growth in awareness was triggered through the participants' conversation with images, which was the way we manifested the presence of the profiling algorithm through pre-selected as well as personal images. This (1) guided the assessment of any (past) experience; (2) induced reflection on the ability to protect private information (present experience); and (3) shaped the imagination on how privacy protecting behaviours could be deployed (future experience) (Figure 6).

The conversations with past, present and future personal experiences fostered the acknowledgment of the consequences of disclosing private information. The *descriptive* value guided participants in articulating why privacy needs to be protected; the *prescriptive* account was used to evaluate the possible actions that can respond to the consequences of disclosing images with personal information. Conversation was used for participants to engage with abductive thinking and help them change; fostering *descriptive* and *prescriptive* conversations gave us the means to engage participants with the evaluation of alternative actions and solutions. This process guided people to adopt different "postures" towards privacy (Irwin, T., 2015).

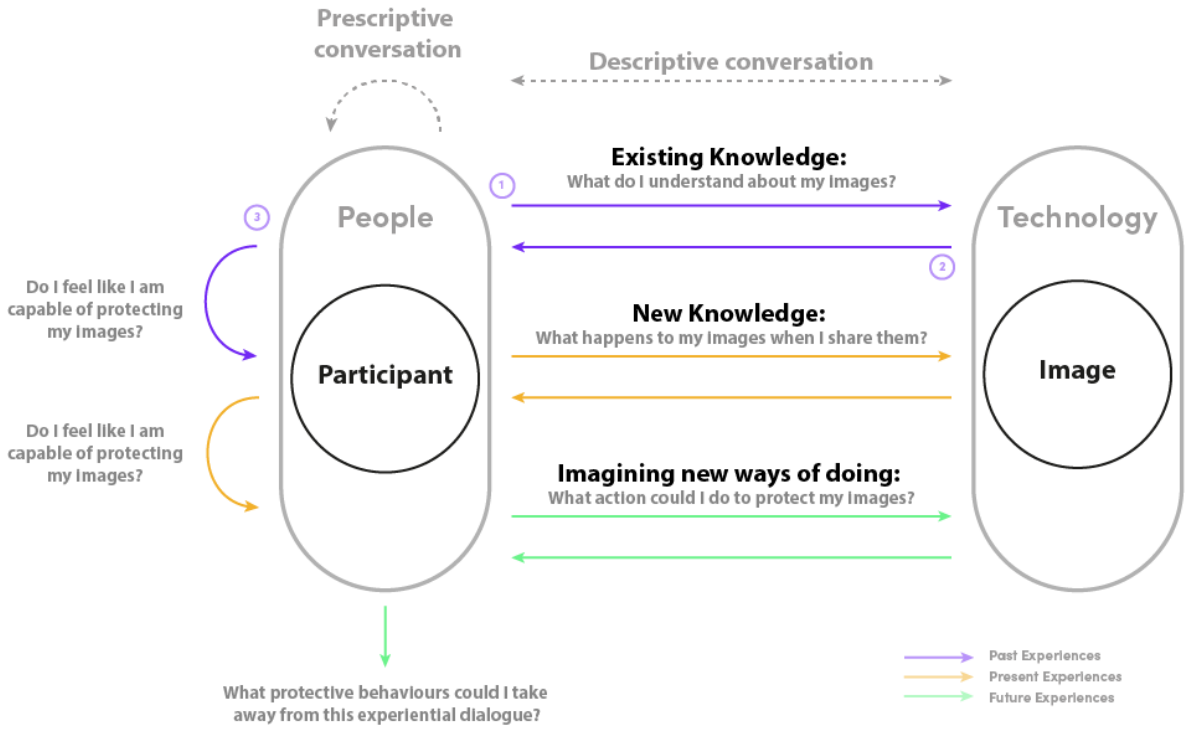

Figure 6 - Prescriptive and descriptive conversations fostering new protective behaviours

Through Pask's Theory of Conversation we designed participation as a subjective and reflective experience across the past, present and future (Dubberly, Pangaro, 2009).

4. The Questionnaire Experience

4.1 Designing the experience

The questionnaire is composed of four sections that represent the past (Section 1 and 2), the present (Section 3) and the future (Section 4). The four sections consist of thirty cards, which contain ten quantitative and nine qualitative questions, comments or actions, such as uploading an image. Figure 7 shows a snapshot of the interface which is based on the navigation experience of Instagram to provide participants with a familiar context to the dialogue between people and algorithms.

The four sections structure the experiential dialogue that gives form to the profiling algorithm. We followed Bandura's (2000) approach on how people differ in their sense of efficacy through four major processes (Figure 8), namely cognitive (visualising future scenarios that can be used as guides for actions), motivational (propensity to act), affective (regulation of emotional state to act) and selective (choosing environments to act).

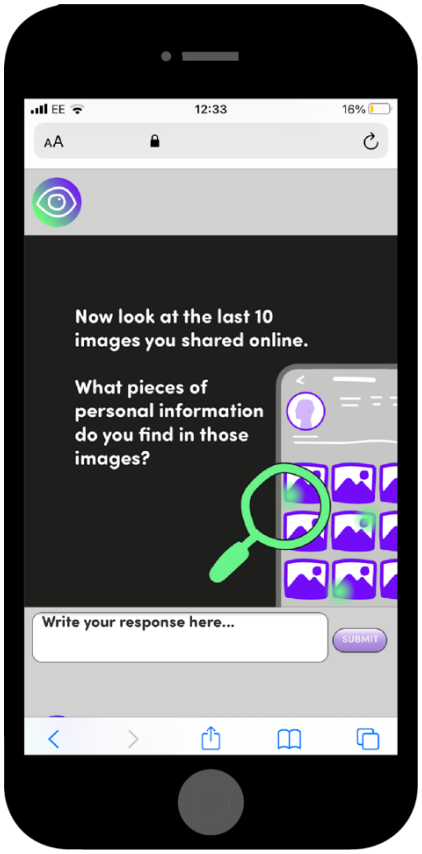

Figure 7 - Snapshot of the interface designed for the questionnaire to enable an experiential dialogue

In Section 1 we assess the capacity to identify any private information in three pre-selected images and among the last twenty images posted in social networks by the participant (past experience). Section 2 enquiries how this information could be protected and how often one would be willing to do so (present experience). In Section 3 a personal image already published in social networks is uploaded on the platform and scanned by an algorithm, which extracts any relevant information to profile the person. The result of this analysis is illustrated with a custom-designed advertisement showing the bidding of the detected personal information to third parties, which is actioned by the algorithm. The bidding is a narrative we developed to show the consequences of being profiled, which motivates participants to express how they feel. This emotional response was used as a form of assessment and validation of the willingness to act and use custom filters to protect privacy. The concept of these filters was designed and implemented to prevent algorithms from predicting personal information from images while maintaining their perceived quality (Sanchez-Matilla, et al., 2020) (Shamsabadi, et al., 2021). Finally, in Section 4 we invite participants to define privacy and comment on the experience.

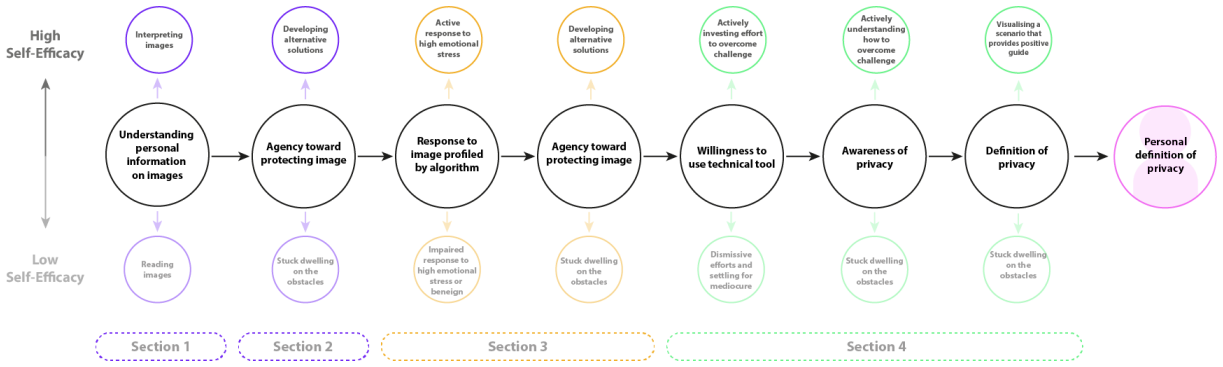

Figure 8 - The self-efficacy journey through an experiential dialogue (Bandura, 2000)

4.2 Reflections on the participants' engagement with the questionnaire

Over two hundred participants experienced the questionnaire, revealing different levels of self-efficacy; for some this was an effective way to learn more about digital privacy, as evidenced by the high variability of self-efficacy across the sample group we engaged with.

The data analysis has been the ultimate litmus test of our assumptions, as we could assess the extent to which engaging with the experience personally connected participants with privacy to stimulate awareness. The analysis of the data revealed that the semi-structured questions, formalising the *descriptive* and *prescriptive* dialogue, gave space for reflection and learning. Through the analysis of the attitudes and behaviours participants manifested across the questionnaire we were able to develop a better understanding of the impact of the conversations in generating a transitional experience; this implied the revision and realignment of our initial objective to analyse the definition of privacy, which led the strategy for designing the experience: with the data analysis we discovered that conversations were key for generating change, as the *descriptive* and *prescriptive* conversations helped people draw from their personal experience to engage with the questions.

From the participant's perspective, dialoguing with profiling algorithms was an eye-opening experience that stimulated the reflection on the risks we are exposed to for which the large majority expressed concern, especially regarding how the owners of social networks may use personal information. This was evidenced by quotes such as:

> *I think this was an interesting experience and opened my eyes to how even the simplest of images can contain a lot of personal references that can be used to build a profile. I think the format was engaging and flowed well.*
>
> *I am very pleased that I have done this survey as it has opened my eyes to what can happen when I share photos online.*

The questionnaire provided to some the affordance to understand the process of algorithmic profiling and how this can be mitigated using our custom filters that were made available with the interface:

> *This was fantastic, really opened my eyes into how easy it is to take personal information and target and sell advertisements to you, that you aren't ever in control of your data online, unless you have a filter.*

Others felt unable to protect their private information, despite having developed knowledge about the risks of algorithm profiling and the protection enhancing tools may provide:

> *This experience was really thought provoking and I am shocked at how easy it is for companies to get information on us. However I don't feel this has helped me to understand how to protect myself more.*

Some of the participants validated the use of interactive narratives as a method to guide the understanding of abstract and difficult concepts, like privacy; some of the comments highlighted that the experience helped them reflect on the impacts and consequences, which increased knowledge and awareness of the risks of a careless disclosure of private information:

> *A wonderful survey highlighting some particularly scary thoughts about what might happen when posting online. Really enjoyed the interactive side and the 'shock' factor.*
>
> *I found it very interesting and a bit chilling as well. The amount of hashtags created from a simple picture was scary and made me feel very exposed. I think I'm my head I need to remember that this is AI and algorithm generated which makes it a much quicker and more effective way of gathering my information and breaking my privacy.*

Many of the participants became aware of the use of images for extracting private information:

> *It was a very interesting experience and I was surprised how much I learned about the amount of information extracted from photos.*
>
> *It was great to see a real life example with one of my own images to truly understand how information is gathered.*
>
> *This was a useful tool for showing what data can be found from a simple image.*
>
> *Very interesting experiment. Enjoyed taking it and the layout was simple. Learned a lot about online privacy, such as how easy it is for an algorithm to pick a photo apart.*
>
> *It was very informative to find out all the information that can be found out from a single image. Also I think it is very clever how the filters work to protect your information.*

Finally, several participants recommended that we engage more vulnerable sections of the population in this type of experience, to help them develop knowledge (and awareness) of the risks of sharing images:

> *It would be great for elderly to see and understand.*
>
> *I think that this kind of experience should be mandatory for schools everywhere in order to educate kids growing up who will be exposed to such usage of social media in order for them to understand early on how important it is to protect yourself.*

> *I found this survey really informative and it opened my eyes to the loopholes within privacy online. I feel this should be further rolled out to the general public particularly to schools as the majority of young people post online.*
>
> *This experience has taught me to think before sharing personal information on social media platforms. In just one photo anyone can take a lot of information regarding yourself and use it in a very negative way. I will be passing on this to my friends and family and make them aware of these situations.*

5. Conclusion

In this paper we have discussed how a transdisciplinary approach that emerged from Design and Computer Vision supported the study of the factors stimulating, or discouraging, privacy protecting behaviours. The model of collaboration we adopted created the premises for shifting from user-centred design to designing socio-technical systems, where solutions account for the types of social and technological complexities and interconnections that exist in a system. Working through a transdisciplinary approach changed our and the participants' "posture" (Irwin, T., 2015), which indicated what should be designed to help people change their attitude towards more protective behaviours. With this research we explored our hypothesis that privacy should be studied as the set of interactions between people and profiling algorithms, as illustrated in Figure 1.

Analysing the dialogue between a person and the algorithm as a set of responses that people express when dialoguing with the algorithm has demonstrated that complexity could be tamed. We used design to explore and (re)design the relations between the nodes of the system (e.g., behaviour, emotions, values) to lower complexity by distributing this across the nodes (Manzini, E., 2015). Redesigning the relations is what stimulated awareness and agency in our research (Manzini, E., 2015). Hence, these types of interactions could be described with a map (Figure 9) which is one of the possible configurations that could generate a "posture" that participants could adopt to engage with the issue of privacy.

We believe that the methodology we described in this paper could be beneficial to address behavioural change for other complex yet abstract problems for the general public, such as climate change and cyber security.

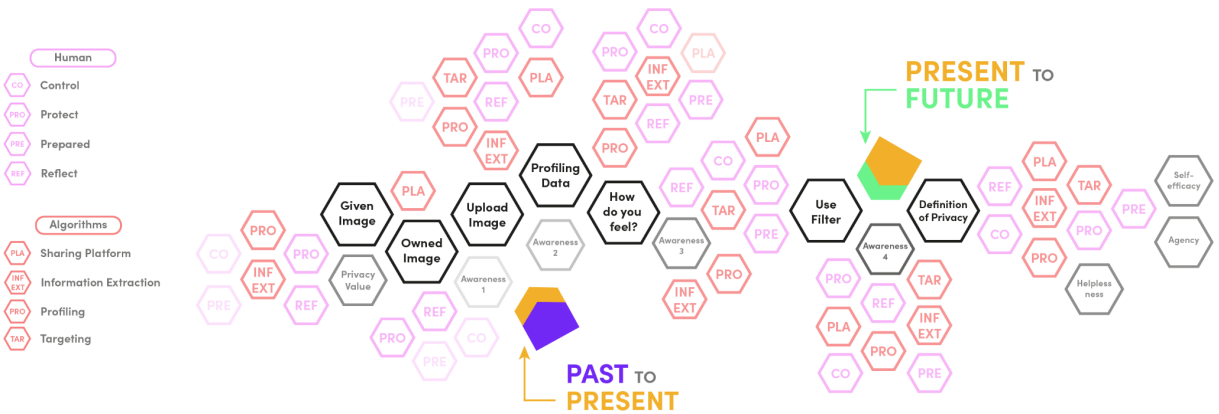

Figure 9. The experiential dialogue described through the human and algorithm systems

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About the Authors:

Laura Ferrarello is the MRes Design Pathway Leader at the Royal College of Art, School of Design. Laura investigates design-led methodologies for inclusive innovation, and change, tackling complex problems. She researches ethics and design, design for resilience and human-led AI innovation.

Rute Fiadeiro is a PhD Candidate at the Royal College of Art, School of Design. Rute's PhD investigates design methodologies for people's engagement in gender-based violence focused humanitarian innovation. Rute's research interests include gender and feminism, social and humanitarian design, people engagement.

Riccardo Mazzon received his PhD in Electronic Engineering from Queen Mary University of London in 2013. He is a Research Manager with the Centre for Intelligent Sensing and his research interests include video processing and analysis, camera networks and privacy.

Andrea Cavallaro is Professor at Queen Mary University of London and Turing Fellow at The Alan Turing Institute, the UK National

Institute for Data Science and Artificial Intelligence. Andrea's research interests include Computer Vision, Audio Processing, Robot Perception and Privacy.