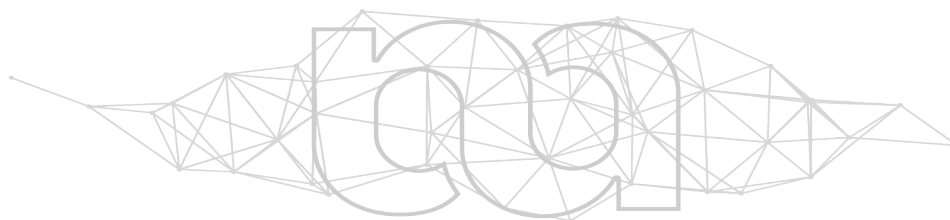
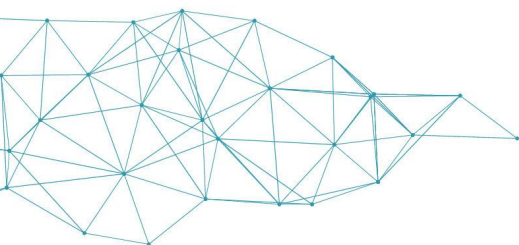


A Tale of Two Metaverses: Assessing the EU's Influence on Standard-Setting in Virtual Worlds

**Proceedings of the International Congress Towards a Responsible
Development of the Metaverse, Alicante 13-14 June 2024**

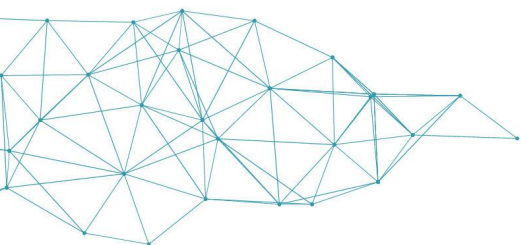
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Abstract

This paper examines the potential influence of the European Union (EU) in setting standards for the metaverse, focusing on the need for a unified, international approach to avoid monopolization. It argues that a truly interoperable metaverse will facilitate smoother interactions between platforms and users, thereby enhancing both economic activity and consumer utility. In contrast, the EU's current rhetoric on promoting multiple metaverses carries significant risks, such as technical incompatibilities and economic concentration, which could lead to new digital divides. To make this argument, the paper presents a detailed analysis of the EU's involvement in metaverse governance to date and discusses the most important standards essential for a cohesive metaverse, including web protocols, persistent identity, 3D rendering, data sharing, and privacy protection. The analysis suggests a proactive role for the EU in global standard-setting bodies to ensure that these standards are in line with European values of openness and accessibility. Due to the geopolitical and economic importance of the metaverse, the EU must facilitate a unified, accessible metaverse to ensure that Europe remains competitive in the digital future.

Keywords: Metaverse, virtual worlds, European Union, standards, interoperability, SS0

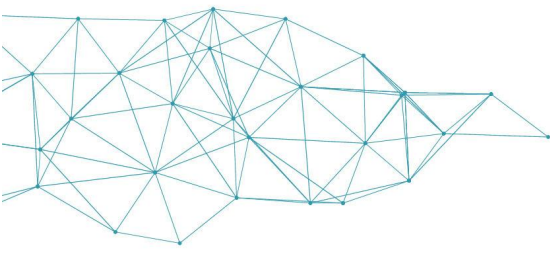
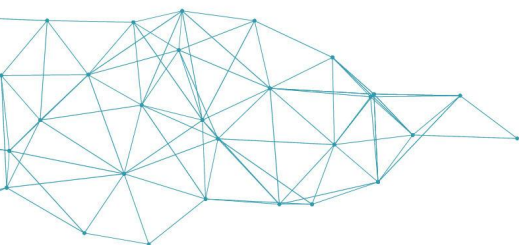


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1. Introduction

Together with the rest of the world, the European Union (EU) is about to enter the next generation of the internet that promises boundless and immersive digital experiences in real-time.¹ At the moment, the huge popularity of Artificial Intelligence (AI)-based image generators – think DALL-E, Midjourney, and Stable Diffusion – is laying further groundwork for the crafting of new virtual worlds. The current European approach towards the nascent formation of this so-called “metaverse”,² however, it is based on a central misunderstanding, namely that we are destined to witness the birth of not just *one*, but *multiple* metaverses. As Single Market Commissioner Thierry Breton expressed in September 2022, the Commission’s objective is to ensure that “not one but many metaverses are being developed”, vowing to avoid a “new Wild West or new private monopolies.”³ This frequently raised notion might be explained by the success of multiple digital platforms with metaverse-like features, such as “Decentraland” and “Sandbox”.⁴ Meanwhile, Mark Zuckerberg, who guides the industry leader “Meta” (known as owner of Facebook), makes contrary claims. His company promises to unroll a singular “metaverse” – instead of multiple metaverses – in the next decade, potentially contributing billions of Euros to the European economy.⁵ European policymakers must soon decide which vision of the metaverse(s) they ultimately want to follow.

This paper argues that the vision of a pluralistic metaverse – each governed by different rules and standards – risks catapulting the next evolution of the Internet into increasing fragmentation, creating barriers to entry, and potentially fostering future monopolies. The notion of different metaverses offers an illusion of choice for consumers but might lead to technical incompatibility, economic inefficiency, and new “digital divides”.⁶ In contrast, a unified, standardized, and truly interoperable metaverse facilitates interactions between virtual platforms and users, thus stimulating the economy as well as

¹ I would like to thank my colleagues at the Centre for European Policy (cep), Dr Matthias Kullas and Dr Patrick Stockebrandt, for their helpful feedback in developing ideas for this paper and for our joint work on the EU Commission’s Communication on Virtual Worlds, which forms the basis for section 3 of this paper. It is available here: Anselm Küsters, Matthias Kullas and Patrick Stockebrandt, ‘EU-Metaverse-Strategy: Web 4.0 & Virtual Worlds’ (2023) 14/2023 cepPolicyBrief 1.

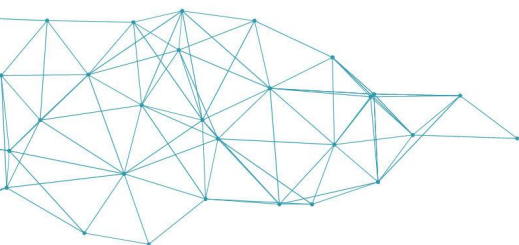
² Commonly defined as “the emerging 3-D-enabled digital space that uses virtual reality, augmented reality, and other advanced internet and semiconductor technology to allow people to have lifelike personal and business experiences online.” See: McKinsey, ‘What Is the Metaverse?’ (*McKinsey Featured Insights*, 17 August 2022) <https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-the-metaverse?cid=other-eml-alt-mip-mck&hlkid=0a65e26461624c4bb8507136e74c20fd&hctky=14384130&hdpid=d1cfaadd-89c9-4020-856d-e915acd81943#>.

³ See: Thierry Breton, ‘People, Technologies & Infrastructure – Europe’s Plan to Thrive in the Metaverse’ (*European Commission Press Corner*, 14 September 2022) <https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT_22_5525>.

⁴ For instance: “metaverse prototypes [...], most notably user-created virtual worlds Decentraland and The Sandbox”, in: Jennifer Calver and Julian Cunningham-Day, ‘Why Should We Care about the Metaverse? Because It Is the next Iteration of the Internet...’ (*Linklaters Tech Insights*, 4 July 2022) <<https://techinsights.linklaters.com/post/102hs7e/metaverse-series-1-why-should-we-care-about-the-metaverse-because-it-is-the-ne>>.

⁵ “We are building metaverse – not metaverses, as our dear Commissioner was saying” (Aura Salla, Meta lobbyist in Brussels), quoted after: “Sarah Wheaton, ‘EU Influence Politico Newsletter’ (13 October 2022) <<https://www.politico.eu/newsletter/politico-eu-influence/meet-the-big-men-oreskes-on-uncertainty-meta-versus-2/>>.

⁶ In the sense of digital inequalities, see: Polyxeni Vassilakopoulou and Eli Hustad, ‘Bridging Digital Divides: A Literature Review and Research Agenda for Information Systems Research’ (2023) 25 *Information Systems Frontiers* 955.



producing consumer welfare. To make this more positive scenario a reality, technical standards are required, which provide guidance and specifications to products and services. As of now, game engines like Unity and Unreal have emerged as inadvertent standard-bearers of virtual worlds, helping merge the physical and the digital.⁷ Similarly, the feasibility of blockchain-operated virtual environments already hint at the possibility of a “credibly neutral substrate”⁸ for individuals to communicate in a single, decentralized metaverse. This is the vision that should drive the EU’s metaverse strategy and its emerging approach to govern it.

Overall, by championing a vision of one metaverse, grounded in universal standardization and interoperability, the EU could help preventing monopolization and market fragmentation while fostering an accessible and competitive digital space. To make this claim, this paper begins by summarizing the main steps in the European discourse on regulating the metaverse (section 2) before highlighting key hurdles for the EU’s present initiative on virtual worlds (section 3). On this basis, the paper argues in its main section that by fostering standardization and interoperability, the EU can avert the impending risk of monopolization (section 4). By outlining, in detail, the different set of standards necessary for a true metaverse to take effect, and by prioritizing them from the perspective of European digital sovereignty, this section responds to the call from EU legislators to explore the potential of interoperable virtual worlds.⁹ These regulators must soon decide between two competing visions on what the metaverse should be – one metaverse that must then rule all, or several competing metaverses. The implications of choosing one vision over the other for the state of competition are not as straightforward as one might think.

2. The dawn of European metaverse regulation

The start of a commercial “metaverse”, i.e., an expansive virtual reality (VR) space where users, through avatars, can interact, transact, and experience a variety of content, is already unfolding, thanks to recent advances in technology. The expression gained particular prominence when Facebook changed its name to Meta and committed to pioneering immersive social VR platforms like Horizon Worlds. Meta’s influence on this discourse is underscored by over 350 patents regarding optical technologies and numerous technical publications advancing the sector.¹⁰ Despite technological challenges and a significant market value loss in 2022, Meta, alongside a number of smaller gaming firms, still aims to establish a metaverse combining physical and digital commerce.¹¹ With competitors emerging, including Valve, HP, Sony, and, since 2023, Apple, this market is

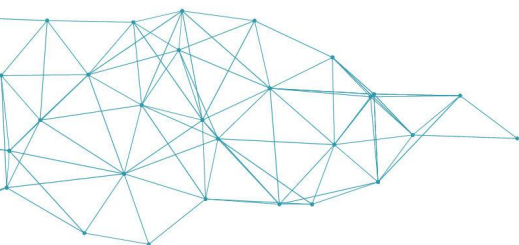
⁷ See: Matthew Ball, *The Metaverse: And How It Will Revolutionize Everything* (Liveright Publishing Corporation 2022) 107-120.

⁸ Kevin Kelly, ‘Picture Limitless Creativity at Your Fingertips’ *Wired - Backchannel* (17 November 2022) <<https://www.wired.com/story/picture-limitless-creativity-ai-image-generators/>>.

⁹ See: Committee on the Internal Market and Consumer Protection, ‘Report on Virtual Worlds – Opportunities, Risks and Policy Implications for the Single Market’ (European Parliament 2023) 2022/2198(INI) <https://www.europarl.europa.eu/doceo/document/A-9-2023-0397_EN.html>.

¹⁰ E.g. on measuring visual quality, see: Meta, ‘Stacking the Optical Deck: Infinite Display + a Primer on Measuring Visual Quality in VR’ (*Meta Quest-Blog*, 19 December 2022) <<https://www.meta.com/de-de/blog/quest/vr-display-optics-pancake-lenses-ppd/>>.

¹¹ See: Andrew Bosworth, ‘Why We Still Believe in the Future’ (*Tech at Meta Blog*, 19 December 2022) <<https://tech.facebook.com/reality-labs/2022/12/boz-look-back-2023-look-ahead/>>.



poised for further growth, as evidenced by the introduction of lightweight augmented reality (AR) glasses.¹²

With a potential value generation of up to USD 5 trillion by 2030,¹³ the metaverse warrants close attention from European policymakers. Europe's VR/AR market, valued at EUR 9.6 billion in 2021 is anticipated to reach between EUR 35 billion to EUR 65 billion by 2025, providing employment for 440,000 to 860,000 individuals.¹⁴ For instance, digital twins, a key element of the "enterprise metaverse", allow to virtually map processes in factories and optimize them with the aid of simulations.¹⁵ EU researchers anticipate the coming years as pivotal for the metaverse, expecting significant developments that may expand its relevance beyond gaming.¹⁶ Indeed, beyond its economic ramifications, the metaverse is expected to challenge European legal frameworks, geopolitical standing, and social dynamics, necessitating pre-emptive regulatory consideration.¹⁷ As such, it will play a role in establishing and maintaining European "digital sovereignty" in the future, a concept that has become a mainstay of current EU digital policy-making.¹⁸ Accordingly, an informed understanding of the underlying technologies and their challenges is crucial.

Initial discussions around a European approach towards this metaverse market and its potential regulation emerged with the so-called VR/AR Industrial Coalition, followed by high-profile statements from Commission President von der Leyen and Commissioner Breton. After conducting preliminary assessments and hearings, including citizen panels, the Commission then released a detailed communication and working paper further exploring the topic in mid-2023. The remainder of this section briefly summarizes these first steps in European metaverse governance, before the paper turns to a critique of the EU's current approach (section 3) and suggesting avenues for further policy actions (section 4).

As early as 2020, the European Commission aimed to initiate the development of a cohesive ecosystem for the burgeoning metaverse, as outlined in the Media and Audiovisual Action Plan.¹⁹ Engaging stakeholders from various sectors, including hardware, technology, content provision, and user communities, the key idea was to enhance the European media sector and preserve its cultural and technological sovereignty through forming a Virtual Reality/Augmented Reality (VR/AR) Industry Coalition. Despite the robust

¹² See: Ivan Mehta, 'Xiaomi Unveils Lightweight AR Glasses with "Retina-Level" Display' *TechCrunch* (27 February 2023) <<https://techcrunch.com/2023/02/27/xiaomi-unveils-lightweight-ar-glasses-with-retina-level-display/?guccounter=2>>.

¹³ See: Tarek Elmasry and others, 'Value Creation in the Metaverse: The Real Business of the Virtual World' (McKinsey 2022) <<https://www.mckinsey.com/~media/mckinsey/business%20functions/marketing%20and%20sales/our%20insights/value%20creation%20in%20the%20metaverse/Value-creation-in-the-metaverse.pdf>>.

¹⁴ See: European Commission. Directorate General for Communications Networks, Content and Technology., *VR/AR Industrial Coalition: Strategic Paper*. (Publications Office 2022) 12 <<https://data.europa.eu/doi/10.2759/197536>> accessed 24 April 2024.

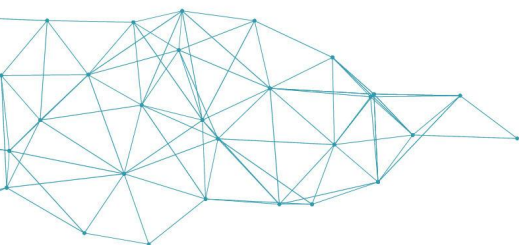
¹⁵ See: Zhihan Lyu and Mikael Fridenfalk, 'Digital Twins for Building Industrial Metaverse' [2023] *Journal of Advanced Research* S2090123223003594.

¹⁶ See: Analysis And Research Team, 'Predictions for 2023' (Council of the European Union 2023) <<https://www.consilium.europa.eu/media/61584/predictions-2023-external.pdf>>.

¹⁷ See: Bruno Maçães, 'Enter the Metaverse' [2022] *City Journal* <<https://www.city-journal.org/article/enter-the-metaverse>>.

¹⁸ See: Gerda Falkner and others, 'Digital Sovereignty - Rhetoric and Reality' [2024] *Journal of European Public Policy* 1; Luciano Floridi, 'The Fight for Digital Sovereignty: What It Is, and Why It Matters, Especially for the EU' (2020) 33 *Philosophy & Technology* 369.

¹⁹ See: European Commission, 'Europe's Media in the Digital Decade: An Action Plan to Support Recovery and Transformation' (2020) COM(2020) 784 final <<https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0784&from=EN>>.



potential inherent in the European VR/AR ecosystem, global market leadership primarily resides outside the EU, particularly with respect to key elements of commercial hardware, platforms, and impending virtual worlds. In light of this assessment, which is still true today, the strategic analysis conducted by the Directorate-General for Communication Networks, Content and Technology (DG CONNECT), released in May 2022, recommended bolstering extant companies that show promise in evolving into significant VR/AR hardware, platforms, or virtual world entities.²⁰ Additionally, it advised new funding mechanisms to accommodate the industry's heterogeneous character, and joint endeavors to heighten awareness and social adoption of VR/AR tools for various industries.

In her "Letter of Intent" issued in September 2022, EU President Ursula von der Leyen for the first time explicitly announced a regulatory initiative on "virtual worlds, including *metaverses*" (emphasis added).²¹ Although the letter provided, at the time, limited details about the proposed virtual worlds package, it underscored the importance of the green and digital twin transition initiated at the start of her tenure in 2019. In her annual state of the union speech accompanying the letter, von der Leyen emphasized these transitions as essential for building a resilient, sustainable future in Europe.²² In addition, her 2022 letter was intended as a signal to show that the EU will persist in exploring emerging digital trends such as virtual worlds, which raises some parallels to the treatment of Artificial Intelligence in the recent EU AI Act. It is thus worth bearing in mind that from the start, the metaverse initiative was positioned *within* the broader context of the EU's agenda for sustainability and digitalization, signaling a political commitment to shaping the new digital ecosystems with a view towards both strategic sovereignty and sustainability – two potentially conflicting goals.

Around the same time, Commissioner Thierry Breton further elaborated on the proposed initiative through a highly influential LinkedIn blog post, reiterating the regulation of metaverses as a pressing digital challenge and delineating a first sketch of what could become a strategic blueprint for the EU's approach. In particular, he spotlighted three core elements.²³ Firstly, Breton envisioned a "people-centric" metaverse that mirrors the quintessential European values and norms, crafting a secure digital milieu reminiscent of physical spaces' safety. He emphasized fostering interoperable standards amongst private metaverses, thereby averting monopoly formations and concurrently fueling innovation. While this early accentuation on safety and interoperability is laudable, implementing these ideas brings its own set of challenges, as will be discussed further below. Certainly, the delineation and operationalization of "European values", as imagined by Breton, in a truly universal, by definition global, metaverse would require careful definition.

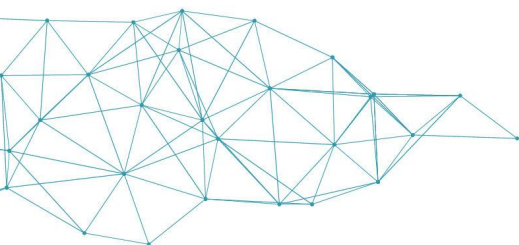
Secondly, Breton underscored the imperative of technological sophistication, wherein Europe should not only be a consumer but a significant contributor to the global technological landscape underpinning the metaverse. His narrative then gravitated towards the creation of a robust and sustainable ecosystem nurtured by cutting-edge

²⁰ See: European Commission. Directorate General for Communications Networks, Content and Technology. (n 18).

²¹ See: Ursula von der Leyen and Maroš Šefčovič, 'State of the Union 2022 - Letter of Intent' (2022) <https://state-of-the-union.ec.europa.eu/system/files/2022-09/SOTEU_2022_Letter_of_Intent_EN_0.pdf>.

²² For a historical perspective, see: Roger Fouquet and Ralph Hippe, 'Twin Transitions of Decarbonisation and Digitalisation: A Historical Perspective on Energy and Information in European Economies' (London School of Economics and Political Science, LSE Library 2022) <<https://EconPapers.repec.org/RePEc:ehl:lserod:115544>>.

²³ See: Breton (n 3).



technologies. With the establishment of the VR/AR Industrial Coalition described above, there has been an early and deliberate effort on the part of the Commission to bring together the various players in the field, for example through strategic roadmaps, but this policy framework appears somewhat nebulous in terms of mechanisms to mitigate potential bottlenecks in collaboration between different companies. Nevertheless, the basic assumption, namely that an ethical and responsible use of VR and AR technology is only possible if one is not only a technology-taker (the equivalent of economic “price takers”)²⁴ but also possesses one’s own technical competencies and skills, is certainly justified. Given Breton’s advocacy of competition in the metaverse, it will be crucial to monitor whether the coalition’s actions will avoid further concentration of power within a limited consortium of players.

Thirdly, Breton acknowledged the avalanche of data exchange that characterizes the metaverse. He rightly emphasized the need for a resilient and robust connectivity infrastructure capable of handling unprecedented volumes of traffic. In this context, he made clear the need for an extended period of reflection and consultation by the Commission to identify the necessary infrastructure before moving on to more direct forms of regulation. Concrete steps to incentivize investment in connectivity infrastructure are essential, as well as a clear strategy to resolve the existing paradox of escalating data volumes and diminishing willingness to invest in infrastructure – something that might be also addressed by the upcoming Digital Networks Act, which deals with the necessary connectivity infrastructure for the digital economy.²⁵ Also relevant is the EU Gigabit Infrastructure Act adopted in April 2024, which aims to speed up the approval process for infrastructure projects and reduce bureaucratic obstacles for operators and administrators.²⁶

The emerging European interest in regulating the metaverse economy was also illustrated, at the time, by an analysis informally published by DG COMP.²⁷ This analysis acknowledged the metaverse as potentially transformative for various life sectors beyond pure gaming, including work, entertainment, and the development of simulations for diverse applications. Given that monetization within the metaverse would likely be driven by e-commerce, advertising, and digital services, the authors were concerned that the structure and interoperability of platforms within the metaverse could prove to be significant determinants of the competitive landscape. Even more explicitly than Breton, they flagged the potential emergence of closed ecosystems and gatekeepers as likely risks to consumer freedom and competition. Indeed, it seems that many of the generic factors that lead to winner-take-all markets for GAFAM, including economies of scale, strong user brands and habitual usage, direct and indirect network effects, unique datasets and AI, as well as potential switching costs and lock-in effects,²⁸ are also present in virtual world

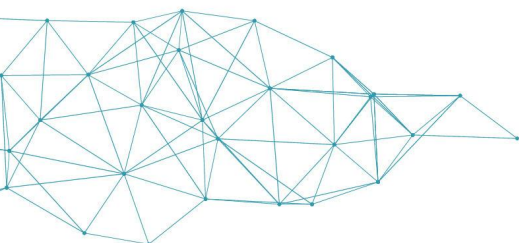
²⁴ For this concept, see also Jens P Flaning, *The Technology Takers: Leading Change in the Digital Era* (First edition, Emerald Publishing 2019):.

²⁵ See: European Commission, ‘White Paper - How to Master Europe’s Digital Infrastructure Needs?’ (2024) White Paper COM(2024) 81 final.

²⁶ See: European Commission, ‘Proposal for a Regulation on Measures to Reduce the Cost of Deploying Gigabit Electronic Communications Networks and Repealing Directive 2014/61/EU (Gigabit Infrastructure Act)’ (2023) COM/2023/94 final.

²⁷ See: Friedrich Wenzel Bulst and Sophie De Vinck, ‘Understanding the Metaverse – a Competition Perspective’ (*European American Chamber of Commerce*, 17 October 2023) <<https://eaccny.com/news/chapternews/dg-comp-understanding-the-metaverse-a-competition-perspective/>>.

²⁸ See: Patrick Barwise and Leo Watkins, ‘The Evolution of Digital Dominance: How and Why We Got to GAFA’ in Martin Moore and Damian Tambini (eds), *Digital Dominance: The Power of Google, Amazon, Facebook, and Apple* (Oxford University Press 2018) 41 <<http://lbsresearch.london.edu/id/eprint/914>> accessed 28 May 2024.



settings. Given the anticipated global impact of the metaverse, the authors from DG COMP also called for international cooperation among regulators. Such cooperation, particularly between the EU and the US, is indeed imperative to facilitate the development of aligned regulatory and technology standardization, a point to which this paper turns below. As the DG COMP analysis notes itself, policy approaches relevant to the metaverse must be discussed at both global and bilateral levels to be effective.

Finally, and following a series of citizens' panels on virtual worlds, the Commission published its first official Communication in July 2023.²⁹ Bringing the earlier elements described above together, the Communication formulated a pro-active approach towards Web 4.0 in order to secure a "first-mover advantage" for the EU. To achieve this goal, a strategic framework of related policy actions was described, focusing on the three pillars of skills development, strengthened industrial ecosystems, and robust governance structures. In addition to addressing infrastructure and human capital challenges, the document states that the EU should support the establishment of basic principles and standards that reflect the core European values of "openness, sustainability and accessibility". Nevertheless, the Communication advises enforcing existing digital economy regulations, such as the GDPR, before considering the introduction of new legislation, such as a future "Metaverse Act". However, the effectiveness of the Commission's Communication is hampered by a number of problems, as discussed in the next section.

3. Economic and legal analysis: emerging problems in European governance of the metaverse

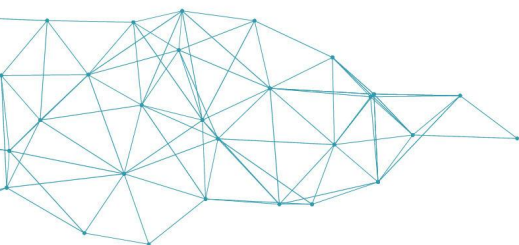
Building on a preliminary analysis published elsewhere,³⁰ this section discusses the challenges and opportunities presented by the EU's current regulatory approach to Web 4.0 and virtual worlds, as described in the Communication from July 2023. On a fundamental level, the Commission is correct in highlighting the need for a proactive economic policy framework in Europe to maximize the benefits and minimize the risks associated with digital technologies. Without such proactive measures, dominant American digital companies are likely to set immutable standards that may not be in line with European values, such as consumer privacy. The question, however, is whether formulating this metaverse strategy is sufficient and whether its proposed actions are tangible enough to ensure this outcome.

To begin with, Europe seems to be lacking key inputs to ensure a smooth adoption of metaverse technologies. The EU's readiness for VR and AR technologies is hampered by insufficient infrastructure investment, particularly in 5G and 6G networks and edge computing, with current connectivity falling short even of the EU's own Digital Decade targets.³¹ In addition, the development of a European metaverse ecosystem requires a sufficient supply of skilled workers and sophisticated basic technology to prevent American companies from overshadowing European initiatives. The Commission's Communication mentions these challenges and outlines an initial strategy that focuses on leveraging Europe's unique capabilities in software, branding, and gaming to strengthen its

²⁹ See: European Commission, 'Communication for an EU Initiative on Web 4.0 and Virtual Worlds: A Head Start in the next Technological Transition.' (2023) COM/2023/442 final.

³⁰ See: Küsters, Kullas and Stockebrandt (n 1).

³¹ See: European Commission, '2023 Report on the State of the Digital Decade' (2023) 11 <<https://digital-strategy.ec.europa.eu/en/library/2023-report-state-digital-decade>>.



position in the global metaverse market, despite existing policy gaps that could hinder this progress.

Nevertheless, the strategy for developing skills in the digital sector takes a rather top-down approach, which may not be effective in attracting the bottom-up talent acquisition needed in fields such as computer science. Skilled computer scientists tend to be attracted to innovative companies with cutting-edge technologies and non-monetary benefits such as independence and autonomy,³² not just by bureaucratic measures such as programmatic initiatives or visa policies. To truly create an environment that naturally attracts and retains metaverse human talent, the EU needs to improve funding opportunities and foster a more innovation-friendly business climate, e.g. by attracting more venture capital and completing the Capital Markets Union first proposed by former Commission President Jean-Claude Juncker. Greater cooperation with Member States is also needed on this front, as they have key legal powers over labour and migration. The EU's Digital Decade program sets an ambitious target for Member States to significantly increase the number of ICT professionals,³³ but to achieve this goal, both monetary and non-monetary working conditions must be improved to create a positive business environment.

More importantly, the current strategy suffers from a standardisation pitfall – both in the *semantic* sense of the different concepts used, and in the *technical* sense of influencing international standards in virtual worlds. On the one hand, the EU's discourse around Web 4.0 and virtual worlds suffers from a significant lack of clarity and consensus on definitions, which complicates communication and hampers policy development. Official documents such as the Commission's Staff Working Document and Communication illustrate this problem, using terms such as "Web 3.0", "Web 4.0" and "virtual worlds" interchangeably and ambiguously, while neglecting more widely recognized terms such as "metaverse". For example, the concept of "digital twins" is inconsistently categorized under both Web 3.0 and Web 4.0 in different parts of the same documents.³⁴ In addition, the term "virtual worlds" is defined in a way that is only partially consistent with the established literature.³⁵ Such inconsistencies are also mentioned in the report of the Internal Market and Consumer Protection Committee.³⁶ This lack of consistent definitions not only leads to confusion as to whether the EU aims to shape one (centralized) metaverse or several (competing) metaverses, but also poses challenges for technical interoperability and international policy cooperation. The avoidance of the term "metaverse", due to its association with the company formerly known as Facebook, now "Meta", suggests a strategic distancing by European regulators who prefer "Web 4.0" to delineate a clear regulatory path.³⁷ Recent failures of decentralized Web 3.0 technologies, such as the collapse of FTX, may also explain this use of terminology.³⁸ Admittedly, some argue that the concept of a "metaverse" may be amorphous, as it is unclear which elements of metaverse

³² See: Michael Roach and Henry Sauermann, 'Can Technology Startups Hire Talented Early Employees? Ability, Preferences, and Employee First Job Choice' [2023] *Management Science* mnsoc.2023.4868.

³³ See: European Commission, '2023 Report on the State of the Digital Decade' (n 34) 26.

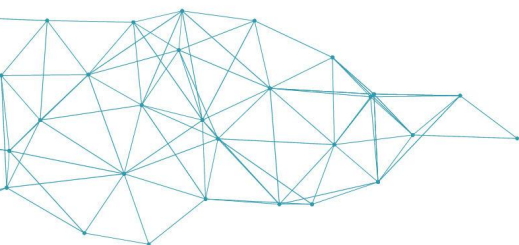
³⁴ Compare, for example, the definition of Web 3.0 on p. 1 with the example of Web 4.0 applications on p. 4.

³⁵ See: Ball (n 7) 57.

³⁶ See: Committee on the Internal Market and Consumer Protection (n 9).

³⁷ See: Derek Robertson, 'Europe's Agenda For... Not "the Metaverse"' *Digital Future Daily - Politico* (7 November 2023) <<https://www.politico.com/newsletters/digital-future-daily/2023/07/11/europes-agenda-for-not-the-metaverse-00105730>>.

³⁸ See: Demond Cureton, 'Will the EU's Web 4.0 Strategy "Lead" Global Metaverse Efforts?' *XR Today* (13 July 2023) <<https://www.xrtoday.com/mixed-reality/will-the-eus-web-4-0-strategy-lead-global-metaverse-efforts/>>



development will endure, or who the economic “winners” will be.³⁹ Nevertheless, the establishment of clear, universally accepted definitions is essential to promote an open, interoperable metaverse.

On the other hand, the development of open standards and an interoperable metaverse is seen as economically beneficial, as it mitigates externalities and prevents the emergence of new metaverse gatekeepers that could exploit network effects and economies of scale, as GAFAM companies have done in the past.⁴⁰ However, a major challenge for the EU is how to exert sufficient influence and credibility in this area, especially given the dominance of non-EU companies such as Meta, Epic Games, and Unity in shaping metaverse standards.⁴¹ This situation is again highlighted in the report of the Internal Market and Consumer Protection Committee,⁴² which underlines the EU’s relative lag in global digital competition and the concentration of digital power in non-European hands. To counterbalance this influence, the EU should ensure a strong presence in international bodies involved in standard setting, such as the Open Metaverse Alliance for Web3 (OMA3), the World Wide Web Consortium (W3C), the Open Metaverse Foundation (OMF), and the “Defining and Building the Metaverse Initiative”, set up by the World Economic Forum.⁴³ The EU’s recent participation in fora such as the Internet Governance Forum demonstrates the potential for such a proactive approach to participating in global metaverse governance.⁴⁴

Moreover, given the increasing need for digital sovereignty in a geo-tech world,⁴⁵ the EU could explore the promotion of a distinctly European metaverse ecosystem to uphold European values and reduce dependencies, especially in critical technologies such as XR headsets and cloud computing, where non-European companies currently dominate. This strategic thinking suggests that promoting European access to the metaverse and its infrastructure will be crucial as the EU deals with increasingly complex trading relationships and could, as a side benefit, ensure that Europe has a say in shaping standards. Such an approach should include, for example, targeted subsidies for XR headsets, gigabit infrastructure, e.g. related to the development of edge nodes, and other technical means of accessing the metaverse through European channels, as there might be strategic and economic spill-over effects from these metaverse-related innovations.

4. The role of standards: choosing one vision of the future metaverse

In the light of increasing pressure to tackle the regulatory challenges of the metaverse while allowing European industry to catch up with current technology leaders in the US and China, the Commission stands at a crossroads: it must choose one vision of the future metaverse before deciding on more concrete action points. Currently, there is a great concern among VR and AR firms that the future metaverse could consist of a large number

³⁹ Benedict Evans, ‘Ways to Think about a Metaverse’ (*Benedict Evans Essays*, 31 October 2022) <<https://www.ben-evans.com/benedictevans/2022/10/31/ways-to-think-about-a-metaverse>>.

⁴⁰ See the company stories in: Barwise and Watkins (n 31).

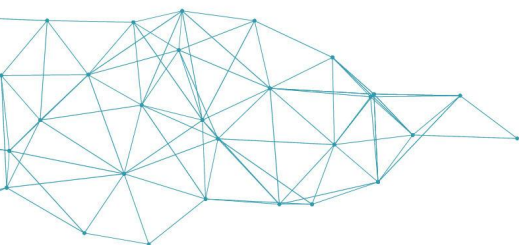
⁴¹ See: Ball (n 7) 107–120.

⁴² See: Committee on the Internal Market and Consumer Protection (n 9).

⁴³ See: World Economic Forum, ‘Interoperability in the Metaverse’ (2023) Briefing Paper <https://www3.weforum.org/docs/WEF_Interoperability_in_the_Metaverse.pdf>.

⁴⁴ At IGF 2023, the Commission organized an open forum on the topic of “The Virtual Worlds we want: Governance of the future web”.

⁴⁵ See: Timo Seidl, ‘Charting the Contours of the Geo-Tech World’ [2024] *Geopolitics* 1.



of isolated, non-interoperable individual worlds⁴⁶ – a concern that is certainly justified in the light of Breton’s comments quoted above and, more generally, the ambiguous vocabulary used by the Commission (section 3). Therefore, this section argues that Commission must champion a universal infrastructure for the metaverse, dropping the notion of separate virtual worlds with different values and instead fostering an ecosystem that embodies truly universal standards, thereby anchoring the metaverse as the successor of the internet. Essentially, the metaverse necessitates joint, universal standards to create virtual worlds and integrate elements of the real world into them.⁴⁷ A portion of this foundational standardization might focus on ensuring social and cultural ethics while engaging in these virtual realms, but the vast majority of the necessary standardization efforts will relate to rather technical fields such as software development, user interfaces, ownership, authority, and safety and security, which necessitate a global answer to function optimally. Such standards are typically released by international organizations, “ensure quality and safety and set product or services’ specifications”, and are difficult to change, since they follow from “negotiations among various stakeholders and are institutionalized”.⁴⁸

At the moment, the Commission’s public vision of the metaverse emphasizes interoperability but also calls for including certain normative values within the technical standards, as described above (section 2). This is in line with the EU’s growing assertiveness in influencing global Internet standard-setting processes,⁴⁹ but also a potential source of conflict. For instance, Breton announced in his blog post mentioned above that “private metaverse spaces should be based on interoperable standards.”⁵⁰ In March 2023, competition chief Margrethe Vestager likewise told the European Parliament’s legal affairs committee that “one should be able to move freely between virtual worlds,” suggesting the principle of interoperability will guide the EU’s regulatory efforts.⁵¹ However, interoperability mandates are not “free lunch”: Especially as the metaverse is still at a very early stage of its development, “interoperability mandates might undermine incentives to innovate, limit competitive selection, and maintain inefficient technological variety and fragmentation.”⁵² This threat becomes larger when one region, such as the EU, aims to unilaterally set the standards according to its own “values” and this is not followed up by other players. Tellingly, the “VR/AR Industrial Coalition” calls for establishing standards that adhere to fundamental principles such as endorsing the “ethical and sustainable” development of VR/AR, and respecting privacy, while also promoting

⁴⁶ See: Christian Zabel, Gernot Heisenberg and Daniel O’Brien, ‘Cross Reality in Deutschland 2022’ (2022) 13 <https://medien.nrw/wp-content/uploads/sites/8/2022/10/XR-Studie-DE-2022_final_screen.pdf>.

⁴⁷ See: Myeong Won Lee, ‘JTC 1 Standards and Standardization for the Metaverse’ (21 August 2023) <<https://jtc1info.org/jtc-1-standards-and-standardization-for-the-metaverse/#:~:text=Requirements%20for%20metaverse%20application%20services,standardized%20governance%20guidance%20for%20social%2C>>.

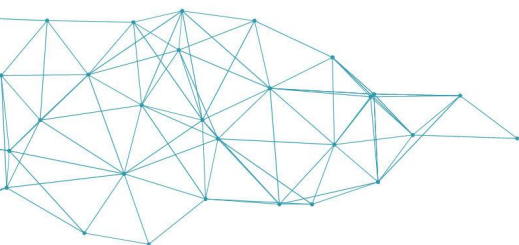
⁴⁸ EU-US Trade and Technology Council, ‘EU-U.S. Terminology and Taxonomy for Artificial Intelligence’ (2023) 10 <<https://digital-strategy.ec.europa.eu/en/library/eu-us-terminology-and-taxonomy-artificial-intelligence>>

⁴⁹ See: Clement Perarnaud and Julien Rossi, ‘The EU and Internet Standards – Beyond the Spin, a Strategic Turn?’ [2023] *Journal of European Public Policy* 1.

⁵⁰ Breton (n 3).

⁵¹ Quoted after: Mohar Chatterjee, ‘AI Might Have Already Set the Stage for the next Tech Monopoly’ *Digital Future Daily - Politico* (22 March 2023) <<https://www.politico.com/newsletters/digital-future-daily/2023/03/22/ai-might-have-already-set-the-stage-for-the-next-tech-monopoly-00088382>>.

⁵² Nicolas Petit and others, ‘Metaverse Competition Agency: White Paper’ [2022] *SSRN Electronic Journal* 6 <<https://www.ssrn.com/abstract=4297960>> accessed 24 April 2024.



compatibility and accessibility worldwide.⁵³ Others have argued that the open source principle “is underpinning many of the positive dynamics shaping the European way of life” and accordingly, European regulation should mandate open source development for critical components of the metaverse.⁵⁴ This is laudable, but if the dominant metaverse players outside Europe establish their own, proprietary standards, as currently seems likely, the EU risks being bound by prevailing market standards that might not uphold “European principles”.

A key problem in this debate is that currently, it is quite unclear what interoperability will mean in the metaverse: “In the metaverse, interoperability might refer to common technical standards for media, digital goods, virtual identities, and communication protocols or to hardware compatibility across devices and consoles. It is not yet clear what standards will most benefit consumers nor whether it is even desirable.”⁵⁵ For instance, the World Economic Forum differentiates three dimensions, namely technical, usage, and jurisdictional aspects: Technical interoperability design addresses topics such as network constraints, asset ownership, intellectual property protections, payments, identity, data privacy and security concerns at both hardware and software levels. Usage interoperability focuses on users and aims to ensure equitable experiences. Finally, jurisdictional interoperability refers to best practices and standards for the data supply chain across localities.⁵⁶ The confusion, which also permeates the Commission’s texts and statements, might come from the fact that the metaverse’s technology stack has essentially several building blocks including diverse elements such as hardware devices and networks as well as software-driven game engines.⁵⁷ According to a well-established scheme, the metaverse value chain consists of seven layers, starting with the infrastructure and ending up with the consumer experience.⁵⁸

⁵³ See: European Commission. Directorate General for Communications Networks, Content and Technology. (n 18) 99–100.

⁵⁴ See: Thomas Dohmke, ‘Europe’s Chance to Be a Leader in the Age of AI’ (*GitHub Blog*, 3 February 2023) <<https://github.blog/2023-02-03-europes-chance-to-be-a-leader-in-the-age-of-ai/>>.

⁵⁵ See: Patrick Grady, ‘Innovation Should Be the Priority as the EU Tip-Toes into the Metaverse’ (*Center for Data Innovation*, 4 January 2023) <<https://datainnovation.org/2023/01/innovation-should-be-the-priority-as-the-eu-tip-toes-into-the-metaverse/>>.

⁵⁶ See: World Economic Forum (n 45).

⁵⁷ See: Elmasry and others (n 17) 5.

⁵⁸ See: Jon Radoff, ‘The Metaverse Value-Chain’ (*Medium*, 7 April 2021) <<https://medium.com/building-the-metaverse/the-metaverse-value-chain-afcf9e09e3a7>>.

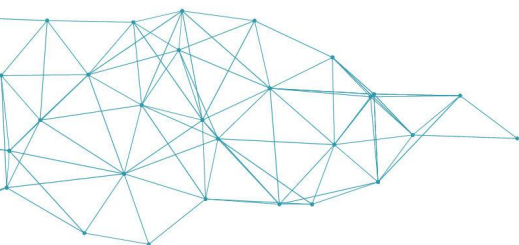
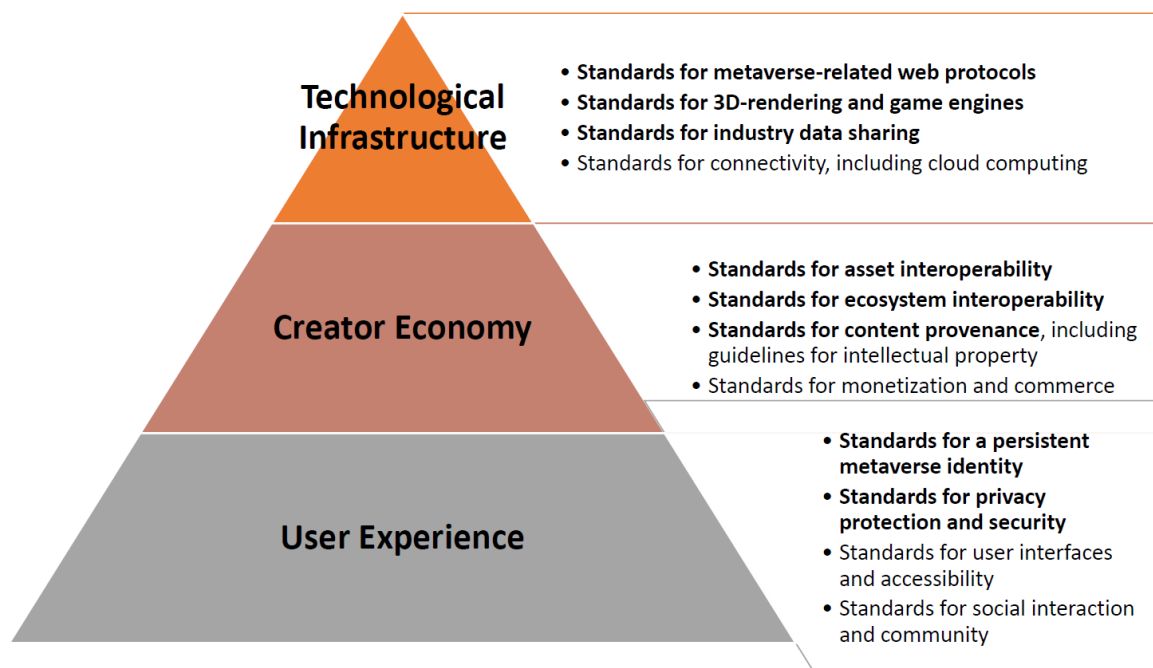


Fig. 1: Metaverse-related standards, displayed along the value chain



Source: Own illustration.

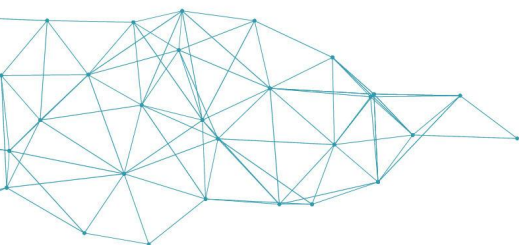
Note: Standards shown in bold should be prioritized by the EU, see main text.

In other words, it is easy to publicly champion “interoperability” or “standards” in EU communications or reports without specifying which building blocks of the technology stack are meant and which type of standards should be followed – and without acknowledging that truly universal standards might mean abandoning some of the “European principles”, in order to allow for compromises with other entities. The remainder of this section thus surveys some of the key areas where universal standards will be crucial, which needs to be recognized more strongly by the EU’s metaverse strategy. For simplicity’s sake, this paper, following the WEF framework, distinguishes three levels in the metaverse ecosystem that are relevant to standard setting: technological infrastructure, creator economy, and user experience. In particular, the Commission should promote the development of interoperable, truly international solutions with the help of guidelines and other supporting material, prioritizing those standards displayed in bold (Figure 1) and explained below. This will reduce the risk of monopolization and ensure that European companies have fair access to the metaverse.

4.1 Which standards should be prioritized by the EU?

4.1.1 Standards for metaverse-related web protocols

A network protocol defines rules and conventions for communication between network devices, allowing them to interact with each other. Just like the current iteration of the internet requires transmission control protocol (TCP)/IP to exchange data and HTML for presenting information, a truly universal metaverse needs a similar degree of



standardization to enable communication⁵⁹. In other words, developing the metaverse necessitates the establishment of comprehensive standards for metaverse-related web protocols to ensure consistency, interoperability, and a seamless user experience across diverse 3D worlds. So far, however, scripting behavior within the emerging metaverse is characterized by disparate standards, such as Verse in Fortnite and Luau in Roblox. Standardizing such scripting languages, potentially treating them as open standards akin to JavaScript in the web domain, is imperative to harmonize behavioral protocols across different platforms.⁶⁰

Standardizing a programming language like Verse for the metaverse would establish essential guidelines for integrating diverse codes and content, in order to allow for an interconnected and dynamically updated virtual environment.⁶¹ Moreover, a unified networking protocol landscape would allow for interactions within the metaverse's different virtual worlds. A noteworthy initiative in this regard is Mozilla's Hubs project, inaugurated in 2018, which enables users to collaborate within a VR environment through a diverse array of browsers and devices: "Adhering to web standards, Hubs supports all the usual headsets and goggles (e.g. Oculus Rift, HTC Vive) while remaining open to those without specialized VR hardware on desktops and smartphones".⁶² More generally, there are already concrete ISO standards available for virtual world information processing that can be used for creating and simulating 3D virtual worlds.⁶³ Alternatively, Tim Berners Lee, the pioneer of the web, is promoting a novel web data infrastructure named Solid, which enables individuals to manage the reuse of their data subsequently (notably without requiring blockchain).⁶⁴ This may be essential for enterprise metaverse applications by accommodating the evolving preferences of the data owners. There are already ongoing efforts by standards groups like the Metaverse Standards Forum, OMA3, the well-known Institute of Electrical and Electronics Engineers (IEEE), and even the W3C itself,⁶⁵ which should be reflected in the EU metaverse strategy to a greater extent.

4.1.2 Standards for a persistent metaverse identity

In the metaverse, individuals, brands, and retailers will benefit tremendously from establishing persistent digital identities to facilitate various social and economic activities, akin to their physical counterparts in the current economy. Initially, enterprises in the metaverse will likely build on their existing identity and access management (IAM) infrastructure,⁶⁶ not least because they have a vested interest in preserving the latter as a form of gatekeeping or means of extracting rents. This scenario would necessitate

⁵⁹ See: World Economic Forum (n 45) 12.

⁶⁰ See: Andrew Webster, 'Tim Sweeney Explains How the Metaverse Might Actually Work' *The Verge* (23 March 2023) <<https://www.theverge.com/2023/3/23/23652928/tim-sweeney-interview-epic-games-fortnite-metaverse>>.

⁶¹ See: Ben Schreckinger, 'Introducing the "5G" War' *Digital Future Daily - Político* (15 December 2022) <<https://www.politico.com/newsletters/digital-future-daily/2022/12/15/the-other-5g-00074195>>.

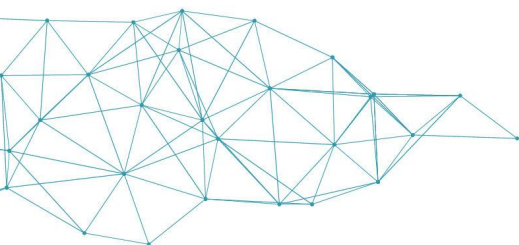
⁶² See: Kyle Wiggers, 'Mozilla Acquires Active Replica to Build on Its Metaverse Vision' *TechCrunch* (2 December 2022) <<https://techcrunch.com/2022/12/01/mozilla-acquires-active-replica-to-build-on-its-metaverse-vision/?guccounter=1>>.

⁶³ ISO/IEC 14772 Virtual Reality Modeling Language (VRML), ISO/IEC 19775-1 Extensible 3D (X3D), and ISO/IEC 18023 Synthetic Environment Data Representation and Interchange Specification (SEDRIS). See: Lee (n 49).

⁶⁴ See the website of this project: <https://solidproject.org> (last accessed: 25 April 2024).

⁶⁵ See: World Economic Forum (n 45) 12.

⁶⁶ See: George Lawton, 'Metaverse Interoperability Challenges and Impact' (*TechTarget*, 7 March 2024) 202 <<https://www.techtarget.com/searchcio/tip/Metaverse-interoperability-challenges-and-impact>>.



creating a new avatar each time a specific virtual environment within the metaverse is entered by a participant and then agreeing to novel codes of conduct or community standards.⁶⁷

For a robust and truly universal metaverse economy to succeed, however, individuals require interoperable identity standards that allow them to “maintain a stable XRself across virtual worlds while giving them unique and decentralized capabilities to control their digital identities”.⁶⁸ This, however, necessitates technical standardization to precisely recognize entities across the metaverse. Today, there are already some humanoid animation ISO standards available that could be used for 3D avatar representation in virtual worlds.⁶⁹ A more general solution comes from new technologies like Decentralized Identifiers (DIDs) and Verifiable Credentials (VCs) that can be connected with traditional identifiers.⁷⁰ For example, researchers have proposed a blockchain-integrated Self-Sovereign Identity (SSI) that individuals can use to authenticate themselves across different platforms while remaining the sole holder of their identity.⁷¹ By supporting further research on decentralized identity standards and supporting them through interoperability mandates, the EU could help create a scalable public key infrastructure for the metaverse without creating new gatekeepers.

4.1.3. Standards for 3D-rendering and game engines

While the emerging metaverse is likely to be populated by a diverse range of entities beyond game-makers, such as retailers, schools, and cities, they will very likely utilize cross-platform technology. The industry has already begun to slowly standardize on high-fidelity 3D file formats, with progress related to graphics language transmission format for sharing 3D objects; universal scene description (USD) open file format for sharing 3D worlds; fbx for sharing textures and lighting effects; and 3D Tiles for efficiently streaming 3D content at scale.⁷² Leading gaming companies like Unity and Unreal are poised to become foundational elements in the virtual world, acting as common standards or universal languages that bridge various domains, as their “game engines” are increasingly used to power virtual simulations: “think of them [Unity, Unreal, PlayFab, and GameSparks] as the ‘English’ or ‘metric’ of the Metaverse”, Matthew Ball notes.⁷³ This predominance can be already seen in the German metaverse industry: 68 percent of German VR and AR companies use Unity, 65 percent are active in the Oculus/Meta ecosystem, and 44 percent rely on the Unreal Engine.⁷⁴

⁶⁷ See: World Economic Forum (n 45) 13.

⁶⁸ Megan Bradley and Maria Fernanda Muñoz, ‘Making Your “XRself” Yours in the Metaverse’ (*Tech Policy.Press*, 1 May 2024) <<https://www.techpolicy.press/making-your-xrself-yours-in-the-metaverse/>>.

⁶⁹ ISO/IEC 19774-1 Humanoid Animation (HAnim) allows to represent human models in 3D virtual worlds. ISO/IEC 19774-2 HAnim motion data animation can be used to exchange humanoid animations. See: Lee (n 49).

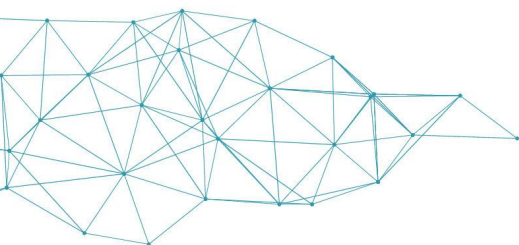
⁷⁰ See: GS1, ‘Building the Metaverse: A Foundation of Standards’ (2022) Release 1.0 6-7 <<https://www.gs1us.org/content/dam/gslus/documents/industries-insights/innovation/GS1-US-Building-the-Metaverse.pdf>>.

⁷¹ See: Siem Ghirmai and others, ‘Self-Sovereign Identity for Trust and Interoperability in the Metaverse’, 2022 *IEEE Smartworld, Ubiquitous Intelligence & Computing, Scalable Computing & Communications, Digital Twin, Privacy Computing, Metaverse, Autonomous & Trusted Vehicles (SmartWorld/UIC/ScalCom/DigitalTwin/PriComp/Meta)* (2022).

⁷² See: Lawton (n 68).

⁷³ Ball (n 7) 108.

⁷⁴ See: Zabel, Heisenberg and O’Brien (n 48) 11.



The use of game engines from these firms will, if properly standardized, facilitate the creation of a metaverse that seamlessly integrates physical and virtual realities. In other words, the metaverse may witness the development of numerous popular virtual worlds and platforms, but they will be supported by underlying cross-platform technology dependent on joint standards and interoperability – and it is this type of underlying technology that should be supported and influenced by the EU in order to increase its later digital sovereignty.

4.1.4. Standards for industry data sharing

Consumer-facing brands are actively innovating within the metaverse to enhance customer experiences by seamlessly intertwining the physical and digital worlds. Prominent brands are already leveraging technologies such as digital twins to create new commerce experiences. Digital twins serve as virtual replicas of physical products, facilitating real-time updates, customization, and transfer of ownership in the virtual domain. For example, Nvidia is promoting its PhysX engine as a method to depict physical properties in the industrial metaverse.⁷⁵ Standards are necessary for digital twins to ensure the seamless integration and interactivity between the digital and physical worlds based on access to actionable, real-time data. In particular, VR/AR based information processing standards, which are already available, can be used to simulate virtual worlds with real world information.⁷⁶

With this, real world information such as data from various types of sensor devices can be represented and simulated in virtual worlds. Similarly, there are standards related to knowledge and semantic information processing in 3D virtual worlds.⁷⁷ By developing a globally unique identifiers that fosters trust and extends the physical product into the metaverse realm,⁷⁸ the EU can help the European culture and consumer-facing industry to maximize the utilization of their pre-existing data and product attributes and data, without creating future dependencies on US Big Tech.

4.1.5. Standards for asset interoperability

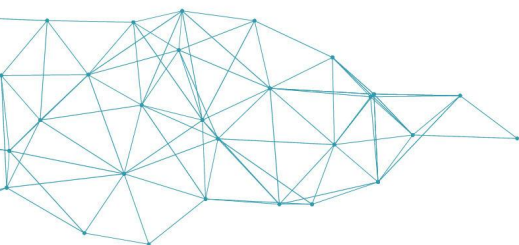
The metaverse can be understood as an interconnected digital infrastructure where various assets, like outfits or items, can seamlessly transition between different virtual environments, such as games. This is facilitated by scalable and consistent rendering of 3D models across various platforms such as AR glasses, VR headsets, and mobile devices. Standards for 3D assets ensure that applications in AR and VR within the metaverse maintain a consistent quality and uniformity, allowing users to seamlessly transition between various digital worlds. For example, an object, such as a coded outfit, can be

⁷⁵ See: Lawton (n 68).

⁷⁶ ISO/IEC 18038 Sensor representation allows for defining sensor information processing in AR and VR; ISO/IEC 18039 Mixed and Augmented Reality (MAR) reference model provides metaverse systems with basic components; and ISO/IEC 18040 allows for defining live actor representation in VR. There are also standards for multimedia storage, communication, and coordination. See: Lee (n 49).

⁷⁷ ISO/IEC 18023 Synthetic Environment Data Representation and Interchange Specification (SEDRIS) defines semantic information about the physical world in VR; ISO/IEC 19775 Extensible 3D (X3D) enriches 3D object in VR with real-world information; ISO/IEC 19788 Metadata for Learning Resources can be used to specify metadata elements in VR. See: *ibid*.

⁷⁸ See: GS1 (n 72) 7–8.



created in one design application and imported into various gaming engines, maintaining visual consistency and functionality – partly, this is already possible today.⁷⁹

Standardization is key to realizing this *at scale*, ensuring the seamless creation, storage, and usage of 3D assets across diverse digital worlds and industries.⁸⁰ By supporting suitable unified standards for asset interoperability, the EU can promote continuity of 3D asset identification in the metaverse and facilitate supply chain visibility, strengthen brand loyalty, and enhance consumer safety by addressing interoperability challenges among competing virtual world platforms. Alternatively, utilizing non-fungible tokens (NFTs) allows for unique ownership linkage of physical or digital items within blockchain's decentralized ecosystem, but currently, this technology still seems to be under-developed and risky. The EU should therefore support industry stakeholders and standard-setting organizations in reviewing how standards and common structures – like APIs and regulations from the physical world – may translate and be enforced in virtual worlds.⁸¹

4.1.6. Standards for ecosystem interoperability

In addition to asset interoperability, a truly integrated metaverse necessitates establishing universal standards for economic interoperability between different virtual world ecosystems. Such standards would facilitate the consistent application and sharing of revenues across diverse gaming environments, as user engagement and in-game purchases will be a key driver behind early metaverse applications. For instance, economic agreements and content standards could enable the purchase of an outfit in one game, like Roblox, to be usable and recognized in another, like Fortnite.⁸² This is ultimately required to ensure a cohesive user experience while respecting each environment's economic model. Prevailing standards have been instrumental in achieving end-to-end visibility and standardized transactions in physical supply chains, offering a blueprint for their digital counterparts.⁸³

4.1.7. Standards for privacy protection and security

As interacting within the metaverse will mandate providing many detailed personal information, certain standards for privacy protection are paramount. Virtual worlds link data that was previously evaluated separately in real time, such as so-called field of view, heart activity, or voice recordings. The combination of VR with biofeedback poses new challenges to data protection, which, however, cannot be sufficiently controlled either by the user or by the process of economic competition, thus necessitating mandatory standards.⁸⁴ Although it will be difficult to reach global unity with respect to privacy protection, the EU should press for standards that advocate for robust encryption

⁷⁹ See: Webster (n 62).

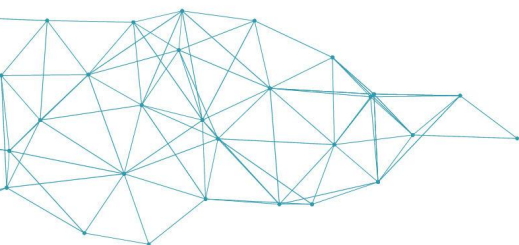
⁸⁰ Organizations like the Khronos Group are already trying to create unified standards for 3D assets. See: GS1 (n 72) 8.

⁸¹ See: World Economic Forum (n 45) 13.

⁸² See: Webster (n 62).

⁸³ See: GS1 (n 72) 8–9.

⁸⁴ See: Anselm Küsters and Patrick Stockebrandt, 'The Right Recipe for the Metaverse' (2023) 8 cepInput <<https://www.cep.eu/en/eu-topics/details/cep/das-richtige-rezept-fuer-das-metaverse-cepinput.html>>.



methodologies and anonymization techniques to secure users' personal data and digital interactions comprehensively. In particular, this requires answering the (empirical) question of how much and which type of data is actually required for supporting a persistent, immersive virtual world. In other words, this means that standards can also define limits of what should be interoperable to protect privacy and security in the metaverse.

Moreover, the EU should support setting metaverse standards for data collection and sharing that align with existing privacy, security, and child safety frameworks and enterprise risk management tools.⁸⁵ The Commission can help develop guidelines that facilitate transparency, requiring service providers to delineate understandable privacy policies, thereby empowering users to make informed decisions regarding their data sharing within a secure and user-friendly metaverse ecosystem.

4.1.8. Standards for content provenance

The issue of content authenticity in the metaverse is complex. How should we attribute sources or ownership, especially in light of the new possibilities offered by generative AI? Recent research has proposed a new decentralized framework named EKILA that might offer a potential solution to this problem by ensuring creatives receive proper acknowledgment and compensation for their input to Generative AI-based, or synthetic, media.⁸⁶ The innovative framework introduces a strong visual attribution method intertwined with a new standard for content provenance and origin, known as the "Coalition for Content Provenance and Authenticity" (C2PA). EKILA's promising approach facilitates the identification of the generative models and underlying training data instrumental in producing AI-generated images, thereby enhancing accountability in AI-generated content.

4.2. Avenues for increasing the EU's influence on standard-setting

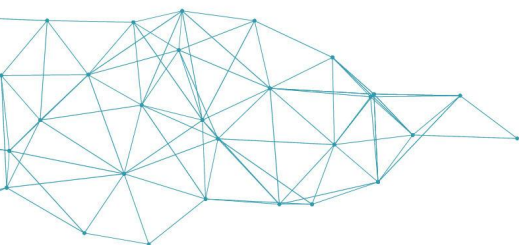
What does all this mean for the emerging EU initiative on virtual worlds? Europe's clearly voiced ambition for the metaverse might lead to a situation where normative values, such as the frequently mentioned "European values", increasingly intertwine – and conflict – with emerging technical standards. For Commissioner Breton, the answer to this dilemma is clear: "Europe's technological sovereignty, ability to reduce dependencies and protection of EU values will rely on our ability to be a global standard-setter."⁸⁷ However, the necessity for universal standards, described above, strongly illuminates the limits of a purely Eurocentric approach to norms or the hoping for another "Brussels Effect",⁸⁸ which will not take effect in the case of the metaverse. Envisaging a metaverse underpinned by universal infrastructure necessitates, by definition, embracing a global perspective. As achieving true interoperability based on common standards is beyond the solitary capabilities of the

⁸⁵ See: World Economic Forum (n 45) 12–13.

⁸⁶ See: Kar Balan and others, 'EKILA: Synthetic Media Provenance and Attribution for Generative Art'.

⁸⁷ See: European Commission, 'New Approach to Enable Global Leadership of EU Standards Promoting Values and a Resilient, Green and Digital Single Market' *European Commission Press Release* (Brussels, 2 February 2022) <https://ec.europa.eu/commission/presscorner/detail/en/ip_22_661>.

⁸⁸ See: Anu Bradford, *The Brussels Effect: How the European Union Rules the World* (Oxford University Press 2020).



Commission, it should focus on addressing how the work of existing Standards-Setting Organizations (SSOs) in defining and updating metaverse standards may be better coordinated and accelerated. It should support their work as well as the Europe-wide adoption of metaverse standards by developing and using consistent terminology and deployment guidelines, in contrast to ambivalent vocabulary used in the Commission Communication on virtual worlds.

Collaborations across multiple stakeholders and international boundaries are crucial to establishing consensus on the above-mentioned operational aspects such as design, best practices, and management standards. Notable organizations, like the W3C, OMF, OMA3, and Metaverse Standards Forum, are pivotal in crafting these common standards. Particularly, the Metaverse Standards Forum, which includes major players such as Meta, Microsoft, and Epic Games, is already coordinating significant efforts to include essential aspects like safety, privacy, and digital identity in developing the metaverse's standards.⁸⁹ From a European perspective, the prevalent issue is therefore the substantial influence of US companies in these fora, which may lead to the creation of standards misaligned with EU principles, as outlined by the Commission, or European interests. Explicitly addressing this influence disparity is essential, especially while the metaverse is in its developmental stages, to ensure a balanced representation of global interests and principles in its foundational standards.

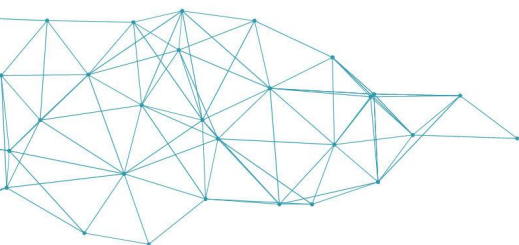
To enhance the EU's influence in establishing metaverse standards, a multifaceted strategy should be devised (Table 1).⁹⁰ Firstly, systematic and continuous interaction processes with the above-mentioned SSOs need to be instituted in order to foster the development of harmonized standards and to ensure a coherent and unified European approach towards metaverse standard setting. Clarifying the internal division of labor within Europe is crucial, too. Clearly delineated responsibilities and points of attention between the EU and Member State agencies will enhance operational efficiency, especially in view of lacking specialized metaverse staff. Continuous engagement with relevant authorities, such as SSOs, but also with industry stakeholders is imperative. By establishing effective dialogue mechanisms, e.g. via new digital platforms or advisory boards, the EU can provide timely guidance to stakeholders, ensuring that European entities involved in the metaverse are always informed and aligned with the latest regulatory expectations.

This dialogue format will also ensure that the EU's regulatory regime for the metaverse remains technically relevant and has the potential to reach global influence in shaping the metaverse's regulatory landscape. Similarly, providing clear guidance to the public sector is essential, especially in prevalent metaverse use cases such as digital twins, e.g. for universities. Finally, an effort should be made towards the harmonization of terminologies within the global discourse, which might require talking less about "virtual worlds" and "Web 4.0" and more explicitly about *one* "metaverse" – as this paper has hopefully shown, this is not just a rhetorical but a technical and thus political issue. Later on, when it comes to legal obligations, this simplification in language will also make compliance more accessible, ensuring that standards are easier to understand and follow.

A particular fitting avenue for the EU to shape this kind of technical standardization might be the EU-US Trade and Technology Council (TTC), which has already turned into a central field of transatlantic policy coordination and could be renewed after this year's EU

⁸⁹ See the website at: <https://metaverse-standards.org> (last accessed: 25 April 2024).

⁹⁰ This is inspired by a report on the coordination requirements for a future AI Office, see: Samuel Curtis, Felicity Reddel and Nicolas Moës, 'A Blueprint for the European AI Office' (The Future Society 2023) <<https://thefuturesociety.org/wp-content/uploads/2023/10/a-blueprint-for-the-european-ai-office.pdf>>.



and US elections. So far, the TTC has met semi-annually with the objective of enhancing bilateral trade and investment and strengthening technological and industrial leadership in adherence to mutual values. Guided by ministerial meetings, the TTC collaborates on various domains such as secure supply chains, tech regulations, and green technologies. Crucially, it focuses on collaborative efforts in standardization for essential emerging technologies, with emphasis on developing robust international standards for innovative sectors like 3D printing and AI. It also emphasizes cooperation in the realm of digital identity, aiming to facilitate interoperable systems through comprehensive research and implementation strategies that prioritize human rights. As the TTC includes a dedicated working group on “technology standards” tasked with facilitating cooperation on technology standards in emerging technologies, this could be a well-placed forum for debating metaverse standards, too. In particular, existing TTC discussions about digital identities and facilitating interoperability will be helpful for pushing alignment on those metaverse-related standards surveyed in the previous section. A suitable role model might be the Roadmap for Trustworthy AI and Risk Management, presented first at the TTC Ministerial Meeting in December 2022, which is designed to foster the development of tools and methodologies essential for managing AI risks. It embodies the concerted effort of the EU and US to champion international standardization initiatives in the realm of AI. At the TTC meeting in May 2023, three specialized groups were initiated concentrating on enhancing AI terminology and taxonomy, establishing standards and tools for trustworthy AI and efficient risk management. This led to a list of key AI terms essential to understanding risk-based approaches to AI, along with their EU and US interpretations.⁹¹ As the importance of aligning terminology and conceptual frameworks is becoming increasingly evident in the field of virtual worlds, too, a similar list of shared terms and definitions would be very helpful in guiding transatlantic cooperation on future metaverse standards that allow for interoperability. In the future, this might enhance legal certainty in the metaverse, promote effective risk management, and reduce administrative burdens for European companies.

Finally, the strategic alignment of public investments with technical standard proposals could propel advancements in R&D and increase Europe’s influence in global fora for metaverse standard-setting.⁹² Here, the recently proposed Strategic Technologies in Europe Platform (STEP), aimed at boosting projects in essential technological sectors and promoting industrial development in less affluent EU regions, could be a suitable tool, if properly financed. STEP is proposed to act as a signal, introducing a “Sovereignty Seal” to expedite the allocation of EU funds, mainly from InvestEU and the Innovation Fund, and to attract additional private investments. Given the huge financial requirements for establishing European firms as standard setters for the metaverse, however, STEP should be the onset of a more ambitious approach, envisioning a comprehensive sovereignty fund that can be also dedicated to supporting all EU metaverse efforts. So far, the current STEP framework mainly redirects existing funds, falling short of establishing a robust fund to enhance the EU’s competitive stance against the US and China in strategic technologies like virtual world technologies.

⁹¹ See: EU-US Trade and Technology Council (n 50).

⁹² See: Tim Rühlig, ‘Technical Standardization and Innovation in a Changing Geopolitical Landscape’ in Enrico Eiaco and Joakim Wernberg (eds), *Rethinking boundaries and revisiting borders. Conditions for innovation, entrepreneurship and economic integration in an interconnected world*. Stockholm: (The Swedish Entrepreneurship Forum 2022).

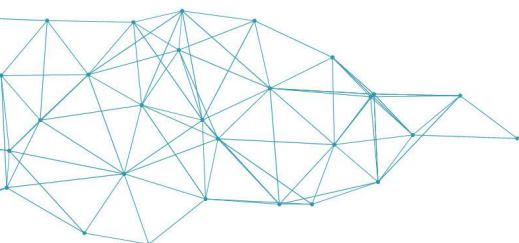
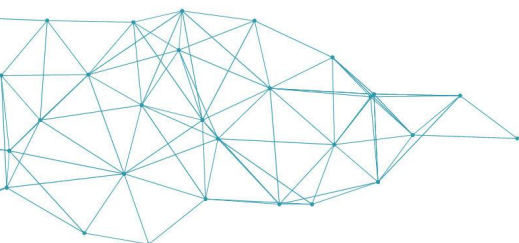


Table 1: Avenues for increasing EU influence on standard-setting

Strategy	Objective	Action items	Key organizations/platforms
Global collaboration	Foster the development of harmonized metaverse standards that reflect EU interests in interoperability and accessibility	Engage with global standards-setting organizations (SSOs) Coordinate and accelerate the updating of standards related to metaverse infrastructure Utilize the EU-US Trade and Technology Council (TTC) for debating metaverse standards and defining key concepts	World Wide Web Consortium (W3C) Open Metaverse Foundation (OMF) Open Metaverse Alliance for Web3 (OMA3) Metaverse Standards Forum EU-US Trade and Technology Council (TTC)
Enhancing internal coordination	Improve operational efficiency within the EU in establishing metaverse standards	Clarify division of labour and responsibilities within EU and Member State Identify existing regulatory entities with relevant knowledge	EU and Member State agencies and digital policy enforcement bodies
Stakeholder engagement and dialogue	Ensure that European companies are aligned with the latest regulatory expectations Benefit from the latest technological knowledge in the formulation of standards	Establish effective dialogue mechanisms with industry stakeholders and relevant academics Simplify language to make compliance with metaverse standards more accessible	Industry stakeholders Academia
Strategic public investment	Propel advancements in R&D and industry diffusion to increase Europe's influence in the long-run	Align public investments with technical standard proposals	EU representatives



		Expand financing for strategic platforms like STEP	
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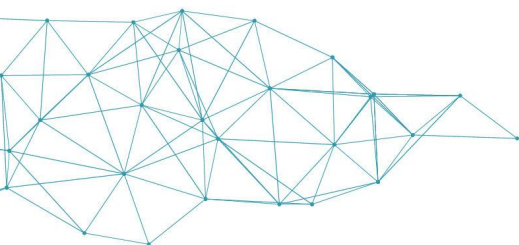
The policy recommendations outlined in this section are summarized in Table 1, grouped according to main objective, supporting action items, and responsible organizations, respectively. Overall, following these strategic paths will help enhance the EU's influence in establishing metaverse-related standards and thus counter future risk of monopolization or market fragmentation.

5. Concluding remarks: architecting the universal metaverse

Through various stages of analysis and consultation, the European Commission has by now reached a first, comprehensive Communication dealing with the emerging opportunities and threats posed by the metaverse, emphasizing the role of a competitive landscape and European values. While the initiative by the Commission is commendable, its success relies heavily on strong execution. The emphasis on nurturing homegrown talent and companies is crucial, given the current dominance of non-EU entities in the VR/AR market.

However, so far, the Commission's documents lack explicit bottom-up strategies for engaging smaller players and startups, which are often the innovation drivers in tech. Going forward, the Commission should not only focus on promoting digital literacy and professional skills, but also prioritize the development of comprehensive standards for metaverse-related web protocols, persistent metaverse identity, 3D rendering and cross-platform technologies. Such standards should ensure interoperability and user experience across different 3D worlds, thereby supporting both the seamless integration of digital and physical realities and future European digital sovereignty. However, it is essential that these standards do not compromise the innovation and diversity that characterize the rapidly evolving VR/AR space. In addition, the Commission should establish clear guidelines that reflect not only European values but also continuous feedback from stakeholders.

In addition, the Commission's strategy towards the metaverse should explicitly address the need for a structured incentive mechanism to stimulate investment in connectivity infrastructure and the critical role of international cooperation in achieving an aligned approach to metaverse standards – in order to ensure that one interoperable metaverse can become the successor to the current iteration of the web. The next EU Communication on virtual worlds, or any type of Metaverse Act, should propose clearer mechanisms for promoting these aspects, in particular through the VR/AR Industrial Coalition, and outline strategies for enhancing the EU's influence in global standard-setting through robust interaction with standards-setting organizations and a renewed focus on transatlantic policy coordination through mechanisms such as the EU-US Trade and Technology Council.



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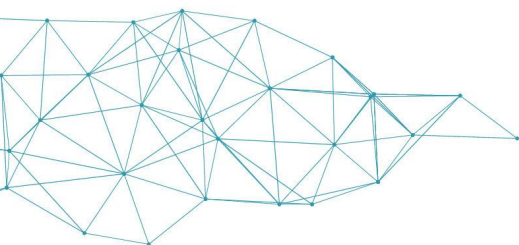
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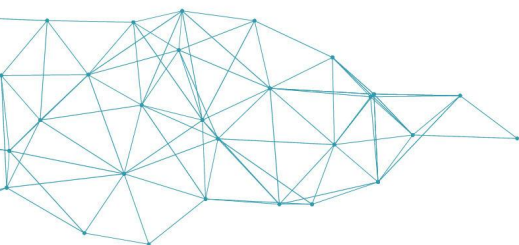
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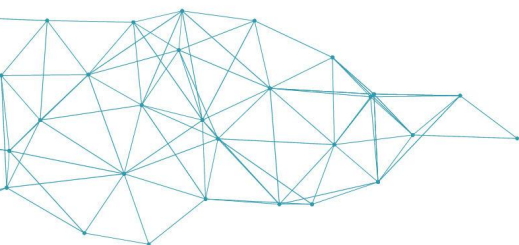
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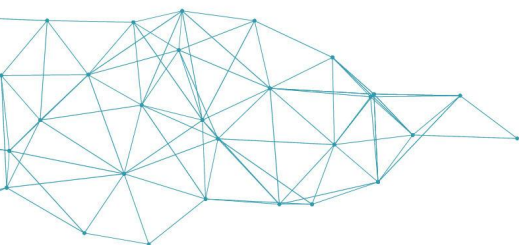
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