TECHETHOS

FUTURE ○ TECHNOLOGY ○ ETHICS

D4.1 Analysis of international and EU law and policy

Part III: Digital Extended Reality

Draft version submitted to the European Commission for review

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D4.1 Analysis of international and EU law and policies – Part III: Digital Extended Reality			
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The TechEthos Project

TechEthos is an EU-funded project that deals with the ethics of the new and emerging technologies anticipated to have high socio-economic impact. The project involves ten scientific partners and six science engagement organisations and runs from January 2021 to the end of 2023.

TechEthos aims to facilitate “ethics by design”, namely, to bring ethical and societal values into the design and development of new and emerging technologies from the very beginning of the process. The project will produce operational ethics guidelines for three to four technologies for users such as researchers, research ethics committees and policy makers. To reconcile the needs of research and innovation and the concerns of society, the project will explore the awareness, acceptance and aspirations of academia, industry and the general public alike and reflect them in the guidelines.

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Definitions and abbreviations

Table 1: List of Definitions

Term	Explanation
Augmented reality	Overlay of digital information or objects with a person's current view of reality; enhancement of reality by computer-generated perceptual information across multiple sensory, visual or auditory modalities.
Digital extended reality (XR)	Refers to a collection of technologies that are related to each other, with a common functionality to emulate and imitate human traits and social circumstances: language, appearance, lived spaces, objects, experiences, etc. XR is also known as a "mix of virtual reality (VR), augmented reality (AR) and mixed reality."[1]
Mixed reality	Blending the real and virtual worlds to create new digital or manufactured realities, where physical and digital objects co-exist and interact in real-time.
Virtual reality	Environment that is completely simulated by digital means, completely obscuring the view of their existing reality.

Table 2: List of Abbreviations

Term	Explanation
AI HLEG	European High-Level Expert Group on Artificial Intelligence
AIA	Artificial Intelligence Act (AIA)

[1] European Commission. (2022) *Extended Reality* [Online]. Available at: https://digital-strategy.ec.europa.eu/en/policies/extended-reality.

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AR	Augmented Reality
CCPR	United National Human Rights Committee
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CERD	International Convention on the Elimination of All Forms of Racial Discrimination
CIL	Customary international law
CFREU	Charter of Fundamental Rights of the European Union
CJEU	Court of Justice of the European Union
CoE	Council of Europe
CPRMW	Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families
CRC	Convention on the Rights of the Child
CRPD	Convention on the Rights of Persons with Disabilities
DA	Data Act (EU)
DGA	Data Governance Act (EU)
DoA	Description of Action
DSA	Digital Services Act (EU)
EC	European Commission
ECHR	European Convention on Human Rights (CoE)
ECtHR	European Court of Human Rights (CoE)
EP	European Parliament
EU	European Union
FRA	Fundamental Rights Agency (EU)
GDPR	General Data Protection Regulation (EU)
HRC	Human Rights Council (UN)
IBC	International Bioethics Committee (UNESCO)
ICCPR	International Covenant on Civil and Political Rights

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ICESCR	International Covenant on Economic, Social and Cultural Rights
IEEE	Institute of Electrical and Electronics Engineers
MR	Mixed Reality
MRB	Media Ratings Bodies
OECD	Organisation for Economic Co-operation and Development
OHCHR	Office of the United Nations High Commissioner for Human Rights
Oviedo Convention	The Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine
PEGI	Pan European Game Information
TFEU	Treaty on the Functioning of the European Union
XR	Digital extended reality
UDHR	Universal Declaration of Human Rights
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VR	Virtual Reality
XR	Extended reality

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Executive Summary

This Deliverable 4.1, involving an analysis of international and EU law and policies, was developed as part of TechEthos, a project funded by the European Union's Horizon 2020 Research and Innovation Programme. TechEthos aims to facilitate "ethics by design" by bringing ethical and societal values into the design and development of new and emerging technologies with a high socio-economic impact. The technology families selected for the project are climate engineering, neurotechnologies, and digital extended reality (XR).

TechEthos Deliverable 4.1 explores and analyses relevant international and EU laws and policies for their relevance and applicability to each of the technology families. Based on the analysis of the characteristics, applications, ethics and socio-economic impacts of these technologies, as emerged in previous phases of the TechEthos project, Deliverable 4.1 serves different purposes:

- To review the legal domains and related obligations at international and EU levels.
- To identify potential implications for fundamental rights and principles of democracy and rule of law, considering both enhancements and interferences.
- To reflect on issues and challenges of existing legal frameworks to address current and future implications of the technologies.

TechEthos Deliverable 4.1 is divided into three parts. Parts I and II focus on climate engineering and neurotechnologies, respectively. Part III focuses on XR, and the significant legal issues associated with such technologies.

For the purposes of this report, digital extended reality is defined as follows:

- **Digital Extended Reality (XR)** refers to a collection of technologies that are related to each other, with a common functionality to emulate and imitate human traits and social circumstances: language, appearance, lived spaces, objects, experiences, etc. XR is also known as a "mix of virtual reality (VR), augmented reality (AR) and mixed reality."[2]

There is no comprehensive or dedicated international or EU law governing XR. However, there are many legal obligations under existing legal frameworks. The legal issues and challenges discussed in this report are grouped into applicable legal frameworks at the international and EU level. The legal frameworks relevant to XR include human rights law, privacy and data protection law, consumer rights law, and the law related to artificial intelligence, digital services and data governance.

TechEthos Deliverable 4.1 presents the obligations of States (for international law) and/or Member States (for EU law) and the rights of private individuals under those laws for each technology family. Discussion of the obligations of private individuals and entities will be the focus on a report (TechEthos Deliverable 4.2) on the legal frameworks at the national level (forthcoming Winter 2022). The work of these two reports, and the gaps and challenges in existing legal frameworks identified by

[2] European Commission. (2022) *Extended Reality* [Online]. Available at: https://digital-strategy.ec.europa.eu/en/policies/extended-reality.

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this work, will form the basis for legal and policy recommendations in the TechEthos project in the coming months (forthcoming Spring 2023).

Digital Extended Reality (XR)

Part III of Deliverable 4.1 discusses the ways in which digital extended reality (XR) is or may be governed by international and EU law and policy within the legal frameworks for human rights, privacy and data protection, consumer rights, artificial intelligence, and digital services. While no international or EU law directly addresses or explicitly mentions XR, many aspects are subject to domain-specific international and EU law frameworks. Further legislative measures with application to XR are also expected, particularly at the EU level. In the meantime, a key advantage of the existing rights-based legal frameworks is the built-in flexibility to adapt to the challenges posed by new and emerging technologies, including XR, in order to better protect the rights of individuals against interference.

Overall, legal and policy developments have focused on how XR should be regulated, not whether such technologies should be permitted. A key consideration for legislators and policymakers, therefore, is the most suitable and inclusive definition to be attributed to XR technologies, the significance of which is in determining the applicable basis for legal regulation. At present, however, there is no proposal to comprehensively regulate XR at the international or EU level. Further governance of this technology family may therefore occur at the national level, the possibility for which will be analysed in the forthcoming TechEthos deliverable on legal frameworks at the national level (Deliverable 4.2).

Following an overview of the relevant international and EU law frameworks, the following specific laws and legal issues are considered:

Table 3: Legal framework and issues in relation to XR

Legal framework	Legal issues
Human rights law	Right to dignity Right to autonomy Right to privacy Freedom of expression Right to health Right to education Access to justice and the right to a fair trial Right to just and favourable conditions of work Right to rest and leisure Right to benefit from science Non-discrimination and vulnerable groups Trends and emerging rights
Privacy and data protection	Privacy Classification of data Consent Transparency Vulnerable users Potential developments and future trends
Consumer protection	Right to safety Right to be informed

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	Right to choose Right to redress Right to consumer education Right to a healthy environment Potential developments and future trends
AI governance	Risk classification of XR technologies with AI Environmental impacts of AI in XR
Digital services governance	Digital service providers' obligations Discrimination

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1. Introduction

Digital extended reality (XR) presents many significant legal issues that impact socio-economic equality and fundamental rights. There is no comprehensive or dedicated international and EU law governing this technology family, though many elements of the technology are subject to existing laws and policies.

Part III of TechEthos Deliverable 4.1 explores and analyses relevant international and EU laws and policies in relation to XR. Parts I and II focus on climate engineering and neurotechnologies, respectively. While there are some cross-cutting issues, each technology family is subject to different legal frameworks. The following table outlines the legal frameworks presented in Part III.

Table 4: International and EU legal frameworks

Digital extended reality
• Human rights law • Privacy and data protection • Consumer protection

1.1 Defining the technology family

For the purpose of the TechEthos project and this report, we have used the following definition for digital extended reality:

- **Digital Extended Reality (XR)** refers to a collection of technologies that are related to each other, with a common functionality to emulate and imitate human traits and social circumstances: language, appearance, lived spaces, objects, experiences, etc. XR is also known as a "mix of virtual reality (VR), augmented reality (AR) and mixed reality."[3]

For more information about the technology families and their innovation ecosystems, visit: https://www.techethos.eu/resources/.

1.2 Key legal issues

As TechEthos Deliverable 4.1 presents international and EU law, discussions focus on the obligations of States (for international law) and/or Member States (for EU law) and the rights of private

[3] European Commission. (2022) *Extended Reality* [Online]. Available at: https://digital-strategy.ec.europa.eu/en/policies/extended-reality.

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individuals under those laws. Discussion of the obligations of private individual and entities will be the focus of a report on the legal frameworks at the national level (forthcoming Winter 2022).

While some of the legal issues considered in Deliverable 4.1 are cross-cutting (e.g., privacy, safety) across the technology families, the issues manifest in different ways. Furthermore, even within a technology family, distinct legal frameworks treat the same issues in different ways. Therefore, some legal issues are discussed in the context of more than one technology family and legal framework.

The legal issues considered in relation to XR are identified in the table below.

Table 5: Legal issues in XR

Legal issues in international and EU law: Digital extended reality (XR)
o Right to dignity o Right to autonomy o Right to privacy o Freedom of expression o Right to health o Right to education o Access to justice and right to a fair trial o Right to just and favourable conditions of work o Right to rest and leisure o Right to benefit from science o Non-discrimination and vulnerable groups o Right to healthy environment o Right to disconnect o Right to online access o Data protection and classification of data o Consent o Transparency o Right to safety o Right to be informed o Right to choose o Right to redress o Right to consumer education

1.3 Structure of report

Following this introduction, **Section 2** describes the methodology for developing TechEthos Deliverable 4.1. **Section 3** provides a high-level summary of the relevant legal frameworks and **Section 4** presents the international and European Union law frameworks with application to digital extended reality. The report concludes with a high-level discussion of gaps, challenges and trends in **Section 5**. A reference list is included at the end.

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2. Methodology and scope

Deliverable 4.1 is part of the policy, legal and regulatory analysis conducted in the EU-funded TechEthos project. The development of this report followed the description of action in the TechEthos Description of Action (DoA):

- T4.2: For each of the 3-4 selected tech, we will identity the legal issues and challenges – with a focus on those affecting/contributing to the stimulation of innovation, socio-economic inequalities including, in health treatment, social status and social inclusion and gender equality and fundamental human rights and freedoms of individuals. We will carry out a literature review of documents addressing legal aspects, i.e., articles in academic and legal practitioner journals, books, legal commentaries or legal policy studies (last five years). This review will be a starting point to help determine which specific legal issues are being discussed and debated in relation to the selected topic areas and should be further explored in the project and particularly investigated in the country studies.

- T4.3: In this task using desktop research, we will identify and analyse relevant international and EU laws and policies with respect to each of the identified technologies and carry out a comparison on both the legal/regulatory and procedural framework (existing or under development) for the identified technologies. We will explore whether international policies and laws cover the issues identified in Task 4.2 and the adequacy of these.

The overall approach to legal analysis, in particular the human rights analysis, was informed by and builds on past work in the EU-funded SHERPA and SIENNA projects, which also looked at the ethical and human rights implications of new and emerging technologies.[4] Some TechEthos partners with legal expertise were partners in the SHERPA and SIENNA projects and also contributed to the legal analysis work in those projects.

For each technology family, we began by compiling a list of key legal issues. To identify legal issues, we used the TAPP legal analysis method:

- T: Things (What are the relevant objects?)

- A: Actions (What actions are done or not done?)

- P: People (Who is involved or impacts by the action?)

- P: Places (Where (physical space or domain) does the action take plan?)[5]

With a TAPP list, we identified the corresponding legal frameworks governing the things, actions, people, and/or places relevant to the three technologies areas. To select the issues discussed in this report, we were guided by the language in the DoA to "focus on those affecting/contributing to the stimulation of innovation, socio-economic inequalities including, in health treatment, social status and

[4] For SHERPA, the technology focus was smart information systems (a combination of artificial intelligence (AI) and Big Data). See: https://www.project-sherpa.eu/. For SIENNA, the three technologies families analysed were genomics, human enhancement, and AI and robotics. See: https://www.sienna-project.eu/.
[5] *See*, Danner, R.A. (1987) 'From the Editor: Working with Facts', *Law Library Journal*, 79.

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social inclusion, and gender equality and fundamental human rights and freedoms of individuals." Additionally, we considered which legal issues were particularly significant and timely, and worked in parallel to an ethical analysis of the three technologies in the project.

The focus of TechEthos Deliverable 4.1 is legal frameworks at the international and EU level. Each of the technology families are the subject of individual reports. A subsequent report, to be finalised in late 2022, will look at the same legal issues through the lens of domestic law in nine countries (TechEthos Deliverable 4.2).

We carried out the research for this report from March-June 2022, primarily through desk research. To best understand the legal context, we looked at both hard (binding) law and soft (non-binding) law, as well as policies and judicial jurisprudence. Our analysis of the laws has been made with reference to legal and academic scholarship. To understand how the law may develop, we also look at proposed laws and policies.

As the three technology families are new and emerging, the legal scholarship does not always use the same terminology. For digital extended reality, we used the search terms 'extended reality', 'virtual reality', 'augmented reality', and 'mixed reality'.

The gaps and challenges identified in this report will serve as a basis for legal and policy recommendations in the TechEthos project in the coming months (forthcoming Spring 2023).

3. International laws and policies

The legal issues and challenges discussed in this report are grouped into applicable legal frameworks at the international and EU level. The legal frameworks reviewed in this report are human rights law, privacy and data protection law, consumer rights law, and the proposed regulation of artificial intelligence, digital services and data governance.

The **sources of international law and policy** referred to in this report include binding treaties (which may also be called conventions, covenants, agreements, protocols, etc.), customary international law, decisions from international courts (e.g., International Court of Justice, European Court of Human Rights), non-binding guidance documents, statements from policymakers and official reports. For the purpose of this report, the Council of Europe is included in discussions of international law.

The **sources of EU law and policy** include treaties, directives, regulations, decisions of the European Court of Justice, statements from EU policymakers, and reports from EU agencies and committees.

The following sub-sections provide a brief summary of the legal frameworks analysed.

3.1 Human rights law

International human rights law is comprised of international treaties and customary international law (CIL).

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The 1948 Universal Declaration of Human Rights (UDHR), while not binding on States, is the primary source of human rights law and many articles are considered customary international law.[6] Subsequent treaties are legally binding on contracting States.[7] There are seven core international human rights treaties, each with a committee of experts (treaty body) responsible for monitoring treaty implementation.[8] The UDHR and two of those treaties – International Covenant on Civil and Political Rights (ICCPR) and International Covenant on Economic, Social and Cultural Rights (ICESCR) – are collectively known as the International Bill of Human Rights.[9] To assist States with interpreting treaty language, the treaty bodies publish non-binding guidance in the form of *General Comments* or *General Recommendations*.[10] The Office of the United Nations High Commission for Human Rights (OHCHR) is the department of the U.N. Secretariat responsible for promoting and protecting human rights at the international level.[11] Human rights experts advise the U.N. High Commission for Human Rights on specific thematic topics or countries, such as 'the rights of persons with disabilities', 'the right to privacy', and 'the issue of human rights and transnational corporations and other business enterprises'.[12] These experts take the form of Working Groups, Independent Experts and Special Rapporteur; collectively, they are known as the OHCHR 'Special Procedures'.[13] Also relevant is the U.N. Human Rights Council, an inter-governmental body responsible for addressing human rights violations.[14] There is no international human rights court, but U.N. treaty bodies and Special Procedures can respond to complaints filed by victims of human rights abuses.[15] Other relevant rule making bodies for human rights at the U.N. level include the U.N. Secretary-General, who issues statements and commissions reports, and the U.N. General Assembly, which adopt declaration, convention and resolutions.[16] Work on human rights at the international level is complemented by work on the U.N. Sustainable Development Goals, a set of seventeen global goals related to ending poverty, reducing inequality, and protecting the environment.[17]

[6] United Nations. *The Foundation of International Human Rights Law* / [Online]. Available at: https://www.un.org/en/about-us/udhr/foundation-of-international-human-rights-law#:~:text=The%20Universal%20Declaration%20of%20Human,binding%20international%20human%20rights%20treaties.
[7] Vienna Convention Law of Treaties (entered into force 27 January 1980), Article 2(1).
[8] The seven core treaties and their respective treaty bodies are: (1) Human Right Committee (HRC) - International Covenant on Civil and Political Rights (ICCPR); (2) Committee on Economic, Social and Cultural Rights (CESCR) – International Covenant on Economic, Social and Cultural Rights (ICESCR); (3) Committee on the Elimination of Racial Discrimination (CERD) – International Convention on the Elimination of All Forms of Racial Discrimination (CERD); (4) Committee on the Elimination of Discrimination Against Women (CEDAW) - Committee on the Elimination of Discrimination Against Women (CEDAW); (5) Committee Against Torture (CAT) – Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT); (6) Committee on the Rights of the Child (CRC) – Convention on the Rights of the Child (CRC); (7) Committee on Migrant Workers (CMW) - International Convention on Protection of the Rights of All Mirant Workers and Members Their Families (ICMRW).
[9] U.N. General Assembly. (1948) *Resolution 217 (III) international Bill of Human Rights*, adopted 10 December 1948.
[10] U.N. Office of the High Commissioner for Human Rights. *General Comments* / [Online]. Available at: https://www.ohchr.org/en/treaty-bodies/general-comments.
[11] U.N. Office of the High Commissioner for Human Rights. *High Commissioner* / [Online]. Available at: https://www.ohchr.org/en/about-us/high-commissioner.
[12] U.N. Office of the High Commissioner for Human Rights. *About special procedures* / [Online]. Available at: https://www.ohchr.org/en/special-procedures-human-rights-council.
[13] Ibid.
[14] U.N. Office of the High Commissioner for Human Rights. *United Nations Human Rights Council* / [Online]. Available at: https://www.ohchr.org/en/hrbodies/hrc/home.
[15] *See* U.N. Office of the High Commissioner for Human Rights. *What the treaty bodies do* / [Online]. Available at: https://www.ohchr.org/en/treaty-bodies/what-treaty-bodies-do and U.N. Office of the High Commissioner for Human Rights. *What are Communications?* / [Online]. Available at: https://www.ohchr.org/en/special-procedures-human-rights-council/what-are-communications.
[16] United Nations. *Main Bodies* / [Online]. Available at: https://www.un.org/en/about-us/main-bodies.
[17] U.N. Department of Economic and Social Affairs. *The 17 Goals* / [Online]. Available at: https://sdgs.un.org/goals.

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Other international and regional organisations also support the promotion and protection of human rights. For the purpose of this report, the two key organisations are the Council of Europe and the European Union.

The Council of Europe (CoE) is an international organisation with 46 member states, founded to promote and protect human rights, democracy and the rule of law.[18] The European Convention on Human Rights (ECHR) was negotiated within the auspices of the CoE and all CoE Member States are party to the Convention.[19] The European Court of Human Rights (ECtHR) is the body of the CoE responsible for hearing cases under the ECHR.[20] Decisions of the ECtHR are binding on Member States of the CoE.[21]

Human rights within the 27-Member State European Union (EU) are enshrined in the Charter of Fundamental Rights of the European Union (Charter of Fundamental Rights or CFREU).[22] The European Court of Justice (CJEU), the supreme court of the EU, is responsible for interpreting EU law, including the Charter of Fundamental Rights.[23] The current EU policy on human rights is laid out in the *EU Action Plan on Human Rights and Democracy (2020-2024)*, which includes 'new technologies: harnessing opportunities and addressing challenges' as one of the five main areas of action.[24] The Fundamental Rights Agency (FRA) is the EU agency that supports the promotion and protection of human rights within the EU.[25] EU policy and work on human rights is complemented by the 'European Pillar of Social Rights', an initiative for "building a fairer and more inclusive European Union" through work on twenty principles.[26]

3.2 Privacy and data protection law

The right to privacy is applicable to everyone under international law.[27] The right to privacy is, moreover, recognised in regional organisations, including the Council of Europe. The European Convention on Human Rights (ECHR), for instance, provides that "Everyone has the right to respect for his private and family life and his correspondence."[28] Conversely, the right to data protection is not

[18] Council of Europe. *Values: Human rights, Democracy, Rule of Law* / [Online]. Available at: https://www.coe.int/en/web/about-us/values.
[19] European Convention on Human Rights (ECHR) (as amended by Protocols 11, 14 and 15) (entered into force 3 September 1953) E.T.S. 5, 4.XI.1950.
[20] Council of Europe. *European Court of Human Rights* / [Online]. Available at: https://echr.coe.int/Pages/home.aspx?p=home.
[21] ECHR, Article 46.
[22] Charter of Fundamental Rights of the European Union (entered into force 18 December 2009), 2000/C 364/01 (CFREU).
[23] E.U. Court of Justice. *Presentation* [Online] Available at: https://curia.europa.eu/jcms/jcms/Jo2_7024/en/.
[24] Council of the European Union. (2020) *EU Action Plan on Human Rights and Democracy 2020-2024*, 18 November 2020, 12848/20
[25] E.U. Fundamental Rights Agency. *FRA – Promoting and protecting your fundamental rights across the EU* / [Online]. Available at: https://fra.europa.eu/en.
[26] European Commission. *European Pillar of Social Rights* / [Online]. Available at: https://ec.europa.eu/info/strategy/priorities-2019-2024/economy-works-people/jobs-growth-and-investment/european-pillar-social-rights_en.
[27] Universal Declaration of Human Rights (8 December 1948) G.A. Res 217(A) III, Article 12; International Covenant on Civil and Political Rights (entered into force 23 March 1976) G.A. Res 2200A (XXI), Article 17; Convention on the Rights of the Child (entered into force 2 September 1990) 1577 U.N.T.S. 3, Article 16; International Convention on the Protection of All Migrant Workers and Members of Their Families (entered into force 18 December 1990) G.A. Res 45/158, Article 14; Convention on the Rights of Persons with Disabilities (entered into force 3 May 2008) A/RES/61/106, Article 22.
[28] ECHR, Article 8.

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explicitly protected under international law. However, the United Nations Human Rights Committee (CCPR) has suggested that the protection of personal data is an integral aspect of the right to privacy, as indicated by the explanation that '[i]n order to have the most effective protection of his private life, every individual should have the right to ascertain in an intelligible form, whether, and if so, what personal data is stored in automatic data files, and for what purposes.'[29]

There are various EU laws and draft legislation applicable to privacy and data protection, including the Charter of Fundamental Rights of the European Union (CFREU), the General Data Protection Regulation (GDPR), and legislative proposals, including the Regulation on Privacy and Electronic Communications (e-Privacy Regulation), the Artificial Intelligence Act (AIA), the Digital Services Act (DSA), the Data Governance Act (DGA) and the Data Act (DA).

Charter of Fundamental Rights of the European Union (CFREU)[30] The CFREU provides citizens of the EU with an essential catalogue of fundamental rights protections, with the enactment of the Treaty on European Union (TEU) in 2009 establishing that the Charter is primary EU law and has "the same legal value as the Treaties."[31] The Charter makes provision for various fundamental freedoms, including a substantive right to respect for private and family life,[32] and a procedural right to data protection,[33] as discussed below.[34] Each of these articles has a shared provenance in the ECHR, in accordance with which the CFREU provides that, whilst not precluding "Union law providing more extensive protection", the meaning and scope of the rights contained in the Charter "shall be the same as those laid down by the said Convention."[35] According to the Explanations relating to the Charter, this formulation "is intended to ensure the necessary consistency between the Charter and the ECHR".[36] As the Grand Chamber of the Court of Justice of the EU (CJEU) has observed, "the rights enshrined in Articles 7 and 8 of the Charter are not absolute rights but must be considered in relation to their function in society".[37] According to the Charter, however, "[a]ny limitation on the exercise of the rights and freedoms recognised by the Charter must be provided for by law and respect the essence of those rights and freedoms."[38] Further, in view of "the principle of proportionality, limitations may be made only if they are necessary and genuinely meet objectives of general interest recognised by the Union or the need to protect the rights and freedom of others."[39] In addition to these restrictions on derogations, the protection of the various fundamental rights contained in the CFREU is enhanced by the rights to an effective remedy and a fair trial for those whose rights and freedoms guaranteed under EU law are violated.[40]

[29] CCPR General Comment No.16: Article 17 (Right to Privacy) The Right to Respect of Privacy, Family, Home and Correspondence, and Protection of Honour and Reputation (8th April 1988), para. 10.
[30] Charter of Fundamental Rights of the European Union (CFREU) (entered into force 18 December 2009) 2000/C 364/01.
[31] Consolidated Version of the Treaty on European Union (TEU) 2012/C 326/15, Article 6(1).
[32] CFREU, Article 7.
[33] Ibid, Article 8.
[34] Politou E., Alepis E., and Patsakis C., (2018) 'Forgetting personal data and revoking consent under the GDPR: Challenges and proposed solutions', *Journal of Cybersecurity*, vol.4(1), pp.1-20, pp.2.
[35] CFREU, Article 52(3).
[36] Explanations Relating to the Charter of Fundamental Rights (2007/C 303/02). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32007X1214%2801%29.
[37] Judgement of 16 July 2020, *Data Protection Commissioner v Facebook Ireland Ltd and Maximillian Schrems* C-311/18 EU:C: 2020:559, para. 172.
[38] CFREU, Article 52(1).
[39] Ibid.
[40] Ibid, Article 47

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General Data Protection Regulation (GDPR)[41] Adopted in April 2016 and implemented in May 2018, the General Data Protection Regulation (GDPR) lays down a harmonised framework for data protection in the EU which seeks to strike a balance between "the protection of natural persons with regard to the processing of personal data", as provided for under Article 8 CFREU (see above) and the Treaty on the Functioning of the European Union (TFEU),[42] and "the free movement of personal data."[43] The GDPR "applies to the processing of personal data wholly or partly by automated means",[44] with data controllers[45] and processors[46] required to comply with various principles relating to the processing of personal data,[47] such as the requirement that personal data shall be "processed lawfully, fairly, and in a transparent manner in relation to the data subject".[48]

In addition to compliance with these principles, the processing of personal data must have a lawful basis, yet this differs depending on the type of personal data being processed, specifically whether or not such data is listed in the "special categories of personal data" under the GDPR.[49] Pursuant to this distinction, the processing of personal data characterised as special category is, in principle, prohibited,[50] unless one of the exhaustively listed exceptions to the rule applies,[51] for instance "the data subject has given explicit consent to the processing of those personal data for one or more specified purposes",[52] whereas the processing of all other personal data is in principle permitted provided that at least one of the in principle less rigorous conditions for lawfulness of processing is applicable,[53] for instance "the data subject has given consent to the processing of his or her personal data for one or more specific purposes".[54] The types of personal data characterised as special category are exhaustively listed in the GDPR and include,[55] inter alia, "genetic data",[56] "biometric data for the purpose of uniquely identifying a natural person"[57] and "data concerning health".[58]

Consistent with the framing in the language of fundamental rights,[59] the GDPR makes provision for various rights of the "data subject", including to "the rectification of inaccurate personal data concerning him or her",[60] the "right to erasure" or the "right to be forgotten",[61] and the right to "data portability".[62] Furthermore, the data subject is empowered to lodge a complaint with a supervisory

[41] Regulation (EU) 2016/679 (General Data Protection Regulation) COM/2012/010 final.
[42] Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union 2012/1 326/01, Article 16(1).
[43] GDPR, Article 1(1).
[44] Ibid, Article 2(1).
[45] Ibid, Article 4(7).
[46] Ibid, Article 4(8).
[47] Ibid, Article 5.
[48] Ibid, Article 5(1).
[49] Ibid, Article 9.
[50] Ibid, Article 9(1).
[51] Ibid, Article 9(2)(a)-(j).
[52] Ibid, Article 9(2)(a).
[53] Ibid, Article 6.
[54] Ibid, Article 6(1)(a).
[55] Ibid, Article 9(1).
[56] Ibid, Article 4(13).
[57] Ibid Article 4(14).
[58] Ibid, Article 4(15).
[59] Politou E. Alepis E. and Patsakis C. (2018), supra note 34, pp.2.
[60] GDPR, Article 16.
[61] Ibid, Article 17.
[62] Ibid, Article 20.

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authority[63] and to an effective judicial remedy against either a supervisory authority,[64] or a controller or a processor.[65] Such rights are contained within Chapter 8, which details the remedies, liabilities and penalties associated with breaches of the GDPR, such as the general conditions for imposing administrative fines, principally that such penalties shall be "effective, proportionate and dissuasive."[66] Thus, for infringements of "the basic provisions for processing, including conditions for consent", the financial penalty is up to 4% of an organisation's global annual turnover or 20 million euros, whichever is higher.[67]

***Proposed* Regulation on Privacy and Electronic Communications (e-Privacy Regulation)**[68] The draft e-Privacy Regulation, one of several legislative changes proposed as part of the European Commission's Digital Single Market Strategy,[69] purports to repeal and replace Directive 2002/58/EC (e-Privacy Directive) on the basis that the former "has not fully kept pace with the evolution of technological reality, resulting in an inconsistent or insufficient effective protection of privacy and confidentiality in relation to electronic communications."[70] It follows that the draft Regulation seeks to enhance the protection of the "fundamental rights and freedoms of natural and legal persons in the provision and use of electronic communication services",[71] specifically the rights to privacy and data protection provided for in the CFREU (see above). According to the proposal, "the processing of electronic communications data"[72] is prohibited "by persons other than the end-users" under the principle of confidentiality,[73] except for the instances in which such processing is permitted,[74] for example "if all end-users concerned have given their consent to the processing of their electronic communications content for one or more specified purposed that cannot be fulfilled by processing information that is made anonymous".[75] Consistent with the legislative intention to "particularise and complement" the GDPR under the principle of *lex specialis*,[76] the proposed e-Privacy Regulation provides that the definition of and conditions for consent of end-users are the same as those provided for under the GDPR.[77]

[63] Ibid, Article 77.
[64] Ibid, Article 78.
[65] Ibid, Article 79.
[66] Ibid, Article 83.
[67] Ibid, Article 83(5)(a).
[68] Proposal for a Regulation of the European Parliament and the Council concerning the respect for private life and the protection of personal data in electronic communications and repealing Directive 2002/58/EC (Regulation on Privacy and Electronic Communications) COM/2017/010 final.
[69] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A Digital Single Market Strategy for Europe COM/2015/0192 final.
[70] Proposal for a Regulation of the European Parliament and the Council concerning the respect for private life and the protection of personal data in electronic communications and repealing Directive 2002/58/EC (Regulation on Privacy and Electronic Communications) COM/2017/010 final, para. 6.
[71] Ibid, Article 1(1).
[72] Ibid, Article 2(1).
[73] Ibid, Article 5.
[74] Ibid, Article 6.
[75] Ibid, Article 6(3)(b).
[76] Ibid, Article 1(3).
[77] Ibid, Article 9.

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3.3 Consumer rights law

Consumer rights and consumer protection law provide a way for individuals to fight back against abusive business practices by enterprises. Significant events in consumer protection history[78] were the struggles against capitalism, the birth of consumer protection organisations in Europe (in Denmark and Great Britain), the creation of the creation of the Federal Trade Commission (1914) in the USA, president John F Kennedy's 1962 Special message to Congress on protecting consumer interests,[79] enactment of the Single European Act (modified by the Treaty of Rome that strengthened the role of the Economic and Social Committee, the Maastricht Treaty (1992) and the enactment of the United Nations Guidelines for Consumer Protection (UNGCP) (adopted 1985, revised 1999).

Consumer protection law has evolved over the years and consumer rights generally include the following basic rights:

- Right to safety (reasonably safe for intended purpose)
- Right to be informed (sufficient information to weigh alternatives and to protect the consumer from false and misleading claims in advertising and labeling practices; includes truth in advertising laws)
- Right to choose (competing goods and services that offer alternatives in terms of price, quality, and service; includes anti-trust and unfair competition laws)
- Right to be heard (assurance that government will take heed of the concerns of consumers and will protect those interests through wisely enacted statutes and administrative regulations)
- Right to satisfaction of basic needs
- Right to redress
- Right to consumer education, and
- Right to healthy environment.[80]

3.4 Artificial intelligence, digital services, and data governance

At present, there is no international or EU legal framework dedicated to the governance of artificial intelligence (AI) technologies. However, in April 2021, the European Commission proposed a regulatory framework for AI, which includes a draft regulation on the governance of AI (***proposed* AI**

[78] Corradi, A. (2015) *International Law and Consumer Protection: The history of consumer protection.* /Hauser Global Law School Program [Online]. Available at: https://www.nyulawglobal.org/globalex/International_Law_Consumer_Protection.html.
[79] *Special message to Congress on protecting consumer interest, 15 March* 1962 / John F. Kennedy Presidential Library and Museum [Online]. Available at: https://www.jfklibrary.org/asset-viewer/archives/JFKPOF/037/JFKPOF-037-028.
[80] National Consumer Federation, *The 8 consumer rights* / [Online]. Available at: https://www.nationalconsumer.org.uk/consumer-voice/consumer-rights/.

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Act). If adopted as written, the AI Act would prohibit some types of AI systems and place mandatory *ex ante* and *ex post* requirements on 'high-risk' AI systems. The requirements relate to risk management, data governance, documentation, transparency, human oversight, accuracy, robustness, and cybersecurity. Other 'low-risk' systems would be subject to transparency requirements. In April 2022, a year after the finalisation of the proposal by the European Commission (EC) in exercise of its right of legislative intention, the European Parliament (EP) published a joint report from the Committee on the Internal Market and Consumer Protection, and Committee on Civil Liberties, Justice, and Home Affairs with recommendations arising from its first reading. A key amendment requested by the EP is for closer alignment with the GDPR.[81] Pursuant to this legislative intention, the Draft Report amends the various definitions provided for in the AIA[82] to include biometric data[83] and special category personal data,[84] as defined in the GDPR. The Council will consider this and other proposed amendments and either accept or amend the EP's position, after which a legislative act will be adopted, or the proposal will be returned to the EP for a second reading.[85] The proposed AI Act will not come into effect until finalised and adopted by both the Council and the EP, as per the interinstitutional ordinary legislative procedure.[86]

At present, there is also no comprehensive international or EU legal framework dedicated to the governance of digital services. However, the EC has proposed a regulation for digital services (**proposed Digital Services Act or DSA**). Expanding on the essential aspects of the e-Commerce Directive, such as the prohibition on general monitoring, the proposed DSA seeks to establish "harmonised rules on the provision of intermediary services in the internal market."[87] Specifically, the DSA purports to establish "a framework for the conditional exemption from liability of providers of intermediary services",[88] "rules on specific due diligence obligations tailored to certain categories of providers of intermediary services",[89] and rules on implementation and enforcement of the terms of the provision, "including as regards the cooperation and coordination between competent authorities."[90] Such measures are consistent with the aims of the DSA, specifically to "contribute to the proper functioning of the internal market for intermediary services"[91] and to establish "uniform rules for a safe, predictable, and trusted online environment, where fundamental rights enshrined in the Charter are effectively protected."[92] The provisional political agreement reached by the European Parliament and European Council in April 2022 marked the first steps towards the enactment of the DSA. In June, however, the European Parliament rejected a revised version of the DSA, citing a lack of

[81] Committee on the Internal Market and Consumer Protection, and Committee on Civil Liberties, Justice, and Home Affairs, (2022) *Draft Report on the proposal for a regulation of the European Parliament and of the Council on harmonised rules on Artificial Intelligence (Artificial Intelligence Act) and amending certain Union Legislative Acts*, 2021/0106(COD), Amendment 63 and 66. Available at: https://iapp.org/media/pdf/publications/CJ40_PR_731563_EN.pdf.
[82] Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) And Amending Certain Union Legislative Acts COM/2021/206 final, Article 3.
[83] GDPR, Article 4(14).
[84] GDPR, Article 9(1).
[85] Council of the European Union, *The ordinary legislative procedure* / [Online]. Available at: https://www.consilium.europa.eu/en/council-eu/decision-making/ordinary-legislative-procedure/.
[86] Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union 2012/1 326/01, Articles 289 and 294.
[87] Proposal for A Regulation of the European Parliament and of the Council on a Single Market for Digital Services (Digital Services Act) and amending Directive 2000/31/EC COM/2020/825 final, Article 1(1).
[88] Ibid, Article 1(1)(a).
[89] Ibid, Article 1(1)(b).
[90] Ibid, Article 1(1)(c).
[91] Ibid, Article 2(a).
[92] Ibid, Article 2(b).

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consultation on added recitals which were not the subject of the initial political agreement.[93] The DSA is nonetheless expected to pass, with a final vote scheduled in the European Parliament plenary in July, after which official acceptance by the Council will be necessary in order for the DSA to enter into force, as per the ordinary legislative procedure detailed under the Treaty on European Union (TEU) and Treaty on the Functioning of the European Union (TFEU).[94]

Lastly, while there is also no comprehensive international or EU legal framework dedicated to the governance of data, the EC has also proposed a regulation for data governance. The **proposed Data Governance Act (DGA)**, proposed in November 2020, purports to establish a framework for sharing data in the European single market between individuals and the public and private sectors. Key provisions include the conditions for re-use of data[95] and the creation of a notification system for providers of data sharing services.[96] The **proposed Data Act (DA)**, meanwhile, was proposed in February 2022 and complements the DGA by establishing the conditions under which and the compensation obtainable for making data available. Key provisions include the right of users to access and use data generated by the use of products or related services[97] and the non-binding status of a contract for the access to or use of data if the terms are unfair and unilaterally imposed on a micro, small or medium-sized enterprise.[98] In March 2022, the EP appointed the Committee for Industry, Research and Energy (ITRE) as the committee responsible for the Data Act, yet a draft report is not expected to be forthcoming.[99] The DGA, by contrast, received final approval from one of the two co-legislators, namely the EP, in April 2022 and awaits the equivalent final approval from the Council.[100] Both the DGA and DA are within the framework of the European Strategy for Data,[101] the objective of which is to establish the EU as a leader in digital technologies, the data economy, and trustworthy Artificial Intelligence.[102]

[93] Bertuzzi L. (2022) *European Parliament rejects consolidated text of the Digital Services Act* / EURACTIV [Online]. Available at: https://www.euractiv.com/section/digital/news/european-parliament-rejects-consolidated-text-of-the-digital-services-act/.
[94] Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union 2012/1 326/01, Articles 289 and 294.
[95] Proposal for a Regulation of the European Parliament and of the Council on European Data Governance (Data Governance Act) COM (2020) 767 final, Article 5.
[96] Ibid, Article 9.
[97] Proposal for a Regulation of the European Parliament and of the Council on harmonised rules on fair access to and use of data (Data Act) COM (2022) 68 final, Article 4.
[98] Ibid, Article 13.
[99] European Parliament Legislative Train Schedule, *Data Act* / [Online]. Available at: https://www.europarl.europa.eu/legislative-train/theme-a-europe-fit-for-the-digital-age/file-data-act.
[100] European Parliament Legislative Train Schedule, *Proposal for a Regulation on European Data Governance* / [Online]. Available at: https://www.europarl.europa.eu/legislative-train/theme-a-europe-fit-for-the-digital-age/file-data-governance-act.
[101] European Commission, *A European Strategy for Data* / [Online]. Available at: https://digital-strategy.ec.europa.eu/en/policies/strategy-data.
[102] European Commission, Shaping Europe's digital future: Commission presents strategies for data and artificial intelligence / [Online]. Available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_20_273.

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4. Digital Extended Reality (XR)

XR technologies are subject to international and EU laws and policies on human rights, privacy and data protection and consumer rights, and may be subject to forthcoming rules on artificial intelligence, data and digital services.

The following sections discuss some ways that digital extended reality (XR) is or may be governed by international and EU law and policy within the legal frameworks for human rights, privacy and data protection, consumer rights, artificial intelligence, and digital services. Each section begins with a brief introduction to the relevant legal issues and a summary of the international and EU legal framework (for more details on the legal frameworks, see Section 3 above). Specific legal issues within the legal framework are then presented in more detail; each discussion includes specific references to existing (and proposed) law and an explanation of how the law may apply to XR. While no international or EU law directly addresses or explicitly mentions XR, many aspects are subject to international and EU law.

4.1 Human rights

XR has the potential to impact human rights in many ways, both positive and negative. In relation to some rights in particular context, XR has the potential to enhance enjoyment of rights, such as when XR provides safer workplace training modules that help support the right to just and favourable conditions of work. Yet in other ways, the use of XR interferes with and may even violate human rights.

The human rights discussed in this section are:

- Right to dignity
- Right to autonomy
- Right to privacy
- Freedom of expression
- Right to health
- Right to education
- Access to justice and right to a fair trial
- Right to just and favourable conditions of work
- Right to rest and leisure
- Right to benefit from science
- Non-discrimination and vulnerable groups

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All sections outline the relevant international and EU laws and policies, then move to a discussion of key issues, gaps and challenges. For many rights, this discussion is organised into the positive and negative impacts that XR have on realisation of a right ('potential enhancements' and 'potential interferences'); the impacts discussed include both current examples and potential future impacts, sometimes drawn from science fiction.[103] Some rights do not have distinct positive and negative impacts, and therefore the key legal issues are discussed more generally. All sections conclude with remarks on States' current obligations under the law and identifies where the law may be updated to address gaps and challenges.

The final subsection (4.1.13) presents a summary of three trends in human rights law that have relevance to XR: the right to a healthy environment, the right to disconnect, and the right to online access.

4.1.1 International and EU law on human rights

In the context of XR, the most frequently referenced international legal documents are the Universal Declaration of Human Rights, International Covenant on Civil and Political Rights (ICCPR), International Covenant on Economic, Social and Cultural Rights (ICESCR), International Convention on the Elimination of All Forms of Racial Discrimination (CERD); Committee on the Elimination of Discrimination Against Women (CEDAW), Convention on the Rights of the Child (CRC), and the European Convention on Human Rights (ECHR). General Comments and General Recommendations from U.N. treaty bodies and reports from Special Procedures provide interpretative guidance explaining how the rights apply in specific contexts. Where relevant, specific reference is made to the U.N. Sustainable Development Goals and the jurisprudence of the European Court of Human Rights. At the EU level, the primary legal document is the Charter of Fundamental Rights of the European Union (CFREU). Where relevant, specific reference is made to jurisprudence of the European Court of Justice (CJEU) and the EU Pillar of Social Rights.

XR is not explicitly referenced in international or EU human rights law, nor is it the explicit topic of any guidance or reference documents. However, States' obligation to respect, protect and fulfil human rights apply in the context of XR.

4.1.2 Right to dignity

XR technologies have the potential to both enhance and interfere with the right to dignity. The use of XR technologies in certain contexts, such as criminal justice (see the paragraph below on potential enhancements of the right to dignity), may enhance the right to dignity of victims, offenders, and psychiatric patients alike. However, such technologies also carry the potential to interfere with the right to dignity, either directly through harmful graphic content in VR, for instance, or in conjunction with another protected right (see the paragraph below on potential interferences). Whilst international and EU human rights law does not speak directly to the impacts of XR technologies on the right to dignity, States have an obligation to ensure that the development and deployment of such technologies does not interfere with the enjoyment of the right, as will be discussed below.

[103] "By highlighting possible futures, science fiction enables law to consider different strategies for dealing with new events and scenarios." In Mitchell, T. (2014) 'Making Space: Law and Science Fiction', *Law and Literature*, 32(2), pp241-261, 248.

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International law and policy

Although not recognised as a freestanding legal right, dignity is subject to specific references within legal doctrine pertaining to international human rights law. The Universal Declaration of Human Rights (UDHR), the foundational document of the International Bill of Human Rights, provides that "all human beings are born free and equal in dignity and rights."[104] Although primarily symbolic and not formally binding upon State parties to the United Nations (UN), this provides the normative basis for the various civil, political, economic, social, and cultural rights contained within the International Covenant on Civil and Political Rights (ICCPR)[105] and the International Covenant on Economic, Social and Cultural Rights (ICESCR),[106] both of which assert within the preamble to the text that the rights contained therein "derive from the inherent dignity of the human person". It follows from this that explicit reference to dignity can be found in the text of several Articles, for instance the right to education under the ICESCR[107] and the rights of persons deprived of their liberty through imprisonment or detention under the ICCPR.[108] Various other major conventions, for instance on the Rights of the Child,[109] the Rights of Migrant Workers,[110] and the Rights of Persons with Disabilities,[111] have also since included specific references to dignity. Similarly, in international humanitarian law Common Article 3 of the Geneva Conventions protects wounded, sick and shipwrecked soldiers on (i) land and (ii) sea, (iii) prisoners of war and (iv) civilians against "outrages upon personal dignity, in particular humiliating and degrading treatment".[112]

Within the legal framework of the Council of Europe, the most relevant legal instruments are the European Convention on Human Rights (ECHR)[113], the Convention on Human Rights and Biomedicine (Oviedo Convention),[114] and the Convention on Action against Trafficking in Human Beings.[115] The former eschews establishing a codified right and instead, analogous to the formulation of the two Covenants (see above), conceptualises dignity as an overarching principle. On this, the European Court of Human Rights (ECtHR) has observed that "[t]he very essence of the Convention is respect for human dignity and human freedom."[116] The Oviedo Convention, meanwhile, whilst not defining dignity explicitly, refers within the preamble to "the importance of ensuring the dignity of the human being", and moreover, imposes an obligation on State Parties to "protect the dignity and identity of all human beings", specifically within the context of biology and medicine. Finally, the Council of Europe adopted

[104] Universal Declaration of Human Rights (8 December 1948), G.A. Res. 217(A) III, Article 1.
[105] International Covenant on Civil and Political Rights (entered into force 23 March 1976) G.A. Res 2200A (XXI) (ICCPR).
[106] International Covenant on Economic, Social and Cultural Rights (entered into force 3 January 1976) G.A. Res 2200A (XXI) (ICESCR).
[107] ICESCR, Article 13.
[108] ICCPR, Article 10(1).
[109] Convention on the Rights of the Child (entered into force 2 September 1990) GA Res. 44/25 (CRC), Preamble, Articles 23, 28, 37 and 39.
[110] Convention for the Protection of the Rights of All Migrant Workers and Members of their Families (entered into force 1 July 2003) GA Res.45/158 (CPRMW), Articles 17 and 70.
[111] Convention on the Rights of Persons with Disabilities (entered into force 3 May 2008) GA Res. A/61/611 (CRPD), Preamble, Articles 1, 3, 8, 16, 24 and 25.
[112] See, for example, Geneva Convention relative to the Protection of Civilian Persons in Time of War (entered into force 21 October 1950) 75 UNTS 287 (Fourth Geneva Convention).
[113] European Convention on Human Rights (as amended by Protocols 11,14 and 15) (entered into force 3 September 1953), E.T.S. 5, 4. XI. 1950 (ECHR).
[114] Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine (entered into force 1 December 1999), E.T.S 164 4.IV.1997 (Oviedo Convention).
[115] Convention on Action against Trafficking in Human Beings (entered into force 1 February 2008), E.T.S No 197 16.V.2005.
[116] European Court of Human Rights. (2002) *Pretty v the United Kingdom*, 29 July 2002, No. 2346/02, CE:ECHR:2002:0429JUD000234602, para. 65.

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the Convention on Action against Trafficking in Human Beings in 2005, the preamble of which asserts "that trafficking in human beings constitutes a violation of human rights and an offence to the dignity and the integrity of the human being". Further reference to dignity is provided in relation to measures to discourage demand for trafficking of human beings,[117] and repatriation and return of victims.[118]

EU law and policy

Mirroring the international human rights law approach to human dignity, the Treaty on European Union (TEU)[119] establishes dignity as the first of the EU's foundational values.[120] In a clear separation from the former, however, EU law also codifies a substantive and enforceable right to human dignity in primary law under the terms of the Charter of Fundamental Rights (CFREU), specifically within Chapter 1 entitled "Dignity", wherein it is asserted that "Human dignity is inviolable. It must be respected and protected."[121] Whilst judicial interpretation of this provision is limited, with the Court of Justice of the EU (CJEU) often referring to dignity in conjunction with other protected rights,[122] such as the prohibition of torture and inhuman or degrading treatment or punishment,[123] and the right to privacy,[124] an indication of the European Commission's understanding of the right to dignity can be obtained from the 2018 Annual Report on the Application of the EU Charter of Fundamental Rights, according to which human dignity "guarantees the right of human beings to be protected from being treated as mere objects by the state or by their fellow citizens."[125] The prominence of the positioning of the right, coupled with the eponymous title of the Chapter, is indicative of the fundamental importance of dignity in the CFREU.[126] Furthermore, the inclusion of, inter alia, the right to the integrity of the person,[127] the prohibition of torture, inhuman and degrading treatment or punishment,[128] and the prohibition of slavery, forced labour and human trafficking[129]within the Title of Dignity is a reflection of the interrelationship between dignity and other protected rights,[130] as constituted by the former being, according to the Explanations Relating to the Charter, "the real basis of fundamental rights."[131] Finally, dignity is explicitly referred to within the rights of the elderly "to lead a life of dignity"[132] and the right of workers to fair and just working conditions "which respect to his or her health, safety and dignity."[133]

[117] Convention on Action against Trafficking in Human Beings (entered into force 1 February 2008), E.T.S No 197 16.V.2005, Article 6.
[118] Ibid, Article 16.
[119] Consolidated Version of the Treaty on European Union, C 326/15 (TEU).
[120] Alongside freedom, democracy, equality, the rule of law and respect for human rights, including the rights of persons belonging to minorities.
[121] Charter of Fundamental Rights of the European Union (entered into force 18 December 2009), 2000/C 364/01(CFREU), Article 1.
[122] Dupré, C. (2021) 'Article 1' in Peers S., Hervey T., Kenner J., and Ward A., (eds) *The EU Charter of Fundamental Rights: A Commentary* (Hart Publishing) pp. 3-24.
[123] CFREU, Article 4.
[124] Ibid, Article 7.
[125] 2018 Report on the Application of the EU Charter of Fundamental Rights COM (2019) 257 final. https://data.europa.eu/doi/10.2838/44400
[126] Jones J. (2012) 'Human Dignity in the EU Charter of Fundamental Rights and Its Interpretation Before the European Court of Justice', *Liverpool Law Review*, vol.33, pp.281-300.
[127] CFREU, Article 3.
[128] Ibid, Article 4.
[129] Ibid, Article 5.
[130] Dupré, supra note 122, pp. 3-24.
[131] Explanations Relating to the Charter of Fundamental Rights (2007/C 303/02).
[132] CFREU, Article 25.
[133] Ibid, Article 31.

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At the level of EU policy, and consistent with the drafting of the Ethics Guidelines for Trustworthy AI in accordance with the fundamental rights established in the treaties, the CFREU and international human rights law,[134] the High-Level Expert Group on Artificial Intelligence (AI HLEG) calls for the development of AI systems "in a manner that respects, serves and protects humans' physical and mental integrity, personal and cultural sense of identity, and satisfaction of their essential needs."[135]

Potential enhancements

A potentially dignity-enhancing application of XR is in the context of criminal justice for the purposes of, inter alia, conducting risk assessments, rehabilitating and re-integrating offenders, and treating victims of criminal offences, the latter of which may enhance the right to dignity of such persons by alleviating psychological trauma.[136] The use of XR technologies in this context may, inter alia, be used to gain greater insights into offender decision-making in order to provide more targeted treatment by simulating a burglary in virtual reality,[137] enable exposure of sexual offenders to virtual environments for the purposes of training coping skills and conducting risk assessments without posing a risk to others,[138] provide a different form of psychiatric treatment for regulating aggressive behaviours,[139] and even virtually embody perpetrators of domestic abuse in user avatars of female victims in order to modify emotion recognition patterns associated with this specific form of aggressive behaviour.[140] The use of XR for such purposes is, moreover, consistent with the objective of rehabilitating offenders, in relation to which State Parties to the Council of Europe may, in principle, be subject to "a positive obligation" to facilitate "progress towards",[141] based on the requirement under the ECHR of "respect for human dignity."[142]

Potential interferences

Whilst potentially enhancing the right to dignity, the use of XR technologies for treatment purposes (see above) may also create or exacerbate situations that negatively impact and interfere with the right to dignity, typically in conjunction with another fundamental right. One such right, as explicitly protected under the CFREU,[143] and as considered an aspect of the right to respect for private life under Article 8 ECHR,[144] is the right to mental integrity, understood by the Committee of Bioethics of

[134] European Commission, Directorate-General for Communications Networks, Content and Technology (2019) 'Ethics Guidelines for Trustworthy AI'. Available at: https://data.europa.eu/doi/10.2759/346720.
[135] Ibid.
[136] Cornet L.J.M and Van Gelder J-L. (2020) 'Virtual reality: a use case for criminal justice practice', *Psychology, Crime & Law*, vol.26:7, pp.631-647. Available at: https://doi.org/10.1080/1068316X.2019.1708357.
[137] Nee C., et al. (2019) 'Learning on the job: Studying expertise in residential burglars using virtual environments', *Criminology*, vol.57:3, pp. 481-511.
[138] Fromberger P., Jordan K., and Müller J L. (2018) 'Virtual reality applications for diagnosis, risk assessment and therapy of child abusers', *Behavioural Sciences & the Law*, vol.36:2, pp.235-244. Available at: https://doi.org/10.1002/bsl.2332.
[139] Klein Tuente S et al. (2020) 'Virtual Reality Aggression Prevention Therapy (VRAPT) versus Waiting List Control for Forensic Psychiatric Inpatients: A Multicentre Randomized Controlled Trial', *Journal of Clinical Medicine*, vol.9:7, pp.2258. Available at: https://www.mdpi.com/2077-0383/9/7/2258.
[140] Seinfeld S et al. (2018) 'Offenders become the victim in virtual reality: impact of changing perspective in domestic violence', *Scientific Reports*, vol.8 [Online]. Available at: https://doi.org/10.1038/s41598-018-19987-7.
[141] European Court of Human Rights. (2016) *Murray v. The Netherlands*, 26 April 2016, No.10511/10, CE:ECHR:2016:0426JUD001051110, para. 104.
[142] European Court of Human Rights. (2013*) Vinter and Others v. The United Kingdom*, 9 July 2013, Nos. 66069/09, 130/10 and 3896/10, CE:ECHR2013:0709JUD006606909, para. 113.
[143]CFREU, Article 3(1): "Everyone has the right to respect for his or her physical and mental integrity."
[144] European Court of Human Rights. (2016) *Bédat v Switzerland*, 29 March 2016, No.56925/08, CE:ECHR:2002:0711JUD002895795, para. 72: "The concept of "private life" is a broad term which is no susceptible to exhaustive definition. It covers the physical and psychological integrity of a person".

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the Council of Europe to mean "the ability of individuals to exercise control over what happens to…their mental state, and the related personal data."[145] Notwithstanding the general prohibition on compulsory medical treatment under international law,[146] with the exception of treating "a mental disorder of a serious nature" under the Oviedo Convention,[147] the failure to obtain consent where required or the intentional misuse and abuse of XR technologies may adversely affect the right to mental integrity, in conjunction with the right to dignity, by inducing unwanted and/or harmful emotional, cognitive, and/or behavioural changes in affected persons.[148]

A more direct potential interference with the right to dignity by XR technologies is the playing of VR games involving the depiction of extreme violence. Whilst such content is not unique to gaming in VR, there is the potential for a heightened risk of interference based the user experiencing such content from a fully immersed first-person perspective.[149] It has, moreover, been recognised by the CJEU that, in relation to the potentially analogous game of laser tag, EU law "does not preclude an economic activity consisting of the commercial exploitation of games simulating acts of homicide from being made subject to a national prohibition measure adopted on grounds of protecting public policy by reason of the fact that activity is an affront to human dignity."[150] This is indicative of the potential for violent games to infringe upon the right to human dignity in a way that contravenes EU law; a risk that is potentially heightened in the context of VR.

States' obligations and areas for legal development

XR technologies are subject to existing international and EU human rights law on the right to dignity and States have a positive obligation to ensure that the use of such technologies supports realisation of this right. Further guidance specific to XR technologies may be required to address concerns related to, inter alia, the use of XR in criminal justice settings for therapeutic purposes, intentional misuse and abuse, and the potential for, and effect of, depicting harmful graphic content.

4.1.3 Right to autonomy

XR technologies have the potential to both enhance and interfere with the right to autonomy. Whilst international and European Union human rights law and policy on the right to autonomy does not explicitly refer to XR, the right operates in the context of such technologies and the relevant provisions under international and EU law are directly applicable.

International law and policy

Although not expressly provided for within any of the major conventions under international human rights law, the right to "autonomy" is nonetheless listed as one of the general principles of the

[145] Council of Europe, (2019) 'Strategic Action Plan on Human Rights and Technologies in Biomedicine (2020-2025)', [22]. Available at: https://rm.coe.int/strategic-action-plan-final-e/1680a2c5d2
[146] See, for example, ECHR, Article 3 (right to freedom from cruel, inhuman, or degrading treatment); Article 5 (right to liberty) and Article 8 (right to privacy).
[147] Oviedo Convention, Article 7. See also, Council of Europe, Committee of Ministers. (2004) 'Recommendations concerning the protection of the human rights and dignity of persons with mental disorder and its Explanatory Memorandum', REC(2004)10, Article 12.
[148] Slater M et al. (2020) 'The Ethics of Realism in Virtual and Augmented Reality', *Frontiers of Virtual Reality*, vol.1:1 [Online]. Available at: https://doi.org/10.3389/frvir.2020.00001
[149] Ibid.
[150] Judgement of 14 October 2004, *Omega Spielhallen-und Automatenaufstellungs-GmbH v Oberbügermeisterin der Budesstadt Bonn* C-36/02 EU:C:2004:614, para. 41.

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Convention on the Rights of Persons with Disabilities (CRPD),[151] finding specific reference in Articles pertaining to freedom from exploitation, violence and abuse,[152] and health.[153] The right, alongside associated variations,[154] has also been recognised in regional organisations, including the Council of Europe. In relation to the latter, the European Court of Human Rights (ECtHR) has recognised the right to autonomy as derivative of, and therefore protected by, the right to respect for private and family life, conceptualised as "the personal sphere of each individual".[155] In *Pretty v UK*, for instance, the ECtHR observed that "[a]lthough no previous case has established as such any right to self-determination as being contained in Article 8 of the Convention, the Court considers that the notion of personal autonomy is an important principle underlying the interpretation of its guarantees."[156] Further, the ECtHR has strengthened this position by recognising that protecting "the right to personal autonomy" imposes positive obligations on States,[157] in addition to the classical formulation of a negative obligation of non-interference.[158] The factual elements of these cases highlights the primary basis upon which the right to autonomy is given legal effect, namely healthcare decision-making and, more specifically, "the requirement for consent to treatment and a corresponding right to refuse treatment."[159]

EU law and policy

The right to "autonomy" is not directly protected within the Charter of Fundamental Rights of the European Union (CFREU); however, it can be construed as an aspect of several protected fundamental rights. In accordance with Article 52(3) CFREU, pursuant to which the rights in the CFREU which correspond with the European Convention of Human Rights (ECHR) are to have the same "meaning and scope", there are three potential bases of protection for the right to autonomy. The first potential source, for the reasons outlined above, is Article 7 CFREU corresponding to Article 8 ECHR. A further potential source of protection, derived from reference the ECtHR's reference to "a person's physical and psychological integrity" in conjunction with "the right to personal autonomy",[160] is the right to integrity of the person.[161] A final potential basis for protection of the right to "autonomy" is Article 1 CFREU, with legal scholars having highlighted the conceptual overlap with the right to human dignity.[162]

[151] CRPD, Article 3.
[152] CRPD, Article 16(4).
[153] CRPD, Article 25(d).
[154] See, e.g., African Charter om Human and Peoples' Rights (Banjul Charter) (entered into force 21 October 1986) CAB/LEG/67/3 rev.5, 21 I.L.M. 58, Article 20 on the "unquestionable and inalienable right to self-determination."
[155] See, e.g., European Court of Human Rights. (2002) *Christine Goodwin v. The United Kingdom*, 11 July 2002, No.28957/95, CE:ECHR:2002:0711JUD002895795, para.90.
[156] European Court of Human Rights. (2002) *Pretty v. The United Kingdom*, 29 July 2002, No.2346/02, CE:ECHR:2002:0429JUD000234602, para. 61.
[157] European Court of Human Rights. (2007) *Tysiąç v. Poland*, 20 March 2007, No.5410/03, CE:ECHR:2007:0320JUD000585672, para. 107.
[158] Donnelly M., (2011) *Healthcare Decision-Making and the Law: Autonomy, Capacity and the Limits of Liberalism* (Cambridge University Press), p. 78.
[159] Ibid, p. 52.
[160] *Tysiąç v. Poland*, supra note 157, para.107.
[161] CFREU, Article 3.
[162] See, e.g., Dupré, C., (2021) 'Article 1' in Peers, S., Hervey T., Kenner J., and Ward A., (eds) *The EU Charter of Fundamental Rights: A Commentary* (Hart Publishing) pp.3-24. Available at: http://dx.doi.org/10.5040/9781849468350.ch-001.

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Potential enhancements

The use of XR may enhance the right to autonomy of certain persons with disabilities by improving the accessibility of experiences otherwise unattainable in the physical world, such as driving a car or riding a horse.[163] The use of XR in a clinical context, meanwhile, may enhance an individual's right to autonomy, in combination with the right to health, by enabling clinical practitioners to communicate critical but often complex information regarding particular treatments, thereby improving healthcare literacy and ultimately enabling patients to make more educated and informed decisions regarding their healthcare.[164]

Potential interferences

Whilst the use of XR in a clinical context may, for reasons outlined above, enhance the right to autonomy, the use of VR, in particular, may also undermine the right to autonomy by causing interferences, such as motion sickness symptoms and technological difficulties, which distract from patient learning and thereby compromise patient decision-making.[165] Additionally, the use of XR may create or exacerbate situations that negatively impact the right to autonomy, in conjunction with the right to health and the right to privacy, by, inter alia, cultivating addictive behaviour, enabling emotional manipulation, and presenting opportunities for surveillance of users.[166]

States' obligations and areas for legal development

XR technologies are subject to existing, albeit limited, international human rights law on the right to autonomy, and States have an obligation to ensure that the use of such technologies supports realisation of this right. States must take all necessary steps to guarantee that XR technologies do not interfere with an individual's right to autonomy. In addition, States have a particular responsibility to ensure that the right to autonomy of persons with disabilities is not infringed upon, in accordance with their obligations under the CRPD (see above). Further human rights guidance specific to XR may be required to address concerns related to the potential for addiction, emotional manipulation and surveillance.

4.1.4 Right to privacy

XR technologies have the potential to undermine the right to privacy of users and bystanders alike in several ways, as discussed in section 4.2 and below. Although international and EU human rights law on the right to privacy does not explicitly address the impacts of XR, States have an obligation to ensure that the development and deployment of XR technologies does not interfere with the enjoyment of the protected right to privacy. Furthermore, developments on the putative rights to mental privacy and cognitive liberty are directly relevant to XR technologies.

[163] Heilemann F, Zimmermann G and Münster P., (2021) 'Accessibility Guidelines for VR Games – A Comparison and Synthesis of a Comprehensive Set', *Frontiers in Virtual Reality*, vol.2, Available at: https://doi.org/10.3389/frvir.2021.697504.
[164] Adapa K et al., (2020) 'Augmented reality in patient education and health literacy: a scoping review protocol', *British Medical Journal Open*, vol.10. Available at: https://bmjopen.bmj.com/content/10/9/e038416.
[165] Ibid.
[166] O'Brolcháin F et al., (2016) 'The Convergence of Virtual Reality and Social Networks: Threats to Privacy and Autonomy', *Science and Engineering Ethics*, vol.22, pp.1-29. Available at: https://doi.org/10.1007/s11948-014-9621-1.

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International law and policy

Everyone has the right to privacy under international law.[167] This right entails that "No one shall be subjected to arbitrary or unlawful interference with his privacy, family, correspondence, nor to unlawful attacks on his honour and reputation."[168] It follows that States are under an obligation "to adopt legislative and other measures to give effect to the prohibition against such interferences and attacks as well as to the protection of this right."[169] The right to privacy is also recognised in regional organisations, including the Council of Europe.[170]

EU law and policy

The EU Charter of Fundamental Rights similarly provides that under EU law everyone has the "right to respect for his or her private and family life, home, and communications."[171] The right to privacy is closely related to the right to data protection, pursuant to which "data must be processed fairly for specified purposes and on the basis of the consent of the person concerned or some other legitimate basis laid down by law."[172]

Potential interferences

The use of XR technologies may create or exacerbate situations that negatively impact the right to privacy. XR technologies may interfere with the right to privacy of users and bystanders alike, both in the conventional sense of intruding upon physical privacy, as well as in ways that pertain to the emerging ideas of mental privacy and cognitive liberty; intrusions in relation to which may be facilitated by the emergence of new categories of data processing, such as "biometric psychography".[173] Further potential interferences with the right to privacy stem from the opportunity for cybersurveillance in VR,[174] the ability to personally identify users of XR technologies,[175] and the potential for trivial observation and tracking of bystanders who may not be aware of nor have given consent for such processing of their personal data.[176]

States' obligations and areas for legal development

XR technologies are subject to existing human rights laws on the right to privacy and States have an obligation to ensure that the use of such technologies supports realisation of this right. States must take all necessary steps to guarantee that the use of XR does not create circumstances in which an individual may be subject to arbitrary or unlawful interference with their privacy. Further human rights guidance specific to XR technologies may be required to address concerns related to, inter alia, new

[167] Universal Declaration of Human Rights (8 December 1948) G.A. Res 217(A) III (UDHR), Article 12; ICCPR, Article 17; CRC, Article 16; CPRMW, Article 14; CRPD, Article 22.
[168] UDHR, Article 12; ICCPR, Article 17.
[169] ICCPR General Comment No.16: Article 17 (Right to Privacy) The Right to Respect of Privacy, Family, Home and Correspondence, and Protection of Honour and Reputation (8 April 1988) [1].
[170] ECHR, Article 8.
[171] CFREU, Article 7.
[172] CFREU, Article 8(2).
[173] Heller, B., (2021) 'Watching Androids Dream of Electric Sheep: Immersive Technology, Biometric Psychography, and the Law', *Vanderbilt Journal of Entertainment & Technology Law*, vol.23(1), pp. 1-51.
[174] See, e.g., Yadin G., (2017) 'Virtual Reality Surveillance', *Cardozo Arts & Entertainment Law Journal*, vol.35:3, Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3043922.
[175] See, e.g., Miller M.R. et al, (2020) 'Personal identifiability of user tracking data during observation of 360-degree VR video', *Scientific Reports*, vol.10. Available at: https://www.nature.com/articles/s41598-020-74486-y.
[176] McGill M. (2021) 'Extended Reality (XR) and the Erosion of Anonymity and Privacy', *The IEEE Global Initiative on Ethics of Extended Reality (XR) Report*. Available at: https://ieeexplore.ieee.org/document/9619999.

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categories of data processing, the potential for cybersurveillance and the ability to personally identify both users and bystanders. For further analysis of the relationship between XR technologies and the right to privacy, see Section 4.2.

4.1.5 Right to freedom of expression

XR technologies have the potential both to enhance and interfere with the right to freedom of expression. This right applies equally to content created by XR developers and the content generated by XR users. States cannot arbitrarily restrict the right to freedom of expression, and they have an obligation to ensure private actors do not interfere with the right. In balancing between unrestricted freedom and legitimate limitations, particularly salient issues for freedom of expression in the context of XR include, inter alia, violence, pornography, hate speech, and mis/disinformation. Whilst international and European Union (EU) human rights law and policy on the right to freedom of expression does not explicitly refer to XR, the right operates in the context of such technologies and many of the provisions under international and EU law are directly applicable.

International law and policy

The right to freedom of expression is enshrined in international law in various human rights instruments, including the Universal Declaration of Human Rights (UDHR),[177] the International Covenant on Civil and Political Rights (ICCPR),[178] the International Convention on the Elimination of All Forms of Racial Discrimination (CERD),[179] the Convention on the Rights of the Child (CRC),[180] the Convention on the Rights of Persons with Disabilities (CRPD),[181] and the International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families.[182] State parties have an obligation to guarantee the right, which includes the "freedom to seek, receive and impart information of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media".[183] The right "protects all forms of expression and the means of their dissemination", including spoken, written and non-verbal expression, in addition to all forms of audio-visual, "electronic and internet-based modes of expression."[184] Included within the broad remit of protection are expressions considered "deeply offensive",[185] as well as "expressions of an erroneous opinion or an incorrect interpretation of past events."[186] However, exercising of the right to freedom of expression entails "special duties and responsibilities", consistent with which enjoyment of the right may be limited in exceptional circumstances if provided by law for the protection of an enumerated purpose and the restriction is necessary to achieve that purpose.[187] Further, based on its fundamental importance to the enjoyment of all other human rights, any such limitation to the right

[177] UDHR, Article 17.
[178] ICCPR, Article 19.
[179] International Convention on the Elimination of All Forms of Racial Discrimination (entered into force 4 January 1969) G.A. Res. 2106 (XX) (ICERD), Article 5.
[180] CRC, Article 13.
[181] CRPD, Article 21.
[182] CPRMW, Article 13(2).
[183] ICCPR, Article 19(2).
[184] Human Rights Committee, *General comment No.34, Article 19: Freedom of opinion and expression*. CCPR/C/GC/34. 12 September 2011, para.12.
[185] Ibid, para. 11.
[186] Ibid, para. 49.
[187] The enumerated purposes are: "(a) For respect of the rights or reputation of others; (b) For the protection of national security or of public order (*ordre public*), or of public health or morals." ICCPR, Article 19(3).

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to freedom of expression must satisfy the conditions of legality, legitimacy, necessity, and proportionality.[188]

The right to freedom of expression is also recognised in regional organisations, including the Council of Europe.[189] The enjoyment of this right is not absolute and can be restricted where such interferences are "prescribed by law and are necessary in a democratic society", for the purposes of, inter alia, preventing crime or disorder, or the protection of health or morals.[190] However, based on the right to freedom of expression being "one of the essential foundations of a democratic society and one of the basic conditions for its progress and for each individual's self-fulfilment",[191] the European Court of Human Rights (ECtHR) has established a high threshold for legitimate interference, observing that "the adjective "necessary" in Article 10(2) implies the existence of a pressing social need…[which]…must be convincingly established."[192] Domestic legislators and judicial bodies are, in principle, conferred a margin of appreciation to make such determinations, subject to the ECtHR's overall supervisory function and ability "to give the final ruling" on whether an interference has occurred and, if so, whether it is permitted.[193]

EU law and policy

The EU Charter of Fundamental Rights (CFREU) also protects "the right to freedom of expression and information", corresponding to Article 10 of the ECHR (see above) in accordance with Article 52(3) of the CFREU, included within which is the right "to receive and impart information and ideas without interference by public authority and regardless of frontiers."[194] The right to freedom of expression under EU law is not absolute, however, any limitation "must be provided for by law and respect the essence" of the right, in addition to being "necessary" and genuinely meeting "objectives of general interest recognised by the Union or the need to protect the rights and freedoms of others", pursuant to the principle of proportionality.[195]

Potential enhancements

XR technologies can potentially enhance the right to freedom of expression, primarily by facilitating new forms of creative expression. XR technologies may enhance musical expression, for instance by, inter alia, providing the medium for the expression of novel forms of musical creativity and distinctive forms of music,[196] creating opportunities for the pairing of immersive virtual music instruments with 3D interaction techniques such as navigation, selection and manipulation to enhance musical control,[197] and developing virtual environments wherein creative musical collaboration can be

[188] Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression, A/74/486, 9 October 2019, para.6. Available at: https://www.ohchr.org/sites/default/files/Documents/Issues/Opinion/A_74_486.pdf.
[189] See, e.g., ECHR, Article 10.
[190] ECHR, Article 10(2).
[191] European Court of Human Rights. (2021) *Sanchez v. France*, 2 September 2021, No.45581/15, CE:ECHR:2021:0902:JUD004558115, para.76.
[192] Ibid, para.77.
[193] European Court of Human Rights. (1976) *Handyside v. The United Kingdom*, 7 December 1976, No.5493/72, CE:ECHR:1976:1207JUD000549372, para.49.
[194] CFREU, Article 11.
[195] CFREU, Article 52(1).
[196] Barrass S. and Barrass T., (2006) 'Musical creativity in collaborative virtual environments', *Virtual Reality*, vol.10, pp.149-157. DOI: https://doi.org/10.1007/s10055-006-0043-5.
[197] Berthaut F., (2020) '3D interaction techniques for musical expression', *Journal of New Music*, vol.49:1, pp.60-72. DOI: https://doi.org/10.1080/09298215.2019.1706584.

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facilitated by enhanced feelings of togetherness or copresence between performers.[198] The use of AR technologies, specifically, may enhance the right to freedom of expression by developing narrative skill and creativity in storytelling.[199] The use of VR technologies for filmmaking, meanwhile, can enable recording from a 360-degree perspective and empower individuals to choose the sequencing of scenes which may enhance the right to freedom of expression for filmmakers, actors, and viewers alike.[200] VR can also provide a medium for creative expression through 3D immersive painting applications, such as Tilt Brush.[201]

Key issues and challenges

There are several issues that raise concerns related to freedom of expression in XR. Whilst not constituting interferences per se, these issues (and any corresponding regulation) could impact the right to freedom of expression. The issues are as follows: violence, pornography, hate speech and mis/disinformation.

Violence: Possible issues in the context of violent content in XR include, inter alia, whether the law would distinguish between violence included in the XR experience, violence witnessed by users, and violence generated and enacted by users through their actions, both against the XR experience and other users. Underpinning each of these issues is the purported link between playing violent videogames and engaging in violent behavior(s),[202] and the associated possibility that the unique effects of XR technologies on users may heighten this risk and necessitate restricting experiences of violent content. Such concerns are the product of research comparing the experiences of users playing violent videogames in VR and non-VR, which suggests that immersion and elicitation of "illusions of presence and body ownership" in the former context may result in users feeling "more personally involved in receiving and enacting the in-game violence" in comparison to non-VR users.[203] This raises the possibility that the law might treat violent content in XR differently in comparison to traditional media and videogames, yet it has been suggested that Media Ratings Bodies (MRBs), such as Pan European Game Information (PEGI), do not currently distinguish between gameplay experiences in XR and non-XR contexts, supplying the same rating and content descriptors for games irrespective of the mode in which it is played.[204]

In relation to the legal framework, depictions of violence in media and videogames are generally permitted by law, but there are often age restrictions in place to ensure content is age appropriate. In the U.S., for instance, there are age classifications and limits on sale of certain videogames, but the playing of violent and sexual videogames, even by minors, constitutes a form of expression protected by the First Amendment.[205] If the regulation of violent content in XR follows the approach of

[198] Schober M.F. (2006) 'Virtual environments for creative work in collaborative music-making', *Virtual Reality*, vol.10, pp.85-94. DOI: https://doi.org/10.1007/s10055-006-0049-z.
[199] Yilmaz R.M. and Gotkas Y., (2017) 'Using augmented reality technology in storytelling activities: examining elementary students' narrative skill and creativity', *Virtual Reality*, vol.21, pp.75-89. DOI: https://doi.org/10.1007/s10055-016-0300-1.
[200] Forchetti M., (2020) *What You Need to Know About Acting + Virtual Reality* / Backstage [Online]. Available at: https://www.backstage.com/magazine/article/acting-world-virtual-reality-1555/.
[201] See, e.g., *Tilt Brush / Tilt Brush by Google* [Online]. Available at: https://www.tiltbrush.com/.
[202] *See, e.g.*, Gunter B., (2016) *Does Playing Video Games Make Players More Violent?* (Palgrave Macmillan). DOI: https://link.springer.com/book/10.1057/978-1-137-57985-0.
[203] Wilson G., and McGill M., (2018) 'Violent games in virtual reality: re-evaluating the impact and rating of interactive experiences.', *Proceedings of the 2018 Annual Symposium on Computer-Human Interaction in Play*, pp.535-548. DOI: https://doi.org/10.1145/3242671.3242684.
[204] Ibid.
[205] *See, e.g., Brown v. Entertainment Merchants Association* 564 U.S. 786, 790 (2011).

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videogame law, creators may have the unrestricted freedom of expression to develop XR experiences with extreme violence.[206] This is also indicated by case law from the ECtHR, which has interpreted the right to freedom of expression expansively, observing that the right guaranteed under the ECHR "is applicable not only to "information" or "ideas" that are favourably received or regarded as inoffensive or as a matter of indifference, but also to those that offend, shock or disturb the State or any sector of the population."[207] Whilst this appears to indicate that violent content in XR may be subject to the protection of the right to freedom of expression for the purposes of the ECHR, it is important to recall that the Convention confers a margin of appreciation which may lead to variation between State Parties. Depictions of violence in Germany, for example, are subject to regulation by the criminal code,[208] based on which violent videogames such as Mortal Kombat and Manhunt have been banned from sale to the public.[209]

An additional consideration, alongside age rating and access regulations, is the treatment of incidences of harassment, stalking and assault in XR. As discussed in relation to the right to non-discrimination and the rights of vulnerable groups (see Section 4.1.12), incidences of users experiencing harassment and violence in XR have been widely reported,[210] particularly by women encountering sexual misconduct.[211] Yet, whilst the immersiveness of VR, specifically, may render the psychological and emotional harm suffered by victims of "virtual assault" comparable to that which occurs in the physical world,[212] incidences of this nature may not be treated equivalently for the purposes of the law. Instead, XR developers may seek to regulate such harmful content through game design alteration, for instance by introducing invisible safety bubbles and blocking and muting functions.[213]

Pornography: In considering the issue of pornography and freedom of expression in XR, it is necessary to distinguish between adults and children as (i) users of, and (ii) persons depicted by, virtual pornography. Whilst children are entitled to the right to freedom of expression,[214] the use of virtual pornography by such persons may be restricted on the basis of protecting "public health or morals."[215] Contrastingly, the use by and depiction of (consenting) adults in VR pornography, alongside alternatives such as adult VR games,[216] may in certain circumstances be seen as protected by the right to freedom of expression. The central and most contentious issue in this context, therefore, relates to

[206] *See, e.g.*, Blood Trail, described as "the most violent game in VR" at Steam. *Blood Trail* / Steam [Online]. Available at: https://store.steampowered.com/app/1032430/Blood_Trail/.
[207] *Case of Handyside v. The United Kingdom*, supra note 193, para.49.
[208] Criminal Code in the version published on 13 November 1998, as last amended by Article 2 of the Act of 19 June 2019 [Germany], s.131.
[209] Osborne Clarke, *Will virtual reality video game content be protected by the Freedom of Speech? / Osborne Clarke* [Online]. Available at: https://connectedconsumer.osborneclarke.com/digital-entertainment/will-virtual-reality-video-game-content-be-protected-by-the-freedom-of-speech/.
[210] See, e.g., Sum of Us. (2022) *Metaverse: another cesspool of toxic content*, p. 6. Available at: https://www.sumofus.org/images/Metaverse_report_May_2022.pdf.
[211] See, e.g., Basu T. (2021) *The metaverse has a groping problem already / MIT Technology Review* [Online]. Available at: https://www.technologyreview.com/2021/12/16/1042516/the-metaverse-has-a-groping-problem/.
[212] Petter O. (2022) *Why Is No One Taking Sexual Assault In the Metaverse Seriously?* / Vogue [Online]. Available at: https://www.vogue.co.uk/arts-and-lifestyle/article/sexual-assault-in-the-metaverse.
[213] Metz R. (2022) *Harassment is a problem in VR, and its likely to get worse / CNN Business* [Online]. Available at: https://edition.cnn.com/2022/05/05/tech/virtual-reality-harassment/index.html?utm_source=optzlynewmarketribbon.
[214] CRC, Article 13.
[215] Ibid, Article 13(2)(b).
[216] See, e.g., Joho J., (2021) *The best virtual reality porn games, and how to play adult VR* / Mashable [Online]. Available at: https://mashable.com/article/best-vr-porn-games.

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virtual pornography depicting children, potentially including so-called "virtual ageplay",[217] in relation to which it has been suggested that, on the one hand, there is no direct harm, and any indirect harm is contained in the virtual environment, yet, on the other hand, concern remains that permitting such practices "might normalise deviant sexual preferences" and provide a gateway for sexual contact offences to be committed in the real world.[218] Furthermore, the potential for reputational harm and psychological damage to victims rendered in VR child pornography may be comparable to pornographic deepfakes,[219] with relevant provisions in the proposed AI[220] and Digital Services Acts[221] highlighting the tentative steps taken by EU legislators towards stricter regulation of such content.

Whilst it has been suggested that the term fails to adequately capture the associated harms and should be replaced,[222] the issue of "child pornography" is addressed in various provisions under EU[223] and international law, including the Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography (OPSC),[224] and the Council of Europe Conventions on Cybercrime (Budapest Convention)[225] and the Protection of Children against Sexual Exploitation and Sexual Abuse (Lanzarote Convention).[226] It is apparent from the definitions of "child pornography"[227] contained in each of these provisions that the issue of virtual child pornography is only explicitly contemplated within the framework of the Budapest Convention, wherein State Parties are required to criminalise a range of "child pornography" offences, the definition for which includes "realistic images representing a minor engaged in sexually explicit conduct."[228] This phrasing restricts the scope of the provision, yet in the light of the trend towards increasingly human-realistic virtual avatars,[229] it may nonetheless be applicable to instances of virtual child pornography in XR. States Parties to the Lanzarote and Budapest Conventions, however, "may reserve the right not to apply" the identified provisions.[230] Under the Lanzarote Convention, for instance, this entails that State Parties exercising the reservation mechanism will not be required to criminalise the production and possession of child pornographic material "consisting exclusively of simulated representations or

[217] See, e.g., Esposito L., (2019) 'Sexual Ageplay in Virtual Reality: Practicing Free Speech or Producing Child Pornography', *Cardoza Law Review*, vol.40:4, pp.1913-1951. Available at: http://cardozolawreview.com/wp-content/uploads/2019/05/8-Esposito.40.4.8.pdf.
[218] Witting S.K., (2018) 'The "greyscale" of "child pornography": Of mangas, avatars and schoolgirls: Part 1', *Computer and Telecommunications Law Review*, vol.24:3, pp.61-66.
[219] See, e.g., Chesney B and Citron DK. (2019) 'Deep Fakes: A Looming Challenge for Privacy, Democracy, and National Security', *California Law Review*, vol.107, pp.1753-1820. Available at: https://scholarship.law.bu.edu/faculty_scholarship/640/.
[220] Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) And Amending Certain Union Legislative Acts COM/2021/206 final, Article 52.
[221] Amendments adopted by the European Parliament on 20 January 2022 on the proposal for the regulation of the European Parliament and of the Council on a Single Market for Digital Services (Digital Services Act) and amending Directive 2000/31/EC (COM(2020)0825-C9-0418/2020-2020/0361(COD)), Article 30a. Available at: https://www.europarl.europa.eu/doceo/document/TA-9-2022-0014_EN.pdf.
[222] See, e.g., Guidelines regarding the implementation of the Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography (10 September 2019) CRC/C/156, para.5.
[223] See, e.g., Directive 2011/92 of the European Parliament and of the Council of 13 December 2011 on combating the sexual abuse and sexual exploitation of children and child pornography and replacing Council Framework Decision 2004/68/JHA. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011L0093&from=EN.
[224] The Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography (entered into force 18 January 2002) A/RES/54/263 (Optional Protocol to CRC).
[225] Convention on Cybercrime (Budapest Convention) (entered into force 1 July 2004) 23.XI.2001.
[226] Convention on the Protection of Children against Sexual Exploitation and Sexual Abuse (Lanzarote Convention) (entered into force 1 July 2010) 25.X.2007.
[227] Optional Protocol to CRC, Article 2(c); Budapest Convention, Article 9(2); Lanzarote Convention, Article 20(2).
[228] Budapest Convention, Article 9(2)(c).
[229] See, e.g., ServReality, *Virtual Avatars. From Toons to Hyper-Realistic Digital Man/HABR*. [Online]. Available at: https://servreality.com/news/virtual-avatars-from-toons-to-hyper-realistic-digital-man-habr/.
[230] Budapest Convention, Article 9(4); Lanzarote Convention, Article 20(3) and Article 20(4).

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realistic images of a non-existent child".[231] It has been suggested that the basis for this derogation is concern related to, inter alia, the right to freedom of expression, particularly artistic expression,[232] and a possible effect of this may be that some forms of virtual child pornography in XR are not criminalised.

However, the Explanatory Report to the Lanzarote Convention appears to pre-empt this possibility and highlights the risk that rapid developments in technology will enable the production of "extremely lifelike images of child pornography where in reality no child was involved', and accordingly recommends that State Parties "should avoid covering such productions by their reservation."[233] Furthermore, this does not exclude the possibility that State Parties may exercise the reservation mechanism, whilst offering similar and perhaps more enhanced protections under national law. Bulgaria, for instance, has exercised the reservation mechanism in relation to Article 20(1)(f) of the Lanzarote Convention, pertaining to "knowingly obtaining access, through information and communication technologies, to child pornography",[234] yet criminalises such offences pursuant to Article 159(7) of the Criminal Code.[235]

Hate speech: As mentioned above, States can restrict freedom of expression if certain conditions are met, and there are, moreover, certain circumstances where States are obligated to prohibit some forms of expression. For example, the Convention on the Prevention and Punishment of the Crime of Genocide requires States to criminalise expression that incites genocide.[236] States are also obligated under international law to prohibit by law "[a]ny advocacy of national, racial or religious hatred that constitutes incitement to discrimination, hostility or violence".[237] This prohibition applies to (i) advocacy of hatred, (ii) advocacy which constitutes incitement, and (iii) the likelihood of incitement leading to one of the identified outcomes, specifically discrimination, hostility or violence.[238] Guidance in the Rabat Plan of Action, prepared by a Working Group under the U.N. High Commissioner for Human Rights, defines key terms like "hatred", "hostility", "advocacy" and "incitement",[239] whilst also establishing "a six-part threshold test" to determine the severity necessary for expressions to be considered criminal offences.[240] The potential for hate speech in XR which may satisfy these criteria is highlighted by recent research which found that users have reported "observing hate speech that is discriminatory, homophobic, racist, and sexual in nature", the harm resulting from which is particularly acute for women, children, members of the LGBTQ+ community, people of colour and persons with disabilities.[241] In seeking to moderate such content, the Special Rapporteur has suggested that

[231] Lanzarote Convention, Article 20(3).
[232] See, e.g., Witting, supra note 218, pp. 61-66.
[233] Council of Europe (2007). *Explanatory Report to the Council of Europe Convention on the Protection of Children against Sexual Exploitation and Sexual Abuse* CETS 201, para.144.
[234] See, e.g., Reservations and Declarations for Treaty No.201 – Council of Europe Convention on the Protection of Children against Sexual Exploitation and Sexual Abuse (CETS No.201). Available at: https://www.coe.int/en/web/conventions/by-member-states-of-the-council-of-europe?module=declarations-by-treaty&numSte=201&codeNature=0.
[235] Council of Europe (2018). *Replies to the thematic questionnaire: Bulgaria* T-ES(2017)ICT-BG. Available at: https://rm.coe.int/bulgaria-replies-to-the-thematic-questionnaire/168077fa9b.
[236] Convention on the Prevention and Punishment of the Crime of Genocide (entered into force 12 January 1951) G.A. Res 260 A (III) (Genocide Convention), Article 3(c).
[237] ICCPR, Article 19(3); See also, e.g., ICERD, Article 4.
[238] Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression, A/67/357 (7 September 2012), para.43.
[239] Rabat Plan of Action on the prohibition of advocacy of national, racial or religious hatred that constitutes incitement to discrimination, hostility or violence, Annual report of the United Nations High Commissioner for Human Rights, Addendum, A/HRC/22/17/Add.4, 11 January 2013, Annex, footnote 5.
[240] Ibid, Annex, para. 29.
[241] Sum of Us, supra note 210.

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penalties for prohibited expression should be the same online and offline.[242] It follows that the penalties for prohibited hate speech should be enforced in XR environments just as they are enforced offline and in other online contexts.

A more challenging issue is that of "hate speech" which does not constitute advocacy or incitement to discrimination, hostility and violence.[243] Under international human rights law, some legal restrictions on non-incitement expression, such as anti-blasphemy laws, are "specifically disfavoured" because such expression is protected.[244] Instead, States are encouraged to "take robust steps", such as education, training and "government condemnation of prejudice" to counter such instances of hate.[245] States may not use private companies, including XR developers and deployers, "as tools to limit expression that they themselves would be precluded from limiting under international human rights law."[246] This is particularly relevant when considering the introduction of strict liability measures purporting to hold ICT companies and other online intermediaries directly responsible for failure to remove hate speech.[247] Any State which establishes a restriction to the freedom of expression by law must ensure that the exceptional conditions provided by international human rights law, specifically those listed under Article 20(2) ICCPR (see above), are complied with.

Mis/disinformation: XR technologies are among the various digital technologies seen to represent a new frontier in the rise of mis/disinformation in the online environment.[248] As closely related but distinct phenomena, both misinformation and disinformation entail the sharing of false information yet are typically distinguished on the basis that misinformation does not embody an intention to cause harm, whereas disinformation does.[249] The potential for content in XR which may constitute mis/disinformation has been highlighted in recent research, with reporters from Buzzfeed, for instance, having created an experimental private VR world called "Qniverse", complete with misinformation slogans pertaining to electoral fraud, vaccines, and the Covid-19 pandemic, the content of which was only removed after being reported by one of the journalists.[250]

[242] Report of the Special Rapporteur, supra note 238, para. 29: "Penalties on individuals for engaging in unlawful hate speech should not be enhanced merely because the speech occurred online."
[243] See, e.g., United Nations Strategy and Plan of Action on Hate Speech (2019). Available at: https://www.un.org/en/genocideprevention/documents/advising-and-mobilizing/Action_plan_on_hate_speech_EN.pdf - "There is no international legal definition of hate speech, and the characterization of what is 'hateful' is controversial and disputed. In the context of this document, the term hate speech is understood as any kind of communication in speech, writing or behaviour, that attacks or uses pejorative or discriminatory language with reference to a person or a group on the basis of who they are, in other words, based on their religion, ethnicity, nationality, race, colour, descent, gender or other identity factor."
[244] Report of the Special Rapporteur, supra note 238, para.21.
[245] Ibid, para.24. See also, e.g., Human Rights Council Resolution 16/18 A/HRC/RES/16/18 (12 April 2011). Available at: https://documents-dds-ny.un.org/doc/RESOLUTION/GEN/G11/127/27/PDF/G1112727.pdf?OpenElement.
[246] Report of the Special Rapporteur, supra note 238), para.29.
[247] See, e.g., European Court of Human Rights. (2015) *Delfi AS v Estonia*, 16 June 2015, No.64569/09, CE:ECHR:2015:0616JUD00645690, para.159: "the rights and interests of others and of society as a whole may entitle Contracting States to impose liability on Internet news portals, without contravening Article 10 of the Convention, if they fail to take measures to remove clearly unlawful comments without delay, even without notice from the alleged victim or from third parties."
[248] See, e.g., European Commission, Directorate-General for Communications Networks, Content and Technology, (2018) 'A multi-dimensional approach to disinformation: report of the independent High Level Group on fake news and online disinformation', *Publications Office*. Available at: https://data.europa.eu/doi/10.2759/739290
[249] See, e.g., Wardle C., and Derakhshan H., (2017) 'Information Disorder: Toward an interdisciplinary framework for research and policymaking', Council of Europe report DGI (2017) 09. Available at: https://rm.coe.int/information-disorder-toward-an-interdisciplinary-framework-for-researc/168076277c.
[250] Baker-White E. (2022) *Meta Wouldn't Tell Us How It Enforces Its Rules in VR, So We Ran A Test To Find Out* / Buzzfeed [Online]. Available at: https://www.buzzfeednews.com/article/emilybakerwhite/meta-facebook-horizon-vr-content-rules-test.

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Whilst there are "certain restrictions" on the right to freedom of expression under international law,[251] including any propaganda for war and where such expression is hatred constituting incitement to discrimination, hostility or violence (see above),[252] States are not permitted to impose a general prohibition on "expressions of an erroneous opinion or an incorrect interpretation of past events."[253] Similarly, the ECtHR has observed that the right to freedom of expression under the ECHR "does not prohibit discussion or dissemination of information received even if it is strongly suspected that this information might not be truthful."[254] This indicates that the right to freedom of expression entails the right to disseminate false information, yet this may not be an unrestricted right based on the potential for harm to various human rights, including the right to free elections,[255] the right to health (see Section 4.1.6) and the right to non-discrimination (see Section 4.1.12). Furthermore, whilst this right may be guaranteed *de jure*, XR developers may require that users sign up to terms of service agreements through which such expression can be restricted on a *de facto* basis.

States' obligations and areas for legal development

XR technologies are subject to existing international human rights law on the right to freedom of expression and States have an obligation to ensure that the use of XR supports the realisation of this right. States must ensure that any restrictions to the enjoyment of the right to freedom of expression in XR are lawful, legitimate, necessary and proportionate for the attainment of a specified and recognised purpose. Furthermore, based on the duty to protect individuals against human rights abuses by third parties, including private corporations, States must regulate commercial XR developers so that their content moderation policies are consistent with international standards. In seeking to strike a balance between the right to freedom of expression and the avoidance of harm to other protected rights, XR developers may consider adopting specific content moderation policies. The Santa Clara Principles 2.0, for instance, contain a series of foundational and operational principles intended to assist companies in complying with their responsibilities to respect human rights, as directed by the UN Guiding Principles on Business and Human Rights,[256] and have been endorsed by various companies involved in the development of XR, including Facebook (Meta) and Google.[257]

4.1.6 Right to health

XR has the potential to both enhance and undermine the right to health. XR may be used for training of medical professions, in treatment and care, and as a platform for telemedicine. However, XR may also cause direct or indirect harm to health. Additionally, there are concerns related to telemedicine, including inequality of access, limited capabilities for quality care, and cybersecurity risks with health-related data. While international or EU human rights law on the right to health does not explicitly address the impacts of XR, States have an obligation to ensure that the development and deployment of XR does not violate enjoyment of the right.

[251] ICCPR, Article 19(3).
[252] Ibid, Article 20.
[253] Human Rights Committee, *General comment No.34, Article 19: Freedom of opinion and expression*. CCPR/C/GC/34. 12 September 2011, para. 49.
[254] European Court of Human Rights. (2005) *Salov v. Ukraine*, 6 September 2005, No.65518/01, CE:ECHR:2005:0906JUD006551801, para.113.
[255] See, e.g., ECHR, Article 3.
[256] United Nations, (2011) *Guiding principles on business and human rights: implementing the United Nations "Protect, Respect and Remedy" framework*. Available at: https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinesshr_en.pdf.
[257] *The Santa Clara Principles On Transparency and Accountability in Content Moderation* [Online]. Available at: https://santaclaraprinciples.org.

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International law and policy

Under international law, everyone has the right "to the enjoyment of the highest attainable standard of physical and mental health."[258] This right is also recognised in regional organisations, including the Council of Europe.[259]

It is not a right to be *healthy*, but rather a right to certain freedoms (right to control one's health and be freed from interference) and entitlements (equal opportunity to enjoy the highest attainable level of health).[260] States have an obligation to "take the necessary steps to the maximum of its available resources" to ensure access to timely, acceptable, and affordable healthcare.[261]

Also relevant to the right to health and XR is the *Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine (Oviedo Convention).*[262] It is the only international binding legal instrument on human rights and biomedicine and includes provisions on relevant topics including equitable access and informed consent.

The Council of Europe's Strategic Action Plan on Human Rights and Technologies in Biomedicine (2020-2025) elaborates how the international organisation will address emerging challenges posed by new technologies, including telemedicine.[263] For example, its Committee on Bioethics intends to prepare a Recommendation 'on equitable and timely access to innovative treatments and technologies in healthcare systems'.[264]

Three of the UN Sustainable Development Goals relate to the right to the right to health: good health and well-bring, zero hunger, and clean water and sanitation.[265]

EU law and policy

The EU Charter of Fundamental Rights includes the right "of access to preventative health care and the right to benefit from medical treatment under the conditions established by national laws and practices."[266] The European Pillar of Social Rights also includes a principle on health care and "the right to timely access to affordable, preventive and curative health care of good quality."[267]

Potential enhancements

XR may enhance an individual's right to enjoy the highest attainable standard of health. For example, XR may enhance the education of health care professionals by providing low-risk, realistic training experiences, thus improving overall healthcare provision.[268] XR may also be used by medical providers

[258] ICESCR, Article 12. See, also, UDHR, Article 25(1); ICERD, Article 5(e)(iv); Convention on the Elimination of All Forms of Discrimination against Women (entered into force 3 September 1981), 1249 U.N.T.S. 13 (CEDAW), Article 12; CRC, Article 24; and CRPD, Annex I, Article 25.
[259] European Social Charter (entered into force 26 February 1965), E.T.S. 35 – Social Charter, 18.X.1961, Part I, para. 11.
[260] Committee on Economic, Social and Cultural Rights. (2000*) General Comment No. 14: The Right to the Highest Attainable Standard of Health (Art. 12)*, adopted 11 August 2000, para. 8.
[261] Ibid, paras. 11-12, 47.
[262] Oviedo Convention; Convention on Human Rights and Biomedicine, 4.IV.1997.
[263] Council of Europe. (2019) 'Strategic Action Plan on Human Rights and Technologies in Biomedicine (2020-2025)'. Available at: https://rm.coe.int/strategic-action-plan-final-e/1680a2c5d2.
[264] Ibid.
[265] Sustainable Development Goals, Goals 2, 3, and 6.
[266] ECHR, Article. 35.
[267] European Pillar of Social Rights, Principle 16.
[268] *See, e.g.,* Logeswaran et al. (2021) 'The role of extended reality technology in healthcare education: Towards a learner-centred approach, *Future Healthcare Journal*, 8(1). DOI: 10.7861/fhj.2020-0112.

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in, for example, clinical care or surgery, as a tool to provide quality care.[269] Telemedicine via XR may also improve access to healthcare, particularly for persons with disabilities and those unable to visit a medical provider in person.[270]

Potential interferences

The use of XR may negatively impact both an individual's health and ability to access the highest attainable standard of healthcare. Research has already documented many negative health-related harms associated with the use of XR, including motion sickness and nausea, physical injuries from contact with physical setting, and bodily neglect.[271] Other potential harms include depersonalisation and derealisation dissociative disorders and addiction.[272] Research on the impacts on children specifically suggest that XR technologies may interfere with brain and neurological development,[273] raises issues about children's development that could have negative and life-long health effects.

Other concerns related to the use of XR in telemedicine, including high costs, limited accessibility especially in low socio-economic areas, privacy concerns for sensitive health data, and the inherent difficultly to adequately diagnose and effectively treat some health conditions remotely.[274]

States' obligations and areas for legal development

XR is subject to existing international human rights law on the right to health and States have an obligation to ensure that the use of XR supports realisation of the right. States must take all necessary steps possible to guarantee that XR does not interfere with individual's right to control their own health and that everyone has equal opportunity to benefit from XR if desired. In relation to the right to health, further human rights guidance specific to XR may be required to address concerns related to, among other issues, impacts on child brain development, inequality of access, and privacy and data protection.

4.1.7 Right to education

XR has the potential to both enhance and undermine the right to education. The use of XR technologies may improve learning outcomes, provide reasonable accommodation for students with disabilities, and enhance accessibility. However, concerns about XR include physical and mental harm from extended periods of use, undue influence of private and commercial actors, and compounded inequalities of access. While international or EU human rights law on the right to education does not

[269] *See, e.g.*, Marr, B. (2021) *Extended Reality in Healthcare: 3 Reasons The Industry Must Get Ready for AI and VR / FORBES* [Online]. Available at: https://www.forbes.com/sites/bernardmarr/2021/06/14/extended-reality-in-healthcare-3-reasons-the-industry-must-get-ready-for-ar-and-vr/?sh=18b747fe73a4 (Accessed: 17 May 2022); and Andrews at al. (2019) 'Extended Reality in Medical Practice', *Current Treatment Options in Cardiovascular Medicine*, 21(4). DOI: 10.1007/s11936-019-0722-7.

[270] *See, e.g.*, Ong et al. (2021) 'Extended Reality for Enhanced Telehealth During and Beyond COVID-19: Viewpoint", *JMIR Serious Games*, 9(3). DOI: 10.2196/26520.

[271] See, e.g., Spiegel, J.S. (2017) 'The Ethics of Virtual Reality Technology: Social Hazards and Public Policy Recommendations', *Science and Engineering Ethics.* DOI: 10.1007/s11948-017-9979-y; Snijders et al. (2020) *Responsible VR. Protect consumer in virtual reality.* The Hague: Rathenau Instituut; and Bagheri, R. (2017) 'Virtual reality, The real life consequences', *UC Davis Business Law Journal,* 17.

[272] *See, e.g.*, Spiegel, supra note 271.

[273] *See, e.g.*, Miehlbradt et al. (2021) 'Immersive virtual reality interferes with default head-trunk coordination strategies in young children', *Scientific Reports*, 11. DOI: 10.1038/s41598-021-96866-8.

[274] *See, e.g.,* Ong et al., supra note 270; and Evans, J. (2022) 'Extended Reality (XR) Ethics in Medicine, IEEE Global Initiative on Ethics of Extended Reality. Available at: https://standards.ieee.org/wp-content/uploads/2022/02/whitepaper-ethics-in-medicine.pdf (Accessed: 17 May 2022).

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explicitly address the impacts of XR, States have an obligation to ensure that the development and deployment of XR does not interfere with the enjoyment of the right.

International law and policy

Under international law, everyone has the right to education.[275] This right is also recognised in regional organisations, including the Council of Europe.[276]

Education should be "directed to the full development of the human personality and the sense of its dignity" and "enable all persons to participate effectively in a free society, promote understanding, tolerance and friendship among all nations and all racial, ethnic or religious groups".[277] States are obligated to provide free, compulsory primary education to children and ensure equal access to secondary and higher education without discrimination.[278] All education should be available, accessible, acceptable, and adaptable within the specific context of the State.[279] Particular care should be afforded to persons with disabilities; States are obligated to provide reasonable accommodation to ensure equal access to education.[280]

To address concerns about the privatisation and commodification of human rights, human rights experts adopted the Adibjan Principles in 2019 to provide guidance on regulating private actors' involvement in education.[281] The Adibjan Principles call on States to establish effective regulation of private actors consistent with international rights and standards.[282] The Adibjan Principles have been endorsed by the U.N. High Commission for Human Rights,[283] U.N. Special Procedures (including the then U.N. Special Rapporteur on the right to education),[284] and the U.N. Human Rights Council,[285] among others.

Goal 3 of the UN Sustainable Development Goals is to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all".[286]

[275] UDHR, Article 26; ICCPR, Article 13; ICERD, Article 5(e)(v); CEDAW, Article 10; CRC, Article 28; and CRPD, Article 24.
[276] ECHR, Art. 2.
[277] UDHR, Article 26; and ICCPR, Article 13.
[278] UDHR, Article 26; and ICESCR, Article 13.
[279] Committee on Economic, Social and Cultural Rights. (1999) *General Comment No. 13: The Right to education (article 13 of the Covenant)*, E/C.12/1999/10, 8 December 1999, para.6.
[280] Committee on the Rights of Persons with Disabilities. (2016) *General Comment No. 4 (2016) on the right to inclusive education*, CRPD/C/GC/4, 25 November 2016, paras.28-33; and Committee on the Rights of the Child. (2007) *General Comment No. 9 (2006) on the rights of children with disabilities,* CRC/C/GC/9, 27 February 2007, Section VIII(D).
[281] Guiding Principles on the human rights obligations of States to provide public education and to regulate private involvement in education, adopted 13 February 2019 (Abidjan Principles).
[282] Ibid, para. 53.
[283] U.N. High Commissioner for Human Rights (2019) *Statement by UN High Commissioner for Human Rights Michelle Bachelet at the Social Forum: The promotion and protection of the rights of children and youth through education*, 1 October 2019. Available at: https://www.ohchr.org/en/statements/2019/10/social-forum-promotion-and-protection-rights-children-and-youth-through?LangID=E&NewsID=25085.
[284] U.N. Special Rapporteur on the right to education. (2019) *Right to education: the implementation of the right to education and Sustainable Development Goal 4 in the context of the growth of private actors in education*, A/HRC/41/37, 10 April 2019.
[285] U.N. Human Rights Council. (2021) *Resolution on the right to education*, A/HRC/4/L.26/Rev.1, 8 July 2021; U.N. Human Rights Council. (2019) *Resolution on the right to education: follow-up to Human Rights Council resolution 8/4*, A/HRC/4/L.26, 9 July 2019.
[286] Sustainable Development Goals, Goal 4.

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EU law and policy

The EU Charter of Fundamental Rights includes the right to education, including free compulsory education."[287] The European Pillar of Social Rights also includes a principle on education, training and life-long learning.[288]

Potential enhancements

XR technologies may enhance education and learning in a number of ways.[289] One, XR exposes students to information in engaging, interactive ways, which research suggests may improve overall learning outcomes,[290] particularly for students with disabilities and special learning needs.[291] XR can be used to deliver personalized approaches and lessons for students, which may also improve learning outcomes.[292] XR technologies could, therefore, be used as a tool of reasonable accommodation to adapt learning methods to specific needs. Other benefits may include minimising distractions and improving focus,[293] teaching empathy,[294] and enhancing collaboration, particularly when in-person learning is limited (e.g., COVID-19 pandemic).[295]

For these reasons, XR technologies may augment efforts to ensure education promotes understanding, tolerance and friendship, and may help States fulfil their obligation to ensure education is available, accessible, acceptable, and adapted in their national context.

Potential interferences

The use of XR may create or contribute to situations that negatively impact the right to education. Firstly, XR technologies may pose physical and mental health risks, particularly if used for extended

[287] CFREU, Art. 14.
[288] European Pillar of Social Rights, Principle 1.
[289] *See, e.g.*, Oyelere et al. (2020) 'Exploring the trends of educational virtual reality games: a systematic review of empirical studies', *Smart Learning Environments,* 7. DOI: 10.1186/s40561-020-00142-7.
[290] *See, e.g.*, Dick, E. (2021) 'The Promise of Immersive Learning: Augmented and Virtual Reality's Potential in Education', *Information Technology and Innovation Foundation*. Available at: https://itif.org/sites/default/files/2021-ar-vr-education.pdf.
[291] *See, e.g.*, Zitter, L. (2020) *How VR and AR Can Be Used to Support Students with Special Needs / Tech & Learning* [Online]. Available at: https://www.techlearning.com/how-to/how-vr-and-ar-can-be-used-to-support-students-with-special-needs; Educators in VR. (2019) *Accessibility, Disabilities and Virtual Reality Solutions / Educators in VR* [Online]. Available at: https://educatorsinvr.com/2019/05/31/accessibility-disabilities-and-virtual-reality-solutions/.
[292] See, e.g., Horvath, I. (2021) 'An Analysis of Personalized Learning Opportunities in 3D VR', *Frontiers in Computer Science*, 3. DOI: 10.3389/fcomp.2021.673826.
[293] *See, e.g.*, Zimmerman, E. (2019) *AR/VR in K-12: Schools Use Immersive Technology for Assistive Learning / EDTECH* [Online]. Available at: https://edtechmagazine.com/k12/article/2019/08/arvr-k-12-schools-use-immersive-technology-assistive-learning-perfcon.
[294] *See, e.g.*, Bertrand et al. (2018) 'Learning Empathy Through Virtual Reality: Multiple Strategies for Training Empathy-Related Abilities Using Body Ownership Illusions in Embodied Virtual Reality', *Frontiers in Robotics and AI*, 5. DOI: 10.3389/frobt.2018.00026; Rueda, J and Lara, F. (2020) 'Virtual Reality and Empathy Enhancement: Ethical Aspects', *Frontiers in Robotics and AI*, 7. DOI: 10.3389/frobt.2020.506984. Film-maker Chris Milk made the claim that virtual reality could be the ultimate empathy machine" in 2015 in regard to the short film *Clouds Over Sidra*, which is used to educate about the refugee experience in a camp in Jordan. Milk, C. (2015) *How virtual reality can create the ultimate empathy machine /TED.* Transcript available at: https://www.ted.com/talks/chris_milk_how_virtual_reality_can_create_the_ultimate_empathy_machine/transcript?language=en.
[295] *See, e.g.*, Dick, supra note 290, p. 3; and Zhou, M. and Kalota, F. (2020) 'Promoting Collaborative Learning through VR Technologies in the Era of COVID-19', *2020 Seventh International Conference on Information Technology Trends (ITT), 22-26 November 2020.* DOI: 10.1109/ITT51279.2020.9320886.

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periods of time.[296] There are particular concerns around the impacts of immersive technologies on children's brain, particularly potential interferences with brain and neurological development in children,[297] which could have impacts on an individual's ability to learn and enjoy the right to education.

It is also important to note lessons facilitated through XR does not necessarily equate to enhanced learning or knowledge comprehension.[298] Research on information overload in the context of the internet and digital technologies[299] should inform discussions on whether individuals learn more with XR and whether they should be used in educational settings. Without further research, misconceptions about the benefits of XR in education could negatively impact decisions on the distribution of limited resources in such a way that effective teaching measures are deprioritised or unfunded.

Other concerns include potential negative effects from the use of commercial XR technologies that are not adapted or appropriately integrated into the educational context, or that give private actors too much control over learning content and systems while benefiting financially. A particular concern is the integration of advertising into XR learning tools.[300]

Lastly, inequitable access to XR technologies and their requisite infrastructure (especially reliable, fast internet connections) could exacerbate existing socioeconomic inequalities and frustrate a State's ability to fulfil their obligations to ensure equal access to education.[301]

States' obligations and areas for legal development

XR technologies are subject to existing international human rights law on the right to education and States have an obligation to ensure that the use of XR supports the realisation of this right. States must ensure that XR technologies do not interfere with their obligations to provide free primary education to all children and equal access to secondary and higher education without discrimination. States have a particular responsibility to ensure equal access and non-discrimination for students with disabilities. Furthermore, States must regulate commercial XR technologies so that they, too, are

[296] *See, e.g.*, Lavoie et al. (2021) 'Virtual experience, real consequences: the potential negative emotional consequences of virtual reality gameplay', *Virtual Reality*, 25. DOI: 10.1007/s10055-020-00440-y; and Rosbach, M. (2020) *Virtual reality, real injuries: OSU study shows how to reduce physical risk in VR' / Oregon State University* [Online]. Available at: https://today.oregonstate.edu/news/virtual-reality-real-injuries-osu-study-shows-how-reduce-physical-risk-vr.

[297] *See, e.g.*, Sanctuary, H. (2021) *Virtual Reality Affects Children Differently Than Adults / NeuroscienceNews.com* [Online]. Available at: https://neurosciencenews.com/virtual-reality-children-19370/; and Gent, E. (2016) *Are Virtual Reality Headsets Safe for Children / Scientific American* [Online]. Available at: https://www.scientificamerican.com/article/are-virtual-reality-headsets-safe-for-children/; Kaimara, P., Oikonomou, A. and Deliyannis, I. (2021) 'Could virtual reality applications pose real risks to children and adolescents? A systematic review of ethical issues and concerns', *Virtual Reality.* DOI: 10.1007/s10055-021-00563-w.

[298] *See, e.g.*, Mado et al. (2022) 'Accessibility of Educational Virtual Reality for Children during the COVID-19 Pandemic', *Technology, Mind and Behavior,* 3(1), p.3. DOI: 10.1037/tmb0000066; Mulders, M., Buchner, J. and Kerres, M. (2020) 'A Framework for the Use of Immersive Virtual Reality in Learning Environments', *International Journal of Emerging Technology in Learning,* 15(24). DOI: 10.3991/ijet.v15i24.16615.

[299] *See, e.g.*, Lehman, A. and Miller, S.J. (2020) 'A Theoretical Conversation about Responses to Information Overload', Information, 11(8). DOI: 10.3390/info11080379; Kurelovic, E.K., Tomljanovic, J. and Davidovic, V. (2016) 'Information Overload, Information Literacy and Use of Technology by Students', *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*, 10(3), pp. 917-921.

[300] *See, e.g.,* Herold, B. (2018) *Virtual Reality for Learning Raises High Hopes and Serious Concerns / EdWeek* [Online]. Available at: https://www.edweek.org/technology/virtual-reality-for-learning-raises-high-hopes-and-serious-concerns/2018/02.

[301] *See, e.g.*, Southgate et al. (2018) 'Embedding immersive virtual reality in classrooms: Ethical, organisational and educational lessons in bridging research and practice', *International Journal of Child-computer Interaction.* DOI: 10.1016/j.ijcci.2018.10.002.

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consistent with international standards. In relation to right to education, further human rights guidance specific to XR may be required to address concerns related to, among other issues, physical and mental harms, especially to child development, equality for and accommodation of students with disabilities, regulation of private actors and inequality of access.

4.1.8 Access to justice and right to a fair trial

XR has the potential to both enhance and undermine access to justice. XR may increase access to proceedings and allow for novel ways to present evidence, and its use may reduce the risk of judge, jury, or prosecutorial bias. However, XR may also encourage inferior participation and mask non-verbal cues, and it raises concerns about the accuracy and risk of image manipulation, inequalities of access to the technology, and privacy and data protection. All of these factors together may erode judicial legitimacy and undermine access to justice. While international and EU human rights law on access to justice does not explicitly address the impacts of XR, States have an obligation to ensure that the development and deployment of XR does not violate enjoyment of the right.

International law and policy

Access to justice is a basic principle of law constituted by several related rights. These rights include equal access and treatment before the law, a "fair and public hearing by a competent, independent and impartial tribunal" in criminal cases,[302] and the right to an effective remedy.[303] Specific requirements include the right to be heard, the right to a defence, and the right to a public trial.[304] In addition to specific guarantees, States have an obligation to ensure that access to courts and tribunals is not "systematically frustrated" by any *de jure* or *de facto* factors.[305]

These rights are also recognised in regional organisations, including the Council of Europe.[306] While XR has not been the topic of guidance or jurisprudence in relation to international human rights law, the European Court of Human Rights has considered the use of videoconferencing and found no violation of a defendant's right to a fair trial if certain conditions are met.[307]

Furthermore, Goal 16 of the UN Sustainable Development Goals relates to access to justice.[308]

EU law and policy

The EU Charter of Fundamental Rights includes the right "to an effective remedy" and "a fair and public hearing within a reasonable time by an independent and impartial tribunal."[309]

Potential enhancements

XR can be incorporated into the justice systems in ways that may enhance an individual's right to a fair trial. XR can be used to enable access to courtrooms for parties and witnesses otherwise limited due

[302] UDHR, Article 10; ICCPR, Article 14.
[303] ICCPR, Article 2(a).
[304] Human Rights Committee. (2007) *General Comment No. 32: Article 14: Right to equality before courts and tribunals and to a fair trial*, CCPR/C/GC/32, adopted 23 August 2007, para.28, 32, and 37.
[305] Latin for "in law or in fact." Human Rights Committee. (2007) *General Comment No. 32: Article 14: Right to equality before courts and tribunals and to a fair trial*, CCPR/C/GC/32, adopted 23 August 2007, para. 9.
[306] ECHR, Article 6.
[307] European Court of Human Rights. (2006) *Marcello Viola v Italy (No. 1)*, 5 October 2006, No. 45106/04, CE:ECHR:2006:1005JUD004510604, para.76.
[308] Sustainable Development Goals, Goal 16.
[309] CFREU, Article 47

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to distance, travel cost, or language barriers,[310] providing a timely option for increasing accessibility. Additionally, XR could be used to present evidence to the court, for example to recreate an accident, represent an important scene or bring to life a physical item that cannot be brought into a courtroom.[311] Images and video collected through devices equipped with XR technology, for example first-person recordings from smart glasses, could also be introduced as evidence.[312]

Research also suggests that virtual reality training for judges and juries may reduce bias that may undermine the fairness of a judicial system,[313] and immersive virtual experiences may help minimise prosecutorial bias and reduce prosecutorial misconduct.[314]

Potential interferences

The use of XR can also interfere with access to justice and the right to a fair trial. For example, XR may undermine access to justice if it encourages a type or quality of participation that is inferior to in-person participation, and thus results in an unsatisfactory or unfair result.[315] XR may also undermine accuracy or fairness, such as when witness testimony fails to capture non-verbal cues,[316] or when avatars or digital representations of evidence are manipulated.[317]

Additionally, as access to justice does not refer to mere access or convenience to physical spaces, XR alone is not sufficient to guarantee access and fairness in the delivery of justice. Furthermore, disadvantaged parties may find existing inequalities compounded when they have limited access to the technologies to remotely connect or cannot afford the technology to use XR.[318]

Lastly, XR in judicial proceedings may also present privacy and data protection concerns, particularly as many proceedings involve highly sensitive materials.[319] For example, attendees may retain

[310] *See, e.g.*, Donoghue, J. (2017) 'The Rise of Digital Justice: Courtroom Technology, Public Participation and Access to Justice', *The Modern Law Review*, 80(6); and Long, V. (2021) 'Online Courts: Re-Assessing Inequality in the 'Remote' Courtroom', *(re)connect,* 11(1). Available at: https://excursions-journal.sussex.ac.uk/index.php/excursions/article/view/283.4.

[311] *See, e.g.*, Olmeda, R. (2022) *Is Virtual Reality the Future of Expert Testimony in Court? / Government Technology* [Online]. Available at: https://www.govtech.com/public-safety/is-virtual-reality-the-future-of-expert-testimony-in-court; Elizaroff, N. (2020) *One Step Away from the Matrix: The New Normal of Virtual Reality / @theBar The Chicago Bar Association* [Online]. Available at: https://cbaatthebar.chicagobar.org/2020/09/24/one-step-away-from-the-matrix-the-new-normal-of-virtual-reality/.

[312] *See, e.g.*, Bergman, K. (2014) 'Cyborgs in the Courtroom: The Use of Google Glass Recordings in Litigation', *Richmond Journal of Law and Technology*, 20(3). Available at: http://jolt.richmond.edu/v20i3/article11.pdf.

[313] *See, e.g.*, Salmanowitz, N. (2016) 'Unconventional Methods for a Traditional Setting: The Use of Virtual Reality to Reduce Implicit Racial Bias in the Courtroom', *The University of New Hampshire Law Review*, 15(1). Available at: http://scholars.unh.edu/unh_lr/vol15/iss1/2.

[314] *See, e.g.*, Bloch, K.E. (2019) 'Harnessing Virtual Reality to Prevent Prosecutorial Misconduct', *The Georgetown Journal of Legal Ethics*, 32(1). Available at: https://www.law.georgetown.edu/legal-ethics-journal/in-print/volume-32-issue-1-winter-2019/harnessing-virtual-reality-to-prevent-prosecutorial-misconduct/.

[315] Donoghue, supra note 310; and Long, V. (2021) 'Online Courts: Re-Assessing Inequality in the 'Remote' Courtroom', *(re)connect)*, 11(1). Available at: https://excursions-journal.sussex.ac.uk/index.php/excursions/article/view/283.

[316] Legg, M. and Song, A. (2021) 'The Courts, the remote hearing and the pandemic: From action to reflection', *New South Wales Law Journal,* 44(1). DOI: 10.53637/ZATE4122, p.138.

[317] *See, e.g.*, Smith, R. (2020) *Remote Courts and the consequences of ending 'practical obscurity' / Law, Technology and Access to Justice* [Online]. Available at: https://law-tech-a2j.org/remote-courts/remote-courts-and-the-consequences-of-ending-practical-obscurity/.

[318] *See, e.g*, Rossner, M., Tait, D. and McCurdy, M. (2021) 'Justice reimagined: challenges and opportunities with implementing virtual courts', *Current Issues in Criminal Justice,* 33(1). DOI: 10.1080/10345329.2020.1859968; Legg, M. and Song, A. (2021) 'The Courts, the remote hearing and the 10.53637/ZATE4122; Mulcahy, L. (2020) *Exploring the case for Virtual Jury Trials during the COVID-19 crisis: An evaluation of a pilot study conducted by JUSTICE*. Available at: https://justice.org.uk/our-work/justice-covid-19-response/.

[319] *See, e.g.*, Karp, J. (2021) *Virtual Courts Lead to Tension Between Access and Privacy / Law 360* [Online]. Available at: https://www.law360.com/pulse/articles/1348795/virtual-courts-lead-to-tension-between-access-and-privacy.

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unauthorized copies of confidential information (e.g., by screenshot or recording device), including information that is stricken from the official record.[320] Access breaches may also result in unauthorized attendance or viewing.[321]

In light of the collective concerns, the use of XR in judicial systems "may erode judicial legitimacy and the court's authority".[322]

States' obligations and areas for legal development

XR is subject to existing international human rights law on access to justice and the right to a fair trial, and States have an obligation to ensure that the use of XR supports realisation of the rights. States must take all necessary steps possible to guarantee that the use of XR does not create circumstances constituting a *de jure* or *de facto* interference with individual's right to equal access to justice and a fair trial. In relation to the right to a fair trial and access to justice, further human rights guidance specific to XR may be required to address concerns related to, among other issues, accuracy of digital representations and evidence, inequality of access, and privacy and data protection.

4.1.9 Right to just and favourable conditions of work

XR has the potential to both enhance and undermine the right to work and associated rights. XR may be used to make work more accessible and training safer and to address discrimination in the workplace. However, for end-users in the workplace, XR may cause harm to physical and mental health from extended use and increased workload, interfere with rest and leisure, raise privacy and data protection concerns, and compound existing inequalities of access. In the supply chain for XR devices, other labour rights concerns include forced and child labour, workplace health and safety, and fair wages. While international and EU human rights law on the right to work and related rights do not explicitly address the impacts of XR, States have an obligation to ensure that the development and deployment of XR do not interfere with these rights.

International law and policy

Under international law, everyone has the right to work in "just and favourable conditions."[323] Children can perform work activities but must be "protected from economic exploitation and from performing any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development."[324]

To fulfil the right to work, States have an obligation to ensure that individuals can freely choose and accept work.[325] This relates to the general prohibition in international human rights on slavery and forced labour.[326] States must also ensure that work is accessible (including both physical accessibility

[320] *See, e.g.*, Gori, P and Pahladsingh, A. (2021) 'Fundamental rights under COVID-19: an European perspective on videoconferencing in court', *ERA Forum*, 21, p576. DOI: 10.1007/s12027-020-00643-5.
[321] This type of breach would be akin to a 'zoom bomb', a term coined during the COVID-19 pandemic to refer to an unauthorized and unwanted intrusion into a virtual meeting, commonly held on Zoom, an online meeting platform. *See, e.g.,* Lorenz, T. and Alba, D. (2020) *'Zoombombing' Becomes a Dangerous Organized Effort / The New York Times* [Online]. Available at: https://www.nytimes.com/2020/04/03/technology/zoom-harassment-abuse-racism-fbi-warning.html.
[322] Rossner, M., Tait, D. and McCurdy, M. (2021) 'Justice reimagined: challenges and opportunities with implementing virtual courts', *Current Issues in Criminal Justice,* 33(1). DOI: 10.1080/10345329.2020.1859968, p. 97.
[323] UDHR, Article 23; ICESCR, Articles 6-7; ICERD, Article 5(e)(i); CEDAW, Article 11; and CRPD, Annex I, Article 27.
[324] CRC, Article 32.
[325] Committee on Economic, Social and Cultural Rights. (2006) *General Comment No. 18: The right to work*, adopted 6 February 2006, paras. 4,6.
[326] UDHR, Article 4; and ICCPR, Articles 8.

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and non-discrimination) and acceptable, which means guaranteeing the conditions of just and favourable work are met.[327] Those conditions include fair wages and equal renumeration, safe and healthy working conditions, and provision of rest and leisure.[328]

This right to just conditions of work and the prohibition on slavery is also recognised in regional organisations, including the Council of Europe.[329]

Goal 8 of the Sustainable Development Goals relates to "decent work for all".[330]

EU law and policy

The EU Charter of Fundamental Rights includes the right to engage in work and "working conditions which respect his or her health, safety and dignity."[331] The European Pillar of Social Rights also includes a chapter on fair working conditions, which include a principle for a "healthy, safe and well-adapted work environment."[332] In January 2021, the European Parliament adopted a resolution on work-life balance and a 'right to disconnect' and called on the European Commission to put forward a "legislative framework with a view to establishing minimum requirements for remote work across the Union".[333] For more on the emerging 'right to disconnect', see Section 4.1.13.

Potential enhancements

XR may enhance an individual's right to work and related protections. For example, XR may enable some work environments to be more accessible, whether it be through the use of remote access or augmented applications within the physical workplace.[334] XR may be used to make training safer, particularly for high-risk occupations[335] and to conduct anti-bias training to address workplace discrimination.[336]

Potential interferences

The use of XR may negatively impact the right to work and related rights. For users of XR, long periods of time within XR may result in physical and/or mental health harm (See Section 4.1.6). Earlier research also suggested that XR use may contribute to higher workloads (including mental and physical demand),[337] which may cause exhaustion and other harms to health. Concerns about 'disconnecting'

[327] Committee on Economic, Social and Cultural Rights. (2006) *General Comment No. 18: The right to work*, adopted 6 February 2006.
[328] Committee on Economic, Social and Cultural Rights. (2006) *General Comment No. 23 (2016) on the right to just and favourable conditions of work (article 7 of the International Covenant on Economic, Social and Cultural Rights)*, 27 April 2016, E/C.12/GC/23.
[329] European Social Charter, Part I; ECHR, Article 4.
[330] Sustainable Development Goals, Goal 8.
[331] CFREU, Art. 15 and 31.
[332] European Pillar of Social Rights.
[333] European Parliament. (2021) *Resolution of 21 January 2021 with recommendations to the Commission on the right to disconnect*, P9_TA(2021)0021, adopted 21 January 2021.
[334] *See, e.g.*, PEAT and XR Association (2022) *Inclusive XR in the Workplace*. Available at: https://www.peatworks.org/futureofwork/xr/inclusiveworkplacexr/.
[335] *See, e.g.*, Kaplan et al. (2021) 'The Effects of Virtual Reality Augmented Reality, and Mixed Reality as Training Enhancement Methods: A Meta-Analysis', *Human* Factors, 63(4). DOI: 10/1177/0018720820904229; and Fade, L. (2020) *Training for Dangerous Jobs With Virtual Reality / FORBES* [Online]. Available at: https://www.forbes.com/sites/theyec/2020/07/28/training-for-dangerous-jobs-with-virtual-reality/?sh=15b4547c1c37.
[336] *See, e.g.*, Ascott, E. (2021) *How Can Virtual Reality Be Used to Conduct Anti-Bias Training For Workers? / AllWork* [Online]. Available at: https://allwork.space/2021/12/how-can-virtual-reality-be-used-to-conduct-anti-bias-training-for-workers.
[337] Xi et al. (2022) 'The challenges of entering the metaverse: An experiment on the effect of extended reality on workload', *Information Systems Frontiers*. DOI: 10.1007/s10796-022-10244-x.

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and work-life balance in extended reality (See Sections 4.1.10 and 4.1.13) also impact whether work conditions are considered just and favourable, as do privacy and data protection concerns related to the constant surveillance and recording capabilities within XR (see Sections 4.1.4 and 4.2).[338] Additionally, inequality of access to XR technologies that become *de facto* required to participate in the workforce may undermine the ability to secure work and lead to workplace discrimination.[339]

A distinct set of concerns relates to the working conditions of individuals who enable the creation of XR devices. While not a risk unique to XR, concerns include child and forced labour in the mining of rare minerals,[340] labour violations in overseas manufacturing centres,[341] and the harmful health effects associated with e-waste disposal.[342]

States' obligations and areas for legal development

XR is subject to existing international human rights law on the rights related to work and States have an obligation to ensure that the use of extended support realisation of the rights. States must take all necessary steps possible to guarantee that XR technologies do not interfere with individual's right to work, right to just and favourable conditions of work, and the prohibition on slavery and forced labour. Further human rights guidance specific to XR may be required to address concerns related to, among other issues, health and safety impacts, privacy of employees, inequality of access, and labour abuses within the supply chain for XR devices.

6.1.10 Right to rest and leisure

XR technologies have the potential to both enhance and undermine the right to rest and leisure. XR technologies may be used for leisure activities, and some claim that the use of XR for non-leisure activities will afford more time for leisure. Persons with disabilities may particularly benefit from leisure activities enjoyed through XR. However, XR technologies may undermine enjoyment of the right to leisure due to the digitalised commercialisation of leisure activities in XR and challenges of work-life balance. While international human rights law on the right to rest and leisure does not explicitly address the impacts of XR, States have an obligation to ensure that the development and deployment of XR technologies do not violate enjoyment of the right.

[338] *See, e.g*, Schuir, J. and Teuteberg, F. (2021) 'Understanding augmented reality adoption trade-offs in production environments from the perspective of future employees: A chose-based conjoint study', *Information Systems and e-Business Management*, 19. DOI: 10.1007/s10257-021-00529-0.
[339] *See, e.g.*, Seifert, A. and Schlomann, A. (2021) 'The Use of Virtual and Augmented Reality by Older Adults: Potentials and Challenges', *Frontiers in Virtual Reality*. DOI: 10.3389/frvir.2021.639718; and Amano-Smerling, T. (2021) *The Inequality of Virtual Reality / USC Viterbi School of Engineering* [Online]. Available at: https://vce.usc.edu/weekly-news-profile/the-inequality-of-virtual-reality/.
[340] *See, e.g.*, Kelly, A. (2019) 'Apple and Google named in a US lawsuit over Congolese child cobalt mining deaths', *The Guardian* [Online]. Available at: https://www.theguardian.com/global-development/2019/dec/16/apple-and-google-named-in-us-lawsuit-over-congolese-child-cobalt-mining-deaths.
[341] *See, e.g.*, Wong, J.C. (2021) 'Revealed: Google illegally underpaid thousands of workers across dozens of countries', *The Guardian* [Online]. Available at: https://www.theguardian.com/technology/2021/sep/10/google-underpaid-workers-illegal-pay-disparity-documents; U.N. Special Procedures (2018) Press release: *Vietnam: UN Experts concerned by threats against factory workers and labour activities'*, U.N. Office of the High Commissioner for Human Rights, 20 March 2018. Available at: https://www.ohchr.org/en/press-releases/2018/03/vietnam-un-experts-concerned-threats-against-factory-workers-and-labour.
[342] See, *e.g.*, World Health Organization (2021) *Soaring e-waste affects the health of millions of children, WHO warns.* Available at: https://www.who.int/news/item/15-06-2021-soaring-e-waste-affects-the-health-of-millions-of-children-who-warns.

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International law and policy

Under international law, everyone has the right to rest and leisure."[343] This right is related to the right to work and labour protection, as it includes "reasonable limitation of working hours and periodic holidays with pay."[344] Children are specifically entitled "to engage in play and recreational activities appropriate to the age of the child and to participate freely in cultural life and the arts."[345] All individuals have a right to equally participate in leisure activities, including persons with disabilities.[346] The Council of Europe also recognises the right to rest, leisure and play for children.[347]

EU law and policy

In relation to fair and just working conditions, the EU Charter of Fundamental Rights includes the right "to daily and weekly rest periods."[348] Member states are directed to take necessary measures to ensure restrictions on working hours.[349] Work-life balance, particularly in the context of telework, is one of the European Pillars of Social Rights.[350] The 2021 European Parliament resolution on a 'right to disconnect' (mentioned above in Section 4.1.13) calls for a legal framework to limit remote work to protect rest and leisure".[351]

Potential enhancements

XR may enhance the enjoyment of leisure because many leisure activities can involve XR (e.g., games, social interaction platforms, cultural activities, virtual travel).[352] Furthermore, some believe that increased uptake of digital technologies, like XR, may allow individuals more time to engage in rest and leisure activities[353]. For persons with disabilities in particular, XR may offer a particular benefit in facilitating leisure experiences that would otherwise be limited in the physical world.

Potential interferences

Extended realities may create or contribute to negative impacts on an individual's ability to enjoy the right to rest and leisure. Some concerns relate specifically to the digitalisation and commercialisation of leisure activities, such as power imbalances from intensified political and economic interests,

[343] UDHR, Article 24; ICCPR, Article 7(d).
[344] Ibid.
[345] CRC, Article 31.
[346] CRPD, Article 30.
[347] Council of Europe. *Leisure time / Council of Europe* [Online]. Available at: https://www.coe.int/en/web/childrens-voices/leisure-time (Accessed: 17 May 2022).
[348] CFREU, Art. 31(2).
[349] European Parliament and European Council. (2003) *Directive 2003/88/EC of the European Parliament and of the Council of 4 November 2003 concerning certain aspects of the organisation of working time*, 4 November 2003.
[350] European Commission. (2021) European Pillar of Social Rights. Available at: https://ec.europa.eu/info/strategy/priorities-2019-2024/economy-works-people/jobs-growth-and-investment/european-pillar-social-rights_en.
[351] European Parliament. (2021) *Resolution of 21 January 2021 with recommendations to the Commission on the right to disconnect*, P9_TA(2021)0021, adopted 21 January 2021.
[352] *See, e.g.*, Dhar, P. (2021) 'The future of 'extended reality' tourism is now, thanks to the pandemic', *The Washington Post*, 8 July 2021; Margetis et al. (2021) 'X-Reality Museums: Unifying the Virtual and Real World Towards Realistic Virtual Museums', *Applied Sciences*, 11. DOI: 10.3390/app11010338; and Marr, B. (2022) *The 5 Biggest Virtual, Augmented and Mixed reality Trends in 2022 / FORBES* [Online]. Available at: https://www.forbes.com/sites/bernardmarr/2022/01/07/the-5-biggest-virtual-augmented-and-mixed-reality-trends-in-2022/?sh=6fdebd324542.
[353] *See, e.g.*, Stansberry, K., Anderson, J. and Rainie, L. (2019) *4. The internet will continue to make life better / Pew Research Center* [Online]. Available at: https://www.pewresearch.org/internet/2019/10/28/4-the-internet-will-continue-to-make-life-better/.

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surveillance and control, privacy of the data collected, and inequalities of access.[354] Other concerns relate to the use of XR technologies for work and work-life balance.'[355]

States' obligations and areas for legal development

XR is subject to existing international human rights law on the right to rest and leisure and States have an obligation to ensure that the use of XR support realisation of the right. Further human rights guidance specific to XR technologies may be required to address concerns related to, among other issues, the influence of private and commercial actors, privacy and data protection, and the work-life balance.

4.1.11 Right to benefit from science

Everyone has the right under international law to benefit from scientific progress, which includes XR technologies. States may not arbitrarily interfere with the ability to enjoy this right, which includes ensuring access to XR without discrimination, particularly when the use of XR is "instrumental" for enjoyment of other fundamental rights. States may not, however, force the use of technologies like XR, excepted in limited situations.

International law and policy

Under international law, everyone has the right to "to share in scientific advancement and its benefits."[356] Historically, this right is one of the least studied or applied in international human rights, but recent interest from UNESCO, the UN Special Rapporteur in the Field of Cultural Rights, and the UN Committee on Economic, Social and Cultural Rights as prompted new interest in the right.[357]

In this context, the definition of 'science' encompasses both process and the results of process[358] and "the technology deriving from scientific research".[359] The term 'benefits' refers to "the material results" and "the scientific knowledge and information directly deriving from scientific activity".[360] States have obligations "to abstain from interfering in the freedom of individuals and institutions to develop science and diffuse its results" and to ensure individuals can enjoy the benefits of science without discrimination.[361] In particular, States must ensure "that everyone has equal access to the applications of science, particularly when they are instrumental for the enjoyment of other economic, social and cultural rights."[362] The U.N. Committee on Economic, Social and Cultural rights identifies that new emerging technologies present many risks and promises for the enjoyment of other rights,

[354] Silk et al. (2016) '(Re-)thinking digital leisure', *Leisure Studies*, 35(6 [Online]. Available at: https://doi.org/10.1080/02614367.2016.1240223.
[355] Plitt, D., Scapoli, J and Farrell-Thomas, A. (2022) *Work in the metaverse will pose novel employment law questions / Lexology* [Online]. Available at https://www.osborneclarke.com/insights/work-metaverse-will-pose-novel-employment-law-questions; and Henshall, A. (2021) *Can the 'right to disconnect' exist in a remote-work world? / BBC* [Online]. Available at: https://www.bbc.com/worklife/article/20210517-can-the-right-to-disconnect-exist-in-a-remote-work-world.
[356] UDHR, Article 27. In the ICESCR, the right is articulated as the "right to benefit from scientific progress and its application". International Covenant on Economic, Social and Cultural Rights, Article 15(b).
[357] *See* Yotova, R. and Knoppers, B.M. (2020) 'The Right to Benefit from Science and Its Implications for Genomic Data Sharing', *The European Journal of International Law*, 31(2).
[358] Committee on Economic, Social and Cultural Rights. (2020) *General comment No. 25 (2020) on science and economic, social and cultural rights (article 15 (1) (b), (2), (3), and (4) of the International Covenant on Economic, Social and Cultural Rights*, E/C.12/GC/25, 20 April 2020, paras.4-5.
[359] Ibid, para.7.
[360] Ibid, para.8.
[361] Ibid, para.15.
[362] Ibid, para.17.

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and calls on States to "adopt policies and measures that expand the benefits of these new technologies while at the same time reducing their risks."[363]

This right does not create an obligation on individuals to benefit from or use technologies. For example, in the context of medical treatment, States "must guarantee everyone has the right to choose or refuse the treatment they want with the full knowledge of the risks and benefits."[364] Anything contrary to this guarantee must be determined by law and "solely for the purpose of promoting the general welfare in a democratic society".[365]

To address risks associated with some science and technologies and their applications, State may put limits on scientific research, but they must also be in law and promote "the general welfare in a democratic society".[366]

In the specific context of biomedicine, the Council of Europe stresses "the need for international co-operation so that all humanity may enjoy the benefits of biology and medicine."[367]

EU law and policy

The EU Charter of Fundamental Rights includes 'freedom of the arts and sciences' to ensure scientific research is "free of constraint,"[368] but a similar right to benefit from scientific progress does not exist.

XR and the right to benefit from scientific progress

The enjoyment of the right to benefit from scientific progress is possible and may be enhanced through the use of XR, as the right extends to new and emerging technologies, including XR. States must ensure that individuals have access to XR without discrimination, particularly when XR technologies are instrumental to the enjoyment of other rights like the right to health and education. To those individuals who choose, a State cannot arbitrarily interfere in the development, deployment, or enjoyment of XR. On the other hand, except in certain circumstances determined by law, individuals cannot be forced to use XR technologies.

States' obligations and areas for legal development

States have an obligation to not arbitrarily interfere with the ability to enjoy the benefits of scientific progress, particularly when the use of XR is "instrumental" for enjoyment of other fundamental rights. At the same time, States may not force the use of technologies like XR, except in limited situations. To ensure that an individuals' choice to 'benefit from science' is respected, there is an interest in a right of refusal to not use a technology or engage its use in a specific application.[369] A right to refusal may

[363] Ibid, para.74.
[364] Ibid, para.44.
[365] ICESCR, Article 4.
[366] Committee on Economic, Social and Cultural Rights, supra note 358, para.21.
[367] Oviedo Convention.
[368] CFREU, Art. 13.
[369] This is distinct from involuntary limitations on access because of the 'digital divide'. *See* Gangadharan, S.P. (2021) 'Digital Exclusion: A Politics of Refusal' in Bernholz, L., Landemore, H. and Reich, R. (eds) *Digital Technology and Democratic Theory*. University of Chicago Press: Chicago; Gangadharan, S.P. (2019) Video: 'Technologies of control and our right of refusal', TEDxLondon. Available at: https://www.ted.com/talks/dr_seeta_pena_gangadharan_technologies_of_control_and_our_right_of_refusal; and Benjamin, Ruha. 2016. "Informed Refusal: Toward a Justice- Based Bioethics." Science, Technology, & Human Values 41 (6): 967– 90. https:// doi .org/ 10 .1177/ 0162243916656059.

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enhance an individual's ability to enjoy other rights without the potential negative impacts of XR. However, the idea is not widely discussed or codified in any laws.

4.1.12 Non-discrimination and vulnerable groups

XR has the potential to both enhance and undermine the rights of vulnerable groups, including women, children, and persons with disabilities. The use of XR technologies may lead to improved health, education, and leisure experiences amongst children. Such potential benefits of the use of XR technologies may also apply to persons with disabilities, in addition to assisting in establishing *de facto* non-discrimination between disabled and non-disabled persons. However, the use of XR technologies may undermine the rights of women, children, and persons with disabilities through incidences of harassment, physical and mental harms, especially to child development, and accessibility challenges, all of which may contravene the right of such persons to non-discrimination. Whilst international and EU law on the rights of vulnerable groups does not explicitly refer to XR, the rights of such groups are relevant in the context of XR technologies and many of the specific provisions under international and EU law are directly applicable.

International law and policy

The rights of all persons to equality and non-discrimination are explicitly guaranteed under international law.[370] The right to non-discrimination prohibits specific instances of discrimination, such as racial discrimination,[371] whilst also protecting particular groups against discriminatory treatment, including women,[372] children,[373] migrant workers,[374] and persons with disabilities,[375] the particularised rights relating to whom are contained in specific international conventions. The Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), for instance, is the most comprehensive of the treaties on the rights of women, requiring that State Parties, inter alia, 'take all appropriate measures for the elimination of discrimination against women' in the context of employment,[376] healthcare,[377] and other areas of economic and social life.[378] In addition to the elimination of discrimination and the establishment of equality between men and women, the CEDAW also contains more targeted provisions, such as the imposition of an obligation on State Parties to 'take all appropriate measures, including legislation, to suppress all forms of traffic in women and exploitation of prostitution of women.'[379]

In relation to children, meanwhile, the Convention on the Rights of the Child (CRC) establishes the Committee on the Rights of the Child (CRC Committee)[380] and provides, inter alia, that State Parties "shall take all appropriate measures to ensure that the child is protected against all forms of discrimination",[381] while also establishing "the best interests of the child" as a "primary consideration"

[370] UDHR, Article 7; ICERD, Article 2; ICESCR, Articles 2 and 3; ICCPR, Articles 2(1), 3 and 26; CEDAW, Article 2; CRC, Article 2; CPRMW, Article 1; CRPD, Articles 1, 3, 4 and 5.
[371] ICERD, Article 2.
[372] CEDAW, Article 2.
[373] CRC, Article 2.
[374] CPRMW, Article 1.
[375] CRPD, Articles 1, 3, 4 and 5.
[376] CEDAW, Article 11.
[377] Ibid, Article 12.
[378] Ibid, Article 13.
[379] Ibid, Article 6.
[380] CRC, Article 43.
[381] Ibid, Article 2.

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in actions taken by public and private sector bodies relating to children.[382] The application of the right to non-discrimination in the digital environment entails that "State parties should take all measures necessary to overcome digital exclusion",[383] while in order to comply with the assessment of the best interests of the child, the CRC Committee recommends that State parties ensure national and local bodies have regard "for all children's rights, including their rights to seek, receive and impart information, to be protected from harm and to have their views given due weight".[384] Further non-binding recommendations are advanced by the OECD, which provides several principles for "a safe and beneficial digital environment for children", in accordance with which it is recommended that members and non-members alike promote and implement (i) fundamental values, (ii) empowerment and resilience, (iii) proportionality and respect for human rights, (iv) appropriateness and inclusion, and (v) shared responsibility, cooperation and positive engagement.[385]

The rights of persons with disabilities under international law are contained in the Convention on the Rights of Persons with Disabilities (CRPD), the primary purpose of which "is to promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their inherent dignity."[386] Akin to the CEDAW and the CRC (see above), the CRPD requires that State Parties "promote equality and eliminate discrimination",[387] thereby permitting "specific measures which are necessary to accelerate or achieve de facto equality of persons with disabilities",[388] whilst also explicitly recognising the intersectionality between vulnerable groups through particular provisions relating to women and children with disabilities.[389] Furthermore, the CRPD introduces various Convention-specific rights, such as the right of accessibility to, inter alia, 'information and communications, including information and communications technologies and systems',[390] and the right to live independently and be included in the community.[391]

The rights of women, children and persons with disabilities are also recognised in regional organisations. For instance, the European Convention on Human Rights, a treaty of the Council of Europe providing for civil and political rights, contains a prohibition upon discrimination that is applicable to each of the identified vulnerable groups,[392] meanwhile the corresponding European Social Charter guarantees various fundamental social and economic rights directly addressed to women, children and persons with disabilities.[393] Pursuant to the latter, there is an obligation upon Contracting Parties to 'recognise the right of men and women workers to equal pay for work of equal value',[394] and moreover commit to taking measures consistent with 'ensuring the effective exercise of the right of employed women to protection', such as establishing provision for paid maternity leave.[395] Children and young persons are similarly entitled to specific protection under the European Social

[382] Ibid, Article 3.
[383] Committee on the Rights of the Child, (2021) *General comment No.25 (2021) on children's rights in relation to the digital environment*, CRC/C/GC/25, 2 March 2021, para.9.
[384] Ibid, [13].
[385] OECD, (2022) *Recommendation of the Council on Children in the Digital Environment*, OECD/LEGAL/0389. Available at: https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0389.
[386] CRPD, Article 1.
[387] Ibid, Article 5(1)-(3).
[388] Ibid, Article 5(4).
[389] Ibid, Articles 6 and 7.
[390] Ibid, Article 9(1).
[391] Ibid, Article 19.
[392] ECHR, Article 14.
[393] European Social Charter.
[394] Ibid, Article 4(3).
[395] Ibid, Article 8(1).

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Charter, both alongside mothers in a joint right to social and economic protection,[396] and as specific group; the protections in relation to which are primarily focused upon the age of, remuneration for, and general working conditions relevant to the employment context.[397] Lastly, persons with disabilities have a right to vocational training, rehabilitation and social resettlement under the European Social Charter, pursuant to which Contracting Parties have an obligation 'to take adequate measures' relating to the provision of training facilities and the placing of persons with disabilities in employment.[398]

EU law and policy

The Charter of Fundamental Rights guarantees that "[e]veryone is equal before the law"[399] and prohibits "[a]ny discrimination based on any ground".[400] Alongside the rights to equality and non-discrimination, the specific rights of women, children and persons with disabilities under EU law are contained in Chapter III entitled Equality of the EU Charter of Fundamental Rights (CFREU).[401] In relation to the former, the CFREU ensures equality between men and women "in all areas, including employment, work and pay", whilst not precluding "the maintenance or adoption of measures providing for specific advantages in favour of the under-represented sex."[402] The specific Article containing the rights of the child is based on the CRC (see above) and includes, inter alia, a right to "protection and care" as is necessary for wellbeing,[403] whilst the CFREU also lays down a requirement that the working conditions of young people be age-appropriate and protective against associated harms to health, safety and general development, in addition to establishing a prohibition upon child labour.[404] Finally, building upon the equivalent provision under the European Social Charter (see above),[405] persons with disabilities are entitled "to benefit from measures designed to ensure their independence, social and occupational integration and participation in the life of the community."[406]

At the level of EU policy, meanwhile, the European Commission has proposed signing a joint declaration with the European Parliament and the Council entitled the "European Declaration on Digital Rights and Principles", an aspect of which refers to the need "to ensure inclusiveness and support of vulnerable people, elderly, children and people with disabilities, so that they can benefit fully from the digital transformation."[407] Consistent with this, the Commission has also recently updated its better internet for kids strategy (BIK+), as initially established in 2012, pursuant to which actions are proposed in relation to three key pillars, namely: firstly, ensuring "safe digital experiences to protect children from harmful illegal online content, conduct, contact and consumer risks" and improving "their well-being online through a safe, age-appropriate digital environment, created in a

[396] Ibid, Article 17.
[397] Ibid, Article 7(1)-(10).
[398] Ibid, Article 15.
[399] CFREU, Article 20.
[400] Ibid, Article 21.
[401] CFREU.
[402] Ibid, Article 23.
[403] Ibid, Article 24(1)-(2).
[404] Ibid, Article 32.
[405] Explanations Relating to the Charter of Fundamental Rights (2007/C 303/02), Explanations on Article 26.
[406] CFREU, Article 26.
[407] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *Establishing a European Declaration on Digital rights and principles for the Digital Decade* COM/2022/27 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0027&qid=1643363406727.

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way that respects children's best interests"; secondly, increasing "digital empowerment" and; thirdly, creating opportunities for children to actively participate in the shaping of the digital environment.[408]

Potential enhancements

XR technologies may enhance the rights of vulnerable groups in several ways. In relation to children, the use of VR has been linked to various potential enhancements, including physical rehabilitation and pain management, the creation of engaging learning environments and the improvement of learning outcomes, and the cultivation of desirable prosocial behaviours and emotions, such as empathy.[409] The use of XR technologies generally, and VR applications specifically, may also improve cognitive and psychosocial development in children, for instance by improving attention span and facilitating collaboration.[410] Such potential enhancements are linked to the right to health,[411] the right to education,[412] and the right to rest and leisure of children.[413] Furthermore, XR technologies can be useful tools for supporting the education of students with disabilities[414] and special learning needs, for instance by facilitating interaction for autistic students and improving communication skills in students with hearing loss.[415] Expanding on the latter, the pairing of traditional hearing aids with AR, for instance, may enable enhanced auditory experiences,[416] thereby highlighting how XR technologies can also be used to improve aspects of the right to health for persons with disabilities.[417] Finally, research indicates that embodiment in VR entails a "heightened sense of realism" for users, one effect of which may be to elicit greater "self-other merging, favourable attitudes, and helping towards persons with disabilities",[418] the potential benefits of which relate to the principle of respect for and acceptance of persons with disabilities under the CRPD.[419]

Potential interferences

The use of XR technologies may create or exacerbate situations that negatively impact the rights of women, children and persons with disabilities. Firstly, XR technologies may create accessibility challenges for persons with disabilities, particularly in the context of VR, wherein the interactive and

[408] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *A Digital Decade for children and youth: the new European strategy for a better internet for kids (BIK+)* COM/2022/212 final. Available at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13160-Better-internet-for-children-strategy-update_en.
[409] See, e.g., Bailey J.O., and Bailenson J.N., (2017) 'Considering virtual reality in children's lives', *Journal of Children and Media*, vol.11:1, pp107-113. DOI: https://doi.org/10.1080/17482798.2016.1268779; Aubrey J.S., Robb M.B., Bailey J., and Bailenson J., (2018) 'Virtual Reality 101: What You Need to Know About Kids and VR', *Common Sense*. Available at: https://www.commonsensemedia.org/sites/default/files/research/report/csm_vr101_final_under5mb.pdf.
[410] Kamara P., Oikonomou A., and Deliyannis I., (2022) 'Could virtual reality applications pose real risks to children and adolescents? A systematic review of ethical issues and concerns', *Virtual Reality*, vol.26, pp.697-735. Available at: https://doi.org/10.1007/s10055-021-00563-w.
[411] CRC, Article 24.
[412] Ibid, Article 28.
[413] Ibid, Article 31.
[414] See, e.g., Educators in VR, supra note 291.
[415] See, e.g., Zitter, L. (2020) *How VR and AR Can Be Used to Support Students with Special Needs* / Tech & Learning [Online]. Available at: https://www.techlearning.com/how-to/how-vr-and-ar-can-be-used-to-support-students-with-special-needs.
[416] Mehra R., Brimijoin O., Robinson P., Lunner T., 'Potential of Augmented Reality Platforms to Improve Individual Hearing Aids and to Support More Ecologically Valid Research', *Ear and Hearing*, vol.41, pp.140-146. Available at: https://journals.lww.com/ear-hearing/fulltext/2020/11001/potential_of_augmented_reality_platforms_to.15.aspx.
[417] CRPD, Article 25.
[418] Ahn S.J., Tran Le A.M., and Bailenson J., (2013) 'The Effect of Embodied Experiences on Self-Other Merging, Attitude, and Helping Behaviour', Media Psychology, vol.16:7, pp.7-38. Available at: https://doi.org/10.1080/15213269.2012.755877.
[419] CRPD, Article 3(d).

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visual aspects of the medium may lead to difficulties for those with motor or sensory impairments.[420] A further concern relates to the potential for, and effect of, vulnerable groups experiencing harassment whilst using XR technologies. On this, whilst the difficulties associated with parental monitoring may lead to children experiencing harassment and cyberbullying whilst using XR technologies,[421] it is women in relation to whom the highest incidence of harassment is recorded,[422] with up to 49% of women having reported experiencing at least one instance of sexual harassment whilst using VR.[423] Such harassment takes multiple forms, ranging from flirting and lack of respect for personal boundaries,[424] to VR groping,[425] masturbatory gestures, and sexist comments,[426] and is most prevalent in social VR applications where the focus is upon "general social interaction between users rather than on a shared game or experience".[427] Whilst the introduction of new user control measures, such as a "space bubble" feature enabling users to prevent others from entering their personal space,[428] may help to protect women against such harassment, concern remains that the immersiveness of VR may lead to greater feelings of presence, one consequence of which is that incidences of harassment in VR may be experienced more intensely by victims in comparison to other forms of digital harassment.[429]

Furthermore, whilst there is a paucity of scientific research on the impact of XR technologies on the sensorimotor abilities of children,[430] and much depends on the device used, the time spent using it and the type of content engaged with, there is concern in relation to the impact of such technologies on vision and brain development.[431] On this, research indicates that immersion in VR can, inter alia,

[420] Heilemann F, Zimmermann G, and Münster P., supra note 163.
[421] Jerome J., (2021) 'Safe and Secure VR: Policy Issues Impacting Kids' Use of Immersive Tech', *Common Sense*. Available at: https://www.commonsensemedia.org/sites/default/files/featured-content/files/safe_and_secure_vr_policy_issues_impacting_kids_final.pdf.
[422] Shiram K and Schwartz R., (2017) 'All are welcome: Using VR ethnography to explore harassment behaviour in immersive social virtual reality', *2017 IEEE Virtual Reality*. Available at: https://ieeexplore.ieee.org/abstract/document/7892258.
[423] Outlaw J. (2021) *Virtual Harassment: The Social Experience of 600+ Regular Virtual Reality (VR) Users* / The Extended Mind [Online]. Available at: https://www.extendedmind.io/the-extended-mind-blog/2018/04/04/2018-4-4-virtual-harassment-the-social-experience-of-600-regular-virtual-reality-vrusers.
[424] Outlaw J and Duckles B., (2017) *Why Women Don't Like Social Virtual Reality* / The Extended Mind [Online]. Available at: https://www.extendedmind.io/why-women-dont-like-social-virtual-reality.
[425] Belamire J. (2016) My First Virtual Reality Groping / Medium [Online]. Available at: https://medium.com/athena-talks/my-first-virtual-reality-sexual-assault-2330410b62ee#.lwtpcaxzk.
[426] Buchleitner J. (2018) *When virtual reality feels real, so does the sexual harassment* / Reveal [Online]. Available at: https://revealnews.org/article/when-virtual-reality-feels-real-so-does-the-sexual-harassment/.
[427] Blackwell L et al., (2018) 'Harassment in Social Virtual Reality: Challenges for Platform Governance', *Proceedings of the ACM on Human-Computer Interaction*, vol.3, pp.1-25. Available at: https://doi.org/10.1145/3359202.
[428] Kelly K. (2016), *Introducing space bubble* / AltspaceVR [Online]. Available at: https://altvr.com/introducing-space-bubble/.
[429] See, e.g., Lemley M.A., and Volokh E., (2018) 'Law, Virtual Reality, and Augmented Reality', *University of Pennsylvania Law Review*, vol.166:5, pp.1051-1138. Available at: https://scholarship.law.upenn.edu/cgi/viewcontent.cgi?article=9622&context=penn_law_review; Reinhard R et al., (2019) 'Acting your avatar's age: effects of virtual reality avatar embodiment on real life walking speed', *Media Psychology*. Available at: https://doi.org/10.1080/15213269.2019.1598435; Blackwell L et al., supra note 427; Cortese M., and Outlaw J. (2021) 'The IEEE Global Initiative on Ethics and Extended Reality (XR) Report -- Social and Multi-User Spaces in VR: Trolling, Harassment, and Online Safety', IEEE. Available at: https://ieeexplore.ieee.org/document/9650825/authors#authors; Bailey J.O., and Bailenson J.N., supra note 409.
[430] Sanctuary H. (2021*) Virtual Reality Affects Children Differently Than Adults* / Neurosciencenews.com [Online]. Available at: https://neurosciencenews.com/virtual-reality-children-19370/.
[431] Gent, E. (2016) *Are Virtual Reality Headsets Safe for Children*/ Scientific American [Online]. Available at: https://www.scientificamerican.com/article/are-virtual-reality-headsets-safe-for-children/.

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lead to short-term "simulator sickness"[432] or "cybersickness" (terms attributed to the nauseas symptoms experienced by users either during or after immersion in VR),[433] disruptions to distance perception and balance,[434] as well as symptoms of depersonalisation and derealisation,[435] with further research required to assess the potential for long-term effects. Related to this are longstanding concerns regarding the possible link between violent videogames and increased aggressive behaviour,[436] which, whilst lacking consensus,[437] may be exacerbated by the increased feeling of psychological presence in XR, with resultant implications for child behavioural development.[438] Finally, inequitable access to XR technologies and associated infrastructure (such as a reliable internet connection) may deepen and reinforce the "digital divide",[439] with resultant implications for child development.

States' obligation and areas for legal development

XR technologies are subject to existing human rights laws on the rights of women, children and persons with disabilities, and States have an obligation to ensure that the use of such technologies supports realisation of these rights. States must ensure that XR technologies do not interfere with their obligations to guarantee the rights of such vulnerable groups on the basis of non-discrimination. Further human rights guidance specific to XR technologies may be required to address concerns related to, inter alia, incidences of harassment, potential long-term impacts to vision and brain development in children, inequality of access, particularly amongst children, and accessibility issues faced by persons with disabilities.

4.1.13 Trends and emerging rights

Human rights law is constantly evolving to address new challenges and trends, whether it be through expanded interpretations of currently recognised rights or the introduction of new rights. The following three proposals for development of the human rights law would impact States' obligations vis-à-vis XR technologies.

[432] Ferguson C.J. et al, (2022) 'Video games, frustration, violence, and virtual reality: Two studies', *British Journal of Social Psychology*, vol.61, pp.83-99. Available at: https://bpspsychub.onlinelibrary.wiley.com/doi/epdf/10.1111/bjso.12471.
[433] Caserman P., et al., (2021) 'Cybersickness in current-generation virtual reality head-mounted displays: systematic review and outlook', *Virtual Reality*, vol.25, pp.1153-1170.
[434] McKie R. (2017) *Virtual reality headsets could put children's health at risk* / The Guardian [Online]. Available at: https://www.theguardian.com/technology/2017/oct/28/virtual-reality-headset-children-cognitive-problems.
[435] Peckman C. et al, (2022) 'Virtual reality induces symptoms of depersonalisation and derealisation: A longitudinal randomised control trial', Computers in Human Behaviour, vol.131. Available at: https://doi.org/10.1016/j.chb.2022.107233.
[436] Wilson G., and McGill M., supra note 203.
[437] Bushman, B. J., Gollwitzer, M., & Cruz, C. (2015). 'There is broad consensus: Media researchers agree that violent media increase aggression in children, and paediatricians and parents concur.' *Psychology of Popular Media Culture, 4*(3), pp.200–214. Available at: https://doi.apa.org/doi/10.1037/ppm0000046; Cf. Ferguson C.J., and Coldwell J., (2017) 'Understanding Why Scholars Hold Different Views on the Influences of Video Games on Public Health', *Journal of Communication*, vol.67:3, pp.305-327. Available at: https://doi.org/10.1111/jcom.12293.
[438] Lull R.B., and Bushman B.J., (2016) 'Immersed in violence: Presence mediates the effect of 3D violent video gameplay on angry feelings', *Psychology of Popular Media Culture*, vol.5:2, pp.113-144. DOI: https://psycnet.apa.org/doi/10.1037/ppm0000062; Cf. Ferguson C.J. et al, supra note 432.
[439] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *A Digital Decade for children and youth: the new European strategy for a better internet for kids (BIK+)* COM/2022/212 final. Available at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13160-Better-internet-for-children-strategy-update_en.

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Right to a healthy environment

XR technologies may have an impact on the environment and may therefore impact the right to enjoy a health environment. While international human rights law on the right to a healthy environment does not explicitly address XR, States have an obligation to ensure individuals can enjoy a healthy environment in the context of XR.

The right to healthy environment is very new, recognised by the U.N. Human Rights Council in a 2021 resolution.[440] The right includes substantive elements like "healthy ecosystems, clean air and water, a safe and stable climate, adequate and nutritious food, and a non-toxic environment."[441]

Some issues about the environment and XR technologies relate their production components, contribution to e-waste, and energy usage. A common concern with all electronics is the use of rare earth and precious metals, whose extraction causes significant environmental destruction, including habitat destruction and toxic waste contamination.[442] A related concern is the use of plastics (made with non-renewable fossil fuels) in XR devices,[443] leading some developers to consider other production materials like cardboard.[444] At the other end of the use-cycle are concerns around disposal and recycling of e-waste including XR devices, particularly given that planned obsolescence in many devices leads to frequent disposal.[445] A final concern is the significant energy consumption needed for data processing and storage, particularly for XR systems using AI.[446]

However, some argue that XR has the potential to spur beneficial environmental benefits for example by reminding children to recycle with gamification in AR[447], raising awareness of climate change impacts through immersive experiences,[448] decreasing GHG emission by reducing need for

[440] Human Rights Council. (2021) *Resolution 48/13 The human rights to a clean, health and sustainable environment*, A/HRC/RES/48/13, 18 October 2021.
[441] Bachelet, M. (2022) *"The right to a clean, healthy, and sustainable environment – what does it mean for States, for rights-holders and for nature?", Speech by UN High Commissioner for Human Rights*, 16 May 2022. Transcript available at: https://www.ohchr.org/en/statements/2022/05/right-clean-healthy-and-sustainable-environment-what-does-it-mean-states-rights.
[442] *See, e.g.*, Nayar, J. (2021) 'Not So "Green" Technology: The Complicated Legacy of Rare Earth Mining, *Harvard International Review*. Available at: https://hir.harvard.edu/not-so-green-technology-the-complicated-legacy-of-rare-earth-mining/.
[443] *See, e.g.*, Joehnig, J. (2018) *Is Virtual Reality Technology Bad for the Environment / AR Post* [Online]. Available at: https://arpost.co/2018/07/12/virtual-reality-technology-bad-environment/.
[444] "Eco-friendly, environmentally safe, sustainably sources Google cardboard VR headsets." Maxbox VR. Available at: https://www.maxboxvr.com/.
[445] Harris, J. (2020) *Planned obsolescence: the outrage of our electronic waste mountain / The Guardian* [Online]. Available at: https://www.theguardian.com/technology/2020/apr/15/the-right-to-repair-planned-obsolescence-electronic-waste-mountain.
[446] *See, e.g.*, Labbe, M. (2021) '*Energy consumption of AI poses environmental problems / TechTarget* [Online]. Available at: https://www.techtarget.com/searchenterpriseai/feature/Energy-consumption-of-AI-poses-environmental-problems; and Knight. W. (2020) *AI Can Do Great Things – if It Doesn't Burn the Planet / WIRED* [Online]. Available at: https://www.wired.com/story/ai-great-things-burn-planet/.
[447] Aco Recycling. (2022) *AR and VR Implementation for Recycling Habits.* Available at: https://www.acorecycling.com/blog/ar-and-vr-implementation-for-recycling-habits/.
[448] *See, e.g.*, National Geographic. (2020). *Nat Geo's Instagram interactive shows what the world will feel like in 2070* [Online]. Available at: https://www.nationalgeographic.com/pages/article/earth-day-instagram-ar-experience.

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transportation to physical places,[449] and enhancing water management[450] or waste management[451] with AR.

Right to disconnect

Some scholars and policymakers have interpretated the right to rest and leisure to include the 'right to disconnect' from work and associate digital technologies. While not codified in international law, the right to disconnect has been discussed by the World Health Organization and the International Labour Organization in a technical brief on telework,[452] explaining that the right means "that the worker has the right to disengage from work and refrain from engaging in work-related electronic communications (e.g. emails and text messages) during non-workhours.[453] Furthermore, in January 2021, the European Parliament adopted a resolution on the right to disconnect and called on the European Commission to put forward a "legislative framework with a view to establishing minimum requirements for remote work across the Union".[454] The European Commission notes in particular that "the ever greater use of digital tools for work purposes has resulted in an 'ever-connected', 'always on', or 'constantly on-call' culture, which can have detrimental effect on workers' fundament rights".[455]

As discussed in Sections 4.1.9 and 4.1.10, the use of XR technologies may pose challenges to work-life balance and interfere with the enjoyment of the right to just and favourable conditions of work and the right to rest and leisure. This may be especially difficult when the 'space' for work and leisure is shared, and workers are 'ever-connected' to employers; traditional physical boundaries between work and home are blurred when the activities take place in a virtual environment. The trend towards recognising a 'right to disconnect', either as part of these rights or a stand-alone right, creates obligations on States to ensure that limits are in place to ensure individuals can disengage from virtual workspaces.

Right to be online

In light of the ubiquity and important of internet access, some legal scholars have proposed the need to recognize a human right to internet access or the 'right to be online'.[456] Many States and organisations already acknowledge the role that the internet plays in promoting human rights,[457] and a small number have given legal recognition to the right.[458] Whether as a corollary to the right to benefit from scientific progress or a stand-alone right, it would obligate States to ensure equal access

[449] Miller, A. (2021) *4 Ways AR and VR Can Help Save the Planet / AR Insider* [Online]. Available at: https://arinsider.co/2021/10/27/4-ways-ar-and-vr-can-help-save-the-planet/#:~:text=AR%20and%20VR%20can%20directly,significantly%20contributes%20to%20atmospheric%20pollution.

[450] *See, e.g.*, Acciona. *Augmented Reality to Address the Challenges of the Water Cycle.* Available at: https://www.imnovation-hub.com/water/augmented-reality-address-challenges-water-cycle/?_adin=02021864894.

[451] *See, e.g.*, Simpson, W. (2016) *Augmented Reality Comes to Waste Management / RESOURCE* [Online]. Available at: https://resource.co/article/augmented-reality-comes-waste-management-11342.

[452] World Health Organization and the International Labour Organization. (2021) *Healthy and Safe Telework.* Available at: https://www.who.int/publications/i/item/9789240040977.

[453] Ibid, p. 13.

[454] European Parliament. (2021) *Resolution of 21 January 2021 with recommendations to the Commission on the right to disconnect*, P9_TA(2021)0021, adopted 21 January 2021.

[455] Ibid, para. B.

[456] *See*, Tully, S. (2014) 'A Human Right to Access the Internet? Problems and Prospects', *Human Right Law Review.* Available at: https://doi.org/10.1093/hrlr/ngu011.

[457] Ibid, pp. 3-7.

[458] *See*, Pollicino, O. (2019) 'Right to Internet Access: Quid Iuris?' in von Arnauld, A, von der Decken, K. and Susi, M. (eds), *The Cambridge Handbook on New Human Rights. Recognition, Novelty, Rhetoric*. Cambridge University Press.

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to the internet and perhaps provision of free access.[459] The use of XR applications could, therefore, be bolstered by increased or improved internet access.

A related concept is the rights of digital avatars, proposed specifically in the context of the intellectual property right of publicity.[460] In the future, if XR becomes more integrated into daily life and necessary for securing basic services, there may be a need to articulate a 'right to XR' or 'right to digital identity' in the XR environment to ensure that individual's human rights are guaranteed.

4.2 Privacy and Data Protection

XR technologies collect and process a variety of different data in order to create an interactive and/or immersive experience for users. The gathering of such data, however, raises concerns relating to privacy and data protection. On this, it has been suggested that there are three factors in relation to XR technologies generally and VR/AR devices specifically which, in combination, present potentially serious privacy and data protection challenges, namely: (i) the range of different information-gathering technologies utilised in XR, each presenting specific privacy risks; (ii) the extensive gathering of data which is sensitive in nature, as distinct from the majority of other consumer technologies; and (iii) the comprehensive gathering of such data being an essential aspect of the core functions of XR technologies.[461] Collectively, these factors highlight the ongoing tension between the necessity of collecting intimate data to enable the optimal immersive or interactive experience in XR, balanced against the requirement to uphold rights to privacy and data protection under international and EU law. While these legal frameworks do not specifically address or explicitly refer to XR technologies, many of the relevant provisions are directly applicable.

4.2.1 International and EU laws and policies

International law and policy

The right to privacy is applicable to everyone under international law.[462] The right to privacy is, moreover, recognised in regional organisations, including the Council of Europe. The European Convention on Human Rights (ECHR), for instance, provides that "Everyone has the right to respect for his private and family life and his correspondence."[463] Conversely, the right to data protection is not explicitly protected under international law. However, the United Nations Human Rights Committee (CCPR) has suggested that the protection of personal data is an integral aspect of the right to privacy, as indicated by the explanation that '[i]n order to have the most effective protection of his private life, every individual should have the right to ascertain in

[459] University of Birmingham. (2019) *Free internet access should be a basic human right – study* [Online]. Available at: https://www.birmingham.ac.uk/news/2019/free-internet-access-should-be-a-basic-human-right-study; U.N. Special Rapporteur on the promotion of the right to freedom of opinion and expression, Frank Law Rue. (2011) Report of the Special Rapporteur on the promotion of the right to freedom of opinion and expression, A/66/150, Section IV.
[460] *See*, Khan, O.A. (2010) 'My, Myself, and My Avatar: The Right to the Likeness of Our Digital Selves', *Journal of Law and Policy for the Information Society*, 5(2). Available at: https://kb.osu.edu/bitstream/handle/1811/72946/ISJLP_V5N3_447.pdf;sequence=1.
[461] Dick E., (2021) 'Balancing User Privacy and Innovation in Augmented Reality and Virtual Reality', *Information Technology & Innovation Foundation*, pp.1-27, pp.1.
[462] UDHR, Article 12; ICCPR, Article 17; CRC, Article 16; CPRMW, Article 14; CRPD, Article 22.
[463] ECHR, Article 8.

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an intelligible form, whether, and if so, what personal data is stored in automatic data files, and for what purposes.'[464]

EU law and policies

EU laws and draft legislation applicable to privacy and data protection in XR technologies include the Charter of Fundamental Rights of the European Union (CFREU)[465], the General Data Protection Regulation (GDPR) [466], and legislative proposals, including the Regulation on Privacy and Electronic Communications (e-Privacy Regulation) [467], the Artificial Intelligence Act (AIA), the Digital Services Act (DSA), the Data Governance Act (DGA) and the Data Act (DA). For a detailed discussion of the EU laws and draft legislation applicable to privacy and data protection in XR, see Sections 3.2 and 3.4 above.

4.2.2 Privacy

The right to privacy is a core right within the international human rights law framework, pursuant to which it is conditionally guaranteed that no one shall be subjected to arbitrary interference with their "privacy, family, home, or correspondence nor to unlawful attacks on his or her reputation" and, moreover, that everyone shall be protected by law against such interference or attack.[468] As indicated, the right to privacy is not absolute and may be restricted in certain specified circumstances, yet the threshold for permitted interferences is tightly constrained. According to the ECHR, for instance, interferences with the right to privacy must be in accordance with the law and be "necessary in a democratic society in the interests of national security, public safety or the economic wellbeing of the country, for the prevention of crime or disorder, for the protection of health or morals, or for the protection of the rights and freedoms of others."[469] Similarly, though slightly revised to account for technological developments,[470] the CFREU provides that "[e]veryone has the right to respect for his or her private and family life, home, and communications."[471] The explanatory notes to the Charter make clear that the meaning and scope of the right under Article 7 CFREU is, in accordance with Article 52(3), the same as the corresponding article of the ECHR,[472] namely Article 8, pursuant to which it is instructive to consider the interpretation of this provision by the European Court of Human Rights (ECtHR).

The Grand Chamber of the ECtHR has interpreted the meaning of "private life" as "a broad concept" encompassing, inter alia, the physical and psychological aspects of the personal autonomy, integrity, identity, and development of individuals.[473] Although it has been suggested that Article 7 CFREU is

[464] CCPR General Comment No.16: Article 17 (Right to Privacy) The Right to Respect of Privacy, Family, Home and Correspondence, and Protection of Honour and Reputation (8th April 1988), [10].
[465] CFREU.
[466] Regulation (EU) 2016/679 (General Data Protection Regulation) COM/2012/010 final (EU GDPR). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679.
[467] Proposal for a Regulation of the European Parliament and the Council concerning the respect for private life and the protection of personal data in electronic communications and repealing Directive 2002/58/EC (Regulation on Privacy and Electronic Communications) COM/2017/010 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52017PC0010.
[468] UDHR, Article 12; ICCPR, Article 17; CRC, Article 16; CPRMW, Article 14; CRPD, Article 22.
[469] ECHR, Article 8(2).
[470] Explanations Relating to the Charter of Fundamental Rights (2007/C 303/02).
[471] CFREU, Article 7.
[472] Explanations Relating to the Charter of Fundamental Rights (2007/C 303/02).
[473] European Court of Human Rights. (2010) *A, B and C v Ireland*, 16 December 2010, No.25579/05, CE:ECHR:2010:JUD002557905, para. 212.

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not as broadly construed,[474] this is nonetheless indicative of the coverage of the right to privacy and of the specific aspects included within the remit of it. Perhaps most relevant to XR is the inclusion of personal identity as an aspect of the right to privacy, particularly as the CJEU has observed that an aspect of personal identity relates to a person's image.[475] It follows that the processing of various forms of biometric data by XR devices and applications, as is considered "fundamentally necessary" to "core functionality" of such technologies,[476] could lead to the capturing of real and true likenesses in user avatars, for instance by using body scanning technologies to create a virtual 3D replica,[477] infringements in relation to which may contravene the right to privacy. Further potential interferences with the right to privacy relate to the potential for cybersurveillance in VR,[478] the ability to personally identify users of XR technologies,[479] and the potential for trivial observation and tracking of bystanders.[480]

4.2.3 Classification of data

The right of everyone to the protection of personal data concerning him or her is guaranteed under the CFREU.[481] The right entails that everyone shall have "the right of access to data which has been collected concerning him or her, and the right to have it rectified", and moreover, that "data must be processed fairly for specified purposes and on the basis of the consent of the person concerned or some other legitimate basis laid down by law."[482] Against this background, one of the key data protection issues in relation to XR is the classification of the various forms of data processed by such technologies. It has been suggested that the types of data collected in AR/VR technologies can be categorised as follows: (a) "observable data" in the form of digital communications or virtual personas (i.e., avatars) which enables users to create a virtual presence; (b) "observed data", as provided or generated by the user, such as geolocation or biographical information; (c) "computed data" in the form of new information inferred by AR/VR technologies through the manipulation of observable and observed data, for example biometric identification; and (d) "associated data", meaning information not directly related to an individual, for instance a username or IP address.[483] Whilst providing a useful framework for the various types of data collected and processed in XR, this differs from the types of data identified in the GDPR, which instead refers, inter alia, to "anonymous data",[484] "personal data"[485] and "special category"[486] or "sensitive" data.[487] Further analysis is therefore required to assess the relationship between these respective frameworks, though for clarity the forms of data identified in the subheadings below correspond with the terms used in the GDPR, wherein the process of classifying data type determines whether and, if so, which provisions are applicable.

[474] Mangan D. (2021) 'Article 7 (Private Life, Home, and Communications)' in Peers S., Hervey T., Kenner J., and Ward A., (eds), *The EU Charter of Fundamental Rights: A Commentary* (Hart Publishing) pp. 151-194, pp.154.
[475] Judgement of 9 September 2015, *Gutiérrez v European Commission* T-168/14 T: 2015:607, para. 30.
[476] McGill, supra note 176, pp.7.
[477] Henriksson, E.A., (2018) 'Data protection challenges for virtual reality applications.', Interactive Entertainment Law Review, vol.1(1), pp.57-61.
[478] See, e.g., Yadin G., (2017) 'Virtual Reality Surveillance', *Cardozo Arts & Entertainment Law Journal*, vol.35:3, Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3043922.
[479] See, e.g., Miller, supra note 175.
[480] McGill, supra note 176.
[481] CFREU, Article 8(1).
[482] Ibid, Article 8(2).
[483] Dick, supra note 461, p. 3.
[484] EU GDPR, Recital 26.
[485] Ibid, Article 4(1).
[486] Ibid, Article 9(1).
[487] Ibid, Recital 51.

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Anonymous data

Within the context of the GDPR, "anonymous data" is understood as "information which does not relate to an identified or identifiable natural person or to personal data rendered anonymous in such a manner that the data subject is not or no longer identifiable."[488] On the basis that a data subject cannot be identified, the processing of this type of data in XR technologies is not regulated by the GDPR. Such data is the opposite of "personal data", the protection of which is guaranteed by Article 7 CFREU and the processing of which falls directly within the purview of the GDPR.

Personal data

As indicated above, and consistent with the legislative intention to strike a balance between the protection of fundamental rights and the free movement of data, the terms of the GDPR are applicable when the type of data processed by the data controller or processor is "personal data".[489] As the converse of anonymous data (see above), personal data is defined as "any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural, or social identity of that natural person".[490] As the Second Chamber of the CJEU has observed, the use of the phrase "any information" reflects the aim of the EU legislature to assign a broad scope of meaning to the concept of personal data, "which is not restricted to information that is sensitive or private, but potentially encompasses all kinds of information, not only objective, but also subjective, in the form of opinions and assessments, provided that it 'relates' to the data subject."[491]

The condition of information relating to a data subject is "satisfied where the information, by reason of its content, purpose or effect, is linked to a particular person."[492] Pursuant to this criterion of linking to a particular person, the CJEU has interpreted both dynamic IP addresses,[493] specifically, when combined with additional information "likely reasonably to be used to identify the data subject",[494] and written examination answers to constitute personal data.[495] This highlights the overall expansiveness of the categories of "personal data" included within the remit of the GDPR, one effect of which may be that a greater volume of data processing in XR is required to comply with the various requirements under the GDPR. More specifically, since IP addresses are an example of 'associated data' according to the taxonomy outlined above, this indicates that the collection and processing of such data in XR technologies, as is considered "necessary to associate users with their unique accounts, user preferences, and virtual assets",[496] amongst other things, may be required to comply, inter alia, with the various principles relating to the processing of personal data,[497] in addition to the conditions for lawfulness of processing.[498]

[488] Ibid, Recital 26.
[489] Ibid, Article 2(1).
[490] Ibid, Article 4(1).
[491] Judgement of 20 December 2017, *Peter Nowak v. Data Protection Commissioner* C-434/16 EU:C: 2016:779, para.34.
[492] Ibid, para.35.
[493] Judgement of 19 October 2016, *Patrick Breyer v. Bundesrepublik Deutschland* C-582/14 EU:C: 2017:994, para.49.
[494] Ibid, para.45.
[495] *Peter Nowak v. Data Protection Commissioner*, supra note 491, para.62.
[496] Dick, supra note 461, p.13.
[497] EU GDPR, Article 5.
[498] Ibid, Article 6.

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Special category or sensitive data

In addition to distinguishing between anonymous and personal data (see above), the GDPR also differentiates between general category personal data and "special category" or "sensitive" data. It is explained in the preamble to the GDPR that "[p]ersonal data which are, by their nature, particularly sensitive in relation to fundamental rights and freedoms merit specific protection as the context of their processing could create significant risks to the fundamental rights and freedoms."[499] It follows that whereas the processing of personal data characterised as special category or sensitive data is in principle prohibited, unless, alongside the aforementioned conditions for lawful processing, one of the exhaustively listed exceptions to the rule is applicable,[500] for instance, "the data subject has given explicit consent",[501] or "processing is necessary for reasons of substantial public interest",[502] the processing of all other personal data is in principle permitted provided the conditions for lawfulness of processing are complied with.[503]

The types of data included in the special categories of personal data, and therefore subject to compliance with these conditions, are listed as "personal data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, and the processing of genetic data, biometric data for the purpose of uniquely identifying a natural person, data concerning health or data concerning a natural person's sex life or sexual orientation".[504] There are various use cases of XR which may involve the processing of personal data properly classified as special category sensitive data, with biometric data, for instance, being captured in XR technologies "by means of eye-tracking systems, facial recognition systems, and advanced sensors (e.g., fingerprints, voiceprints, hand and face geometry, electrical muscle activity, heart-rate, skin response, eye movement detection, head position, etc.) in order to provide an immersive and comfortable experience for users."[505] The processing of biometric data is particularly ubiquitous in the context of VR, where the complete immersion of users into a computer-generated virtual environment is enabled through the capturing of assorted intimate data by various biometric sensors in order to track users and fully immerse them in a personalised virtual world.[506] It is, moreover, because of the widespread use of such sensors that VR is perhaps the most suitable medium for gaining additional insights via the processing of biometric data, with the newly coined term "biometric psychography" denoting the inference of user preferences through predictive behavioural analytics of traditional biometric data, such as eye positioning.[507]

Whilst the processing of biometric data, as an example of personal data, falls squarely within the purview of the GDPR, which defines such data as "personal data resulting from specific technical processing relating to the physical, physiological or behavioural characteristics of a natural person, which allow or confirm the unique identification of that natural person, such as facial images or dactyloscopic data",[508] a distinction is drawn between biometric data that is used "for the purpose of

[499] Ibid, Recital 51.
[500] Ibid, Article 9(2)(a)-(j).
[501] Ibid, Article 9(2)(a).
[502] Ibid, Article 9(2)(g).
[503] Ibid, Article 6.
[504] Ibid, Article 9(1).
[505] Olivi G., Anselmi N., and Miele C.O., (2020) 'Virtual Reality: Top Data Protection Issues to Consider', *The Journal of Robotics, Artificial Intelligence & Law*, vol.3(2), pp141-147, pp.142.
[506] Snijders et al., supra note 271, p. 12.
[507] Heller, supra note 173.
[508] EU GDPR, Article 4(14). N.B., under Amendment 9 of the Draft Report by the EP, this definition of biometric data is also applicable to the proposed AI Act.

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uniquely identifying a natural person",[509] and other biometric data.[510] It follows that whereas AR wearables utilising facial recognition technology,[511] for instance, may be subject to the prohibition on and exceptions relating to the processing of special category sensitive data, other XR applications using biometric data may instead be required to comply with the general requirements relating to the processing of personal data.

Alongside biometric data, health data is an additional source of data processed by XR technologies which may be characterised as special category sensitive data for the purposes of the GDPR. There are various clinical applications of XR (see Section 4.1.6), including inter alia, the use of AR for visualising medical information, such as anatomical data, and the use of VR for therapeutic treatment, for instance by immersing patients in a virtual world to distract from the experiencing of pain.[512] Since "data concerning health" is listed as special category sensitive data, this indicates that the more restrictive conditions for data processing will be applicable.[513] A possible exception to this, however, is consumer-grade XR applications, such as healthcare wearables, which process health data on a non-clinical basis. Clarification is required to determine the applicable conditions for lawful data processing in such applications, with much depending on whether special category sensitive data is characterised according to the purpose[514] or context[515] of processing, on which there is a lack of consensus amongst legal scholars.

4.2.4 Consent

In accordance with the requirement that personal data "must be processed fairly for specified purposes and on the basis of the consent of the person concerned or some other legitimate basis",[516] the GDPR establishes various conditions under which the processing of personal data is lawful,[517] most pertinent of which is that "the data subject has given consent to the processing of his or her personal data for one or more specific purposes".[518] Corresponding to the various types of data identified above (see Section 4.2.3), however, there are different requirements for the consent of a data subject depending on the type of data processed. This subsection analyses the definition of and conditions for consent under the GDPR, alongside the role of consent as a basis for lawful processing, highlighting the associated challenges arising in the context of XR.

[509] Ibid, Article 9(1).
[510] Blodgett-Ford S.J., and Supponen M., (2018) 'Data privacy legal issues in virtual and augmented reality advertising' in Barfield W., and Blitz M.J., (eds), *Research Handbook on the Law of Virtual and Augmented Reality* (Edward Elgar), pp471-512, pp.508.
[511] Lemley M., and Volokh E., (2018) 'Law, Virtual Reality and Augmented Reality', *University of Pennsylvania Law Review*, vol.166(5), pp.1051-1138, pp.1062.
[512] See e.g., Marr, B. (2021) *Extended Reality in Healthcare: 3 Reasons The Industry Must Get Ready for AI and VR / FORBES* [Online]. Available at: https://www.forbes.com/sites/bernardmarr/2021/06/14/extended-reality-in-healthcare-3-reasons-the-industry-must-get-ready-for-ar-and-vr/?sh=18b747fe73a4.
[513] EU GDPR, Article 9(2).
[514] See, e.g., Rainey S et al. (2020) 'Is the European Data Protection Regulation sufficient to deal with emerging data concerns relating to neurotechnology?', Journal of Law and the Biosciences, vol.7:1 DOI: https://doi.org/10.1093/jlb/lsaa051.
[515] See, e.g., Ienca M and Malgieri G. (2022) 'Mental data protection and the GDPR', *Journal of Law and the Biosciences*, vol.9:1, pp.1-19. DOI: https://doi.org/10.1093/jlb/lsac006.
[516] CFREU, Article 8(2).
[517] Ibid, Article 6(1).
[518] Ibid, Article 6(1)(a).

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The definition of consent

According to the GDPR, consent is defined as "any freely given, specific, informed and unambiguous indication of the data subject's wishes by which he or she, by a statement or by a clear affirmative action, signifies agreement to the processing of personal data relating to him or her".[519] The CJEU has interpreted the requirement that consent be "informed" as an obligation on behalf of data controllers "to provide the data subject with information relating to all the circumstances surrounding the data processing", such that the data subject is "able to determine easily the consequences of any consent he or she might give and ensure that the consent given is well informed."[520] Furthermore, in relation to the requirement that consent be "unambiguous", the CJEU has held that "[o]nly active behaviour on the part of the data subject with a view to giving his or her consent may fulfil that requirement."[521] It follows that the consent of the data subject is not "validly constituted" if access to the relevant information "is permitted by way of a pre-ticked checkbox which the user must deselect to refuse his or her consent."[522]

The analogous application of these requirements to the context of XR technologies entails that end-user, either before or whilst operating VR/AR/MR applications, are given the entirety of information relating to all identifiable purposes of data processing, in addition to being required to demonstrate in a non-passive way their consent to such processing. An unresolved challenge here, however, is how the providers of XR devices and applications, in relation to whom, as the data controllers for the purposes of the GDPR, there is a requirement "to demonstrate" compliance,[523] will ensure observance of these requirements for the characteristics of consent without impinging on end-user experience. This is essential to enable consent to serve as a basis for lawful processing of personal data, the requirements in relation to which are analysed in the following section.

As a basis for lawful processing

As noted above, consent is one of the six bases upon which the processing of personal data is lawful,[524] with the GDPR providing that processing shall be lawful if "the data subject has given consent to the processing of his or her personal data for one or more specific purposes".[525] In this context, however, it is pertinent to recall that the GDPR draws a distinction between personal data and sensitive data, the relevant point of differentiation between which being that the processing of sensitive data is prohibited unless one of the limited exceptions to the rule applies, most applicably that "the data subject has given explicit consent to the processing of those personal data for one or more specified purposes".[526] Whilst a significant proportion of the processed in XR technologies, particularly observed and observable data, may, for reasons outlined above, appropriately be classified as sensitive under the terms of the GDPR, and therefore subject to the in principle more rigorous requirement for "explicit consent", further guidance may be required to determine the

[519] EU GDPR, Article 4(11).
[520] Judgement of 11 November 2020, *Orange România* SA *v Autoritatea Nationala de Supraveghere a Prelucrarii Datelor cu Caracter Personal (ANSPDCP)* C-61/19 EU:C: 2020:90, para. 40.
[521] Judgement of 1 October 2019, *Bundesverband der Verbraucherzentralen und Verbraucherverbände – Verbraucherzentrale Bundesverband eV v Planet49 GmbH* C-673/17 EU:C: 2019:801, para. 54.
[522] Ibid, para. 63.
[523] *Orange România* SA *v Autoritatea Nationala de Supraveghere a Prelucrarii Datelor cu Caracter Personal,* supra note 520, para. 52.
[524] Alongside necessity for contractual performance, compliance with a legal obligation, protection of vital interests, performance of a task in the public interest, and legitimate interests, EU GDPR Article 6(1)(a)-(f).
[525] Ibid, Article 6(1)(a).
[526] Ibid, Article 9(2)(a).

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practical effect of the premodifier "explicit",[527] particularly in comparison to the general conditions for consent.[528]

The conditions for consent

The various conditions under which the consent of a user of XR technologies is valid and constitutes a lawful basis for the processing of personal data are listed under Article 8 GDPR for children (see below) and Article 7 GDPR for other natural persons. In relation to the latter, Article 7 imposes, inter alia, a requirement for the data controller to demonstrate that the data subject has consented to the processing of his or her personal data,[529] and moreover, for the data subject to be informed prior to giving consent that such consent is withdrawable "at any time".[530] The consent of the data subject is not subject to particular requirements regarding its form and could be provided via electronic means or an oral statement,[531] yet it is stipulated that "[i]f the data subject's consent is given in the context of a written declaration which also concerns other matters, the request for consent shall be presented in a manner which is clearly distinguishable from the other matters, in an intelligible and easily accessible form, using clear and plain language."[532] These requirements are consistent with the principle of transparency underpinning the GDPR (see 4.2.5 below) and are intended to ensure that a data subject is truly agreeing to a particular use of their data.[533]

Furthermore, in "assessing whether consent is freely given, utmost account shall be taken of whether, inter alia, the performance of a contract, including the provision of a service is conditional on consent to the processing of personal data that is not necessary for the performance of that contract."[534] It is unclear exactly how this provision applies to immersive XR technologies, in relation to which scholars widely agree that the processing of personal data is necessary to enable core functions.[535] A possible effect of this requirement, however, is to mitigate against the risk of "consensual erosion" of users' rights to privacy and data protection, whereby the interests of such users in gaining access to the latest XR technologies is leveraged by companies in making access conditional upon agreement to "terms of service or privacy policies that permit extensive capture and processing activities."[536] It follows that the linking of "freely given" consent to necessity for contractual performance may enhance the protection of data subjects against possible exploitation through catch-all privacy notices.

4.2.5 Transparency

The principle of transparency is central to the ethical and legal regulation of new and emerging technologies, including XR. In the context of human-machine interactions facilitated by XR "chatbots" using AI-based natural language processing (NLP) approaches, for instance, it has been suggested that the principle of transparency requires that such systems are designed in a way that "is not opaque or

[527] Kranenborg H., (2021) 'Article 8' in Peers S., Hervey T., Kenner J., and Ward A., (eds), *The EU Charter of Fundamental Rights: A Commentary* (Oxford, Hart Publishing), pp231-290, p. 267.
[528] EU GDPR, Article 7.
[529] Ibid, Article 7(1).
[530] Ibid, Article 7(3).
[531] Ibid, Recital 32.
[532] Ibid, Article 7(2).
[533] European Union Agency for Fundamental Rights, (2018) *Handbook on European data protection law*, pp.1-400, p. 112.
[534] EU GDPR, Article 7(4).
[535] Dick, supra note 461; Heller, supra note 173.
[536] McGill, supra note 176, p. 17.

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incomprehensible to humans."[537] In the context of the GDPR, meanwhile, transparency forms one of the various principles relating to the legitimate processing of personal data,[538] establishing an obligation for which the data controller is required to be able to demonstrate compliance with under the principle of "accountability".[539] Although not defined specifically, the Recitals to the GDPR are instructive as to the meaning and effect of the principle of transparency in the context of data protection,[540] specifically, by providing that it should be clear "to natural persons that personal data concerning them are collected, used, consulted or otherwise processed and to what extent", and moreover by asserting "that any information and communication relating to the processing of those personal data be easily accessible and easy to understand, and that clear and plain language be used."[541] This understanding of transparency in the GDPR forms the basis of specific practical requirements on behalf of data processors and controllers, and, concomitantly, specific rights of the data subject.[542]

A central consideration relating to XR is the requirement for information relating to data processing to be provided by the data controller "in writing, or by other means, including, where appropriate, by electronic means."[543] Such "other means" are not exhaustively listed, but it is specified that "information may be provided orally",[544] if measures are taken to verify the identity of the data subject for information relating to the exercise by a data subject of their various rights under the GDPR.[545] It follows that the controllers of data processed in XR technologies are required to provide the information to users via a means that is appropriate to the particular circumstances of processing, for instance whilst the provision of information in an electronic form may be suitable for AR applications accessed via a smartphone,[546] it may be more suitable for alternative means, such as a hard copy instruction manual, to be used for supplying the relevant information in VR applications.[547]

The draft AI Act, meanwhile, lays down a requirement, as unamended by the EP Draft Report,[548] for AI systems classified as "high risk"[549] to "be designed and developed in such a way to ensure that their operation is sufficiently transparent to enable users to interpret the system's output and use it appropriately."[550] The classification of AI systems as high risk is based on the "function performed" and the "specific purpose and modalities for which that system is used",[551] with the draft AI Act

[537] Comité National Pilote D'Éthique Du Numérique, (2021) 'Opinion No.3 Ethical Issues of Conversational Agents', pp. 1-38, p. 36.
[538] EU GDPR, Article 5(1).
[539] Ibid, Article 5(2).
[540] Article 29 Data Protection Working Party, (2018) 'Guidelines on transparency under Regulation 2016/679', 17/EN WP260, para. 6. Available at: https://ec.europa.eu/newsroom/article29/items/622227
[541] EU GDPR, Recital 39.
[542] See, e.g., ibid, Articles 12-14.
[543] Ibid, Article 12(1).
[544] Ibid, Article 12(1).
[545] Article 29 Data Protection Working Party, supra note 540.
[546] For instance, Pokémon Go is accessed via a smartphone app. Available at: https://www.pokemon.com/uk/app/pokemon-go/.
[547] Article 29 Data Protection Working Party, supra note 540.
[548] Committee on the Internal Market and Consumer Protection Committee on Civil Liberties, Justice, and Home Affairs, (2022) 'Draft Report on the proposal for a regulation of the European Parliament and of the Council on harmonised rules on Artificial Intelligence (Artificial Intelligence Act) and amending certain Union Legislative Acts' 2021/0106(COD). Available at: https://iapp.org/media/pdf/publications/CJ40_PR_731563_EN.pdf.
[549] Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) And Amending Certain Union Legislative Acts COM/2021/206 final (draft AI Act), Article 6.
[550] Ibid, Article 13.
[551] Ibid, p.12.

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identifying several high-risk AI systems, including, perhaps most applicably to XR applications, "AI systems intended to be used for the 'real-time' and 'post' remote biometric identification of natural persons".[552] Whilst much depends on whether, as per the definition of an AI system, an XR application has been developed with one or more of machine learning, statistical, logic or knowledge-based techniques,[553] there are multiple use-cases of XR applications involving biometric identification, the design and development of which may be required to comply with the transparency obligations applicable to high-risk AI systems. For instance, AR and VR devices may use biometric identification to, inter alia, "replicate a user's actions in virtual space" and improve security by authenticating users.[554]

Alongside imposing specific transparency obligations in relation to AI systems classified as high risk, the draft AI Act seeks to introduce "harmonised transparency rules for AI systems intended to interact with natural persons, emotion recognition systems and biometric categorisation systems, and AI systems used to generate or manipulate image, audio or video content".[555] The imposition of transparency obligations to this effect,[556] as similarly unamended by the EP after first reading, are intended to address the specific risks of manipulation posed by the identified AI systems. Perhaps most relevant to XR applications using AI systems, under the terms of Title IV there is an obligation on providers of low-risk AI systems to design and develop such systems so "that natural persons are informed that they are interacting with an AI system, unless this is obvious from the circumstances and the context of use".[557] To this end, whilst there may be certain circumstances and contexts in which it will it be "obvious" to natural persons that they are engaging with an XR application using AI, for instance while socialising, gaming, or exercising in the Metaverse,[558] it is possible to contemplate situations in which this will not necessarily be as "obvious", for instance in the use of VR for practical healthcare applications, such as diagnosis and pre-procedural planning.[559] In this context, there are also multiple mental health risks associated with the therapeutic use of VR, for instance depersonalisation and difficulty readjusting to the material world,[560] thereby requiring that providers, and vicariously medical professionals, ensure patients are informed and can choose to step back from the situation if desired. Furthermore, the draft AI Act also imposes a requirement on users of emotion recognition and biometric categorisation systems to inform exposed natural persons of the operation of such systems, except where the use of such systems is permitted by law for the purposes of crime prevention.[561] It follows that users of XR wearables enabled with facial recognition technology,[562] for instance, may be required to inform affected persons (bystanders) that they have been the subject of biometric categorisation.

At the level of EU policy, meanwhile, transparency is listed under Chapter II of the 'Ethics Guidelines for Trustworthy AI' as one of the seven key requirements for trustworthy AI, as devised by the High-

[552] Ibid, Annex III (1).
[553] Per the definition of AI under ibid, Article 3(1).
[554] Dick, supra note 461, p.8.
[555] Draft AI Act, supra note 549, Article 1(1)(c).
[556] Ibid, Article 52(1)-(3).
[557] Ibid, Article 52(1).
[558] The Oculus Quest 2 VR headset, for instance, offers each of these use cases. Available at: https://www.oculus.com/quest-2/.
[559] Andrews C., Southworth, M.K., Silva, J.N.A., and Silva, J.R., (2019) 'Extended Reality in Medical Practice', *Current Treatment Options in Cardiovascular Medicine*, vol.21:4, pp. 1-12.
[560] Spiegel, supra note 271.
[561] Draft AI Act, supra note 549, Article 52(2).
[562] For instance, the Vuzix M400 smart glasses enable the mobile deployment of the NeoFace Kaoato facial recognition system offered by NEC Solution Innovators. Available at: https://www.biometricupdate.com/202201/new-worldwide-deals-facial-recognition-integration-for-vuzix-smart-glasses.

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Level Expert Group on Artificial Intelligence (AI HLEG). In this context, the requirement for transparency is closely associated with the principle of explicability and is comprised of three overlapping elements, namely: traceability, explainability and communication.[563]While only voluntarily opted-into by stakeholders, and therefore not legally binding, this policy document serves to contextualise and complement the provisions of the proposed AI Act, specifically by offering practical guidance on the operationalisation and implementation of ethical principles in socio-technical systems, potentially including some XR applications.[564]

4.2.6 Vulnerable users

A key privacy and data protection challenge in relation to XR technologies is to ensure the adequate protection of vulnerable users, particularly children, the processing of whose data has the potential to be disproportionately harmful when compared with non-vulnerable users.[565] This is so because "they may be less aware of the risks, consequences and safeguards concerned and their rights in relation to the processing of personal data."[566]

The right to data protection is construed as an aspect of a child's right to privacy under international law,[567] in accordance with which the Committee on the Rights of the Child has advocated the prohibition by law of practices which seek to engage directly or indirectly with children those practices to promote products, applications, and services through immersive advertising in VR and AR environments.[568] Whilst not binding, this reflects an acknowledgement of the ease with which children may be targeted with advertisements in XR,[569] and identifies a potential regulatory solution to avoid children suffering associated harms.

Expanding on the protection of children under international human rights law, the GDPR asserts that children "merit special protection with regard to their personal data",[570] consistent with which the European Data Protection Board, as constituted by the GDPR,[571] has included as an aspect of its Work Programme for 2021/2022 the establishment of guidelines relating to children's personal data.[572] Such guidelines are intended to complement the various provisions within the GDPR relating to children, most specifically the conditions applicable to child's consent in relation to information society services.[573] Pursuant to this provision, there is an age restriction of 16, or between 13 and 16 if provided for under Member State law, in order for consent to act as a lawful basis for processing of personal data,[574] the alternative to which being "that consent is given or authorised by the holder of parental responsibility over the child."[575] In relation to the latter, there is a requirement on the behalf

[563] High-Level Expert Group on Artificial Intelligence, (2019) 'Ethics Guidelines for Trustworthy AI', pp.1-39. Available at: https://ec.europa.eu/futurium/en/ai-alliance-consultation.1.html.
[564] Ibid.
[565] Dick, supra note 461, p.17.
[566] EU GDPR, Recital 38.
[567] CRC, Article 16.
[568] General comment No.25 (2021) on children's rights in relation to the digital environment, supra note 383, para. 42.
[569] Blodgett-Ford S.J., and Supponen M., (2018) 'Data privacy legal issues in virtual and augmented reality advertising' in Barfield W., and Blitz M.J., (eds), *Research Handbook on the Law of Virtual and Augmented Reality* (Edward Elgar), pp471-512, p. 490.
[570] EU GDPR, Recital 38.
[571] Ibid, Article 68.
[572] European Data Protection Board, (2021) 'Working Programme 2021/2022'. Available at: https://edpb.europa.eu/system/files/2021-03/edpb_workprogramme_2021-2022_en.pdf.
[573] EU GDPR, Article 8.
[574] Ibid, Article 6(1)(a).
[575] Ibid, Article 8(1).

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of data controllers to "make reasonable efforts to verify in such cases that consent is given or authorised by the holder of parental responsibility over the child, taking into consideration available technology."[576] For instances in which processing is addressed to a child, the principle of transparency (see above) requires that any information and/or communication is provided in clear and plain language that a child can easily understand.[577] Such provisions may serve to mitigate the risks posed to child users of XR, which include, inter alia, physical harm, exposure to harmful content, bullying, and harassment.[578]

Finally, whereas there exist specific provisions for the protection of children under the terms of the GDPR, there is no explicit protection for other "vulnerable natural persons",[579] with the exception of the assertion in the Recitals to the GDPR that consent does not provide a valid legal ground for the processing of personal data in situations "where there is a clear imbalance between the data subject and the controller".[580] It follows that protections for other vulnerable users of XR, such as older people or those with disabilities, are not explicitly contemplated within the framework of the GDPR.

4.2.7 Potential developments and future trends

This section has explored the relationship between privacy and data protection in relation to XR technologies, situating this analysis in the context of the relevant international and EU laws and draft legislation. Whilst the precise effect of certain provisions in relation to XR awaits further clarification, for instance the requirements for obtaining user consent pursuant to Article 6 GDPR (see section 4.2.4), the relevant international and EU laws may be sufficiently comprehensive and technologically neutral to effectively protect the rights to privacy and data protection of users against the various challenges posed by XR technologies, notwithstanding the calls from certain scholars for more specific and particularised laws, such as the putative Extended Reality Privacy Rights Framework.[581]

4.3 Consumer protection

Consumer rights and consumer protection law are designed to hold sellers of goods and services accountable when they seek to profit, for example by taking advantage of a consumer's lack of information or bargaining power. Some conduct addressed by consumer rights laws is simply unfair, while other conduct might be fraudulent, deceptive, and/or misleading. Consumer rights are particularly important in the XR context, as the AR/VR market share is expected to increase by USD 162.71 billion from 2020 to 2025, and the market's growth momentum to accelerate at a CAGR of 46% (with growth being driven by increasing demand).[582] The use of XR is already transforming diverse industries (healthcare, manufacturing) and at the same time changing culture, travel,

[576] Ibid, Article 8(2).
[577] Ibid, Recital 58.
[578] Dick E., (2020) 'How to Address Privacy Questions Raised by the Expansion of Augmented Reality in Public Spaces', *Information Technology & Innovation Foundation*, pp.1-24.
[579] EU GDPR, Recital 75.
[580] Ibid, Recital 43.
[581] McGill, supra note 176, p.18.
[582] Technavio, *Augmented Reality and Virtual Reality Market by Technology and Geography - Forecast and Analysis 2021-2025*, June 2021. SKU: IRTNTR43509. Available at: https://www.technavio.com/report/augmented-reality-and-virtual-reality-market-industry-analysis?utm_source=prnewswire&utm_medium=pressrelease&utm_campaign=T47_RVO_report_wk1_003_2022&utm_content=IRTNTR43509&nowebp.

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retail/ecommerce, education, training, gaming and entertainment (the latter two being the most significant).

All consumer rights could potentially be affected in XR in some manner or the other, but for the purpose of this report we have focused on the right to be informed, the right to safety, the right to choose, the right to redress, the right to consumer education and the right to healthy environment.

Risks for consumers in XR can be grouped into four categories[583]:

- Physical and mental risks (e.g., emotional involvement, long-term damage, blurring of boundaries, alienation and addiction);
- Social risks (damage to social values, slander and intimidation, social disassociation, virtual violence, sexualisation);
- Abuse of power (manipulation, lack of transparency, curtailing autonomy, political autonomy, political influence, use of data without permission);
- Legal risks (invasion of privacy, identity abuse, property issues and uncertain status of legal actions).

While some of the issues are not unique to XR, the persuasive, illusionist, invasive, immersive, and/or intimate nature of XR products exacerbates the challenges and impacts on consumers. Furthermore, different XR applications have different target groups of consumers (e.g., children, elderly, other vulnerable groups) who might be impacted dissimilarly by their use.

4.3.1 International and EU law and policies

International law and policy

At the international level, there are several instruments related to consumer protection. From the UN, the United Nations Guidelines for Consumer Protection (UNGCP) is a non-binding guidance document that sets out elements of effective consumer protection law. From the Organisation for Economic Co-operation and Development (OECD) are the OECD Recommendation on Consumer Protection in E-commerce (2016)[584], the Consumer Policy Guidance on Intangible Digital Content Products (2014), the OECD Recommendation of the Council Concerning Guidelines for Protecting Consumers from Fraudulent and Deceptive Commercial Practices Across Borders (2003) and the Recommendation of the Council on Consumer Dispute Resolution and Redress (2007). While OECD Recommendations are not legally binding, they represent a political commitment and an expectation that adherents will do their best to implement them.[585] Lastly, there is the legally binding Convention on the Law Applicable to Products Liability, but it only has 11 Member State parties (all within Europe).

The United Nations Guidelines for Consumer Protection (UNGCP) The UNGCP (revised by the General Assembly in resolution 70/186 of 22 December 2015)[586] set out the main characteristics of effective consumer protection legislation, enforcement institutions and redress systems. The Guidelines (not

[583] Drawn from four cluster of risks in VR identified by: Snijders et a., supra note 271.
[584] OECD (2016), *Consumer Protection in E-commerce: OECD Recommendation,* OECD Publishing, Paris. Available at: http://dx.doi.org/10.1787/9789264255258-en.
[585] OECD, *Legal Instruments / OECD*. Available at: https://www.oecd.org/legal/legal-instruments.htm.
[586] United Nations Conference on Trade and Development (UNCTAD), United Nations Guidelines for Consumer Protection, 2016. UNCT AD/DITC/CPLP/MISC/2016/1. Available at: https://unctad.org/system/files/official-document/ditccplpmisc2016d1_en.pdf.

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legally binding but have been widely used globally[587]) help Member States formulate and enforce domestic and regional laws, rules and regulations that are suitable to their economic, social and environmental circumstances and promote international enforcement cooperation among Member States along with encouraging the sharing of experiences in consumer protection. The Guidelines address e-commerce aspects and provide that Member States should work towards enhancing consumer confidence in electronic commerce by the continued development of transparent and effective consumer protection policies. They also state that Member States should, where appropriate, review existing consumer protection policies to accommodate the special features of electronic commerce and ensure that consumers and businesses are aware of their rights and obligations in the digital marketplace. The UN Conference on Trade and Development (UNCTAD) promotes the guidelines and encourages interested member States to create awareness of the ways in which Member States, businesses and civil society can promote consumer protection in the provision of public and private goods and services.[588] The Intergovernmental Group of Experts on consumer protection law and policy was established to monitor the implementation of the guidelines, provide a forum for consultations, produce research and studies, provide technical assistance, undertake voluntary peer reviews, and periodically update the UNGCP.[589]

The **OECD Recommendation on Consumer Protection in E-commerce (2016)[590]** applies to business-to-consumer e-commerce, including commercial practices through which businesses enable and facilitate consumer-to-consumer transactions and covers commercial practices related to both monetary and non-monetary transactions for goods and services, which include digital content products. It, inter alia, recognises the need to address consumer challenges related to information disclosure, misleading or unfair commercial practices, confirmation and payment, fraud and identity theft, and dispute resolution and redress. It sets out general principles related to transparent and effective protection, fair business, advertising and marketing practices, online disclosures (clarity accuracy accessibility and conspicuousness), confirmation process, payment, dispute resolution and redress, privacy and security and education, awareness and digital competence.

The OECD Consumer Policy Guidance on Intangible Digital Content Products (2014)[591] covers a broad range of digital content products, including media and entertainment items (such as film, music, games, virtual world items, literature, e-books, magazines, journals, images, news and IP TV services), apps and personalisation services/add-ons, including ringtones and screensavers. It addresses issues concerning a) digital content product access and usage conditions, b) privacy and security, c) fraudulent, misleading and unfair commercial practices, d) children, e) dispute resolution and redress, and f) digital competence.

[587] United Nations. (2013). *Implementation report on the United Nations Guidelines on Consumer Protection (1985–2013)* (E/1999/INF/2/Add.2). Geneva: United Nations Conference on Trade and Development. Available at: http://unctad.org/meetings/en/SessionalDocuments/ciclpd23_en.pdf.
[588] United Nations. *United Nations guidelines for consumer protection / UNCTAD* [Online]. Available at: https://unctad.org/topic/competition-and-consumer-protection/un-guidelines-for-consumer-protection.
[589] United Nations, *Intergovernmental Group of Experts on Consumer Protection Law and Policy / UNCTAD* [Online]. Available at: https://unctad.org/topic/competition-and-consumer-protection/intergovernmental-group-of-experts-on-consumer-protection.
[590] OECD (2016), *Consumer Protection in E-commerce: OECD Recommendation,* OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264255258-en.
[591] OECD (2014), 'Consumer Policy Guidance on Intangible Digital Content Products', *OECD Digital Economy Papers*, No. 241, OECD Publishing, Paris. Available at: http://dx.doi.org/10.1787/5jxvbrjq3qg6-en.

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The OECD Recommendation of the Council concerning Guidelines for Protecting Consumers from Fraudulent and Deceptive Commercial Practices across Borders[592] addresses fraudulent and deceptive commercial practices occurring in connection with business-to-consumer transactions.

The OECD Recommendation on Consumer Dispute Resolution and Redress (2007)[593] sets out common principles for Member countries on mechanisms for consumers to resolve disputes and obtain redress for economic harm resulting from transactions with businesses involving goods or services, including transactions across borders.

The Convention on the Law Applicable to Products Liability[594] determines the law applicable to the liability of the manufacturers and other persons specified for damage caused by a product, including damage in consequence of a misdescription of the product or of a failure to give adequate notice of its qualities, its characteristics or its method of use. Products here include natural and industrial products, whether raw or manufactured and whether movable or immovable. The States signatory to the Convention are bound to apply it, but it does not preclude consideration being given to the rules of conduct and safety prevailing in the State where the product was introduced into the market.

EU law and policy

At the European Union level, there are many laws, policies, and reports with direct relevance to consumer rights in the context of XR. The European Commission Communication on the *2030 Digital Compass: the European way for the Digital Decade*[595], highlights that "augmented reality will be at the core of new products, new manufacturing processes and new business models based on fair sharing of data in the data economy, digitalisation of public services".

The EU regulatory framework includes the Consumer Rights Directive (CRD)[596] and its Guidance, Unfair Commercial Practices Directive (UCPD)[597], Digital Content Directive (DCD)[598], and Product Liability Directive.[599] Additionally, the following proposed pieces of EU law would have bearing on consumer

[592] OECD, *Recommendation of the Council concerning Guidelines for Protecting Consumers from Fraudulent and Deceptive Commercial Practices across Borders*, OECD/LEGAL/0317. Available at: https://legalinstruments.oecd.org/public/doc/184/184.en.pdf.
[593] OECD (2007) *OECD Recommendation on Consumer Dispute Resolution and Redress*. OECD Publishing [Online]. Available at: https://www.oecd.org/sti/consumer/38960101.pdf. This applies to solely to complaints initiated by or on behalf of consumers, and not to complaints initiated by businesses against consumers or another business.
[594] Convention of 2 October 1973 on the Law Applicable to Products Liability (entered into force 1977). Available at: https://www.hcch.net/en/instruments/conventions/full-text/?cid=84.
[595] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the 2030 Digital Compass: The European way for the Digital Decade. Brussels, 9.3.2021COM(2021) 118 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021DC0118&rid=4.
[596] European Parliament and the Council, Directive 2011/83/EU of the European Parliament and of the Council of 25 October 2011 on consumer rights, amending Council Directive 93/13/EEC and Directive 1999/44/EC of the European Parliament and of the Council and repealing Council Directive 85/577/EEC and Directive 97/7/EC of the European Parliament and of the Council *OJ L* 304, 22.11.2011, p. 64–88.
[597] European Parliament and the Council, Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices in the internal market and amending Council Directive 84/450/EEC; Directives 97/7/EC, 98/27/EC and 2002/65/EC of the European Parliament and of the Council and Regulation (EC) No 2006/2004 of the European Parliament and of the Council ('Unfair Commercial Practices Directive') *OJ L* 149, 11.6.2005, p. 22–39.
[598] Directive (EU) 2019/770 of the European Parliament and of the Council of 20 May 2019 on certain aspects concerning contracts for the supply of digital content and digital services PE/26/2019/REV/1 *OJ L 136,* 22.5.2019, p. 1–27.
[599] Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products *OJ L 210,* 7.8.1985, p. 29–33.

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rights in the EU: Digital Services Act (DSA)[600], Digital Markets Act (DMA)[601], Data Governance Act (DGA)[602], and Artificial Intelligence Act (AIA).[603]

Collectively, EU consumer laws provide consumers with the following specific rights: right to truthful advertising, right to have faulty goods repaired or replaced, right to contracts without unfair clauses, right to return most goods purchased online within 14 days, right to access goods and services on the same terms as local customers, and the right to free assistance from European Consumer Centres for problems with a trader based within the EU/EEA.[604]

Consumer Rights Directive (CRD)[605] and CRD Guidance: The CRD provides consumers with strong rights across the EU and harmonises national consumer rules. It is applicable to all contracts between a consumer and trader.[606] It defines a consumer as "any natural person who, in contracts covered by this Directive, is acting for purposes which are outside his trade, business, craft or profession".[607] The CRD Guidance[608] facilitates the effective application of the CRD for consumers, businesses, the authorities of the Member States, including national courts, and legal practitioners, across the EU. Important in the context of XR, the guidance clarifies 'goods' includes digital content supplied on a tangible medium.[609] Therefore, providers offering goods with digital elements, digital content and digital services must fulfil certain obligations, including informing the consumer also about products functionality, compatibility and interoperability.

The Unfair Commercial Practices Directive (UCPD)[610] The UCPD approximates the laws of the EU Member States on unfair commercial practices (business-to-consumer commercial practices), including unfair advertising, which directly harm consumers' economic interests and thereby indirectly harm the economic interests of legitimate competitors. It protects consumers from the consequences of such

[600] Proposal for a Regulation of the European Parliament and of the Council on a Single Market for Digital Services (Digital Services Act) and amending Directive 2000/31/EC COM/2020/825 final. Available at: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=COM%3A2020%3A825%3AFIN.
[601] Ibid.
[602] Ibid.
[603] Draft AI Act, supra note 549.
[604] Citizens Information, *Consumer Rights in the EU / Citizens Information* [Online]. Available at: https://www.citizensinformation.ie/en/consumer/consumer_laws/consumer_rights_in_eu.html.
[605] European Parliament and the Council, Directive 2011/83/EU of the European Parliament and of the Council of 25 October 2011 on consumer rights, amending Council Directive 93/13/EEC and Directive 1999/44/EC of the European Parliament and of the Council and repealing Council Directive 85/577/EEC and Directive 97/7/EC of the European Parliament and of the Council *OJ L* 304, 22.11.2011, p. 64–88.
[606] Any natural person or any legal person, irrespective of whether privately or publicly owned, who is acting, including through any other person acting in his name or on his behalf, for purposes relating to his trade, business, craft or profession in relation to contracts covered by this Directive.
[607] Directive 2011/83/EU, supra note of the European Parliament and of the Council of 25 October 2011 on consumer rights, amending Council Directive 93/13/EEC and Directive 1999/44/EC of the European Parliament and of the Council and repealing Council Directive 85/577/EEC and Directive 97/7/EC of the European Parliament and of the Council. Available at: https://eur-lex.europa.eu/eli/dir/2011/83/2018-07-01, *amended by* Directive (EU) 2019/2161 of the European Parliament and of the Council of 27 November 2019 amending Council Directive 93/13/EEC and Directives 98/6/EC, 2005/29/EC and 2011/83/EU of the European Parliament and of the Council as regards the better enforcement and modernisation of Union consumer protection rules PE/83/2019/REV/1 OJ L 328, 18.12.2019, p. 7–28
[608] European Commission, Commission notice Guidance on the interpretation and application of Directive 2011/83/EU of the European Parliament and of the Council on consumer rights (CRD Guidance) 2021/C 525/01 C/2021/9314 *OJ C 525*, 29.12.2021, p. 1–85.
[609] Ibid, p. 1–85.
[610] European Parliament and the Council, Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices in the internal market and amending Council Directive 84/450/EEC, Directives 97/7/EC, 98/27/EC and 2002/65/EC of the European Parliament and of the Council and Regulation (EC) No 2006/2004 of the European Parliament and of the Council ('Unfair Commercial Practices Directive') *OJ L* 149, 11.6.2005, p. 22–39.

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practices and addresses commercial practices directly related to influencing consumers' transactional decisions in relation to products. A 'product' is defined as any goods or service including immovable property, rights and obligations – this would capture XR products. The UCPD prohibits unfair commercial practices i.e., practices that are contrary to the requirements of professional diligence, and materially distort or are likely to materially distort the economic behaviour with regard to the product of the average consumer whom it reaches or to whom it is addressed, or of the average member of the group when a commercial practice is directed to a particular group of consumers. EU Member States must ensure that adequate and effective means (via legal provisions) exist to combat unfair commercial practices to enforce compliance with the provisions of the UCPD in the interest of consumers. Persons or organisations regarded under national law as having a legitimate interest in combating unfair commercial practices, including competitors, may take legal action against such unfair commercial practices; and/or bring such unfair commercial practices before an administrative authority competent either to decide on complaints or to initiate appropriate legal proceedings.

Digital Content Directive (DCD) The Digital Content Directive (DCD)[611] aims to provide a high level of consumer protection by laying down common rules on certain requirements concerning contracts between traders and consumers for the supply of digital content (data which are produced and supplied in digital form) or digital services (services that allows the consumer to create, process, store or access data in digital form or allows the sharing of or any other interaction with data in digital form uploaded or created by the consumer or other users of that service). Goods with digital elements' means any tangible movable items that incorporate, or are inter-connected with, digital content or a digital service in such a way that the absence of that digital content or digital service would prevent the goods from performing their functions. The Directive covers inter alia, computer programmes, applications, video files, audio files, music files, digital games, e-books or other e-publications, and digital services which allow the creation of, processing of, accessing or storage of data in digital form, including software-as-a-service, such as video and audio sharing and other file hosting, word processing or games offered in the cloud computing environment and social media.

Product Liability Directive In the EU, consumers can claim compensation for damage caused by defective products.[612] The key piece of legislation in force is Directive 85/374/EEC which provides strict liability for damage from defective products.[613] 'Products' here mean all movables, with the exception of primary agricultural products and game, even though incorporated into another movable or into an immovable. A producer is liable for damage caused by defects in their products. A product is defective, per the Directive, when it does not provide the safety which a person is entitled to expect, taking all circumstances into account, including: (a) the presentation of the product; (b) the use to which it could reasonably be expected that the product would be put; (c) the time when the product was put into circulation. The European Commission evaluated the Directive and set up an expert group on liability and new technologies[614] that will assist the Commission in drawing up guidance on the directive and assess the implications of emerging digital technologies for the wider

[611] Directive (EU) 2019/770 of the European Parliament and of the Council of 20 May 2019 on certain aspects concerning contracts for the supply of digital content and digital services PE/26/2019/REV/1 *OJ L 136,* 22.5.2019, p. 1–27.
[612] European Commission, *Liability of defective products / European Commission* [Online]. Available at: https://ec.europa.eu/growth/single-market/goods/free-movement-sectors/liability-defective-products_en.
[613] Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products *OJ L 210,* 7.8.1985, p. 29–33.
[614] European Commission, *Register of Commission Expert Groups and Other Similar Entities: Expert Group on liability and new technologies (E03592) / European Commission* [Online]. Available at: https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?do=groupDetail.groupDetail&groupID=3592&NewSearch=1&NewSearch=1.

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liability frameworks at EU and national level. In 2020, the Commission published a report on the broader implications for, potential gaps in and orientations for, the liability and safety frameworks for artificial intelligence, the Internet of Things and robotics.[615] The report itself does not mention XR but confirms that the Product Liability Directive's definition of product is broad, its scope could be further clarified to better reflect the complexity of emerging technologies and ensure that compensation is always available for damage caused by products that are defective because of software or other digital features. National non-harmonised regimes provide fault-based liability rules.

***Proposed* Digital Services Act (DSA)** The DSA proposes harmonised rules on the provision of intermediary services in the EU internal market for a safe, predictable, and trusted online environment.[616] It lays down a framework for the conditional exemption from liability of providers of intermediary services; rules on specific due diligence obligations tailored to certain specific categories of providers of intermediary services; rules on the implementation and enforcement of this Regulation, including as regards the cooperation of and coordination between the competent authorities. With regards to consumers, it aims to ensure users are more informed and can contest content, have access to dispute resolution, have transparent terms and conditions and greater safety and better knowledge of the real sellers of products bought. Illegal content under the DSA would include or activities involving infringements of consumer protection law.

***Proposed* Digital Markets Act (DMA)** The DMA proposes harmonised rules ensuring contestable and fair markets in the digital sector across the Union where gatekeepers are present, to prevent them from imposing unfair conditions on businesses and consumers.[617] Gatekeepers include companies that have a strong economic position, significant impact on the internal market and is active in multiple EU countries, has a strong intermediation position (meaning that it links a large user base to a large number of businesses), or has (or is about to have) an entrenched and durable position in the market, meaning that it is stable over time. The DMA specifies practices of gatekeepers that limit contestability or are unfair, market investigation conditions and rules and investigative, enforcement and monitoring powers for the European Commission.

***Proposed* Data Governance Act (DGA)** The DGA lays down conditions for the re-use, within the Union, of certain categories of data held by public sector bodies; a notification and supervisory framework for the provision of data sharing services; a framework for voluntary registration of entities which collect, and process data made available for altruistic purposes.[618]

***Proposed* Artificial Intelligence Act (AIA)** The AIA is intended to improve the protection of fundamental rights and providing legal certainty for operators and consumers in the specific context of AI. [619] The AIA introduces a harmonised set of core requirements with regard to AI systems classified as high-risk and obligations for providers and users of those systems. Article 13 (Transparency and provision of information to users), Article 16 (Obligations of providers of high-risk

[615] Report From the Commission to the European Parliament, The Council and the European Economic and Social Committee, Report on the safety and liability implications of Artificial Intelligence, the Internet of Things and robotics COM/2020/64 final. Available at: https://eur-lex.europa.eu/legal-content/en/TXT/?qid=1593079180383&uri=CELEX%3A52020DC0064.
[616] Draft Digital Services Act, supra note 600.
[617] Proposal for a Regulation of the European Parliament and of the Council on contestable and fair markets in the digital sector (Digital Markets Act) COM/2020/842 final. Available at: https://eur-lex.europa.eu/legal-content/en/TXT/?qid=1608116887159&uri=COM%3A2020%3A842%3AFIN.
[618] Proposal for a Regulation of the European Parliament and of the Council on European data governance (Data Governance Act) COM/2020/767 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0767.
[619] Draft AI Act, supra note 549.

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AI systems) and Article 28 (Obligations of distributors, importers, users or any other third-party) are examples of some provisions that would support consumer rights. It has been suggested that the "AIA only indirectly addresses the consumer" and that "consumer concerns can only be channelled into the AIA if they enjoy 'constitutional status' under Article 38 of the Charter or be subsumed under one of the more outspoken rights. In short, the consumer acquis matters only as far as it can be 'constitutionalised' and 'individualised'."[620]

4.3.2 Right to safety

One of the key consumer rights implicated by XR is the right to safety. The consumer right to safety means entails protection from marketing of hazardous products; it means safe enjoyment/use (intended or foreseeable).

Safety concerns related to XR are wide-ranging,[621] and may include physical injury caused by distraction[622], injury/harm caused by misidentification or mistakes,[623] exposure to pornography, violence and assault,[624] headaches, eyestrain/vision issues and trauma, seizures, motion sickness,[625] psychological harm and well-being issues (addiction, desensitisation).[626] Product liability claims could arise where XR products are found to be defective (manufacture, design) or where no safety warnings or instructions are provided or found lacking giving rise to strict liability.[627] Furthermore, negligence claims/actions for damages or claims for breach of warranties might arise where technical issues or errors are found. Claims might arise against application developers, hardware makers, or the platforms selling the products.[628]

XR consumer safety concerns could be addressed via regulations, standards, policies, market entry requirements, consumer warranties and information (health and safety risk warnings), technical measures, education and awareness and product recalls/withdrawals.

[620] Natali Helberger, Hans-W. Micklitz, Peter Rott, EU Consumer Protection 2.0 The Regulatory Gap: Consumer Protection in the Digital Economy Addendum to the report 'Structural asymmetries in digital consumer markets', BEUC, December 2021. Available at: https://www.beuc.eu/publications/beuc-x-2021-116_the_regulatory_gap-consumer_protection_in_the_digital_economy.pdf.
[621] BEIS, The safety of domestic virtual reality systems A literature review BEIS Research Paper Number 2020/038, RPN 4527. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/923616/safety-domestic-vr-systems.pdf.
[622] Ayers, J.W., et al., "Pokémon GO—A New Distraction for Drivers and Pedestrians," *JAMA Internal Medicine*, Sept. 16, 2016. Available at: http://archinte.jamanetwork.com/article. aspx?articleid=2553331.
[623] Hobson A., *Reality Check: the Regulatory Landscape for Virtual and Augmented Reality*. R Street Policy Study No. 69 September 2016 [Online]. Available at: https://www.rstreet.org/wp-content/uploads/2016/09/69.pdf.
[624] Slater et al., supra note 148.
[625] Behr, K.-M., et al. (2005) 'Some practical considerations of ethical issues in VR research' *Presence,* 14, 668–676. Available at: https://doi.org/10.1162/105474605775196535; Kirk Hamilton (2016) *One Wild, Occasionally Nauseating WeekOof virtual reality With The Oculus Rift / KOTAKU* [Online]. Available at: http://kotaku.com/one-wild-occasionally-nauseating- week-of-virtual-reali-1767442615.
[626] Slater et al., supra note 148.
[627] Simmons + Simmons (2020) *TechNotes – Top 10 issues for AR/VR / Simmons + Simmons* [Online]. Available at: https://www.simmons-simmons.com/en/publications/ck9o6smekb1q009003dpy4aqe/technotes-top-10-issues-for-ar-vr.
[628] Hoppe, D. (2016) *Collateral Damage: Real Legal Risks for Virtual Reality Companies / Gamma Law: Media, Technology, Innovation* [Online]. Available at: https://gammalaw.com/collateral-damage-real-legal-risks-for-virtual-reality-companies/.

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4.3.3 Right to be informed

The right to be informed means consumers having sufficient information to weigh alternatives and make an informed choice. It also includes the ability to protect themselves from false and misleading claims in advertising and labeling practices.

The OECD Recommendation[629] clearly states, "Businesses should not make any representation, or omission, or engage in any practice that is likely to be deceptive, misleading, fraudulent or unfair. This includes the general impression likely conveyed to consumers by the representation or practice as well as implied factual misrepresentations conveyed through features such as the good or the service's name, words, pictures, audio and/or video and the use of disclaimers that are hidden, hard to notice or to understand. Businesses should take special care in advertising or marketing that is targeted to children, vulnerable or disadvantaged consumers, and others who may not have the capacity to fully understand the information with which they are presented."

Mhaiddli & Schaub,[630] using scenarios, identified five key mechanisms of manipulative XR advertising: misleading experience marketing; inducing artificial emotions in consumers; sensing and targeting people when they are vulnerable; emotional manipulation through hyperpersonalization; and distortion of reality. The scenarios all show how consumers can be tricked or deceived through XR advertising in their ability to rationally evaluate the claims of an ad and make an informed decision of whether to purchase a product. The listed practices could fall foul of the UCPD, for example, coming within its ambit as unfair commercial practices (contrary to professional diligence, material distortions, misleading, aggressive).

Remedies against unfair commercial practices include use of legal provisions, legal action, bringing such practices before competent administrative authority. Courts or administrative authorities can order the cessation of, or to institute appropriate legal proceedings for an order for the cessation of, unfair commercial practices; if the unfair commercial practice has not yet been carried out but is imminent, to order the prohibition of the practice, or to institute appropriate legal proceedings for an order for the prohibition of the practice, even without proof of actual loss or damage or of intention or negligence on the part of the trader.

4.3.4 Right to choose

The right to choose is an important consumer right that entails consumers can select from a range of products and services, offered at competitive prices with an assurance of satisfactory quality. The monopolisation of the market by BigTech companies is detrimental to the consumer right to choose and frustrates its enjoyment due to the elimination of competition. One example is Meta's VR increasing acquisitions in this space for VR games and headsets, including Oculus in 2014. The US FTC has launched antitrust investigations[631] along with some other states in the US.[632] With regard to

[629] OECD (2016). *Recommendation of the Council on Consumer Protection in E-commerce*. Paris: OECD Publishing. Available at: http://dx.doi.org/10.1787/9789264255258-en.
[630] Mhaidli, A.H., and Schaub F. (2021). *Identifying manipulative advertising techniques in xr through scenario construction*. Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems. Available at: https://mhaidli.github.io/papers/CHI_2021_XR_Advertising_Manipulation.pdf.
[631] Sisco J. (2021) *FTC Slows Meta Platforms' Metaverse Strategy By Extending Antitrust Probe of VR Deal / The Information* [Online]. Available at: https://www.bloomberg.com/news/articles/2022-01-14/meta-s-oculus-unit-faces-ftc-led-probe-of-competition-practices?srnd=technology-vp.
[632] Ibid.

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quality, a pertinent matter is whether consumers have a choice about who (especially third parties) gains access to their information processed in XR and how that will be used further.[633]

The right to choose is underpinned by the ability of consumers to access adequate information enable them to make informed choices according to their individual wishes and needs (UNGCP). The right to choose in the XR consumer context is/could be protected by legislation that promotes an environment where solutions providers can compete and eliminating anti-competitive practices, limitations on concept ownership through patent law, prevention of development of monopolies and sanctions using anti-trust or anti-merger legislation[634] and regulations and prohibitions.

4.3.5 Right to redress

The right to redress entails consumers must receive fair settlements of just claims made and compensation for misrepresentation, shoddy goods or unsatisfactory services.[635]

Terms of use XR products and services govern user disputes. Users are invited to contact the product manufacturer/service provider and resolve the dispute informally by sending written notice of their claim (via registered letter or email with confirmation of receipt) including their personal details and type and reason for the claim, and the specific compensation sought. If the provider and the complainant cannot agree on a solution withing specified period, legal proceedings could be initiated. Where claims are under a certain limit, they could be resolved via binding non-appearance-based arbitration (a right to refrain or waive might also be provided).[636] Jurisdiction for disputes is as specified in the terms of service unless law excludes the specified jurisdiction from being applicable.[637]

The UNCPG outline businesses should make available complaints-handling mechanisms that provide consumers with expeditious, fair, transparent, inexpensive, accessible, speedy and effective dispute resolution without unnecessary cost or burden. They should consider subscribing to domestic and international standards pertaining to internal complaints handling, alternative dispute resolution services and customer satisfaction code. The CRD iterates consumers should have recourse to out-of-court complaints and redress mechanisms, to which the trader is subject, and the methods for consumers to have access to it.

4.3.6 Right to consumer education

The right to consumer education is more than a right to information[638] and means consumers can "acquire knowledge and skills needed to make informed, confident choices about goods and

[633] Reed Smith LLP (2017). Aug*mented and virtual reality: emerging legal implications of the "final platform"* [Online]. Available at: https://www.reedsmith.com/-/media/files/perspectives/2017/06/augmented-virtual-reality-emerging-legal-implications-of-final-platform.pdf.
[634] E.g., Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (the EC Merger Regulation). Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32004R0139.
[635] National Consumer Federation, *The 8 Consumer Rights / National Consumer Federation* [Online]. Available at: https://www.nationalconsumer.org.uk/consumer-voice/consumer-rights/.
[636] See e.g., Resolution Games (2020) *Terms of Use / Resolution* [Online]. Available at: https://www.resolutiongames.com/terms-of-use; Meta (2022) *Oculus Terms of Service / Meta* [Online]. Available at: https://www.oculus.com/legal/terms-for-oculus-account-users/?locale=en_GB.
[637] Google (2014) *Glass Explorer Edition Terms of Use / Google* [Online]. Available at: https://www.google.co.uk/intl/en/glass/termsofuse/.
[638] Paul N. Bloom (1976) 'How Will Consumer Education Affect Consumer Behavior?', in Beverlee B. Anderson, Cincinnati, (eds) *NA - Advances in Consumer Research,* Volume 03, Association for Consumer Research, Pages: 208-212.

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services, while being aware of basic consumer rights and responsibilities and how to act on them".[639]

The lack of consumer education in the XR market has been clearly highlighted (what the technologies are, what they can do.[640] A lack of transparency further complicates matters (especially related to defective XR products as claims are quietly settled).

Consumer education measures (responsibility of both governments and businesses) would include programmes to provide adequate information on XR products and their rights, organisation of public campaigns, fora, meetings, seminars, debates. Education programmes should cover health concerns, product hazards, product labelling, relevant legislation, access to dispute resolution and redress mechanisms and agencies, information on prices, quality, availability, impact on environment.

4.3.7 Right to a healthy environment

The consumer right to a healthy environment means being able to live and work in an environment that is non-threatening to the well-being of present and future generations.[641]

As indicated before, for example, XR has the potential to seriously undermine this right both when an individual is in and has left the XR environment (e.g., extended immersion leading to loss of hand-eye coordination and associated safety risks).[642]

One important consideration is that for the right to healthy environment to be able to be maintained, exercised, and enforced, as Radulescu & Radulescu point out, "individuals must be educated and have access to information, take part in decisions and to access to justice in environmental matters."[643]

4.3.8 Potential developments and future trends

This section explored the relation of consumer law/rights and XR; it presented an overview of the international and EU laws and policies. It also examined the application of key impacted core consumer rights.

Overall, despite the expanding XR market and accessibility of such products to consumers and their wider availability and integration in daily life, compared to before, legislative/policy examination has not kept the same pace. Protections for vulnerable categories of consumers such as children[644] and individuals with mental vulnerability (e.g., proneness to psychosis) should be reviewed.

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[639] National Consumer Federation, supra note 635; also, United Nations, *United Nations guidelines for consumer protection / UNCTAD* [Online]. Available at: https://unctad.org/topic/competition-and-consumer-protection/un-guidelines-for-consumer-protection.
[640] PwC. *Growing VR/AR companies in the UK: a business and legal handbook*. Digital Catapult in association with PwC [Online]. Available at: https://www.pwc.co.uk/intelligent-digital/vr/growing-vr-ar-companies-in-the-uk.pdf.
[641] National Consumer Federation, supra note 635.
[642] BEIS, *The safety of domestic virtual reality systems A literature review BEIS Research Paper Number* 2020/038, RPN 4527. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/923616/safety-domestic-vr-systems.pdf.
[643] Radulescu, D. M. and Radulescu V. (2011) 'Educating the consumer about his right to a healthy environment.' *Procedia-Social and Behavioral Sciences* 15, 466-470.
[644] Jerome, supra note 421.

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4.4 AI governance

As many XR applications integrate AI systems, any laws governing AI would apply to those XR applications.[645] While there are no international laws governing AI specifically, the EU has proposed a regulatory framework dedicated to AI governance. This framework, which includes a proposed AI Act, does not mention XR, but would apply (if adopted as written) to any XR technology using AI.

It should be noted that not all XR technologies utilise AI technologies and would, therefore, not be subject to any proposed AI regulation. For example, chatbots can be developed using AI-based NLP approaches or using an extensive word database (not AI-based). The former would be subject to the proposed AI Act, the latter not. Thus, a case-by-case analysis of the different XR applications would be required to understand if the proposed AI Act is applicable.

4.4.1 International and EU law and policy

International law and policy

There are no international laws or policies exclusively dedicated to the governance of AI.

EU law and policy

At the EU level, the European Commission proposed a regulatory framework for the governance of AI in April 2021, which includes a draft regulation on the governance of AI (proposed AI Act).[646] The primary objective of the proposed AI Act is to ensure the proper functioning of the internal EU market by setting harmonised rules for developing, placing and using AI systems in the EU, as well as pursing "high level of protection of health, safety and fundamental rights" in the context of AI.[647] The proposed AI Act sets out specific requirements for AI systems[648] and obligations for all value chain participants.

The proposed AI Act follows a risk-based approach, where different legal obligations would be imposed depending on the level of risk posed to safety and fundamental rights. The risk-based approach provides a "risk scale" methodology that differentiates between uses of AI that create classifying into unacceptable risk, high risk and low or minimal risk. AI systems with an 'unacceptable' level of risk would be prohibited.[649] 'High' risk AI systems would be subject to mandatory *ex ante* and *ex post* requirements in order to be placed on the EU market; those requirements would relate to high-quality data, documentation and traceability, transparency, human oversight, accuracy and robustness.[650] For 'low' risk AI systems, there would be limited transparency obligations.[651] Minimal risk AI systems would not be subject to any requirements.[652]

[645] *See* Reiners et al. (2021) 'The Combination of Artificial Intelligence and Extended Reality: A Systematic Review', *Frontiers in Virtual Reality*, 2 [Online]. Available at: https://doi.org/10.3389/frvir.2021.721933.
[646] Draft AI Act, supra note 549.
[647] Ibid, Preamble.
[648] In the proposed AI Act, artificial intelligence is defined as: "software that is developed with one or more of the techniques and approaches listed in Annex I and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with". Ibid, Article 3.
[649] Ibid, Article 5.
[650] Ibid, Chapter 2.
[651] Ibid, Article 52.
[652] Ibid, Preamble, para. 81.

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4.4.2 Risk classification of XR technologies with AI

Within the EU, XR technologies with AI systems would be subject to the requirements in the proposed AI Act (if adopted) depending on the level of risk posed by the AI system.

Unacceptable risk

XR with AI that poses an unacceptable risk would be prohibited. The proposal identifies four types of prohibited AI systems:

Uses subliminal techniques to manipulate a person's behaviour in a manner that may cause psychological or physical harm for themselves or another person.

Exploits vulnerabilities of any group of people due to their age, physical, or mental disability in a manner that may cause psychological or physical harm.

Enables governments to use general-purpose "social credit scoring."

Provides real-time remote biometric identification in publicly accessible spaces by law enforcement except in certain time-limited public safety scenarios.[653]

The fourth category is unlikely to apply to XR, as it includes the element of "publicly accessible spaces", which refers to physical (not digital or virtual) public spaces.[654] It is possible, in theory, that the remaining three types of AI systems may be part of an XR system and may therefore be subject to prohibition.

High risk

XR applications with AI that poses a high risk would be subject to mandatory requirements in order to enter the EU marketplace. The classification of high risk would be based on the function and specific purpose of the AI system; specific high-risk domains identified in the proposal include education, employment, and justice systems.[655] Therefore, any XR that uses in AI in high risk domains would need to meet the mandatory requirements. In general, any XR application that is designed to determine and decide the access of a natural person to essential private services, public services, financial benefits, education, training, jobs, migration, asylum, and border control, including verifying the authenticity of travel documents, would fall within the scope of the AI proposal. As there are already many existing XR applications deployed in these domains (see Sections 6.1.7, 6.1.8 and 6.1.9), it is likely they would likely be classified as high-risk and subject to the mandatory requirements under the proposed AI Act.

Low and minimal risk

XR technologies with AI classified as low risk would only be subject to transparency requirements.[656] For example, in the case of AI-based XR systems created to interact with people (e.g., AI-based chatbots), users should be made aware that they are interacting with an AI machine.

XR applications with minimal risk AI would not be subject to any requirements but would be encourage subscribe to voluntary codes of conduct.[657] The EC has stated that "vast majority of AI

[653] Ibid, Article 5.
[654] Ibid, Article 3(39).
[655] Ibid, Article 6-7, Annex III.
[656] Ibid, Article 52.
[657] Ibid, Article 69.

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systems fall into this category" and that the category includes AI-enabled video games.[658] As many current XR systems are deployed for gaming and other entertainment,[659] a significant portion of XR with AI would likely fall in the 'minimal' risk category. Therefore, it is possible – and perhaps likely – that the 'vast majority' of XR with AI would not be subject to any mandatory obligations under the proposed AI Act.

4.4.3 Environmental impacts of AI in XR

AI systems, and the XR technologies that utilise them, may have significant environmental and energy impacts, including carbon footprints.[660] The proposed AI Act does not address this issue with any mandatory requirements. However, individual AI providers and organisations are encouraged to develop voluntary codes of conduct which may include, among other issues, 'environmental sustainability'.[661]

4.5 Digital services governance

Since many XR applications provide services in the online environment, any laws governing the provision of digital services would apply to those XR systems. While there are no international laws governing digital services specifically, the EU has proposed a regulatory framework dedicated to the governance of digital services. This framework, which includes a proposed Digital Services Act, does not mention XR explicitly but would apply (if adopted as written) to providers of XR offering services in the digital environment.

4.5.1 International and EU law and policy

International law and policy

There are no international laws or policies exclusively dedicated to the governance of digital services, however it has been suggested that the legal framework applicable to trade in services under international trade law is additionally inclusive of digital services.[662]

EU law and policy

At the EU level, the European Commission proposed a regulatory framework for the governance of digital services in December 2020, an aspect of which includes a draft regulation on the governance of digital services (proposed Digital Services Act).[663] The draft Digital Services Act (DSA), on which a political agreement was reached in April 2022, sets out a horizontal framework to ensure

[658] European Commission. (2021) *Press release: Europe fit for the Digital Age: Commission proposes new rules and actions for excellence and trust in Artificial Intelligence* [Online]. Available at: https://ec.europa.eu/commission/presscorner/detail/en/IP_21_1682.
[659] Grand View Research. (2021) *Report Overview - Virtual Reality Market Size, Share & Trends Analysis Report By Technology (Semi & Fully Immersive, Non-immersive), By Device (HMD, GTD, PDW), By Component (Hardware, Software), By Application, By Region, And Segment Forecasts, 2022 – 2030* [Online]. Available at: https://www.grandviewresearch.com/industry-analysis/virtual-reality-vr-market/methodology#.
[660] *See*, Andrews, E.L. (2020) *AI's Carbon Footprint Problem / Stanford University Human-Centered Artificial Intelligence (HAI)* [Online]. Available at: https://hai.stanford.edu/news/ais-carbon-footprint-problem.
[661] Draft AI Act, supra note 549, Article 69.
[662] See, e.g., Willemyns I. (2021) *Digital Services in International Trade Law* (Cambridge University Press) Available at: https://doi.org/10.1017/9781108946353.
[663] Draft Digital Services Act, supra note 600.

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transparency, accountability and regulatory oversight of the EU online space.[664] The primary purpose of the proposed DSA is to protect internet users and their fundamental rights by establishing new standards and rules for online platforms regarding illegal and harmful content. The potential implications of the proposed DSA for citizens, business users and providers of digital services, alongside society at large, are summarised in the table below.

Table 6: Potential implications of the proposed DSA

Citizens	• Better protection of fundamental rights • More choice, lower prices • Less exposure to harmful and/or illegal content
For providers of digital services	• Legal certainty, harmonisation of rules • Easier to start up and scale up in Europe
For business users of digital services	• More choice, lower prices • Access to EU-wide markets through platforms • Level playing field against providers of illegal content
For society at large	• Greater democratic control and oversight over systemic platforms • Mitigation of systemic risks, such as manipulation or disinformation

4.5.2 Obligations for a safe and transparent online environment

The proposed DSA imposes different sets of obligations for distinct categories of online intermediaries according to their role, size and socio-economic impact on the online environment.

- **Intermediary services**: Providers of network infrastructure services, including 'mere conduit' services (e.g., internet access), 'caching' services (e.g., automatic, intermediate and temporary storage of information) and 'hosting' services (e.g., storage of information supplied by a recipient of the service).[665]
- **Online platform**: Providers of hosting services which store and disseminate information to the public at the request of the recipient of the service.[666]
- **Very large online platforms (VLOPs)**: Providers of hosting services that pose a particular risk of societal harm in disseminating harmful content. Specific rules are applicable to such platforms, defined as those which reach more than 45 million active recipients in the EU every month,[667] therefore likely including some XR developers, such as Meta.

[664] Madiega T. (2021) *Digital Services Act [EU Legislation in Progress]* / European Parliamentary Research Services [Online]. Available at: https://epthinktank.eu/2021/03/05/digital-services-act-eu-legislation-in-progress/.
[665] Draft Digital Services Act, supra note 600, Article 2(f).
[666] Ibid, Article 2(h).
[667] Ibid, Article 25.

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The draft DSA stipulates various basic obligations applicable to all providers of XR intermediary services falling within the scope of the regulation, including those established outside of the EU,[668] such as establishing a point of contact,[669] appointing a legal representative if based outside the EU,[670] and publishing annual reports on content moderation pursuant to the principle of transparency.[671] Alongside these basic obligations, there are specific obligations applicable to XR hosting services, such as establishing notice and action mechanisms,[672] and additional obligations applicable to all XR online platforms, except for micro and small enterprises,[673] including to establish an internal complaint-handling system[674] and protective measures against misuse,[675] and to ensure the traceability of traders.[676] Micro and small enterprises will have obligations proportionate to their size and ability while ensuring they remain accountable. The same fundamental principle applies to XR providers properly classified as VLOPs which, in recognition of their potentially significant economic and societal impact, are subject to certain substantive obligations in addition to the basic obligations outlined above, including conducting annual risk assessments[677] and independent audits,[678] alongside appointing compliance officers.[679]

4.5.3 Discrimination

As highlighted above (see Section 4.1.12), the use of XR platforms may lead to users, particularly vulnerable users, suffering discrimination. In recognition of this risk to users of digital services, it is stated within the preamble to the draft text of the DSA that the proposal seeks, inter alia, to ensure that users can exercise their right to non-discrimination.[680] Building on this commitment to the protection of individuals against discrimination, the proposed DSA requires, more substantively, that VLOPs explicitly consider the risk of discrimination in their yearly systemic risk assessments,[681] and, moreover, provides that the European Board for Digital Services, as constituted by the DSA,[682] can recommend the Commission draws up crisis protocols which, inter alia, clearly set out the relevant measures to safeguard against any negative effects to the right to non-discrimination.[683]

[668] Ibid, Article 1(3).
[669] Ibid, Article 10.
[670] Ibid, Article 11.
[671] Ibid, Article 13.
[672] Ibid, Article 14.
[673] Ibid, Article 16.
[674] Ibid, Article 17.
[675] Ibid, Article 20.
[676] Ibid, Article 22.
[677] Ibid, Article 26.
[678] Ibid, Article 28.
[679] Ibid, Article 32.
[680] Ibid, preamble, p. 12.
[681] Ibid, Article 26.
[682] Ibid, Article 47.
[683] Ibid, Article 37(4)(e).

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5. Conclusions and future outlook

As shown in Section 4, XR technologies present multiple and complex legal issues and challenges with wide-ranging socio-economic and human rights implications. A survey of the international and EU law landscape has revealed that there is no dedicated legislation with direct application to XR. Such technologies are nonetheless subject to various domain-specific international and EU law frameworks, including human rights law (see Section 3.1) privacy and data protection law (see Section 3.2), and consumer rights law (see Section 3.3). Further legislative measures at the EU level are also expected, with each of the e-Privacy Regulation, the AI Act, the Digital Services Act, the Data Act and the Data Governance Act at varying stages of the legislative schedule (see Sections 3.2 and 3.4) and all likely to impact upon the regulation of XR technologies.

Even in the absence of additional regulatory measures, a key advantage of the existing rights-based legal frameworks is the built-in flexibility to adapt to the challenges posed by new and emerging technologies, including XR, in order to better protect the rights of individuals against interference. Certain human rights frameworks, for instance, are treated as "living instruments",[684] in accordance with which they are constantly evolving to address new challenges, whether it be through expanded judicial interpretations of existing rights, or the introduction of new rights to supplement existing protections. A more expansive interpretation of the right to a healthy environment, for instance, may require that States place restrictions on the use of materials for XR development which cause environmental harms, such as habitat destruction and toxic waste contamination. Meanwhile, the formal recognition at the international or EU level of a right to be online and a right to disconnect, either as an aspect of the right to benefit from scientific progress and the right to rest and leisure, or as standalone rights, may require that States take measures to ensure equal access to engaging with and clear limits upon the use of digital environments, particularly those configured as virtual workspaces (see Section 4.1.13). Such mechanisms could significantly impact States' obligations in relation to both individuals and the development of XR.

A future challenge, however, concerns the definition to be attributed to XR technologies, the significance of which is in determining the applicable basis for legal regulation. In the context of consumer protection, for instance, the definition of XR may determine the applicable recourse mechanism in the event of a breach of a consumer right, such as the right to safety (see Section 4.3.2). Bearing in mind some of the issues associated with the definition of Artificial Intelligence (AI) for the purposes of the proposed AI Act, particularly the potentially underinclusive definition based on approaches and techniques used to create an AI system rather than any other metric, legislators and policymakers at the international and EU level will be required to carefully consider the question of the most suitable and comprehensive definition for XR technologies in the context of legal regulation.

An additional future challenge relates to the regulation of data collected and processed in XR technologies. The issue is not simply the sheer volume of data used by XR technologies to enable core functionality, but also that this data is often of varying type and collected from multiple sources, in relation to which there will be different privacy and data protection considerations and variation in the specific legal provision to be complied with (see Section 4.2.3). In practice, this may impose a

[684] See, e.g., European Court of Human Rights. (1978) *Tyrer v. The United Kingdom*, 25 April 1978, No.5856/72, CE:ECHR:1978:0425JUD000585672, para.31: "The Court must also recall that the Convention is a living instrument which, as the Commission rightly stressed, must be interpreted in the light of present-day conditions."

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significant regulatory burden on XR developers and create gaps in the protection of the fundamental rights of XR users.

Overall, this analysis of international and EU law and policy in relation to XR has highlighted how the discussion is primarily framed as a question of *how best* to regulate such technologies, rather than a question of *whether* such technologies should be developed. This contrasts with AI, another emerging technology with application to XR, in relation to which regulators are increasingly seeking to restrict certain AI systems and/or uses of AI systems which may infringe upon protected rights.[685]

At present, there is no proposal to comprehensively regulate XR at the international or EU level. Further governance of this technology family may occur at the national level, the possibility for which will be analysed in a forthcoming TechEthos report on legal frameworks at the national level (Deliverable 4.2).

[685] Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) And Amending Certain Union Legislative Acts COM/2021/206 final (draft AI Act), Article 5.

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