# Framework for Social XR: Navigating Challenges, Ethics, and Opportunities for Authentic Community Engagement

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**ABSTRACT**

Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) redefine community engagement, posing challenges in user experience, privacy, security, inclusivity, and authentic interactions. This work proposes strategies for authentic community interactions in virtual realms, presenting a framework for ethical engagement through AR/VR/MR. Assessing industry trends, we categorize XR potential and challenges into Users, Technology, and XR experiences, emphasizing research gaps and opportunities for addressing social goals. We review and propose strategies to navigate the ethical considerations, inclusive design practices, and user satisfaction metrics to foster genuine connections across boundaries.

**Keywords**: XR, community engagement, social purposes, presence, ethical design

**Index Terms**: Ethics, presence, community, authentic interaction

## 1 INTRODUCTION

The emergence of Extended Reality (XR), encompassing Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), has fundamentally altered our perception of the world. One of its most impactful areas lies in fostering community engagement, transcending geographical barriers and enabling meaningful interactions. However, this promise is accompanied by challenges, particularly in navigating the ethical complexities inherent in these technologies within community settings [1]. We present a conceptual framework to inform future research, design, and policy-making, for responsible and deeply engaging applications of XR in community interactions.

## 2 THEORY

Social purpose in the context of VR technology is usually referred to using VR to foster positive social interactions, facilitate communication, and promote meaningful connections among individuals or groups [2]. It involves harnessing the immersive and interactive nature of VR to serve various social goals and objectives to enhance social interactions, promote empathy, and address various social needs and goals.

VR technology offers a unique platform for fostering social interaction and presence. It enables individuals to overcome physical barriers, facilitating real-time communication and collaboration in a virtual environment [3]. There is a divide in the definition of social presence, particularly in terms of whether it is primarily a cognitive or behavioral phenomenon. More recent interpretations of presence as a belief, i.e. a cognitive phenomenon, have been challenged by a body of VR research positioning presence as an illusion and therefore as a behavioral phenomenon [4]. As VR technology continues to evolve, a unified understanding of "presence" will be crucial in maximizing its potential and effectively addressing its challenges.

## 3 RESEARCH CHALLENGES

In the landscape of Virtual Reality (VR) for community engagement, several pivotal challenges and ethical concerns need attention. User Experience (UX) and Comfort are critical, given the physiological and psychological implications, including motion sickness and extended immersion effects, impacting users' well-being [5]. Data Privacy and Security rise as essential concerns with the accumulation of sensitive user data and the susceptibility to cyber-attacks, necessitating robust protective measures. Technical limitations, cost, and scalability concerns hinder widespread access, affordability, and quality experiences for diverse communities [6]. Ethically, the Digital Divide poses risks of exclusion, while concerns of Representation, Inclusivity, and Accessibility demand platforms that don't reinforce biases and are universally accessible [7]. Finally, ensuring the Authenticity of Virtual Interactions is critical, guarding against deceptive behaviors and preserving the depth of face-to-face connections.

### 3.1 Experiencing together – physical space as a connecting space

Examples during the pandemic, like BREATH by the English National Opera, illustrate VR's potential beyond concerts, fostering connections for healing and well-being [8]. Emerging research in performing arts explores the interaction between physical and virtual spaces in XR, enhancing presence for musicians performing in virtual concert halls. Scholars highlight the importance of authenticity in XR interactions, emphasizing the role of presence, high-fidelity design, and diverse communication modes in fostering genuine connections [9]. Strategies involve encouraging shared experiences, empathetic exchanges, and opportunities for self-expression to deepen connections [10]. Understanding human behavior and incorporating social cues into XR experiences is crucial for nuanced interactions [10]. To foster a sense of community requires moderation, guidelines for respectful engagement, and personalization tools for users, emphasizing a blend of technological innovation and user-centric design for authentic connections in XR spaces.

## 4 FRAMEWORK

We analyzed the present industry trends and the state-of-the-art in employing Extended Reality (XR) for communities. The analysis reveals significant potential as well as crucial challenges, which are organized into a three-layered framework: Users (Communities), Technology, and Content (XR experience). Each layer encompasses distinct challenges that need to be addressed to shape the future of using the technology for such purposes. The challenges associated with the community (users) layer predominantly pertain to the comprehensive user experience, including representations, accessibility, and inclusivity. These aspects encompass ethical considerations. In the technology layer, challenges are linked to scalability, comfort, ergonomic considerations, as well as data privacy and security. The experience layer, despite its direct connection to the other two layers—

technology and communities—primarily centers on the authenticity and depth of interactions.

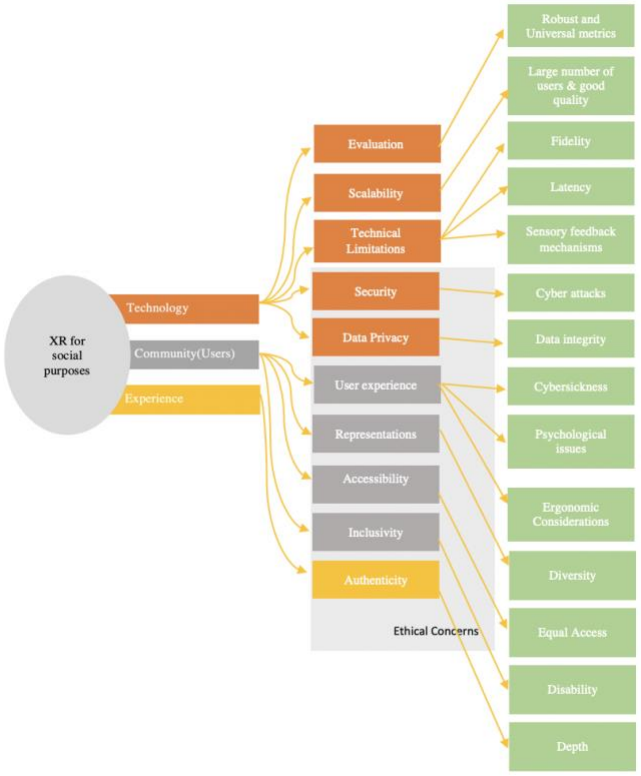


Diagram 1: Conceptual Framework of challenges, ethical concerns and opportunities for research.

## 5 Conclusion

In conclusion, the rise of AR, VR, and MR technologies in the digital era has indeed transformed the landscape of community engagement, creating a myriad of opportunities for fostering positive social interactions, enhancing communication, and promoting meaningful connections across various domains. To ensure authentic and meaningful social interactions in Virtual Reality (VR) spaces, a multi-faceted approach integrating technological innovation, user-centric design, and an understanding of human behavior is pivotal. Strategies encompass fostering a sense of presence within XR environments through high-fidelity graphics, intuitive user interfaces, and real-time feedback systems, minimizing the divide between users and their virtual settings. Additionally, prioritizing diverse communication modes and interaction styles within XR spaces can enhance authenticity, catering to varied user preferences. Building a supportive community within these environments is equally crucial; encouraging shared experiences, meaningful activities, and collaborative storytelling fosters a sense of belonging among users. Creating avenues for self-expression, empathetic exchanges, and personal narrative sharing deepens connections. Incorporating human behavioral cues and non-verbal communication cues within XR experiences can further enrich interactions. Establishing robust moderation and community guidelines to ensure a safe and respectful environment and offering users tools for personalizing avatars and surroundings contribute to a sense of ownership and connection.

These guidelines set clear standards for behavior, promoting respect and preventing harassment or discriminatory actions. combined approach—leveraging innovative technology to enable personal expression, implementing user-oriented design for inclusivity, and adopting human-centric approaches for community guidelines—creates a holistic environment that nurtures genuine connections and a stronger sense of authenticity within VR spaces.


Figure 1. Community guidelines for authentic interactions in VR spaces.

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