BUILDING RESPONSIBLE, SAFE, AND INCLUSIVE EXTENDED REALITY ECOSYSTEMS (THE METAVERSE)

XRSI Recommendations for the Biden-Harris Administration

xrsi.org/metaversewh46

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Summary

The United States is facing the unprecedented challenge of building responsible, safe and inclusive XR and Metaverse related Information and Communication Technology ecosystems.

We need pragmatic policy decisions and governance frameworks that help build responsibility, safety, and inclusion for new and emerging fields of XR technologies (an umbrella term for AR/VR/MR). With the pandemic catalyzing and fueling the growth and adoption of these technologies, we need to pause and reflect: if we are going to extend realities via the immersive domain of XR, what kind of world will we wish to create?

The lawmakers must proactively address the issue of privacy and data protection while enabling responsible research and innovation. This area is particularly relevant today as our dependency on smart technologies grows, and we embrace immersive and emerging technologies to build the future and heal our nation.

XR Safety Initiative (XRSI)[1] is a 501(c)(3) worldwide not-for-profit Standards Developing Organization (SDO)[2] that promotes privacy, security, and ethics in immersive environments. XRSI's mission is to help build safe and inclusive experiences so that XR stakeholders can make informed and pragmatic decisions. XRSI does this by discovering novel cybersecurity, privacy, and ethical risks and proposing potential new solutions to mitigate them.

XRSI, being the first such global effort, is uniquely positioned to provide impartial, practical information about XR and Metaverse-related risks and opportunities to individuals, corporations, universities, government agencies, and other organizations worldwide.

XRSI launched the first novel XRSI Privacy and Safety Framework for the XR domain[3] to address the impact of Biometric Inferences via Special Data Type consideration. The framework has been well received and has been a point of discussion among XR stakeholders and many regulatory entities worldwide. XRSI is currently working on several standards and frameworks including Medical XR and Child Safety frameworks for addressing Privacy and Safety issues in the next iteration of the Internet, today called "the Metaverse".

Since 2019, XRSI has created various programs focusing on the most critical aspects of the immersive domain, such as Medical XR (Medical XR Advisory Council[4]), Child Safety (Child Safety Initiative[5]), Diversity and Inclusion (CyberXR Coalition[6]), Storytelling and Awareness (Ready Hacker

1 https://www.xrsi.org

2 https://www.standardsportal.org/usa_en/sdo/xrsi.aspx

3 XR Safety Initiative (XRSI). (2020c). The XRSI Privacy and Safety Framework. https://xrsi.org/publication/the-xrsi-privacy-framework

4 http://medical.xrsi.org/

5 https://xrsi.org/programs/child-safety

6 http://cyberxr.org/

One[7]), and recently launched the Metaverse Reality Check (The MRC[8]), an oversight board by and for the citizens. To build responsible, safe, and inclusive immersive environments, XRSI recommends that federal policymakers convene representatives of cities, industries, universities, and federal agencies to identify the technological challenges. The mission is creating a pragmatic approach to adopting these technologies at a massive scale by identifying gaps and developing a National Emerging Technology Strategy to be carried out through a bipartisan approach to policy making.

We recommend the following approach for federal action to help build Responsible, Safe, and Inclusive Metaverse:

- Federal level bipartisan Industry Review Board for immersive and emerging technologies
- Federal level bipartisan innovation committee with multidisciplinary expertise
- Provide a regulatory framework to support responsible development of immersive and emerging technologies
- Establish a forum for stakeholder involvement at the Office of Science and Technology Policy (OSTP) to build a bridge between civil society, innovators, and policymakers

7 https://readyhackerone.com/

8 https://metaverserealitycheck.org/

Challenges and Opportunities

Today, most people understand that internet technologies generate data with each click, like, and share. Citizens have relied on data collection and sharing to record and propagate historical facts, ideas, and opinions across timelines. In the past few decades, the creation, processing, and sharing of data have become so common that most people have stopped paying attention to the amount of data they give away every day.

People relinquish their data without realizing the risks or consequences. While this is not new, the difference today is we are moving towards an era of constant reality capture, especially with the increased adoption of immersive technologies and a strong push to build the next iteration of the Internet, also known as the Metaverse[9].

In this era of constant reality capture, the citizens are also concerned, for example, when confronted with the intersection of XR with other emerging technologies such as Artificial Intelligence, 5G, Brain-Computer Interfaces, Radio Frequency Identification Technologies (RFID), and other forms of surveillance technologies. These innovations have the potential to transform how we connect, create, receive healthcare, and conduct commerce online by being virtually present and immersed in newly constructed digital spaces. At the same time, left unchecked, XR technologies may deploy extractive practices which, when stored and processed, can be used not only to exponentially expand profits, but equally for human behavioral modification. This amounts to a kind of "data colonization" with daunting social, cultural, and political effects[10]. The American public is largely ignorant of such extractive practices, beyond what we consider today Personal Identifiable Information (PII) or Personal Health Information (PHI). The Metaverse opens up a minefield of challenges where corporations track every movement, constantly collect data to fuel their innovation, monitor our most intimate and personal behavior, and create detailed, granular psychographic profiles on American Citizens. The profiles that include Biometrically-Inferred Data[11] about our health, finances, location, gender, and race built through immersive technologies can be shared widely and used to predict and influence our future behaviors, including what we buy, how we vote, and how we live.

The impacts of ignoring national-level governance of immersive and emerging technologies are particularly harmful to vulnerable communities of color and low-income populations, fostering discrimination in employment, government services, healthcare, education, and many other

9 Pearlman, K., Visner, S., Magnano, M., & Cameron, R. (2021). Securing the Metaverse - Virtual Worlds Need REAL Governance. In Simulation Interoperability Standards Organization (SISO). https://www.academia.edu/66984560/Securing_the_Metaverse_Virtual_Worlds_Need_REAL_Governance

10 XR Safety Initiative. (2022, February 8). Virtual Worlds, Real Risks and Challenges. XRSI – XR Safety Initiative. https://xrsi.org/publication/virtual-worlds-real-risks-and-challenges

11 XR Safety Initiative (XRSI). (2020, September). The XRSI Privacy Framework version 1.0, page 19. XRSI – XR Safety Initiative. https://xrsi.org/publication/the-xrsi-privacy-framework

institutions. XR and Metaverse related technologies can also build a better future if we infuse ethics, human rights, and anti-discrimination protections into the new immersive digital worlds. The question arises whether the American citizens and lawmakers have sufficient knowledge of how these technologies impact our socio-economics, well-being, and right to be private and safe. Without a deliberate intervention, responsible innovation policies, and governance framework, these technologies will amplify the digital divide and create deeper safety, accessibility, and trust issues.

XR for Healthcare and Safety

In 2021, Israel performed the first-ever augmented reality 3D eye socket surgery utilizing a 3D printer and Augmented Reality, resulting in both a remarkably accurate execution of the operation and a significant reduction in time[12]. Medical XR products are appearing today in multiple hospitals, university research labs, and physical therapy clinics, among other places. From therapy to pain management, Metaverse has the potential to transform the healthcare industry and change the way doctors provide care to American Citizens by:

- Providing an XR-based alternative to pharmaceutical pain management, thus helping combat the opioid crisis
- Healthcare workforce development, especially in hard-to-reach and in otherwise underserved communities
- Enhancing telemedicine to combat the spread of infectious diseases and to serve patients in remote locations
- Anatomical Visualization allows the import of MRI and CT scan data in immersive visual formats and produces reconstructions and visualizations of that data for use.
- Introducing immersive games and daily living activities for physical fitness & rehabilitation that therapists can customize and adapt to each patient's specific needs, ability, and targeted therapy plan

We need to address potential obstacles that may slow the adoption of this technology. XR Safety Initiative envisions some ways to address these challenges. The time to act is now, as we want to prevent the XR industry from mishandling data. We urge the United States public health officials to **create a proactive mechanism** for the safe and secure incorporation of Metaverse technologies into the American healthcare landscape.

12 Jaffe-Hoffman, M. (2021, January 1). Israel performs first-ever augmented reality, 3D eye socket surgery. The Jerusalem Post | JPost.com. https://www.jpost.com/health-science/israel-performs-first-ever-augmented-reality-3d-eye-socket-surgery-653901

XR for Education and Remote Work

XR technologies allow for impactful social engagement and provide opportunities to improve education by making it easy to pursue knowledge and education in a socially distant setting that addresses individual training & education needs regardless of ability level, birthplace, or economic status.

Research shows people remember information better if it's presented to them in a virtual environment[13]. When this information is considered through the lens of effective employee education, integrating XR into training programs provides effective results and increases retention rates of employees and workplace productivity[14]. XR aligns and addresses many of the pressing national and global issues by transforming higher education as well as remote work in various ways:

- Personalizing learning experience that reduces cognitive load and fosters empathy
- Creating immersive learning environments by contextualizing our vision with information, sound, video, and graphics
- Enhancing the interaction between students and teachers by considering the human developmental factors such as the learner's developing cognition, motor, and spatial skills

XR offers new pathways for improved education and high proficiency XR-based training modules at all levels — from elementary school children learning astronomy to trauma residents acquiring hands-on knowledge in lifesaving procedures. XRSI believes the future of education and remote work will benefit significantly from the responsible development and use of XR technologies.

XR for a better future
Creating Inclusion and Accessibility

Study shows that companies with diverse teams outperform less diverse teams. In other words, diversity and inclusion (D&I) efforts are good for business[15]. Some of the XR platforms offer accessibility features that allow people to receive more detailed voice guidance and new types of verbal announcements for walking trips, significantly helping people with vision impairments by prioritizing accessible design.

Machine intelligence learns primarily from observing the provided data, so the input is crucial. If that data contains biases around gender or race, the resulting application of the technology will perpetuate these biases. Some recent studies show that removing bias from learning algorithms is

13 Krokos, E., Plaisant, C., & Varshney, A. (2018). Virtual memory palaces: immersion aids recall. Virtual Reality, 23(1), 1–15. https://doi.org/10.1007/s10055-018-0346-3

14 Morris, C. (2018, October 30). Why Walmart and other F500 companies are using virtual reality to train the next generation of American workers. CNBC; CNBC. https://www.cnbc.com/2018/10/29/why-f500-companies-use-virtual-reality-to-train-workers-of-the-future.html

15 Hunt, V., Layton, D., & Prince, S. (2015, January 1). Why diversity matters. McKinsey & Company. https://www.mckinsey.com/business-functions/organization/our-insights/why-diversity-matters

possible, and decades of research can determine the success of this effort. The models and systems we create and train are a reflection of ourselves. There have been several high profile cases of bias, including computer vision systems for gender recognition that reported higher error rates for recognizing women, specifically those with darker skin tones[16].

This imbalance also applies to the digital beings created in virtual environments. Leading thinkers in the emerging field addressing bias in artificial intelligence are primarily female or minorities, suggesting that those who are potentially affected by bias are more likely to see, understand, and attempt to resolve it. Gender and racial balance in the cross-section of XR and machine learning is crucial to prevent algorithms from perpetuating ideologies that disadvantage under-represented groups. XR is the last frontier for policymakers, big tech firms, and social scientists to stop increasing the digital divide and create more inclusion by systematic inclusion and equity.

16 Smith-McLallen, Aaron & Johnson, Blair & Dovidio, John & Pearson, Adam. (2006). Black and White: The Role of Color Bias in Implicit Race Bias. Social Cognition. 24. 42-69. 10.1521/soco.2006.24.1.46.

Plan of Action

This month, The European Commission adopted an Action Plan to Support Recovery and Transformation Europe's Media in the Digital Decade. The communication proposes fostering a European Virtual and Augmented Reality (VR/AR) industrial coalition, which will potentially give Europe the leading voice on privacy and responsible innovation in the XR domain[17].

XRSI is a coalition of experts in emerging technology, privacy, cybersecurity, ethics, and immersive media that are currently working together to develop a privacy and safety framework for the XR and Metaverse related technologies for everyone around the globe[18]. As we approach the mass adoption of these technologies, we remain particularly concerned about protecting the most vulnerable segments in our society, including Black and Brown communities, children, and low-income populations. The United States urgently needs federal baseline legislation and action by federal agencies to protect individuals from discriminatory data processing practices and unintended consequences that emerge from the convergence of Extended Reality, Artificial Intelligence (AI), 5G, Brain-Computer Interfaces, robotics, and web3.

Part 1. Federal level bipartisan Industry Review Board for immersive and emerging technologies

Initial federal efforts should consist in the establishment of a permanent Industry Review Board. By 2030, Virtual Reality (VR) and Augmented Reality (AR) have the potential to add about 1,5 trillion dollars to the global economy, up from 46 billion dollars in 2019[19].

The range of uses in any given industry is broad, spanning from car manufacturing to the medical sector, enabling opportunities for training, design, mental health, scientific research, and for any daily activity for citizens, students, and consumers.

Most of the big players are currently in Asia and the US, and the technology is finally maturing to a stage where mass adoption can happen. Headsets are now lighter, cheaper and more comfortable to use, and there are significant improvements being made around the field-of-view, resolution, and software. The gigabit per second speeds promised by 5G networks will almost certainly benefit VR and AR through reduced latency, delivering a smoother, richer, user experience. 5G also means that headsets will no longer rely on built-in processing and storage, likely bringing down cost and

17 European Commission. (2020). EN EN. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0784&from=EN

18 XR Safety Initiative (XRSI). (2020c). The XRSI Privacy and Safety Framework. https://xrsi.org/publication/the-xrsi-privacy-framework

19 PwC. (2019). Seeing is believing. https://www.pwccn.com/en/tmt/economic-impact-of-vr-ar.pdf

enabling more user-friendly designs by pushing these operations to the cloud instead.

Evolution of the Metaverse brings us to the intersection of immersive technologies with several other emerging technologies, such as Extended Reality, 5G, Brain-Computer Interfaces, Robotics, and AI, bringing along various risks.

We deal with data profoundly connected with personal identity, intimate behaviors, and thoughts. Immersive technologies entail direct connections to our mental faculties and perceptions of reality, which are not yet fully understood. Today's digital tools' power, speed, and decentralized nature mean that mistakes can be challenging to reverse when they increase.

We highlight **six specific risks** that business leaders and governments need to address urgently. Failure to highlight the risks and challenges could cause damage to mental health, jeopardize social cohesion and damage the industry itself. For businesses, implications are existential; an unintentional misstep that potentially harms customers or employees can destroy trust, brand reputation, and prospects. The risks are especially critical for smaller, less-established organizations.

Leaders from business and government have a responsibility to act now to prepare for these new risks, whether that's designing how XR technologies will ultimately work, the rules for using them, or the business models that can support them. With risks this serious, we are obliged to take preemptive preventive action. The cost of retrospective responsibility would be priceless.

A permanent, bipartisan Industry Review Board should be established at a federal level to evaluate these risks and opportunities, provide clear guidance to the industry, and push the legislators to a constantly evolving set of rules and regulations, able to be on par with the high pace of emerging technologies.

Part 2. Federal level bipartisan Innovation Committee with multidisciplinary expertise

The United States is home to 50% of the world's $1 billion start-ups. This is the place where innovation takes place and hits the market. This unique position needs constant effort to find the path to responsible innovation and foster convergence among the various fields of expertise, from humanities to the hard sciences, from social activities to space exploration.

The United States has a unique capital of science, innovative SMEs, and start-ups to compete in global markets increasingly defined by new technologies.

In emerging technologies, the need to support high-risk, high-impact ideas, turn science into new businesses, and accelerate the scale-up of 'game-changing' innovators shaping the future is particularly urgent and sensitive.

The XR domain has the potential to trigger innovations in other industrial sectors, such as manufacturing industries, by improving product development and processes. Besides, they play an essential role in driving the transformation of the tourism sector and helping creative industries such as fashion or architecture develop new business models, make production more efficient by reducing waste, and enhance customers' experience.

Therefore, XRSI proposes to launch a federal-level bipartisan Innovation Committee to stimulate cooperation and cross-fertilization across sectors and ensure American leadership in this important, growing market. The Innovation Committee would provide a platform for synergies by fostering joint actions and commitments.

The Innovation Committee will be based on a broad, cross-sectoral approach involving industries, technology providers, and creatives. The IC would reflect this diversity of skills and consist of prominent players of the various sectors, ranging from content production and distribution to the availability of technology and innovation and business development. It would include members representing State-level or local XR organizations, industry representatives that could benefit from the broader use of XR technologies.

Part 3. Provide a regulatory framework to support responsible development of immersive and emerging technologies

In February 2019, the White House published a list of the four key technologies that promise to fuel American prosperity far into the future while improving the security of our homeland: Artificial Intelligence (AI), Advanced Manufacturing, Quantum Information Science (QIS), and 5G[20].

The immersive domain sits at the intersection of these emerging technologies. Therefore, it should be considered a priority for the United States and regulated at many levels to support responsible development of the technology, the industry, the market, and the audience.

A regulatory framework is a necessary component to empower individuals and organizations with a common language and a practical tool that is flexible enough to address diverse needs in privacy, security, safety, and trust. Such a regulatory framework must support responsible development of XR hardware, software, and content and must be understood by technical and non-technical audiences. A framework is needed to draw a baseline, offering solution-based controls that have principles like “privacy by design” and “privacy by default” baked in, driven by trust, transparency, accountability, and human-centric design. **Any development and use of such Standards, Certification, accreditation schemes, and labels shall be led and driven by responsible innovation and privacy-focused privacy non-profit organizations and not corporations that are driven by profit.**

Achieving privacy in the Metaverse is challenging because the technology itself is rendered useless without the appropriate data collection. The privacy laws are ever-evolving, although still catching up to the exponential growth in the immersive technology domain. While privacy itself is a human rights challenge that can help safeguard essential values such as human autonomy and dignity, immersive technologies require us to understand and manage risks in a manner that **prevents harm to individual values and society**.

20 Office of Science and Technology Policy. (2019, February 7). America Will Dominate the Industries of the Future – The White House. Trumpwhitehouse.archives.gov. https://trumpwhitehouse.archives.gov/briefings-statements/america-will-dominate-industries-future/

Part 4. Establish a forum for stakeholder involvement at the Office of Science and Technology Policy (OSTP) to build a bridge between civil society, innovators, and policymakers

A bridge between civil society, innovators, and policymakers, is needed to advance sustainable development.

XRSI proposes establishing a forum for stakeholder involvement at the Office of Science and Technology Policy (OSTP) to enhance open, accountable, and participatory decision-making and governance of the development of the XR domain by improving all stakeholders' involvement. The idea is to focus mainly on the effective engagement of stakeholders for responsible governance and allowing a constant dialogue with policymakers.

This approach would enable interaction with a more extensive range of stakeholders through several permanent and targeted platforms, from regulators to academia, from developers to artists, from journalists to gamers.

Registered stakeholders could participate in various standing and ad-hoc platforms, according to their interests and expertise, in scientific colloquia, discussion groups, roundtables, communicators labs, and information sessions.

Conclusion

We are in a period of profound societal change and disruption brought on by the rapid evolution of XR and Communication Technology ecosystems in what we call today the Metaverse. These immersive technologies represent powerful and versatile capabilities that will drive prosperity and economic growth in nearly every economy corner. At the same time, they represent a myriad of concerns, ranging from safety to inclusivity, privacy to accessibility. Fully leveraging the transformative potential of the Metaverse requires supporting the innovative momentum. At the same time, we need to build citizen trust through dialogue, policy, and standards development to balance the opportunities with the risks, especially those impacting safety, privacy, and inclusivity.

We call on the U.S. administration, Congress, and regulators to partner with industry, academia, civil society, and citizens to promote, govern, and regulate immersive technologies in a manner that respects citizen safety, privacy, and inclusivity. Early intervention and federal support are critical since there is no single approach, simple prescription, or proven prescription to achieve responsible immersive technologies. The U.S. administration must activate federal resources and engage stakeholders to equip society to participate in and benefit from these new ecosystems.

About the author

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Well known as the "Cyber Guardian," founder of the XR Safety Initiative (XRSI), **Kavya Pearlman** is an award-winning cybersecurity professional interested in immersive and emerging technologies. Kavya is constantly exploring new technologies to solve current cybersecurity challenges. She is one of the Top 50 cybersecurity speakers and has been named Top 20 Cybersecurity influencers for three consecutive years (2018-2019-2020) by IFSEC Global. Kavya has won many awards for her work and contribution to the security community, including:

- Cybersecurity Woman of the Year 2020 by Cybersecurity Excellence Award Series
- Cybersecurity Professional of the Year 2020 by Cybersecurity Excellence Award Series
- Most Influential Cyber Security Leader 2020 by Acquisition International
- 40 under 40 Top Business Executives 2019 by San Francisco Business Times
- Rising Star of the year 2019 by Women in IT Award Series
- CISO Women Security Leader award from Middle East CISO Council
- Minority CISO of the Year 2018 by International Consortium of Minorities Cybersecurity Professional (ICMCP)

Kavya has previously advised Facebook on third-party security risks during the 2016 US presidential elections and worked as the head of security for the oldest existing virtual world, "Second Life" by Linden Lab. Kavya constantly shares knowledge via webinars, conference talks, and blog posts around Application Security, Cloud-native technologies, Machine Learning, and immersive technologies such as XR.

Kavya holds a master's degree in network security from DePaul University, Chicago, and many prestigious Information Security certifications, including CISM (Certified Information Security Manager) from ISACA and PCIP for Payment Card Industry Security Standard Council.

Kavya is genuinely passionate about her work and inspires many worldwide, including women and underrepresented communities in security and emerging technologies. Kavya is a board of directors for EM360, non-profit "Minorities in Cybersecurity," an advisory board member for "CISO Council North America," Spark Mindset LLC, and a cybersecurity advisory board member for the University of New Haven.