

# Shaping The Future: Developing Principles for Policy Recommendations for Responsible Innovation in Virtual Worlds

Policy Recommendations for Virtual Worlds

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As Extended Reality (XR) technologies continue to evolve at a rapid pace, they hold the promise of transforming the way we interact both with digital information and the physical world. Whilst Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR) technologies offer unbridled opportunities for social connections, productivity, and play, these rapid technological advancements also pose critical challenges to ethics, privacy, accessibility, and safety. At present, there is little policy documentation that directly addresses the novel affordances posed by XR technologies, leading to a 'policy void' in this space. Having clear and effective policy frameworks prior to the widespread adoption of technology encourages and enables responsible and ethical innovation of XR technologies. This workshop is therefore dedicated to developing forward-thinking principles to guide policy recommendations that address potential future vulnerabilities posed

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by the widespread adoption of XR technologies whilst simultaneously encouraging the responsible innovation of new advancements within XR. To ensure these policy recommendations promote responsible innovation, the workshop will assemble multidisciplinary academics, industry developers and international policymakers. Our goal is to ensure that all perspectives are considered such that we can collaboratively chart a responsible and sustainable course for the XR landscape.

**CCS CONCEPTS** • Human-centered computing → Human computer interaction (HCI); Virtual reality • Security and privacy → Usability in security and privacy • Social and professional topics → Computing/technology policy

**Additional Keywords and Phrases:** Extended reality, policy recommendations, responsible innovation

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## 1 Introduction

The widespread adoption of extended reality (XR) technologies has undoubtedly opened up exciting new frontiers in research, entertainment, and education, but its growing prevalence has also raised concerns about potential vulnerabilities. Clearly, real life has numerous harms, and interactions with society through technology are susceptible to the same and potentially others. These vulnerabilities include questions around perceptual manipulation [16], data privacy [18], child safeguarding [5], ethical dilemmas [22] and security [20], to name a few. Presently, several governments, including the European Parliament [13] and the Australian Commonwealth government [24] have commissioned whitepapers to understand the potential risks associated with the metaverse, however, current policy developments remain disparate and unable to extend beyond national barriers. Given the global nature of XR technologies and virtual worlds, it is necessary to move towards a consensus on the appropriate governance of these emerging technologies. We believe that the earlier that comprehensive and coherent policy can be developed, the greater the potential for responsible innovation for big and small companies alike. In this workshop we will be considering a range of topics including consent and consent systems in virtual worlds, international data access, storage, and protection, high realism and high personalization avatars, and moral and ethical frameworks of social behavior in virtual worlds.

At present, there is little research which attempts to systematically assess whether and how current technological policy is suited to addressing the new vulnerabilities posed by XR technologies, and subsequently, where technological policy currently falls short. In this workshop, we aim to bring together diverse stakeholders across XR research, including HCI researchers, experts in technological policy, and industry specialists in order to co-create a set of principles for policy recommendations that aptly captures a multitude of stakeholders' voices and perspectives. To be effective, policy must strike a delicate equilibrium between safety-focused regulation and regulations that foster responsible innovation; this workshop aims to identify that equilibrium through structured debate and discussion. The workshop will take into account that we deal with policy making under deep uncertainty, related to the speed and diversity of technological development. Our methods to support the discussion will address this challenge.

During the workshop, participants will be divided into separate groups, each concentrating on a particular interaction process with technology that may result in vulnerabilities. These six processes (derived from [4]) are; individuals accessing content; individuals providing information or creating content; manipulations and dark patterns; misuse, abuse, and accessibility; data access and storage via advanced tracking capabilities; and data processing and algorithmic concerns. More detail and examples of these processes is provided below. Each group will discuss and identify how these processes may create new vulnerabilities that result from the novel affordances of XR technologies. Following this group

discussion, the groups will present their thoughts back to the other workshop participants. We will then ask participants to regroup to discuss how effectively policy can tackle these vulnerabilities and where it falls short in addressing them.

As consumer-level VR technology is quickly growing but not yet pervasive, now is the ideal time to put structures in place at every level, including conception and design, implementation, policy and governance, and research and assessment. Throughout this workshop, we aim to refine the proposed model, generate potential paths to harm reduction, and to record this process and outcomes in a white paper or peer-reviewed article detailing policy recommendations. We will develop a template prior to the workshop and collectively construct the article throughout the workshop with input from all participants and organizers. This is particularly important to keep vulnerable users like children, young adults, and elderly people, and their data safe when the use of XR technologies will be one ubiquitous in the future. The second aim of this workshop is to create a network of interdisciplinary researchers from design, HCI, game development, psychology, computer science, and policy to ensure that we can address these tenets at every level moving forward.

We are particularly keen to discuss these issues at CHI 2024 due to the interdisciplinary nature of CHI, and the range of global expertise that we will be able to assemble. Whilst several of our co-organizers have previously hosted CHI workshops exploring the ‘Novel Challenges of Safety, Security and Privacy in XR [7], and the ‘Abusive Ethical, Social and Political Implications of Mixed Reality Research’ [6], we believe that using these insights to inform policy recommendations is the next step to ensuring that this expertise directly informs the future development of these technologies. Of note, we have also secured external funding to be able to host a keynote speaker for this workshop. By ensuring that the workshop garners diverse participation across academia, policy and industry, this collaboration aims to produce global policy recommendations which encompass the views of the key stakeholders.

## 2 Background

This workshop will cover a diverse spectrum of potential vulnerabilities that arise from interactions with XR technologies. The six processes below offer a starting point for assessing potential vulnerabilities.

### 2.1 Potential vulnerabilities arising when users access content on XR devices

There are a number of potential vulnerabilities which result from users viewing or experiencing content in virtual worlds. These include harmful types of content such as misinformation [25], violent or extremist content [11, 27] and hate [21] to forms of harmful contact such as harassment [28], cyberbullying [15] or catfishing [29]. It has been suggested that the harm caused by viewing, experiencing or accessing harmful material using virtual reality headsets has the potential to be more insidious than in other forms of technology such as Web 2.0 or multiplayer games, due to the enhanced realism of virtual worlds [19].

### 2.2 Potential vulnerabilities arising when users create content or supply information on XR devices

In addition to the potential vulnerabilities associated with accessing content, there are also significant risks involved in the creation or supply of content or information. For example, delineating between public and private spaces in virtual worlds and the influence that this delineation has on self-censorship [1]. Another area for concern is through the granting of consent, i.e., how appropriate and inappropriate behaviors are negotiated and mutually agreed between individuals [30].

### 2.3 Potential vulnerabilities arising from the storage and collection of XR data

One primary concern for XR technologies relates to data privacy and security. XR devices allow for much more comprehensive forms of data tracking, including user movements and activity (limbs, facial expressions, speech), neural activity (EEG for brain-computer interfaces), contextual data (e.g., location data) and physiological data (e.g., eye-

tracking or heart-rate variability) [14]. In addition to this, these data may be processed to reveal more intimate and personal details about an individual, such as their desires, abilities, and preferences. In this way, XR offers an extended frontier for surveillance capitalism [2]. Importantly, this relates not only to users of the technology, but also bystanders whose data may be captured as a result of their proximity to XR devices [14].

A further concern relating to the collection of sensitive data pertains to how that data are securely stored. Unauthorized access to sensitive personal data – through data breaches or hacking – poses a very significant risk for users of XR technologies [9].

## **2.4 Potential vulnerabilities arising from the processing of XR data**

As well as risks associated with the processing of information to reveal sensitive or personal attributes about individuals or groups, there is also concern about the environmental consequences of the scale of processing needed for the smooth running of persistent, real-time, synchronous virtual worlds [1]. However, there are others who suppose that the metaverse may actually prove to be carbon neutral or negative by virtue of the reduction in travel necessary for work or tourism and the advances in scientific research that can be made through digital twinning [10]. Understanding how to ethically and safely process XR data may become central to many future business models, contributing to a sustainable future of XR technologies.

## **2.5 Potential vulnerabilities arising from the design of XR user interfaces and experiences**

A further area of concern is how these technologies are designed to influence or nudge users in particular directions. For example, dark patterns are deceptive techniques designed to distort a users' ability to make free and informed decisions. They are interface designs that encourage users to make decisions that benefit the platform owner or other commercial interest, rather than the user themselves. Examples of dark pattern designs in VR or AR systems include concealing settings or user preference options, in order to prevent users from changing the settings away from the default values [3, 26]. In addition to this, there have been several concerns around advertising practices in the metaverse [8]. Importantly, manipulation may not occur only on a commercial or advertising basis but could also be used for political persuasion. VR experiences could also be highly addictive, resulting in users prioritizing virtual experiences over real ones [22].

## **2.6 Potential vulnerabilities arising from accessibility issues or the misuse of XR**

There are also concerns around accessibility of XR technologies, particularly for those with bodily impairments such as visual or hearing deficits or for those who are not 'digital natives'. Those with limited access to high-speed internet, advanced XR equipment, or the necessary technical expertise might find it difficult to fully participate in and benefit from the metaverse's opportunities for social interaction, education, and economic activities.

There are also several physical or bodily harms that could result from excessive use of VR technologies. For example, cybersickness is a common symptom of VR and XR use, with users commonly reporting symptoms related to disorientation (e.g., dizziness, vertigo, and difficulty in focusing), nausea (including stomach awareness and increased salivation) and oculomotor disturbances (e.g., headaches, eyestrain and blurred vision) [17, 23]. Additionally, longer time impacts of cybersickness have also been reported such as postural instability, deficits in hand-eye coordination, long term vision problems and impacts on general well-being [12, 23]. These effects may result from sensorimotor adaptations to the immersive experience.

In sum, the way users interact with technology and the way in which technology is designed to promote different kinds of interactions is key to understanding the risks associated with XR use. By breaking XR technologies down into these six risk categories, we aim to get to the heart of how design decisions and affordances promote less safe interactions with technology. Building upon prior work in this area, we will use these six risks to assess the coherence and comprehensiveness of existing technological policies. These include policies such as: the EU's General Data

Protection Regulation (GDPR) laws and Digital Services Act (DSA); the US's California Consumer Privacy Act (CCPA) and Computer Fraud and Abuse Act (CFAA); the UK's Online Safety Bill (OSB) and Computer Misuse Act (CMA); and, Australia's Privacy Act and Online Safety Act.

### 3 Organisers

**Mike Richardson (lead organizer)** is a postdoctoral research associate at the University of Bath in the Department of Psychology working on the large-scale MyWorld project ([www.myworld-creates.com](http://www.myworld-creates.com)), a centre of creative technology innovation. His work includes understanding perceptual, cognitive, and spatial processes underpinning immersive experiences as well as the implementation of technological interventions for accessibility.

**Alicia G. Cork (lead organizer)** is an interdisciplinary postdoctoral research associate at the University of Bath, whose research addresses psychological understandings of online and virtual reality harms. She is part of the National Research Centre for Privacy, Harm Reduction and Adversarial Influence Online, as well as being an associate fellow of the Research Institute for Sociotechnical Cybersecurity.

**Danaë Stanton Fraser** is a Professor in Human-Computer Interaction from the University of Bath and leads the CREATE Lab. Danaë's research focuses on the design and evaluation of mobile and ubiquitous technologies for interactivity and learning. Her current research interests include developing a toolkit to measure audience experience of creative content, transfer of spatial skills from virtual to real spaces and the effects of avatar personalization.

**Michael J. Proulx** is Reader in Psychology and Director of the Crossmodal Cognition Lab at the University of Bath. He is also Co-Director of the REVEAL Research Centre (REal & Virtual Environments Augmentation Labs) in the Department of Computer Science. His research focuses on the cognitive science of human-technology interaction, with particular interest in inclusive design and accessibility for visual impairments, multisensory perception, comparative cognition, and technologies such as AR and VR.

**Xueni Pan** is a Professor of Virtual Reality at Goldsmiths, University London and co-lead the Social, Empathic, and Embodied VR Lab (SEE VR Lab). Xueni's research focuses on developing VR applications for health and healthcare applications, including training and therapy; she is also interested in using VR as a tool for research in social neuroscience and moral psychology. She also co-leads the Masters in Virtual and Augmented Reality at Goldsmiths Computing.

**Veronika Krauß** is a postdoctoral researcher at the Institute for Verbraucherinformatik, University of Siegen and University of Applied Sciences Bonn-Rhein-Sieg. In her research on HCI and XR technology, she focuses on design and prototyping practices of XR media and emerging next generation dark patterns.

**Mohamed Kamis** (<http://www.mkhamis.com/>) is an Associate Professor at the University of Glasgow, where he leads the SIRIUS Lab. The SIRIUS lab focuses on understanding threats to privacy, security and safety that are facilitated by ubiquitous technologies, such as XR, and designing human-centered system to mitigate said threats. His interests include child safety in Social VR, XR sensing privacy, and secure authentication in XR.

**Heide Lukosch** is an Associate Professor at the HIT Lab NZ, University of Canterbury, New Zealand, where she leads the Applied Immersive Gaming Initiative (AIGI). In her research on immersive technologies and games, she includes perspectives of equity and inclusivity, and explores how immersive technologies can offer engaging and safe spaces for learning, training, and decision-making.

### 4 Link to Website

Our website with details of the workshop is hosted at <https://shapingthexrfuture.my.canva.site/>. We will publish successful workshop delegates' submissions here.

### 5 Pre-workshop plans

Given that the workshop's aims are broad and cover the fields of HCI, psychology, policy, industry, and academia, it is crucial that our attendees reflect these domains. As such, we will advertise the workshop through these communities globally. We will leverage our contacts within industry – sharing the call for participation within Meta, Microsoft and

smaller XR companies such as those associated with MyWorld. We will also leverage our contacts within the policy sphere, for example using the well-established REPHRAIN policy network, in order to connect directly with those tasked with implementing these recommendations.

We aim to record the outputs of the workshop in a live document that we populate throughout the day. Prior to the workshop, the organizers will draft and develop this document to ensure that it is able to capture the outputs concisely, without negatively imposing on the day. As a major outcome of the workshop is to produce a policy and design recommendation paper, this document will be structured as such, but with each section blank, ready for population on the day. Additionally, we will ask everyone to provide us with a 1-minute video of their submission prior to the workshop, so that the participants can familiarize themselves with each other prior to the event.

## 6 Asynchronous engagement

Although we plan to run the workshop in person to encourage more intimate networking and to offer a safe space where people feel comfortable discuss potentially difficult topics, we want the workshop to be as inclusive as possible, and, will offer several ways for individuals to asynchronously engage with the workshop in circumstances where they are unable to attend in person. Primarily, the live document that we will generate throughout the day will give a representation of our discussion as it progresses. This document will be hosted indefinitely on the workshop's webpage. The webpage will also publish and host the position papers from each of the successful delegates. These papers will be available prior to the workshop to allow people to investigate the experiences and backgrounds of their fellow delegates, as well as for others not attending the workshop to engage with the topic and gain a holistic understanding of the process that led to the creation of the policy recommendations. The paper will be available at our website and on ArXiv. During the workshop, we will also create a Slack channel for participants to contribute to the discussion and ideas.

## 7 Workshop Structure

The workshop will follow a basic four-section structure: Introductions; Discussions; Refining; Creating. The workshop will take place over the course of a whole day, with breaks and lunch scheduled between sections for networking and organic discussions between participants. Due to the potentially sensitive topics underlined for the day, the workshop will be in person only so that all attendees are presented equally. The workshop will also not be audio-visually recorded to maintain a safe space for discussion (however, we will be updating the output document throughout the day).

The tentative schedule for the workshop is as follows:

### **09.00 - 9.30 Introductions**

Workshop organizers will welcome participants and introduce themselves. The participants and organizers will present their backgrounds and the knowledge that they bring to the table through lightning talks. These talks will include a short question-and-answer section to encourage discussion from the start.

### **09.30 - 10.30 Opening Keynote**

Following the participant's introductions, we will hear from our keynote speaker. We have secured external funding to host a high-profile keynote speaker. It is our hope that the inclusion of a high-profile speaker will encourage greater diversity of applicants for the workshop. We will encourage the keynote to invite participants to think critically and creatively about vulnerabilities and responsible innovation within XR.

### **10.30 - 11.00 Break**

### **11.00 - 12.30 Discussion Section**

Participants will break off into six groups, each containing a mixture of experiences and expertise. Each group will take one of the six processes of potential vulnerabilities to harm outlined above. Each group will refine their given part of the model, with the freedom to adapt and change it as they see fit. The groups will discuss potential harms at a local, national, and international level and contribute potential solutions.

### **12.30 - 13.30 Lunch Break**

### **13.30 - 14.30 Refinement**

Groups will present their outcomes from the discussion section to the wider workshop, refining the model with contributions from the other groups. This section is particularly designed to create links between the types of harms and attempt to move towards a set of universal solutions to the harms proposed in the discussion section.

#### **14.30 - 15.00 Break**

#### **15.00 - 18.00 Creation and Consolidation**

The last section of the day will put everything together from the workshop. Participants will join new groups and collaboratively populate the outcomes document. It is our hope that doing this activity during the workshop rather than after will lead to a more fruitful outcome. The outcome document will already be created with blank sections that require population, and we will utilize online collaborative writing software to co-produce this paper in real time.

## **8 Post-Workshop Plans**

Organizers and participants will continue to refine the outcome document, ready for submission to an ACM journal or other relevant outlet. An additional desired outcome might build on the findings presented in the outcome document to lead to a special issue on the topic for a wider and more detailed exploration of interdisciplinary solutions to potential harms in virtual worlds. If there is an appetite for such a special issue, we will hold continuing online sessions for those interested in collaborations. However, this would be an additional goal, rather than a core goal of the workshop, with the primary focus being the policy recommendation paper that we aim to complete during the workshop.

## **9 Call for Participation**

We invite participants to submit a 2-page position statement which demonstrates their interest and knowledge relevant to the topic of the workshop. Position statements may include previously completed research, future planned research or novel perspectives on key issues relevant to the notion of vulnerability and responsible innovation in XR.

Exemplar topics may include:

- Knowledge of existing technological policy and its adequacy for addressing XR vulnerabilities
- Ethical implications of XR
- Ethical dilemmas within XR
- Challenges for data privacy within XR
- Content creation and consumption vulnerabilities within XR
- Algorithmic vulnerabilities associated with XR
- Abuse and misuse of XR
- Accessibility, inclusivity and equality questions surrounding the use of XR
- Deceptive patterns within XR design
- Novel data sources within XR
- Consent in virtual environments
- High realism and high personalization avatars
- Moral and ethical frameworks of social behavior in virtual worlds.

We encourage participants to submit novel perspectives on XR vulnerabilities and policy concerns, as we are aiming to curate a diversity of ideas at the workshop. Additionally, we will ask successful participants to provide us with a 1-minute video of their submission prior to the workshop, so that the participants can familiarize themselves with each other prior to the event. All successful workshop participants must also register for at least one day of ACM CHI 2024.

Our call for participation will be hosted at <https://shapingthexrfuture.my.canva.site/>.

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