KIRCHNER-FREIS

LEGAL DIMENSION OF VIRTUAL AND AUGMENTED REALITY

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Editor

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PREFACE

These project and conference proceedings are based on the research project "LEG-ART-CHIP" of the Department of Law at the University of Genoa and the Hugo Grotius gGmbH (2019-2025) as well as on the workshop "Legal Dimension of Virtual and Augmented Reality" held on 30 June 2022 at the University of Genoa, and have been supplemented by additional contributions from various authors on this topic.

First of all we thank Prof. Dr. Lorenzo Schiano di Pepe from the Department of Law of the University of Genoa, responsible for the project and who applied for the funding of the research project by the University of Genoa, under the "Call for Incentives for European Projects". Without the generous funding by the University of Genoa the project and this publication would not have been possible.

We express our sincere gratitude to the colleagues who contributed to this publication on „Legal Dimension of Virtual and Augmented Reality", for their legal perspectives and insights about augmented and virtual environments. Virtual reality (VR), augmented reality (AR) and extended reality (XR) — as an umbrella term covering VR and AR — have become an integral part of the multimedia landscape in recent years. These technologies will allow users to enter worlds which are far beyond our normal experience. They can allow people to learn new skills, explore new places, and experience times and events in ways that otherwise would have been impossible.

With its technical characteristics and functionalities, Web 3.0 is considered a prerequisite for the implementation of virtual worlds and immersive simulations. It enables interaction between virtual spaces using avatars, as well as the creation and exchange of digital goods. The term 'metaverse' originates from the Web 3.0 era and is the next-generation internet. It is an umbrella term that encompasses a multitude of virtual worlds. A comprehensive metaverse, however, does not yet exist. Rather, there are different metaverse platforms, each of which can be regarded as a subform of the metaverse. What these platforms have in common is that they are comprehensive digital spaces where users can experience interactive, three-dimensional environments and participate in cultural, social and business interactions with other users from all over the world, regardless of national borders. The metaverse development in terms of interoperability is uncertain, although intended by some of the different global actors which contribute with different kind of devices, platforms, applications, and services to it, e.g. Google, Amazon, Microsoft, Meta and Apple — all with own objectives and priorities. Interoperability would allow users of the metaverse to move between virtual spaces and access different platforms and services using the same devices and digital assets.

Access to these virtual and augmented worlds is often supported by the use of special devices with VR and AR technologies that enable an immersive experience, e.g. AR and VR headsets. VR headsets allow for the most immersive encounters, blocking your view from the physical world and giving you a full embodied 360 degree experience. The headsets do not only allow you to embody a 3D avatar, but you will also be able to interact with 3D virtual objects. AR, as adding a digital layer onto the real world, providing information, entertainment or connection while still allowing to see and interact with the physical world. It is possible to engage with AR on any device with a screen and a camera, including glasses, smartphones and tablets. AR glasses also provide the opportunity to record and share what people who use them see, and to project the content out into the world.

From a legal perspective, these developments pose many challenges. On the one hand, almost all legal issues from the real world also arise in the virtual world and the augmented world, albeit in a modified form. On the other hand, there are also many VR- and AR-specific legal issues.

We hope that this book will contribute to enriching the discussion on how the law should be applied to virtual and augmented reality worlds, and that it will provide support in deciding which legal issues are relevant when designing and using virtual and augmented reality.

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1. COPYRIGHT EXCEPTIONS IN MUSEUMS AUGMENTED REALITY

Raffaele Servanzi

1.1 Objects of augmented reality

Augmented reality involves a series of logical objects, and in particular (i) a first basic object, sometimes consisting of a work of authorship; (ii) a second object added to it, which may consist of another work protected by copyright; (iii) a first device comprising a camera, a screen and a server, and possibly also a second device containing a "remote" server connected to the first via the Internet; (iv) a software that virtually juxtaposes the added object to the basic one, and that can be placed on the server of the first device or on that of the second one; and (v) the so-called "augmented reality" that constitutes the result of the virtual juxtaposition of the object added to the basic one with the devices and the software mentioned above. For the purposes of this article, conventionally and for the sake of brevity, the individual logical objects just mentioned will be indicated as follows: the basic object or work (the first one); the added object or work (the second one); the devices (the third one); the software (the fourth one); and their result will be called "augmented reality" (the fifth).

1.2 Juridical elements herein addressed

Museums do not always own the copyrights on basic and added objects. Finding all the rights holders on basic or added objects and negotiating licences with them may entail substantial transaction costs. It is therefore necessary to examine whether and when such research is needed. In particular, it should be considered whether there are in place uses among those reserved to the holder of the relevant copyright by the museum or by the user of the augmented reality. If so, it is also necessary to verify whether such uses are liberalised by the rules on exceptions and limitations.

I will limit myself here to considering the issue now raised in relation to the reproduction right and the mandatory exceptions provided for by EU directives. However augmented reality may also involve, depending on the case, communications to the public or elaborations of basic and added works, and these uses might be liberalized by one or other of the exceptions and limitations provided for by member States in addition to the ones imposed by EU law. On this topic, I refer to my recent paper[1].

This chapter is dated: 25/05/2022.

[1] See Raffaele Servanzi, 'Realtà aumentata e diritto d'autore' [2021] Le nuove leggi civili commentate 444.

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1.3 Augmented reality and temporary reproduction

An augmented reality user shoots the basic object with a camera, transmits the image to a software that virtually juxtaposes the added object, and finally displays the augmented reality on a screen. Moreover, as already stated, the software is sometimes situated "locally" on the same device containing the camera and the screen, and sometimes "remotely" on an external server that communicates with the camera and the screen, generally via Internet[2].

According to the augmented reality procedures used today, when the software is "local" the above-mentioned sequence realizes (only) the following reproductions: (1) in the phase in which the added object is juxtaposed to the basic object, the software reproduces both of them on the RAM memory of its server[3]; (2) in the phase in which it prepares the visualization of the augmented reality on the screen, the device reproduces it on the same RAM memory, and in doing so reproduces a second time the basic object and the added objects, as the augmented reality includes them; and finally (3) the device "reproduces" the augmented reality on the screen.

When, on the contrary, the software is located "remotely" the same sequence realizes also further reproductions necessary to the dialogue between the first device acting as camera and screen and the second device on which the software is located: in particular (4) in the phase in which it sends the basic object to the second device, the first one reproduces it on its RAM; and (5) in the phase in which it receives the augmented reality from the second device, the first one realizes a copy of it on its RAM, and so reproduces again the basic object and the added objects, as the augmented reality includes them.

These activities are all free, if and in so far as the augmented reality is not otherwise unlawful, as they fall within the scope of art. 5.1 of Infosoc Directive 29/2001. In particular, Article 5.1 of Infosoc Directive liberalises acts of reproduction which are cumulatively "temporary", devoid of any “independent economic significance”, "transient or incidental", "an integral part of a technological process", and carried out (as far as it is of interest here) "for the sole purpose of enabling a lawful use of a work". All the reproductions identified above are indeed temporary, since they persist only for the time necessary for their processing (those referred to in number 1), their display on the screen (those referred to in numbers 2 and 3), or their transmission/reception (those referred to in numbers 4 and 5). The same reproductions are also of no economic significance on their own, because they are only useful insofar as they are instrumental to augmented reality, but in themselves have no further "proper" use and thus no value. They are also transient for the same reason that they are temporary[4]. They are also integral parts of a technological process because they are indispensable for augmenting reality[5]. And finally, they are performed for the sole purpose of

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[2] On this point, see paragraph 2 of this paper.

[3] When they concern sequences of moving images, these temporary copies on the RAM cannot always be considered as reproductions because the sequence of images is often not copied all at the same time, and it is therefore necessary to check each time whether the portion reproduced simultaneously constitutes in itself a result protected by copyright (thus Giovanni Guglielmetti, ‘Riproduzione e riproduzione temporanea’ [2002] Annali italiani del diritto d’autore 3, 24).

[4] According to the Court of Justice of the European Union, an act of reproduction is transient when "its duration is limited to what is necessary for the proper completion of the technological procedure in question, it being understood that that process must be automated to suppress the act automatically, without human intervention, once its function of enabling the completion of such a process has come to an end" (Case C-5/08 *Infopaq* [2009] ECR I–06569 para 64).

[5] The on-screen display considered in the text at para. 3 constitutes the outcome of the technological process for augmented reality. It is reasonable to consider that the outcome of a process constitutes an "integral part" of it and, accordingly, one author has pointed out that “art. 5.1 exempts the reproductions technically necessary to legitimately consult [...] online material, and therefore the reproductions made during browsing by the final user, as well as the temporary on-screen displays of the protected works or materials when they are also qualified as a form of temporary reproduction [Guglielmetti (n 4) 42].

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allowing a legitimate use of the work, at least if and insofar as the augmented reality product does not infringe the rights to the basic work or to the added works [6].

1.4 Augmented reality and permanent reproduction: an overview

The software must activate the added objects only when they are relevant to the basic work framed by the augmented reality user; it must therefore recognise the basic work, i.e. identify in the images taken by the camera elements that are already known to it and which in technical jargon are called "markers"; and for the marker to be known to the software, it must be reproduced on the server used. The role of marker can be played by different objects, and in this regard, it is necessary to distinguish three different hypotheses. In the first hypothesis, the marker function is carried out by small parts of the basic work that are not protected, or by one or more objects placed near to it: in these cases, the creation of the marker is not reserved to the author. In a second hypothesis, the role of marker is carried out by the entire basic work, or by portions of the same that meet the requirements for copyright protection; the compatibility of the relevant reproductions with IP rights will be verified in the next paragraphs. In a third hypothesis, the function of marker is performed by non-creative fragments of the basic work or by other non-protected objects, but these are processed by the software by cross-referencing them with other information already stored, and in this case, it is necessary to check each time whether the information now mentioned constitutes reproductions of a protected part of the basic work. In the affirmative case, the same situation occurs as in the first hypothesis; in the negative, the second hypothesis applies.

Furthermore, the software must have access to the added works in order to juxtapose them with the basic ones. The augmented reality procedures most frequently used today respond to this need by storing and then reproducing the first ones on the server used by the software.

The following paragraphs verify whether the above-mentioned permanent reproductions are liberalized by mandatory exceptions provided for by EU law.

1.5 Possible reasons for the lawfulness of permanent reproductions: mandatory exception provided by Directive 28/2012 concerning orphan works

Orphan Works Directive 28/2012 provides that in certain cases works for which it is difficult to identify the right-holder (so-called "orphan" works) may be used (inter alia) by museums open to the public even without the author's consent, unless he declares to opt out of the exception and therefore to exclude its application.

The beneficiaries of this exception relating to orphan works are identified in Article 1.1 of Orphan Works Directive 28/2012, according to which it is applicable to “publicly accessible libraries, educational institutions and museums, as well as archives, film or sound heritage institutions and public-service broadcasting organisations established in the Member States, with the aim of achieving goals related to their public-interest missions”. Here, the expression "accessible to the public" suggests that the determining factor is accessibility to the public and not the public or private nature of the subject managing the museum collection: the discipline here considered is therefore applicable to all museums accessible to the public.

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[6] According to the Court of Justice of the European Union, the "lawful use" of a work under Article 5.1 of the Infosoc Directive 29/2001 is also that which is not authorised by the author but which is liberalised by the system of exceptions and limitations (Joined Cases C-403/08 and C-429/08 *Football Association* [2011] ECR I-09083, para 169).

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The works subject to the orphan works exception are indicated in Article 1.2 of Directive 28/2012[7].

(i) In particular, Art. 1.2(a) of Orphan Works Directive 28/2012 states that this exception applies to all "works published in the form of books, journals, newspapers, magazines or other writings contained in the collections of publicly accessible libraries, educational establishments or museums". The expression "writings" makes it clear that Orphan Works Directive 28/2012 is not applicable to paintings and statues because art 2 of the CUB distinguishes between “works of drawing, painting, architecture, sculpture” and “writings”; vice versa, a shareable thesis identifies "writings" with printed works[8].

(ii) In addition, Article 1.2(b) of Orphan Works Directive 28/2012 states that the exception concerning orphan works applies to all “cinematographic or audiovisual works and phonograms in the collections of publicly accessible libraries, educational institutions or museums as well as in the collections of archives or of film or audio heritage institutions".

(iii) Furthermore, Article 1.2(c) of Orphan Works Directive 28/2012 states that the exception concerning orphan works also applies to "cinematographic or audiovisual works and phonograms produced by public-service broadcasting organisations up to and including 31 December 2002 and contained in their archives".

(iv) And in conclusion, the exception considered here does not seem to apply to basic works belonging to contemporary art: whereas, for example, it could apply to basic works consisting of comic strips belonging to museums dedicated to this kind of creation. More frequently, the exception considered here may apply to added works, especially if they consist of audiovisual works.

The uses of orphan works permitted by Orphan Works Directive 28/2012 are all regulated by art. 6 of this directive, which liberalises (inter alia) reproductions "for the purposes of digitisation, making available, indexing, cataloguing, preservation or restoration". The reproduction of the basic work to create a marker constitutes digitisation, and therefore certainly falls within the liberalised uses because art. 6 of Orphan Works Directive 28/2012 expressly authorises reproduction "for the purpose of digitisation" without requiring that this digitisation itself has a particular purpose, and therefore allows it (also) if its function is to store a marker. On the other hand, the reproduction of an added work does not always constitute digitisation, since it often concerns works already in digital format. However, it is intended to be communicated to the public[9] and can thus be included among those "for the purpose of making available" if it is considered that in the context of Article 6 of Orphan Works Directive 28/2012 this expression also refers to simple communication to the public[10].

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[7] The list in Article 1.2 of Orphan Works Directive 28/2012 is exhaustive, because according to a well-established orientation of the Court of Justice the rules on exceptions and limitations are of strict interpretation because they are derogatory rules (see. in particular ex multis Case C-527/15 *Stichting Brein* [2017], para 62.

[8] In this sense Uma Suthersanen and Maria Frabboni, ‘The EU Orphan Works Directive 2012’, in Irini Stamatoudi and Paul Torremans (eds), *EU copyright law - a commentary* (Edward Elgar 2012) 653, 658 et seq.; and Domenico Giordano, ‘L’ambito di applicazione della direttiva 2012/28 sulle orphan works’, [2013] Annali italiani del diritto d’autore 130, 135 et seq.

[9] Since this paper does not concern communication to the public, I refrain from making an excursus here. Therefore, I limit myself to refer about this issue to Servanzi (n 1) 467 et seq.

[10] For my part, I have recently argued that the question should be answered in the affirmative, ibid. 469 et seq.

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1.6 Mandatory exception provided for by Directive 790/2019 concerning out-of-commerce works

Article 8 of Digital Copyright Directive 790/2019 provides that, under certain conditions, out-of-commerce works[11] may be used by "cultural heritage institutions" without the author's consent, unless the author expressly states that he does not wish the exception to apply. The system of rules for out-of-commerce works provides for two different disciplines depending on whether or not there are collective management bodies "sufficiently representative of the rightsholders in the relevant type of works"[12]. In particular, in the first case, Article 8.1 of Digital Copyright Directive 790/2019 gives collective management bodies the power to grant licences to cultural heritage institutions for certain uses of the out-of-commerce works; while in the second case, Article 8.2 of the same directive provides that the cultural heritage institutions may still carry out certain uses of the out-of-commerce works without prior agreement with either the author or the collective management bodies.

The beneficiaries of the two disciplines laid down respectively in Article 8(1) and Article 8(2) of Digital Copyright Directive 790/2019 are 'cultural heritage institutions', which are defined in Article 2(3) of that directive as 'publicly accessible library or museum, an archive or a film or audio heritage institution'. This definition reasonably includes both public and private museums open to the public[13].

The works subject to the two disciplines provided for by respectively Article 8.1 and Article 8.2 of Digital Copyright Directive 790/2019 may belong to any kind of creative results protected by copyright. However, both of these disciplines apply only to "out-of-commerce" works, and according to Article 8.5 a work qualifies as such “when it can be presumed in good faith that the whole work […] is not available to the public through customary channels of commerce, after a reasonable effort has been made to determine whether it is available to the public". Moreover, the same two disciplines apply only to works "permanently present in the collection" of the cultural heritage institution. For my part, I will not dwell on these issues now, and instead merely point out here that Articles 8.1 and 8.2 of Digital Copyright Directive 790/2019 are then applicable to both basic and added works, provided that both are "out of commerce" and are part of the museum's collection.

The permissible uses of out-of-commerce works are regulated by Article 8.1 of Digital Copyright Directive 790/2019 if the market perceives the existence of sufficiently representative collective management bodies. For this case, the permitted uses under Article 8.1 of Digital Copyright Directive 790/2019 expressly include "reproduction"; the provision does not require a particular purpose for this reproduction and therefore also allows it to store basic works as markers or added works as added objects in augmented reality processes.

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[11] On the notion of out-of-commerce works see Melanie Brown, ‘Exploring Article 8 of the Copyright Directive: Hope for Cultural Heritage’ [2020] Jean Monnet Working Papers <https://microsites.bournemouth.ac.uk/cippm/files/2020/05/04-2020-MBrown_Exploring-article-8.pdf> accessed 27 January 2022.

[12] On the licensing profiles provided for by Article 8 of Digital Copyright Directive 790/2019 see SARTI, ‘Il licensing collettivo’ [2019] Annali italiani del diritto d’autore 148, and in particular on the requirement of representativeness of collecting societies 162 et seq.

[13] On this point it should be sufficient to observe that Article 2.3 refers (inter alia) to museums without requiring them to be of a public nature, and thus covers a general notion that also includes the particular case of private museums. In the same sense see Séverine Dusollier, ‘The 2019 Directive on Copyright in the Digital Single Market: Some progress, a few bad choices, and an overall failed ambition’ [2020] Common market law review 979, 992, according to whom the notion of "cultural heritage institution" is "likely to encompass a great number of institutions on condition they are open to the public as libraries and museums. Conversely, archives or film institutions would be included in that definition irrespectively of their public accessibility”.

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The uses permitted by Article 8.2 of Digital Copyright Directive 790/2019 concern instead the further and different hypothesis in which there is no sufficiently representative collecting society in the market. In this hypothesis, the uses liberalised by Article 8.2 of Digital Copyright Directive 790/2019 include reproduction "to [...] make available, for non-commercial purposes, works [...] provided that [...] they are made available on non-commercial websites". A first literal interpretation may consider that Art. 8. 2 of Digital Copyright Directive 790/2019 only authorises reproductions instrumental to the making available to the public online of out-of-commerce works, and does not cover reproductions not instrumental to this form of use. If this is the case, this exception is applicable to the reproduction of the basic works in order to constitute markers only in cases where, it is possible to imagine that they are made available to the public[14]; and the same exception is applicable to the reproduction of added objects in order to use them as such only if and when augmented reality makes them available to the public. It seems to me preferable, however, to adopt a different interpretation of Article 8.2 of Digital Copyright Directive 790/2019, which would extend the exception provided for in this provision to reproductions that are not communicated to anyone. At least the following three arguments support this. The first argument is based on logic and on the so called *de maiori ad minus* interpretation, according to which the broader automatically includes the narrower. Given that making a reproduction available to the public may affect the author's interests more than a reproduction intended to remain stored in a digital memory (like for markers) or to be communicated to the public only within the museum (like for added works), if the former is allowed, then *a fortiori* reproductions of markers and added objects must be as well. The second argument is of a systematic nature: the discipline of art. 8.1 of Digital Copyright Directive 790/2019 (which applies when there are sufficiently representative collecting societies) admits reproductions even if they are not intended to be made available to the public and, moreover, there does not seem to be any reason why, instead, when there are no sufficiently representative collecting societies, reproductions should be allowed only if they are made available to the public. The third argument is offered by the preparatory works of Digital Copyright Directive: Article 8.1 of Digital Copyright Directive 790/2019 was already present in the proposal for a directive originally submitted by the Commission, whereas Article 8.2 of Digital Copyright Directive 790/2019 was formulated ex novo by the Parliament. This different "historical" authorship of the two formulas advises against attributing decisive relevance to the small differences between them thus applying the so called principle *ubi lex voluit dixit, ubi noluit tacuit*. If the interpretation I have proposed here is correct, then the exception in Article 8.2 of Digital Copyright Directive 790/2019 relating to out-of-commerce works can be applied not only to reproductions of the basic works for the purpose of constituting markers but also to reproductions of the added works for use as added objects.

Articles 8.1 and 8.2 of Digital Copyright Directive 790/2019 only allow uses "for non-commercial purposes" and it is therefore necessary to verify whether a use is such only when it does not contribute even indirectly to making a profit or vice versa even when it is not directly remunerated. The problem is reminiscent at first sight of the one posed in Italian domestic law by the notion of "profit-making purpose" [“scopo di lucro”] under Articles 15 and 73 of the Copyright

[16] The augmented reality user does not directly benefit from the marker images, which are instead only for the internal use of the software and its device[14]. However, the Court of Justice and the *communis opinio* have not yet unequivocally clarified whether the European discipline also reserves to the author non-expressive uses, i.e. intended not for man but only for the machine. Nonetheless, it seems to me that when EU law does not reserve these activities to the author, then the copy of the marker on the server does not constitute a reproduction of the intellectual work and its accessibility by the software does not make it available to the public; whereas when EU law also reserves to the author uses within a machine, then the storage of the marker can be qualified as a reproduction, and its accessibility by the software integrates a communication to the public or, depending on the case, a making available to the same [on this issues, see amplius Servanzi (n 1) 468].

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Act[15]. However, Article 8 of Digital Copyright Directive 790/2019 does not contain any reference to national laws; the notion of uses for "non-commercial purposes" therefore constitutes an autonomous concept under EU law. Its meaning must be derived from the EU directives harmonising national copyright laws and may also be very different from the meaning of similar expressions in the purely domestic law of the Member States[16]. It seems to me, therefore, that any copy of the work that is not directly remunerated constitutes a reproduction for non-commercial purposes, even if the person making it is an entrepreneur, and even if that reproduction affects his profit. This interpretation is suggested first of all by an argument of a systematic nature: when the European Union legislature wishes to refer also to indirect commercial advantages, it says so explicitly and in very clear terms, as it does for example in Article 4.2(c) of Infosoc Directive 29/2001, Article 1.3 of Directive 100/1992 and Article 4.2(b) of Infosoc Directive 29/2001, which expressly refer to "direct or indirect" economic advantages. It is further suggested by an argument *ab absurdo*: Art. 4.3 (a) of Infosoc Directive 29/2001 provides for an exception for teaching purposes justified by the "non-commercial purpose" pursued[17]. Recital 42 of the same directive makes it clear that in applying this exception 'the non-commercial nature of the activity in question should be determined by the activity as such', and that conversely 'the organisational structure and means of financing of the body in question are not the decisive factors'; thus EU law does not apply the 'non-commercial' exceptions only to so-called non-profit organizations, but on the contrary wants to extend them also to those that pursue and make a profit. The opposite view, on the other hand, regards any use that has an effect on profit as having been made for commercial purposes; it can then only determine with difficulty at what point that effect ceases to be relevant. It therefore always regards any use by a profit-making entity[18] as being made for commercial purposes, and this leads to a conclusion that is incompatible with recital 42 in the preamble to Infosoc Directive 29/2001, according to which 'the organisational structure and the means of financing of the entity in question are not decisive factors'. If this is the case, both the reproductions of the basic works to constitute markers as well as those of the added works are always made "for non-commercial purposes", even when the museum charges a fee for the use of augmented reality because these uses are not directly remunerated.

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[15] On this subject, I will limit myself to recalling that, according to the most widespread opinion, the expression "profit-making purpose" used by the Italian legislator concerns only the direct profit-making purpose of the single use (Paolo Greco and Paolo Vercellone, *I diritti sulle opere dell'ingegno*, (UTET 1974), 138; Maurizio Ammendola, 'Scopo di lucro diretto, scopo di lucro indiretto e interpretazione dell'art. 15 l.a.', [1998] Annali italiani del diritto d'autore *508*; and in case law, among others, Trib. Milano, 28 January 2014, [2015] Annali italiani del diritto d'autore *1677*; Trib. Torino, 21 March 2008, [2015] Annali italiani del diritto d'autore *1658*). However, one author has argued that a use must always be considered as "for profit" when it is part of a lucrative activity and has thus concluded that also the dentist who turns on a radio in the waiting room of his professional office makes a communication to the public of the radio contents for profit (Luigi Carlo Ubertazzi, 'Spunti sulla comunicazione al pubblico dei fonogrammi', [2005] Annali italiani del diritto d'autore 292. In a sense partially in line with this thesis, see in Italian case law Cass. 1 September 1997 n. 8304, [1998] Annali italiani del diritto d'autore *508*, with a note by Ammendola).

[16] In particular, according to the case law of the Court of Justice, "the terms of a provision of Community law which makes no express reference to the law of the Member States for the purpose of determining its meaning and scope must normally be given an independent and uniform interpretation throughout the Community" (Case C-327/82 *Ekro* [1984] ECR 107, para 11).

[17] In particular, Art. 4.3(a) of the Infosoc Directive 29/2001 authorises Member States to provide for an exception to the reproduction and communication to the public rights "where the use is for the sole purpose of illustration for teaching purposes or scientific research, provided that, save where not possible, the source, including the author's name, is indicated to the extent justified by the non-commercial purpose pursued".

[18] The observation according to which whoever considers as having taken place for commercial purposes any use that has affected the profit ends up considering as such any use by a profit-making entity was set out by Ammendola (n 16), who interpreted the requirement of the absence of the purpose of profit under art. 15 of the Italian copyright Law.

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2. PROTECTING AR AND VR PRODUCTS THROUGH EU DESIGN LAWS

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2.1 Introduction: protecting through design law the AR and VR digital images

The AR and VR technologies imply that digital images are overlaid onto the real world. This work focuses on the protection of those images, especially when developed by cultural institutions and entertainment companies (the digital images) as design, pursuant to the European Union design law system. This system[1] has been established by both the Council Regulation (EC) 6/2002 of 12th December 2001 on Community designs, which grants two Community design rights, and by the European Parliament and Council Directive 98/71/EC of 13th October 1998 on the legal protection of design[2] which harmonises national laws. The rights granted to designers by the system are (a) the Community registered design right which provides the holder with an exclusive protection in the whole Union for a maximum of 25 years as from the date of the filing of the application; (b) the unregistered Community design right which provides the holder with an automatic anti-copying right in the whole Europe for 3 years; (c) the national registered design law which provides the holder with an exclusive national protection for a maximum of 25 years from the date of the filing of the application. The EC Dir 98/71 harmonises the substantive aspects of Member States' National law.

In this work I would argue that the digital images can be included in the subject matter of EU design protection and deal with the terms and conditions of this protection. Before starting this analysis, I would like to point out the rational underlying the European Union design law. The EU system not only set out to harmonize the European national design laws to avoid distortions in the internal market as regards goods embodying design[3]. The preparatory works suggest that the EU system aims at granting to valuable registered designs an effective protection in order to encourage serious investments in this field, regarded as a

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This chapter is dated: 21/03/2022.

[1] [2002] OJ L3/1. Hereinafter CDR.

[2] [1998] OJ L289/28. Hereinafter EC Dir 98/71.

[3] European Commission 'Explanatory memorandum to proposed Design Regulation' COM(93) 342, January 31, 1994 [1994] [1994] OJ C29/1, Reg I 1.3-1.5. See also EC Dir 98/71, Rec 1 and 3; CDR, Rec 7 and 8.

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key one for the EC competition strategy[4]. To make this concern clearer the preparatory works explain that industries in developing countries enjoy a significant reduction of labour cost and can found their marketing strategy on price. In this contest design is a key marketing tool for European industries which are facing price competition world-wide[5]. Moreover, innovation based on design can stimulate a high level of production, sale and employment even in the period when technological innovation is lacking and cannot lead to significant differentiation of product on the market.

2.2 The AR and VR products are within the scope of protection of EU design protection

A first issue to be dealt with is whether the digital images are within the subject matter of design protection in the EU system. Pursuant to Articles 3(a) CDR and 1(a) EC Dir 98/71: ''*design' means the appearance of the whole or a part of a product resulting from the features of, in particular, the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation*'. Pursuant to articles 3(b) CDR and 1(b) EC Dir 98/71: ''*product' means any industrial or handicraft item, including inter alia parts intended to be assembled into a complex product, packaging, get-up, graphic symbols and typographic typefaces, but excluding computer programs*'. In addition, to be protected, the design as defined above shall '*remains visible*' during normal use of the complex product into which has been incorporated (Articles 3(a) CDR and 1(a) EC Dir 98/71) and shall not represent the only way to achieve a particular technical effect (Articles 3(a) CDR and 1(a) EC Dir 98/71).

I would argue that the definitions of design and product seem wide enough to include the AR digital images within the scope of protection of the CDR and of the EC Dir 98/71. This is suggested by a literal interpretation of the relevant provisions and by the aim of the EU legislators when drafting them. Notably, Articles 3(a) CDR defines design as the appearance of the whole or a part of a product resulting from its lines, contours, colours, shape, texture, while Articles 3(b) CDR provides for a broad definition of product, including '*graphic symbols*' which constitute per se a product, not necessarily to be applied to an industrial 'material' product. This interpretation is confirmed by the preparatory works of the EU legislation according to which computer software cannot be protected per se by the means of design law, while icons and graphic interfaces which appear on electronic devices can be protected as design in the European Union[6]. Finally, this is confirmed by the aim of the EU

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[4] Explanatory Memorandum, Reg I 4.1-4.5. J Philips, 'International Design Protection, Who Needs it?' [1993] EIPR 431, 434; H Cohen Jehoram, 'The EC Green Paper on the Legal Protection of Industrial Design. Half Way down the Right Track' [1992] EIPR 75; A Kur, 'TRIPs and Design Protection', in C Beier and B Schricker (eds), From GATT to TRIPs: the Agreement on Trade-Related Aspects of Intellectual Property Rights (VCH 1996) 142.

[5] On the market approach underlying the EU design law see A Kur and M Levin, 'The Design Approach revisited: background and meaning', in A Kur, A Levin and J Schovsbo (eds), The EU Design Approach (Edward Elgar 2018) 7.

[6] Explanatory Memorandum, Reg I 4.1-4.5: 'computer programs are not protected as such by the discipline of dis. and mod. However, some static images that appear on the screen, such as fonts, selection icons, menus, fall into the categories of typographical characters, graphic signs or presentations and constitute autonomous products, the appearance of which is registrable if endowed with novelty and individual character'. See A Kur, 'Protection of Graphical User Interfaces under European Design Legislation' [2003] IIC 50; T Dubuisson, 'IP Protection for Graphical User Interfaces in the EU, US and China' [2015] JIPLP 767; S Vousden, 'Protecting GUIs in EU Law' [2011] JIPLP 728.

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system mentioned in the first paragraph above, which is granting to valuable designs an effective protection, irrespectively of the industrial field in which they are developed[7].

A possible cause of exclusion of digital images from design protection could be fund in Articles 4(2)(a) CRD and 3(3)(a) EC Dir 98/71 according to which a design applied to or incorporated in a product which constitutes a component part of a complex product shall only be considered to be new and to have individual character 'if the component part, once it has been incorporated into the complex product, *remains visible* during normal use of the latter (..)'. Also assuming that the support in which the digital images are incorporated could be considered a complex products (which seems to be the case to the extent the digital images are used concretely only in the context of cultural/entertainment AR or VR products[8]), in any event the digital images would remain visible during the normal use made by the end-user. This exclusion is conceived to exclude from protection the so called 'under the bonnet part', which does not normally play a role for the consumer because it is only visible during repair or maintenance[9]. Normal use is the one made by the end user (excluding maintenance, servicing or repair work) and the design images are visible while the end user is enjoying the AR or VR digital images made available by a cultural institution or entertainment company.

A second possible cause of exclusion of digital images from design protection could be the presence in the design of some features dictated by technical function pursuant to Articles 8(1) CDR and 7(1) EC Dir 98/71 according to which '*a design right shall not subsist in features of appearance of a product which are solely dictated by its technical function*'. The purpose of Article 7 is clearly to exclude from protection merely functional designs to demarcate design from patent or utility model protection[10]. This provision is justified by the traditional policy of avoiding restrictive effects on legitimate competition which can arise when functional shapes are monopolised beyond the limits posed by the patent system. This principle, common to the whole European law system, has also been laid down in TRIPs, Article 25[11]. Most scholars have argued that this exclusion should be constructed narrowly in that the design features are excluded when they represent the only way to achieve a particular technical effect[12]. The European Court of Justice held that to determine whether the features

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[7] The praxis of the EUIPO is to allow protection of computers icons https://euipo.europa.eu/ohimportal/en/online-services/design-walkthrough. See also TG Durkin, 'Design protection for graphical users interfaces', in H Hartwig (ed), "Design Law" (Edward Elgar 2021) 348.

[8] Case T 39/13 OHIM v Poli-Eco Tworzywa Sztuczne sp. z o.o. (3 October 2014) para 28.

[9] Explanatory Memorandum, Reg II sub Art 1; Case T 11/08 Kwang Yang Motor Co., Ltd, v OHIM (20 October 2015) para 20; Case Poli-Eco (n 9) para 42; A Kur ''Freeze Plus' Melts the Ice - Observation on the European Design Directive' [1999] IIC 620.

[10] Explanatory Memorandum, Reg I 1.8.2; see also EC Dir 98/71, Rec 14; CDR, Art 10; see P Fabbio, Disegni e modelli (Cedam 2012) 107; T Faelli, 'Art. 31 cpi' in A Vanzetti (ed), Codice della proprietà industriale (Giuffè 2013) 570; M Bogni 'Art. 31 cpi' in C. Galli and G Gambino (eds) Codice commentato della proprietà industriale e intellettuale (Giappichelli 2011) 467.

[11] Agreement on trade-Related Aspects of Intellectual Property Rights (TRIPS) (Marrakech, 15 April 1994 [1994] OJ L336/1).

[12] M Levin 'Art 3 Reg.', in M Franzosi (ed), EC Design and Regulation Commentary (Kluwer 1996) 73; U Suthersanen, Design Law in Europe (Sweet & Maxwell 2000) 33; D Musker, Community Design Law Principles and practice (Sweet and Maxwell 2001) 56; Case C-299/99 Philips Electronics NV v Remington Consumer Products [2001] RPC 745, Opinion of AG Colomer; J Lahore, 'The Protection of Functional Design: the Emended Proposal for an EU Design Directive' [1997] I IPQ 128 and 130; P Auteri, 'La futura disciplina europea del design fra tutela del diritto d'autore e repressione della concorrenza sleale' [1998] Cont. imp. EU 229; F Sanna, 'Disegni e modelli' in LC Ubertazzi (ed), La proprietà intellettuale (Giappichelli 2011) 185.

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of appearance of a product are exclusively dictated by its technical function, it must be established that the technical function is the only factor which determined those features, the existence of alternative designs not being decisive in that regard[13]. Therefore, the EC Design law system doesn't protect bare technical design[14]. Digital images are not dictated by any technical function and then do not fall within this exclusion.

A further exclusion is to be found in Articles 8 CDR and 7(2) EC Dir 98/71. The *ratio* of this provision is to prevent manufactures of design products from creating captive markets for spare part products, by monopolising the shape and dimensions of interconnections and to promote interoperability of parts[15]. It has been argued that the wording of the directive suggests that the exception be construed narrowly[16]. Therefore, it applies only to features which permit a precise correspondence between two products, as in a plug and socket[17]. Digital images do not allow correspondence between products and then do not fall within this exclusion.

2.3 The relevant prior arts are constituted by any design that could have been known by professional circles of one or more member states

The relevant prior art for comparison is common for both the novelty and individual character tests to access protection described below. Any design made available to the public in any way may be a part of a constitute relevant prior art. Nevertheless, the owner of the design right is allowed to object that these 'events could not reasonably have become known in the normal course of business to the circles specialised in the sector concerned, operating within the Community' (Articles 7 CDR and 6 EC Dir 98/71). To ascertain whether a prior art can be considered in judging novelty and individual character courts should therefore appreciate if the event which made it available to the public – even if occurred outside the

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[13] Case 395/16 DOCERAM GmbH v CeramTec GmbH (8 March 2018); see U Suthersanen, 'Excluding designs (and shaper marks): where is the Court of Justice going?' [2019 IIC 157], JJ Du Mont and MK Denis, 'Trends in functionality jurisprudence: U.S. and E.U. design law', in Hartwig (n 8) 49.

[14] The features of a design which are necessary to achieve a technical effect are still protected if the technical function is not the only factor which determined those features.

[15] Explanatory Memorandum, Reg I 8.2 and II sub Art 9; Musker (n 13) 59; V Scordamaglia, 'La nozione di 'disegno e modello' ed i requisiti per la sua tutela nelle proposte di regolamentazione comunitarie' [1995] I Riv Dir Ind 146; G Guglielmetti, 'Pezzi di ricambio, interconnessioni e prodotti modulari nella nuova disciplina dei disegni e modelli [2002] Riv Dir Ind 6. During preparatory works the provisions has been subject to amendments and the final version has been modelled on the must fit provision of the UK unregistered design law.

[16] Musker (n 12) 59; Suthersanen (n 13) 36; Guglielmetti (n 15) 28.

[17] Moreover the exclusion does not apply to interconnecting features which can be reproduced in alternative forms or dimensions and to designs 'serving the purpose of allowing multiple assembly or connection of mutually interchangeable products within a modular system'. Cfr. EC Dir 98/71, Art 7(3). FK Beier, 'Protection for Spare Parts in the Proposal for a European Design Law' [1994] IIC 841, 843; Scordamaglia (n 16) 147; A Horton, 'EU Design Law and the Spare Parts dilemma: the Proposed Regulation and Directive' [1994] EIPR 51; PAE Frassi, 'Protection of Modular Products Under Italian Law' [2002] IIC 267, 267-270. Explanatory Memorandum, Reg II sub Art 9; EC Dir 98/71, Rec. 15; Council Reg, Rec. 11.

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European Union – could reasonably have become known among specialists[18]. Before assessing if the event could reasonably have become known Courts should therefore firstly identify the 'sector concerned' and the 'circles' specialised in this sector and finally investigate whether the way by which the design under consideration was made available to the public is typically know by the said circles.

I would firstly like to clarify what is the 'sector concerned' in this case from the point of view of products. The relevant sector is firstly that of AR products[19]. Nevertheless, this is only the first step to ascertain the prior art to be taken into consideration for judging designs seeking registration. Especially in this field, it may happen that a prior art coming from a different business sector and notably from the 'real world' would be submitted as able to destroy individual character. In this case it is still possible that the antecedent had been known by the relevant circle of the sector concerned in the normal course of business. Article 6 CDR allows to consider not only prior designs belonging to the industrial sector to which the product is applied or incorporated belongs, but also a wider spectrum of items within several classes of goods[20].

A second problem is who the members of the relevant sector are in this case. To solve this problem, we should remember that (a) the absolute concept of novelty has been watered down in the EU system to a relative concept, to guard against the danger that a design right could be invalidated based on antecedents of which the European industry could not possibly be aware; and (b) the design law wants to protect designs which are truly new. These considerations on the rationale of the system suggest that the extension of the knowledge required must be constructed narrowly. Therefore, any professional circle involved in the creation of digital images and marketing of AR products for cultural and entertainment industries can be taken into consideration[21].

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[18] Case 479/12 Gautzsch Großhandel GmbH & Co. KG v Münchener Boulevard Möbel Joseph Duna GmbH (13 February 2014) para 27; Case T-651/16 Crocs Inc. v EUIPO (14 March 2018) para 51; Cases T-22/13 and T-23/13 Senz Technologies v OHIM (21 May 2015) para 29.

[19] Under the registration system admitted by the directive the application for registration can be a useful means for ascertaining the relevant market.

[20] Cases 361/15 and 405/15 Easy Sanitary Solutions BV v Group Nivelles NV (21 September 2017) paras 126 and 133. The problem of whether relevant prior arts are limited to design applied to products in the same commercial sector of the design under consideration or are extended to the whole existing design corpus (without reference to any particular field) has been hotly debated. This latter solution has been argued on the basis of a literal interpretation of EC Dir 98/71, Art 1, which does not expressly link the protection of a design to its application to a special product; EC Dir 98/71, Art. 6 which say that designs has to differ from any preceding design; and EC Dir 98/71, Rec13 which refers to the existing design corpus. See V Laddie, A Prescott, M Vitoria, A Speck and D Lane, The modern Law of Copyright and Design (4th edn Butterworths 2011) 1885. The same interpretation seems to be also suggested by the wording of earlier preparatory works and has been upheld by the Court of Justice in the case Easy Sanitary Solutions quoted above (B Volken, 'Requirements for design protection: global commonalities', in Hartwig (n 8) 6-7; H Hartwig, 'Reciprocity in European design law', in Hartwig (n 8) 145). It has also been argued that prior arts are limited to design applied to products in the same commercial sector of the design under consideration (Case T-15/13 Group Nivelles v OHIM (13 May 2015) para 122; M Levin, 'Art 5 Reg.' in Franzosi' (n 13) 71; Suthersanen (n 13) 38). In any event, CDR, Art 6 certainly allows to consider also prior designs not belonging to the industrial sector to which the product to which is applied or incorporated belongs, but also goods belonging to other classes of goods, especially if the market of these goods may be taken into account and known by those specialised in the market of the product under consideration (Scordamaglia (n 15) 142; Sanna (n 12) 190).

[21] Case 479/12 Gautzsch Großhandel GmbH & Co. KG v Münchener Boulevard Möbel Joseph Duna GmbH (13 February 2014) para 27.

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A third issue I would like to clarify is the geographical extension of the relevant sector. The arguments proposed above suggest that also the geographical extension of knowledge should not be constructed to make the test too easy to fulfil. When a design has already enjoyed a degree of notoriety in the community there is no reason to exclude it from the relevant prior art. Therefore, I would argue that a design already known among the relevant sector of a single European state is a relevant prior art[22].

2.4 The novelty requirement could be easily meet in this field

Novelty excludes from protection only designs which are identical or different only in immaterial details to one prior art[23] and involves merely an objective comparison between the design under consideration and antecedent designs[24]. By contrast individual character is a stricter test which aims to ascertain a strong difference between the design under consideration and the prior art. Hence**,** as the same prior art is relevant for testing novelty and individual character, and the individual character test is far stricter than the novelty test, it may be said that we can hardly imagine a design which shows individual character but lacks novelty[25]. Therefore, in most cases the novelty test seems to be encompassed in individual character and to be useful only to exclude commonplace designs. This is certainly true in connection with the design of digital images, especially if the prior art comes from the real world. It is likely that the design of the real world object is subject to a process of adaptation when turned into a digital image design. Changes to the appearance of a prior design due to technical adaptation reasons are not commonly considered sufficient to exclude novelty[26]. Therefore, the mere transposition of a design from the offline world to the online world does not make it new. However, it is easy to imagine that in the process of 'adaptation' of the design from the offline world to the online world 'material' details may be easily modified, such that the design can be considered new. The requirement of novelty may then be met in most of these cases. The individual character would then be the relevant test to access protection.

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[22] Sanna (n 12) 190.

[23] CDR, Art 5 and EC Dir 98/71, Artt 4 and 6. See Case T-15/13 Group Nivelles v OHIM; Case T-68/11 Erich Kastenholz v OHIM (30 September 2014).

[24] On novelty see also Explanatory Memorandum, Reg II sub Art 5(1); A Kur, 'TRIPs and Design Protection' (n 6) 150; M Levin 'Art 5 Reg.' in Franzosi (n 14) 75; Suthersanen (n 14) 37; Musker (n 14) 26; Scordamaglia (n 17) 134-136; Fabbio (n 12) 19-26; Faelli (n 12) 580.

[25] MH Speyart, 'The grand design' [1997] EIPR 607.

[26] Sanna (n. 12) 191; Fabbio (n. 12) 22.

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2.5 The individual character requirement

2.5.1 The informed user as the consumer of AR and VR cultural/entertainment services or professional working in that field who have had extensive personal experiences in using the AR and VR services

The test of individual character is gauged through the eyes of the informed user[27]. This is a figure of design-oriented user[28] which means a consumer or a professional which has an experience in buying and/or using the products including the design[29]. The adjective 'informed' points out then that the consumer must have not just an average care but particular diligence due to personal experience or in-depth knowledge of the field in question as, without being a designer or a technical expert, 'the user knows the various designs which exist in the sector concerned, possesses a certain degree of knowledge with regard to the features which those designs normally include, and, as a result of his interest in the products concerned, shows a relatively high degree of attention when he uses them'[30]. For the AR design images the informed user is then the individual, consumer of AR and VR cultural/entertainment services or professional working in that field (e.g. a customer assistant at a cultural institution offering the AR service) who have had extensive personal experiences in using the AR services. Conversely, as in other industries, the informed user cannot be a figure with professional knowledge in the field, and notably in the sector of augmented reality and e-design[31].

2.5.2 In testing individual character the wide margin of designer's creativity should be considered

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[27] CDR, Art. 6 and EC Dir 98/71, Art 5.

[28] The informed user is an is 'intermediate' figure between that of the average consumer applicable to trademarks (who is not required to have any specific knowledge and who generally does not make a direct comparison between conflicting trademarks) and that of the person competent in the field with in-depth technical skills (i.e. 'is not the well-informed and reasonably observant and circumspect average consumer who normally perceives a design as a whole and does not proceed to analyse its various details …he is also not an expert or specialist capable of observing in detail the minimal differences that may exist between the designs in conflict'), see Case C-101/11 Baena Group v OHIM (18 October 2012) para 53; Case 281/10 PepsiCo Inc. v Gruppo Promer Mon Graphic SA (20 October 20122) para 59; Case T-367/17 Linak A/S v OHIM (19 December 2018) para 20; Case T-684/16 Ciarko spòlka z ograniczona sp.k. v EUIPO (17 November 2017) para 26; Case T-337/12 El Hogar Perfecto de Siglo XXI SL v OHIM and Wenf International Advisers (21 November 2013) para 21; Case T-80/10 Bell & Boss BV v OHIM and KIN AB (25 April 2013) para 100.

[29] Case T-153/08, Shenzen Taiden Industrial Co. Ltd. v OHIM e Bosh Security Systems BV (22 June 2010) para 46.

[30] PepsiCo (n 30) para 59; Shenzen Taiden Industrial (n 31) para 25; Linak (n 30) para 27; Case T-251/14 Promarc Technics v OHIM (24 January 2017) para 26; Case T-525/13, H&M Hennes & Mauritz BV & Co. KG v OHIM (10 September 2015) para 25; Case T-68/10 Sphere Time v OHIM and Punch SAS (14 June 2011) para 51.

[31] See n 29 above. The EU General Court held that the informed user is neither a designer or technical expert inter alia in cfr. Case T-246/10, Industrias Francisco Ivars SL v OHIM and Motive S.r.l. (6 October 2011) para 16; nor a manufacturer or distributor of the product in Case T-9/07, Group Prometer Mon Graphic S.A. v OHIM and PepsiCo Inc. (18 March 2010) para 62; Kwang Yang Motor (n 11) para 23.

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The first stage of the test of individual character is the assessment of relevant prior art. This common selection is always needed also for the novelty test, which usually come before the individual character exam. This entails therefore that the selection under Article 7 CDR (6 EC Dir 98/71) is the first step for any test in the system. The test does not require the judge to construct the knowledge of the informed user[32] on the market but only its degree of attention to details and peculiar features. The informed user is not asked to remember any anterior prior art but only to compare the design under consideration with the prior art proposed and assesses whether an impression of difference can be drawn based on its general knowledge on the designs populating the relevant market.

The test should therefore be conducted adopting these separate stages: (a) identifying the prior art for comparison; (b) identifying the degree of attention to details of the informed uses; and (c) comparing the overall impression of the design under consideration to every singular admitted prior art. The design under consideration should show a feature or a combination of features which produces on the informed user an overall impression of difference[33] in respect of any other prior art admitted singularly considered[34]. The impression of difference may be caused by both the application of new features to the design, or some commonplace features recombined.

Focusing on the second stage of the test it should be noted that the EU design law provides that the assessment of individual character must consider the 'margin of freedom of the designer in making the design'. This rule requires to value the individualizing elements that the designer has been able to introduce in the form in the light of the design constraints specific to the goods considered, resulting especially from the characteristics imposed by the technical function of the product and/or any requirements applicable to it[35]. With respect to goods of a highly standardized form, even slight differences may induce in the user a general feeling of dissimilarity with respect to the prior art[36], conversely in other field a higher threshold of distinctive character is requested to access protection. The elements that allow a wider aesthetic discretion should significantly be different from the forms known by the informed users[37]. In the field of digital images, the designer's margin of creativity is undoubtedly wide. This influences the sensitivity of the informed user as to the truly individual character of the proposed design and, as a result, also the threshold of protection.

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[32] The informed user is not required to have actual knowledge of the relevant prior arts (Easy Sanitary Solutions BV v Group Nivelles NV, para 126).

[33] Ciarko spòlka z ograniczona sp.k. v OHIM (n 29) para 43; Case T-334/14 Roca Sanitario v OHIM (29 October 2015) para 58. On this comparison see D Musker 'Easier to say: catching the elusive spirit of design in a net of words', in Hartwig (n 8) 88.

[34] Case 345/13, Karen Millen fashion Ltd v Dunnes Stores (19 June 2014) paras 23-35.

[35] Case T-227/16 Haverkamp IP GmbH v OHIM (21 June 2018) para 54; Ciarko spòlka (n 29) para 26; El Hogar Perfecto (n 29) para 31; Group Prometer Mon Graphic (n 32) para 67; Kwang Yang Motor (n 10) para 32. Franzosi, 'Art 6 Reg.' in Franzosi (n 13) 62; D Sarti, 'Il sistema di protezione comunitario dei disegni e modelli industriali' [1999] CIE 751,755; Suthersanen (n 13), 39.

[36] Haverkamp IP (n 36) para 66; Case T-57/16 Chanel SAS v OHIM (18 July 2017) para 30; Cases T-828/14 and T829/14 Antrax It v OHIM (16 February 2017) paras 89 and 90.

[37] Group Prometer Mon Graphic (n 32) paras 78-82. In a marked crowd with standardized products, the informed user focuses his or her attention on characteristics that are 'arbitrary and different from the norm' that are likely to cause a general impression of dissimilarity. M Levin 'Art 6 Reg.', in Franzosi (n 13) 74; Hartwig (n 21) 125. For a partially different view The modern Law of Copyright and Design (n 21) 2008.

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2.5.3 The design of digital images should clearly differ from the shapers known by the informed users

Whether the height of the threshold of protection for design seeking registration be kept high or low has been widely discussed during the preparatory works and after worth. On the one hand it has been suggested that a low standard of individual character would have helped the European industry to enjoy widely the protection granted by the new system[38]. On the other hand, it has been argued that only a high threshold of protection would allow the system to grant a broad scope of protection to truly valuable design in order to encourage investment in this field[39]. The first possible interpretation argues that the individual character test should pose a significantly higher threshold than mere near-novelty. The design seeking registration should therefore differ significantly from prior art and the informed user should not only gather a generic impression of dissimilarity but also be 'struck visually' by the design[40]. On the contrary the second point of view argues that the individual character test should not be a strict one as requiring a significant difference would reintroduce into the system an aesthetic criterion of selection. The test of individual character should therefore ascertain that the design seeking registration is not identical to prior art. This second approach seems now prevailing[41]. However, in the field of digital design I would suggest that a fairly high threshold of protection is to be applied. As noted in the paragraph above, the designer has usually a wide margin of freedom in creating the design. Therefore, also based on the current case law, it should be concluded that the design of digital images should clearly differ from the shapers known by the informed users. This approach appears to be confirmed also based on the following consideration. Granting an exclusive right to digital design which give just a small 'creative contribution' is not justified because they would not make the European AR industries more ready to face competition in the world markets, as sought by the legislator when establishing the EU design system and would instead create obstacles to a working competition.

2.6 The scope of protection: 'real world' translations of digital images could infringe the design right on the same

Finally, I would like to deal with the problem of whether the scope of protection of the design, and notably whether this scope is limited to the same field of digital images, or may be extended also to other fields (i.e. if a design conceived for the digital/AR world can be protected also against 'translation' in the real world). This latter solution may be argued on the

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[38] Beier (n 87 above) 841.

[39] Levin (n 38) 72; J Phillips, 'Art 6 Reg' in Franzosi (n 13) 93; Scordamaglia (n 16) 138.

[40] In conducting the test Courts should ascertain whether an informed user would be able to point out clearly the features of the design which make it different from prior art M Levin (n 38) 72. It has also been suggested that the overall impression of difference shown by a protectable design should mean something on the market in that the individual character should be relevant as a 'possible factor' influencing the informed consumer to prefer the product over the others (D Sarti, 'Marchi di Forma ed imitazione servile di fronte alla disciplina europea del Design', in A Vanzetti and G Sena (eds), Marchi e forme di-stintive: la nuova disciplina (Giuffrè 2001) 257.

[41] PepsiCo (n 29) para 59 indicates that the informed user's 'level of attention' to the details of the design should be considered 'relatively high', and this stance would thus seem to argue in favour of lowering the level of individuality required of the design to access protection.

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basis of a literal interpretation of EU laws: Article 1 of EC Dir 98/71 does not expressly link the protection of a design to its application to a special product; Recital 13 of EC Dir 98/71 refers to the *existing design corpus*, and Articles 10 of CDR and 9 EC Dir 98/71 set forth that '*The scope of the protection conferred by a Community design shall include any design which does not produce on the informed user a different overall impression*'. This latter interpretation seems to be suggested by the wording of earlier preparatory works[42] and is the one currently preferred by the European courts[43]. Under this point of view, it should be considered that the infringement test set forth by the EU legislator accepts the German theory of the Abstandslehre which postulates that the same distance sufficient to establish the protectability of a creation is also necessary and sufficient to exclude infringement, and that the test of infringement then should be carried out in the same way the one to access protection[44]. Therefore, 'real world' translations of digital images could infringe the design right on the same, provided that the subsequent design does not show a real autonomy with respect to the elements that give a particular individual character to the protected prior design in eyes of the informed user, even if applied to a product category different from that of registration or product application.

[42] D Musker, 'Desgin law', in C Gielen and V von Bomhard (eds), Concise European Trademark and Design Law (Wolters Kluwer 2016) 376; The modern Law of Copyright and Design (n 22) 2109.

[43] See n 22 above. Easy Sanitary Solutions (n 22) para 133; Group Prometer Mon Graphic (n 33) para 55.

[44] J Philips, 'Art. 11 Reg.', in Franzosi (n 13) 94.

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3. UNFAIR COMMERCIAL PRACTICES, ADVERTISING AND CONSUMER PROTECTION

Cecilia Isola

Extended Reality, a technological innovation which includes immersive technologies such as Virtual Reality and Augmented Reality, is rapidly gaining popularity and significantly impacting the advertising industry. These technologies create immersive and interactive experiences that blur the lines between physical and digital environments, providing novel ways for traders to engage with consumers. However, the use of XR technology also poses risks of consumer manipulation, as it can induce feelings and emotions and exploit consumers' vulnerability, thus undermining their autonomy of choice and lead to unintended economic decisions. This calls for a critical reflection on the effectiveness of existing EU consumer protection policies in facing the challenges posed by technological developments. This essay aims to contribute to a better understanding of XR-based advertising as a new form of business-to-consumer commercial practice and investigates whether Directive 2006/25 EC (UCPD), the key regulation in business-to-consumer commercial practices, can efficiently prevent XR advertising manipulation.

3.1 Introduction

Extended Reality (XR) is an umbrella term used to describe technologies that encompass various forms of reality manipulation, including Virtual Reality (VR), Augmented Reality (AR)[1]. These technologies create immersive and interactive experiences that allow users to engage with digitally constructed environments that augment or replace the real world[2]. As a result, they are poised to transform a broad range of industries, including marketing, education, healthcare, and manufacturing, among others. and are poised to transform a broad range of industries, including marketing, education, healthcare, and manufacturing, among others.
This essay aims to examine the potential applications of Extended Reality (XR) technology for marketing and advertising practices, with a focus on its ability to provide consumers with a more immersive and authentic experience of products and services. However, despite the benefits that XR technology may offer to the field of marketing and advertising, it is also important to consider the potential drawbacks and challenges that come with its

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[1] In addition to AR and VR, Extended Reality encompasses other technologies such as Mixed Reality (MR), which merges physical and digital elements, and Augmented Virtuality (AV), which enhances a virtual environment with real-world elements.

[2] Philipp A. Rauschnabel and others, 'What Is XR? Towards A Framework for Augmented and Virtual Reality' (2022) 133 Computers in Human Behavior.

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implementation. A prominent concern is the potential use of XR technology to interfere with consumers' decision-making processes, taking advantage of their vulnerabilities, such as emotions and attention. This raises significant concerns about the potential for manipulative advertising in the context of XR technology. This essay examines XR advertising from the perspective of EU consumer protection law and it will unfold as follows. Section 2 provides a conceptual analysis of Virtual and Augmented Reality, by first exploring their defining features and then introducing the concept of Metaverse, a novel technological innovation based on XR technology. In Section 3, by drawing on the key insights from current economic theory, the Author will compare traditional advertising and XR-based advertising, exploring the technical aspects, representational elements, and influence of XR technology on consumers. In Section 4, the current EU legal framework regarding unfair commercial practices is explored, with particular focus on Directive 2005/29/CE, the key regulation in business-to-consumer commercial practices. Finally, Section 5 discusses how Directive 2005/29/CE should be interpreted and applied to address unfair advertising in the context of XR technology.

3.2 XR Technologies, User's Perception and the "Realism of Simulation"

This essay seeks to explore the intersection of advertising, manipulation, and consumer protection in the context of XR technology. To provide a basis for the analysis, this section defines the technical underpinnings of XR technology, namely Virtual Reality (VR) and Augmented Reality (AR).

3.2.1 Virtual Reality

When approaching 'Virtual Reality' (VR), people may refer to something that has to do with an artificial world, usually generated by a computer software, where the users can explore a reality not necessarily related to the physical world. Actually, 'virtual reality' is a context-dependent term: its semantic meaning varies drastically across contexts of communications and often depends on the perspective through which it is analysed. Depending on the technical and cultural background of the speaker, VR can be qualified both as a technology and as an experience.

From a strictly technical perspective, typically favoured by engineers, VR is a technology that creates an entirely artificial 3D environment, commonly referred to as a virtual world. It allows users to explore and interact with the objects in the virtual world using a head-mounted display (HMD) and interactive controllers[3]. In simple terms, VR technology acts as an intermediary between the real environment and a virtual environment (VE), enabling users to experience their presence in the VE and have the perception of being somewhere other than where they physically are. VR can be either immersive or non-immersive. Immersive VR offers realistic simulation experience, with 3D vision and immersive sound. It is usually achieved through HMDs, which provide high resolution content with a wide field of view. The display typically splits between the user's eyes, creating a stereoscopic 3D effect, and relies on input tracking systems to establish a truly immersive experience: for example, when tilting the head, the virtual perspective adapts to this new position. In contrast, non-immersive VR, such as a recorded or simulated VR scene, can be played on standard displays such as desktop or laptop screens and it lacks the ability to provide the perceptual experience of being present in the VE.

[3] Shen S. Xuemin, et al, 'Toward Immersive Communications in 6G' (2023) 4 Frontiers in Computer Science, 6.

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Indeed, the viewing direction is changed manually via a mouse or keyboard or by rotating and tilting on smartphones or tablets. However, a given level of immersion of the VR cannot be taken as a useful benchmark for assessing the human reaction to a certain VE of the whole category of VR users. Stimuli achieved through VR systems have similar – but not identical – ramifications across an undefined range of perceivers. Therefore, given the same immersive system, different people may exhibit different levels of presence, and different immersive VRs may give rise to the same level of presence in different people. Thus, even in the same VE, its perception will vary across individuals[4].

VR environments can expand our cognitive horizons to include intangible worlds, which may not precisely simulate a "real" environment but are still plausible to us. Through interaction with a VE, our senses can be stimulated to the point where cognitive and emotional patterns consistent with the perceived environment are formed. This perceptual illusion (i.e., *telepresence*[5]*)* allows the user to respond to stimuli 'as if' the VR medium were not present, enabling a partial suspension of disbelief[6], (The two main technological properties of telepresence are *vividness* and *interactivity*[7]. Interactivity refers to the degree to which users can influence the form or content of the mediated environment. Vividness refers to the ability of a technology to produce a sensorial rich mediated environment. Note that it does not refer to the ability to perfectly replicate real objects, such as the ability to reproduce a virtual car exactly like a real car; it refers to the 'sensory richness'; namely the intensity with which a mediated environment is able to present information to the senses[8]. Consequently, since VR can address multiple senses (e.g., being able to look around and having the sensation of moving and being able to fall), it offers a greater sensory richness to the users compared to simple digital environments represented in 2D resolution. Vividness is often mistaken for interactivity. It differs on the capacity for two-way communication; in fact, certain pieces of communication can be highly vivid but non-interactive (e.g., television, magazine). Similarly, certain forms of communication can be highly interactive but also be low in vividness. Using the case of e-mail, the level of interactivity can fluctuate whether it is part of a one-on-one or newsgroup communication (e.g., a continuous public discussion about a particular topic).

The ability to produce scenarios, experiences and processes that closely resemble real life are what confers authenticity to a virtual experience: the more the VE is perceived as real, the more the user will feel 'immersed' in the VE. Over the years, scholarship debated the distinction between *immersion* and *presence*[9]. Immersion refers to what is, in principle, a quantifiable description of a technology: it describes the extent to which the computer displays can deliver an inclusive, extensive, surrounding, and vivid illusion of reality to the senses of a human

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[4] Jonathan Steuer, 'Defining Virtual Reality: Dimensions Determining Telepresence' (1992) 42 Journal of Communication, 6.

[5] Giuseppe Riva, 'Is presence a technology issue? Some insights from cognitive sciences' (2009) 13 Virtual Reality, 159-169.

[6] Steve Bryson, a pioneer of VR, defined it as "the use of computer technology to create the effect of an interactive three-dimensional world in which the objects have a sense of spatial presence". Steve Bryson, 'Virtual Reality: A Definition History-A Personal Essay' (2013), available online: <arxiv.org/pdf/1312.4322.pdf>

[7] Jonathan Steuer, 'Defining Virtual Reality: Dimensions Determining Telepresence' (n 4), 10.

[8] See David R. Fortin and Ruby Roy Dholakia, 'Interactivity and Vividness Effects on Social Presence and Involvement with a Web-Based Advertisement' (2005) 58 (3) Journal of Business Research,387-396.

[9] Mel Slater, 'Immersion and the illusion of presence in virtual reality' (2018) 109 British Journal of Psychology 431; Carrie Heeter, 'Being There: The subjective experience of presence' (1992) 1(2) ,Presence: Teleoperators and Virtual Environments, 262-271.

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participant[10]. In other words, immersion is an objective assessment related to what a certain technology 'delivers' from an objective point of view: the more a system preserves fidelity in relation to their equivalent real-world sensory modalities, the more it will be 'immersive'. On the contrary, presence refers to the human response to experiencing environments that such technology delivers. It is a state of consciousness, the (psychological) sense of being in the VE and behaviours therein should be consistent with behaviours that would have occurred in everyday reality in similar circumstances[11]. Overall, immersion is an objective assessment, based on technical parameters whereas presence is a psychological state. According to this meaning of *presence,* techno-philosophers argue[12] that the key factor of VR lies right on the user's perception of the *presence* in the VE: when the perception of the VE comes close to the perception of the real world, the virtual experience inevitably creates an illusion in the eyes of the user and, at the same time, it provides something that appears vivid and convincing from a sensorial point of view. Even though the virtual experience is artificial, the feelings and emotions that it generates in users are real: users consider the VE as places visited rather than as images seen. This paradigm is what philosophers call 'simulation realism[13]', whereby the simulation is so close to reality that there is no perceived difference between what is real and what is not.

The effects of VR on users' brains are still being studied and can vary depending on the individual and the specific application or use case. For instance, VR has been employed as a therapeutic tool to assist individuals with various health problems, such as phobias, post-traumatic stress disorder (PTSD), and chronic pain[14]. However, there are also potential negative effects to consider, such as the prolonged use of VR that can lead to physical symptoms such as eye strain, headaches, and nausea, due to the visual and vestibular demands of the technology[15]. VR can also have negative impact on social interactions as some people may be more likely to engage in virtual activities instead of real-world interactions, leading to addiction and isolation[16].

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[10] See Mel Slater and Sylvia Wilbur; 'A Framework for Immersive Virtual Environments (FIVE): Speculations on the Role of Presence in Virtual Environments' (1997) 6 (6), Presence: Teleoperators and Virtual Environments, 603-616.

[11] Mel Slater, Vasilis Linakis, Martin Usoh and Rob Kooper, 'Immersion, Presence, and Performance in Virtual Environments: an Experiment with Tri-dimensional Chess' (1996) in VRST '96: Proceedings of the ACM Symposium on Virtual Reality Software and Technology, 165.

[12] 'Technophilosophy' is the two-way interaction between technology and philosophy, where philosophy helps to come to grips with new questions about technology, and technology helps to shed light on ancient questions in philosophy. See generally David J. Chalmers, *REALITY+: Virtual Worlds and the Problems of Philosophy* (WW NORTON & Co 2022); Giuseppe Riva, 'Is presence a technology issue? Some insights from cognitive sciences' (n 4).

[13] David J. Chalmers, *REALITY+: Virtual Worlds and the Problems of Philosophy* (n 12), 105-123,

[14] Giuseppe Riva, 'Virtual Reality Health and Safety: A Brief Overview and Call to Collaboration' in Mark Grimshaw (ed), *The Oxford Handbook of Virtuality* (Oxford University Press 2014), 649-665.

[15] Ibid 659.

[16] Kyrlitsias Christos and Michael-Grigoriou Despina, 'Social Interaction With Agents and Avatars in Immersive Virtual Environments: A Survey' (2022) 2 Frontiers in Virtual Reality, 1-13.

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3.2.2 Augmented Reality

A second widely implemented technology in the virtual industry is Augmented Reality (AR). One of the earliest definitions of augmented reality was formulated in 1962 by the engineer Ronald Azuma, credited with defining augmented reality and guiding its early developments. His conception of AR can be resumed as the technology, which '*allows the user to see the real world, with virtual objects superimposed upon or composited with the real world*[17]'. More specifically, a software adds/ erases in real time digital objects[18] to a real environment or any other indirect view of the real-world surroundings, such as live-video stream[19]. Using smartphones or cutting-edge devices as special glasses[20] the users can see the real world as it exists, but with digital images superimposed on the world**,** so that they seem to exist as part of the world. Sometimes, the improper use of VR and AR terms creates confusion amongst the distinction of both. As hinted above, the key aspect of VR is *presence*: VR provides a simulated experience that is similar to (or completely different from) the real world, in which both the objects and the environment are virtualized. During this experience, the user has dabbled in an artificial environment and, while immersed, it is difficult for him or her to perceive the actual world *how it really is*. In contrast, AR does not rely on the perception of 'being there': the user is not virtually bounced somewhere and does not feel his presence in the virtual surroundings. His perception of the real environment is simply modified: either augmented or diminished. In other words, AR systems supplement reality rather than completely replacing it, allowing users to sense a hybrid experience, which consists in seeing virtual objects superimposed on (or deleted from) the real world[21]. However, a prolonged use of AR can impact on vision as the eyes must adjust to the changing brightness and focus between the virtual and real world, causing eye strain, headaches, and fatigue and, in some cases, AR can also lead to accidents if the user is not aware of their surroundings while using it. In this regard, it is worth mentioning Pokémon GO app, a popular AR mobile game released in 2016 due to which there have been several accidents and incidents caused by players becoming too engrossed in the game have been recorded, such as distracted driving, trespassing, injuries, and distracted walking[22]. AR can also lead to decreased physical activity and social interactions, which can have a negative impact on cognitive and overall health, such as obesity and cardiovascular disease, while lack of social interaction can lead to feelings of anxiety, isolation, and depression.

3.2.3 Metaverse

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[17] Ronald T. Azuma, 'A Survey of Augmented Reality' (1997) 6 (4) Presence: Teleoperators and Virtual Environments (MIT press), 355–385.

[18] Even if AR technology is being known as a technology that 'augments' reality, it also includes 'diminished reality', where contents, instead of being added to the real environment, are erased. Philipp A. Rauschnabel and others, 'What Is XR? Towards A Framework for Augmented and Virtual Reality' (n 2) 13.

[19] See in general Julie Carmigniani and others, 'Augmented Reality Technologies, Systems, and Applications' (2011) 51, Multimedia Tools and Application, 341–377.

[20] For example, Google Glass by Google LLC or Microsoft HoloLens 2 by Microsoft Corporation.

[21] Ronald T. Azuma, 'A Survey of Augmented Reality' (n 17) 2.

[22] Toyoaki Sawano, et al., 'Pokémon GO & driving' (2017) 110 (5), QJM: An International Journal of Medicine, 311–312.

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The Metaverse has been the subject of much discussion and speculation over the past year. The term is typically used to refer to a three-dimensional space that is fully immersive and interactive[23], in which users can interact with each other and with digital objects in a way that resemble the physical world: a supposed 'post-reality universe[24]', based on the convergence of technologies such as VR and AR that enable multisensory interactions with virtual environments, digital objects and people. This upsurge of interest started when Mark Zuckerberg, founder and CEO of Facebook Inc., in October 2021 announced his decision to rebrand the company with the name 'Meta Platforms, Inc.[25]'. After Zuckerberg's announcement, companies rushed to implement their own metaverse or, more frequently, to create partnerships with virtual platforms to establish their presence in the Metaverse. A question immediately arises: what actually is the Metaverse? The term Metaverse was coined in 1992 by Neal Stephenson, author of the science fiction novel "Snow Crash", to describe a three-dimensional virtual world inhabited by avatars of real people. This is not the first time the term has been used since Snow Crash. Pioneering forms of social digital spaces already existed in the 2000s, such as the still active platform 'Second Life' – at the time termed Metaverse – which is an online community where people can connect through avatars (i.e., 'residents') and create communities, buy (virtual) properties, go to (virtual) concerts and bars, buy and sell virtual goods and services, find friendships and so forth. Second Life has its own economy and its own coin 'Linden Dollar', a closed-loop virtual currency used for exchange of goods and services in Second Life: thus, transactions in the Metaverse already existed well before Zuckerberg's Metaverse. However, this economy operates independently of the price of the game that users pay to the company. While Linden Dollars can be used to purchase virtual goods and services within Second Life, they hold no monetary value outside of the Second Life platform and Linden Lab does not provide a mechanism for converting Linden Dollars into fiat currency or other forms of payment.

Back to our days, where the term Metaverse is back in the limelight, the 'Metaverse 2.0' is conceived as a new iteration of the internet—a new paradigm for how we will use and interact with digital technologies within an immersive virtual environment, where avatars are now supposed to interact with each other in a variety of settings: at work, in the office, while going to concerts or sports events, or even trying on clothes. Purported Metaverse(s) are Fortnite, Roblox, War of Warcraft, Decentraland and Horizon (Meta's Metaverse).

3.3 Extended Reality Technologies in the Modern Internal Market

In recent years, there has been a noticeable surge in the employment of VR and AR within the context of marketing and advertising campaigns. This trend can be attributed to the capacity of these technologies to provide immersive and interactive experiences that engender consumer engagement. These experiences include, for example, virtual showrooms, virtual product demonstrations, virtual tours, interactive product demonstrations, augmented ads and AR product packaging, which have been shown to increase consumers' confidence in purchasing decisions and their willingness to pay. To illustrate, the AR "Place" app developed by Ikea

[23] Matthew Ball, *The Metaverse: And How It Will Revolutionize Everything* (Liveright Publishing 2022); Richard L. Pate, 'View Legal Issues Inside the Unnatural World of Metaverse' (2022) 43(1) Business Law Review, 8.

[24] Mystakidis Stylianos, 'Metaverse' (2022) 2 Encyclopedia 486.

[25] See the official announcement in https://about.fb.com/news/2021/10/facebook-company-is-now-meta/ accessed 10 October 2022.

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permits potential buyers to virtually place furniture from Ikea's catalogue within their own living space using the camera on their smartphone, thereby facilitating informed purchasing decisions prior to making a purchase. The app also includes information about the product, such as dimensions and materials, and allows buyers to purchase the item directly through the app. On the other hand, VR advertising (e.g., immersive tourist destinations virtual tours, immersive virtual product previews) enables users to experience the quality and technical features of products and services before making a purchase. This section explores the main characteristics of XR-based advertising compared to traditional advertising, delving into its technical components and potential effects on consumers.

3.3.1 Economic analysis of advertising

Traditionally, economists attribute to advertising three central and correlative functions: an informative function, a persuasive function, and a complementary function[26]. The informative function consists in providing information to consumers about products, services and prices, allowing consumers to make reasoned choices about their purchases. In this regard, a central issue in market economy is the asymmetry of information between traders and consumers. Most of the economic models used by economic theorists assumed that individuals, in their choices and actions, maximize their own utility on the base of their preferences and, conversely, firms maximize profits by selecting best or optimal strategies and actions[27]. To put it differently, economists assume that both individuals and companies are rational; rationality, in turn, is defined in terms of the rational choice theory. The availability of information is essential for evaluating individuals' decisions, given that it shapes the agents' decisions and defines the possibilities they must reach optimal outcomes given their preferences[28]. This principle is also regarded as one of the pillars of EU consumer law, which expressly safeguards 'the health, safety, and economic interests of consumers', as well as 'their right to information, education and to organise themselves in order to safeguard their interests[29]'.
Information asymmetry constitutes an obstacle in the correct functioning of the market, since incorrectly exchanged and perceived information distorts the consumer's ability to make efficient choices, laying the basis for the market decline or failure. In order to prevent market failures, different jurisdictions turn to legal and regulatory interventions, one of which is the requirement to disclose information. In This leads to what legal scholars call 'information paradigm[30]', which suggests that when the trader fulfils his obligation to provide information to the consumer, the latter is sufficiently informed and therefore can make rational choices. In turn, the consumer's ability to rationally locate products gives firms an incentive to compete to

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[26] For an excellent discussion Kyle Bagwell, 'The Economic Analysis of Advertising' in Armstrong and Porter (eds), *Handbook of Industrial Organization*, 3 (Elsevier, 2007), pp. 1701–1844. From a philosophical perspective, see also Paul C. Santilli, 'The Informative and Persuasive Functions of Advertising: A Moral Appraisal' (1983) 2 Journal of Business Ethics, 27-33.

[27] Richard A. Posner, *Economic Analysis of Law* (Wolters Kluwer 2014).

[28] Fernando Gómez Pomar and Mireia Artigot Golobardes, 'Rational choice and behavioural approaches to consumer issues' in Hans-W. Micklitz, Ann-L. Sibony and Fabrizio Esposito (eds), *Research Methods in Consumer Law* (Edward Elgar Publishing 2018) 119-164.

[29] Art. 169 Treaty on the Functioning of the European Union (TFEU).

[30] Norbert Reich, Hans-W. Micklitz, Peter Rott and Klaus Tonner, *European Consumer Law* (Intersentia 2014), 21.

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improve their offerings, including prices. Without such information, the incentive to compete on price and quality would be weakened, reducing consumer welfare[31] and, consequently, market efficiency would be affected as well. In contrast, some scholars argue that the availability of information is a necessary but not a sufficient condition to ensure that individuals act properly on it when making decisions, since individuals do not equally understand and evaluate the information available to them, due to the various circumstances in which the information may come or be accessible to them[32]. Recent behavioural analyses when evaluating individuals' decisions have shown evidence of cognitive limitations and biases revealed by humans when making decisions[33]. Such limitations and biases may result in different evaluations of the information available by different agents, but also incorrect of harmful – for the agents themselves – assessments, which do not seem to correspond to the predictions of rational choice. In this context, advertising, as a source of information, increases the efficiency of the market since, by expanding the amount of information available, consumers have all the information and can make efficient choices.

The persuasive function of advertising consists in inducing consumers to buy products and services. In this vein, advertising is designed to influence consumer purchasing practices, and influential persuasion is often necessary for firms that act under profit-maximization objective[34]. Such commercial practice encourages consumers to, at the very least, consider a particular product or service. In philosophy, it is a habit to distinguish between the concepts of persuasion and manipulation. Without going into details about the current debates in literature, for the purposes of this contribution, we just need to outline that – conceptually – persuasion is a form of influence that, as for manipulation, is aimed to alter beliefs, values, attitudes and actions of others but, unlike manipulation, a certain degree of autonomy in maintained by readers or listeners, that is, a sufficiently independent formation of preferences, and the possibility to critically and rationally review these preferences. When the autonomy in the choice is interfered and it becomes, at least, sufficient impaired, the influence shall be regarded as *manipulative*[35]. Manipulation is regarded to 'bypass' the target's rational deliberation[36], where 'bypass' means exploiting psychological mechanisms or techniques that can generate behaviour without any input from rational deliberation. From this perspective, manipulation differs from rational persuasion since it influences behaviour by means that do not engage the target's rational capacities[37].

The third view is the complementary function of advertising. According to this perspective, instead of altering consumers' preferences or primarily conveying information, advertising is 'complementary' to the promoted product, namely it increases the value of the product or

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[31] Howard Beales, Richard Craswell and Steven C. Salop, 'The Efficient Regulation of Consumer Information' (1981) 24 (3) The Journal of Law and Economics, 491-539.

[32] Jan Trzaskowski, 'Behavioural Innovations in Marketing Law', in Hans-W. Micklitz, Ann-L. Sibony and Fabrizio Esposito (eds), Research *Methods in Consumer Law a Handbook* (Edward Elgar 2018), 296-333; Rossella Incardona and Cristina Poncibò, 'The Average Consumer, the Unfair Commercial Practices Directive, and the Cognitive Revolution' (2007), 30 (1), Journal of Consumer Policy Issue, 21-38.

[33] Jan Trzaskowski, 'Behavioural Innovations in Marketing Law' (n 32), 309.

[34] John O'Shaugnessy and Nicholas O'Shaughnessy, *Persuasion in Advertising* (Routledge 2003), 232.

[35] Allen W. Wood, 'Coercion, Manipulation, Exploitation', in Christian Coons, and Michael Weber (eds), *Manipulation: Theory and Practice* (Oxford University Press 2014), 17-50.

[36] Robert Noggle, The Ethics of Manipulation' (2018), Stanford Encyclopedia of Philosophy.

[37] Allen W. Wood, 'Coercion, Manipulation, Exploitation' (n 35) 35.

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service perceived by consumers (e.g., consumers prefer to buy products that are well known for social prestige purposes[38]).

3.3.2 Traditional digital advertising vs XR advertising

Recent research has shown that XR advertising can be more effective than traditional digital advertising in at least two ways. First, by providing more immersive and engaging experiences, XR advertising expands the amount and accuracy of product/service information. Indeed, the heightened degree of immersion and interactivity of XR advertising, such as previewing a product with complete and high-quality representations of items (e.g., 3D digital recreation rather than a 2D picture), or manipulating a product by picking it up, rotating it, and examining it in detail, enables consumers to experience products and services instead of merely viewing them on a screen. As a result, XR advertising increases the likelihood that the information consumers need to make an informed economic decision will be considered, thereby promoting greater market efficiency[39]. Second, due to sensors and cutting-edge input devices, XR technology can gather a greater volume of data compared to traditional digital methods (e.g., user movement and position data, eye-tracking data, environmental data, biometric data, etc). Indeed, traditional digital advertising such as banners or video ads typically relies on passive engagement since the target audience is exposed to the advertisement but does not have the ability to interact with it beyond the option to click. Consumer data is typically collected in advance to identify target audiences for planning and research purposes. On the contrary, XR advertising target audience is active rather than passive: potential buyers can interact and engage with the brand in a virtual environment, enabling greater and real-time data collection[40].

3.3.3 Extended Reality effects on consumers

By leveraging visual, auditory, and tactile stimuli, XR advertising has the potential to influence the cognitive processes by which consumers acquire knowledge and understanding of a product or service, thereby affecting their mental states[41]. At first glance, XR advertising enables the matching of consumers with their needs and preferences, resulting in a more efficient allocation of resources and a reduction in information asymmetry between traders and consumers. For example, research in the tourism industry has revealed the potential impact of VR systems on users' intention to visit destinations showcased as virtual content. Results have shown that VR tourism increases users' tendency to form strong emotional connections to destinations, people,

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[38] Gary S. Becker and Kevin M. Murphy, 'A Simple Theory of Advertising as a Good or Bad' (1993) 108 (4), The Quarterly Journal of Economics, 941–964.

[39] Abraham Hani Mhaidli and Florian Schaub, "Identifying Manipulative Advertising Techniques in XR Through Scenario Construction," CHI '21: Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems, Article No.: 296, (May 2021), 6.

[40] Ibid 7.

[41] Jung-Hwan Kim, Minjeong Kim, Minjung Park and Jungmin Yoo, 'How interactivity and vividness influence consumer virtual reality shopping experience: the mediating role of telepresence'(2021) 15(3) Journal of Research in Interactive Marketing, 502-525; Anne Mollen and Hugh Wilson, 'Engagement, Telepresence and Interactivity in Online Consumer Experience: Reconciling Scholastic and Managerial Perspectives' (2010) 63 (9-10) Journal of Business Research, 919-925.; Thomas P. Novak, Donna L. Hoffman and Yiu-Fai Yung, 'Measuring the Customer Experience in Online Environments: A Structural Modeling Approach' (2000) 19 (1) Marketing Science, 22–42.

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and objects shown in the virtual representation, influencing their intention to visit the proposed destination.
On the other hand, the improper exploitation of emotional and cognitive manipulable human traits aimed at inducing or exacerbating consumer vulnerabilities can lead to unintended economic decisions, thereby amplifying the information asymmetry between traders and consumers. Furthermore, induced vulnerability, combined with the vast data collection capabilities of XR technology and the proliferation of other advanced technologies (e.g., Artificial Intelligence (AI), Machine Learning (ML), Blockchain, Quantum Computing, 5G technology, etc.) raises concerns that traders may collect in-depth data on consumers' behaviour, preferences, and decision-making processes to create targeted advertising that targets consumers' specific mental states and vulnerabilities. Indeed, the increasing sophistication of software and devices in XR technology may lead to more photorealistic graphics in XR advertising, posing a challenge for consumers to distinguish between reality and advertising. For example, if an AR application overlays a digital sandwich or beer can on a user's field of vision, and the graphics are realistic enough, the consumer may struggle to discern whether the product is real or not. Additionally, XR advertising may simulate individuals who hold significant emotional sway over a consumer, and the exploitation of such emotions may interfere with a consumer's ability to rationally evaluate the ad, leading to bias in their evaluation of the product and hindering their buying intention when making an economic choice[42].
In this context, a key issue is the manipulative nature of XR advertising. Indeed, it may operate in a blurred area between a legitimate persuasion attempt, intended to inform the consumer and persuade him to take an action without significantly altering its preferences, and a (unlawful) manipulation technique that exploit biases and personal data to undermine the consumer's ability to make an informed decision, thereby causing the consumer to take a transactional decision that he would not have taken otherwise. Given the lack of well-defined criteria and guidelines in the current EU legislative framework, a critique evaluation of existing consumer protection policies is required to determine whether existing consumer protection policies can efficiently safeguard consumers' health, safety and economic interests and maintain a fair and transparent market in the digital age.

3.4 Legal Framework

3.4.1 Directive 2005/29/CE (Unfair Commercial Practices Directive)

Business-to-consumer transactions are mainly addressed by the Directive 2005/29/EC of the

[42] Natali Helberger, Marijn Sax, John Strycharz and Hans-W. Micklitz 'Choice Architectures in the Digital Economy: Towards a New Understanding of Digital Vulnerability' (2022), 45 (2) Journal of Consumer Policy, 197.

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European Parliament of the Council of 11 May 2005[43], also called Unfair Commercial Practices Directive (UCPD), recently amended by Directive (EU) 2019/2161[44]. Under the UCPD, unfair commercial practices that occur before, during and after a business-to-consumer transaction has taken place are prohibited[45]. In order to include the widest number of practices potentially harmful to consumers, the EU legislator adopted a broad definition of 'commercial practice' i.e., 'any act, omission, course of conduct or representation, commercial communication including advertising and marketing, by a trader, directly connected with the promotion, sale or supply of a product to consumers[46]'. The UCPD does not address commercial practices carried out primarily for other purposes, including commercial communication aimed to investors (such as annual reports or corporate promotional literature) and business-to-business commercial practices, the latter regulated by the Directive 2006/114/EC concerning misleading and comparative advertising[47], which seeks to protect traders from other firms.
Article 5 (2) and Articles 6-9 UCPD set out the specific criteria for the assessment of the unfairness of a commercial practice, presenting a pyramid structure (or, according to another widespread figure, *concentric circles* structure[48]) which includes a general clause of prohibition of unfair practices[49] (Article 5 (2) UCPD), two main categories of unfair practices (respectively, *misleading* – Articles 6 and 7, and *aggressive* – Articles 8 and 9) and a list of practices that are considered unfair in all circumstances (Annex I, also called *blacklist*)[50]. The UCPD does not specify the logic proceeding that national courts should follow to assess the

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[43] 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. The Directive provides for a maximum level of harmonisation of the rules contained therein establishing a regulatory framework where Member States may not adopt stricter rules than those provided for in the Directive, in order to achieve a higher level of consumer protection. The rationale under the full harmonisation lies in the fact that differentiated regulations among Member States can generate appreciable distortions of competition and obstacles to the smooth functioning of the internal market for two reasons. On the one hand, these disparities cause consumer's uncertainty about their rights, undermining their confidence in the internal market and harming consumers' economic interests. On the other hand, such barriers cause uncertainty about which national rules apply to unfair commercial practices, which increases the cost for businesses to exercise the freedoms of the internal market, creating many barriers that affect consumers and businesses; in particular, when the latter wish to engage in cross-border marketing, advertising campaigns and sales promotions.

[44] 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.

[45] Art. 5 UCPD.

[46] Art. 2(d) UCPD.

[47] Directive 2006/114/EC of the European Parliament and of the Council of 12 December 2006 concerning misleading and comparative advertising.

[48] Mario Libertini, 'Clausola generale e disposizioni particolari nella disciplina delle pratiche commerciali scorrette' (2009) 1 Contratto e Impresa, 94.

[49] Art. 5, para 1 UCPD.

[50] Annex I UCPD.

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unfairness of a commercial practice. Despite the debates among legal scholars[51], the Court of Justice of the European Union (CJEU) clarified that the standard of professional diligence set out in Article 5 (2) UCPD must be considered as a fundamental rule, whereas the specific categories of misleading and aggressive commercial practices are specific applications of the general principle[52]. When a commercial practice satisfies the criteria of the UCPD for being categorised as misleading or aggressive, there is no need to examine whether such practice is also contrary to the requirements of Article 5 (2) UCPD. Therefore, in line with the Court of Justice of the European Union (CJEU)'s case law, the general clause of Article 5 (2) represents a residual criterion applicable only when there is no codified practice.

According to Article 5 (2) UCPD, a commercial practice is unfair a) when it is contrary to the requirements of professional diligence and b) when it distorts or it is likely to materially distort the economic behaviour 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. Article 2 (h) UCPD states that 'professional diligence' is 'the standard of special skill and care which a trader may reasonably be expected to exercise towards consumers, commensurate with honest market practice and/or the general principle of good faith in the trader's field of activity'. Since Article 5 (2) refers to a standard of special skill and care which a trader 'may reasonably be expected to exercise towards consumers', the adherence of trader's conduct to the standard of professional diligence must be assessed on a case-by-case basis, considering the peculiarities of the concrete case. The parameters that must be used to evaluate whether these reasonable expectations are being met are the 'honest market practices' in use in the trader's sector of operations and the 'general principle of good faith'. Accordingly, the requirements of professional diligence do not end with 'the honest market practices' or 'the general principle of good faith', which represent instead the parameters to be used to evaluate the level of special skill and care that may be legitimately expected of the trader in his business practices[53]. When this level is not reached, the practice shall be qualified as contrary to the requirements of professional diligence. In order to be regarded as unfair, a commercial practice must also cause the material distortion of the economic behaviour of the average consumer or of the average member of the group when the default setting is directed to a particular group of consumers. According to Article 2(e) UCPD, a practice materially distorts the economic behaviour of consumers when it is used to significantly impair the consumer's ability to make an informed decision, thus causing the consumer to take a transactional decision that he/she would not have made otherwise.

Article 5 (4) states that commercial practices shall be unfair which are misleading (by action or by omission) as set out in Articles 6 and 7, or aggressive as set out in Articles 8-9. Actions are the activities traders carry out in the promotion and sales of their products. A commercial practice by action is misleading when it contains false information or gives an overall impression that deceives, or is likely to deceive, the average consumer (even if the information

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[51] Hans-W. Micklitz, 'The General Clause of Unfair Practices' in Gerasint Howells, Hans-W. Micklitz, Thomas Wilhelmsson (eds), *European Fair Trading Law: The Unfair Commercial Practices Directive* (Routledge 2016), 119; Paolo Siciliani and Harriet Gamper, Should a Finding of 'Material Distortion' under Art 6 Para 1 UCPD Raise an Unrebuttable Presumption of Breach of the Duty of Professional Diligence?' (2013) 4, Journal of European Consumer and Market Law, 225-229; Giovanni De Cristofaro, 'Il divieto di pratiche commerciali sleali. La nozione generale di pratica commerciale "sleale" e i parametri di valutazione della "slealtà"' in Elena Bargelli and Giovanni De Cristofaro (eds), *Le Pratiche Commerciali Sleali tra Imprese e Consumatori: la Direttiva 2005/29/CE e il Diritto Italiano* (Giappichelli 2007), 109.

[52] Case C-435/11, *CHS Tour Services GmbH v Team4 Travel GmbH*, 19 September 2013, ECLI:EU:C:2013:574, para 42.

[53] Giovanni De Cristofaro, 'Il divieto di pratiche commerciali sleali. La nozione generale di pratica commerciale "sleale" e i parametri di valutazione della "slealtà"' (n 51) 119.

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is factually correct) and causes or is likely to cause him to take a transactional decision that he would have otherwise not taken. False information must relate to certain matters set out in Art. 6(2) UCPD which includes product's essential elements such as the price and quality of goods or services. According to Article 7, a practice is also misleading if the material information needed to make an informed purchasing decision is omitted or provided in an unclear, unintelligible, ambiguous, or untimely manner. The rationale under article 7 is based on the aforementioned information paradigm, according to which the increasing amount of information and establishing full transparency help consumers to make rational choices. As a result, UCPD provides a general list of information that should be regarded as material, such as the price and main characteristics of the product, - also complemented by other Directives such as Consumer Rights Directive, which imposes further information requirements (for example, for distance and off-premises contracts).
According to Article 8(1) a practice is aggressive if it significantly impairs the average consumer's freedom of choice by harassment, coercion or undue influence and thereby causes him or is likely to cause him to take a transactional decision that he would not have taken otherwise. As clarified by the CJEU[54], Article 8 must be interpreted taking into account certain factors (specifically listed in Article 9) when determining whether an unfair aggressive practice has occurred. Finally, the commercial practices included in Annex I of UCPD are those that shall be – in any case – regarded as unfair and shall be punished without having to apply a case-by-case test. This list has been drawn up to enable enforcers, traders and consumers to identify certain practices and give them a more immediate enforcement response, leading to greater legal certainty.

3.4.2 The consumer benchmarks

UCPD leaves Member States the right to choose the appropriate authorities (courts or administrative authorities) to whom enforcement powers are granted (ordering the cessation of unfair commercial practices, taking appropriate legal proceedings against them, etc.). In Italy, for example, the Italian Competition Authority (AGCM) has wide latitude to take action against practices that it deems misleading or deceptive. When a court or an administrative authority is required to assess the fairness of a commercial practice, it needs to determine which benchmark for consumers should be applied.
According to Article 5(2) UCPD, commercial practices must be assessed from the perspective of the 'average consumer', who is a person 'reasonably well informed and reasonably observant and circumspect[55]'. This concept was developed by the CJEU prior to the UCPD, and its origins can be traced in the free movements of goods case law. The notion of the average consumer has been used by the CJEU to tackle overprotective national laws related to unfair commercial practices and, in particular, against Germany, where it was common practice to assess commercial practices from the point of view of a superficially observing and generally uncritical consumer[56]. In *Gut Springenheide*[57], the CJEU ruled that when assessing the legality of a commercial practice, national courts must consider the presumed expectations of a

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[54] Case C-628/17, *Prezes Urzedu Ochrony Konkurencji i Konsumentów v. Orange Polska S.A.*, EU:C:2019:480.

[55] Recital 18 of the Preamble to the UCPD.

[56] See generally Bram B. Duivenvoorde, *The Consumer Benchmarks in the Unfair Commercial Practices Directive* (Springer 2015) and Vanessa Mak, 'Standards of Protection: In Search of the 'Average Consumer' of EU Law in the Proposal for a Consumer Rights Directive' (2011) 19 (1), European Review of Private Law, 25-42.

[57] Case C-210/96, *Gut Springenheide GmbH v. Oberkreisdirektor des Kreises Steinfurt.* ECLI:EU:C: 1998:369.

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consumer which is assumed to be 'reasonably well informed and reasonably observant and circumspect. However, the CJEU also stressed that the average consumer test is not a statistical test: this means that national authorities and courts should be able to use, if necessary, empirical evidence to determine whether a practice is liable to mislead the average consumer[58]. In later cases, the CJEU emphasised that social, cultural and linguistic factors can be taken into account in the application of the average consumer benchmark[59].

Besides the "average consumer" test, the UCPD provides for two further benchmarks: the 'target group' and the 'vulnerable consumer' benchmarks, respectively. As follows from the text of Art. 5(2) UCPD, when commercial practices are aimed at certain groups of consumers (who, for example, are less than averagely informed, observant, or circumspect), the average member of that group is the benchmark[60]. Art. 5(3) UCPD provides for the notion of the vulnerable group of consumers, i.e., 'a clearly identifiable group of consumers who are particularly vulnerable to the practice or the underlying product because of their mental or physical infirmity, age or credulity'. The attention reserved to such vulnerable consumers is based on the idea that they should be ensured a higher level of protection than 'the average consumer' referred to in Article 5(2), by virtue of their particular conditions which make them most in need of protection. Consequently, when commercial practices are addressed to a vulnerable group, the unfairness of the practice shall be assessed from the perspective of the average member of that group, provided that this vulnerability is foreseeable by the trader. Part of consumer law literature strongly criticizes this approach of identifying particular groups of vulnerable users as unnecessarily stigmatizing and far away from social reality. They argue that vulnerability should not be considered as a distinctive character of particular weaker individuals and groups, based on specific situations or socio-economic contexts[61], but rather suggest a reformulation of the understanding of vulnerability as a universal human condition to which anyone may be exposed at any given moment and subject to changes due to different

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[58] Since its adoption, the average consumer benchmark has raised criticism in academic literature. The prevailing assumption in consumer law is that consumers act rationally when they have the necessary information. However, empirical evidence has shown that individual consumers may not always be at all observant and circumspect or may not be so in a particular situation. Some scholars argue that the purely normative approach adopted at EU level seems to fail to consider behavioural insights of the consumer-decision making process, which is mistakenly considered to be always reasonably aware and circumspect. According to this standpoint, the expected awareness of the average consumer is unrealistically high because consumers do not always have the time and resources at their disposal to acquire and process sufficient information for rational decision-making. Even well-informed consumers of a high intellectual and educational level, who would be – at least in theory – ideally suited for rational market behaviour, may often base their decisions on custom and feelings rather than on an analytical process. Anne-Lise Sibony, 'Can EU Consumer Law Benefit from Behavioural Insights? An Analysis of the Unfair Practices Directive' (2014) 6 European Journal of Private Law, 901-941; Rossella Incardona and Cristina Poncibò, 'The Average Consumer, the Unfair Commercial Practices Directive, and the Cognitive Revolution' (n 32) 21-38; Geraint Howells, Hans-W. Micklitz and Thomas Wilhelmsson, *European Fair Trading Law* (Routledge 2006).

[59] Case C-220/98, *Estee Lauder Cosmetics GmbH & Co. OHG v. Lancaster Group GmbH*, ECLI:EU:C:2000:8, para 28.

[60] Legal scholars argue that the demarcation between the average consumer benchmark and the target group benchmark is not clear, since even the average consumer is determined on the basis of who is reached by the practice or to whom the practice is directed. In this regard, the EC Guidance for the interpretation of UCPD clarified that to isolate a 'particular group of consumers', the group should be sufficiently identifiable, limited in scope and homogeneous. For instance, this could be the case when a commercial practice concerns the promotion of a specific product, through marketing channels specifically addressed to a limited group of recipients, such as a particular profession. In this case, the average member of that particular group may have more specific knowledge or characteristics that an average consumer would not necessarily have. If a particular group cannot be identified, then the assessment should focus on the general average consumer benchmark. Bram B. Duivenvoorde, *The Consumer Benchmarks in the Unfair Commercial Practices Directive* (n 56), 23.

[61] Gianclaudio Malgieri and Jedrzej Niklas 'Vulnerable Data Subjects' (2020) 37 Computer Law and Security Review, 3.

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periods and also in spaces[62]. According to this universal understanding of vulnerability, vulnerable consumers would not be the exception but the rule and this is essentially the opposite approach adopted by the UCPD.

3.5 XR Advertising Manipulation: An Exercise in Legal Futurology[63]

This section undertakes a 'futurology' analysis, exploring how the UCPD can efficiently address consumer manipulation in the context of XR advertising. Notably, it should be stressed that the extent to which UCPD rules can be applied to XR advertising has yet to be widely tested in both national courts and the CJEU. Accordingly, any discussion regarding the application of UCPD to this relatively new practice remains purely speculative.

As discussed in the previous sections, XR advertising is not merely a more engaging form of digital advertising, but rather a complex technological evolution that presents opacity for consumers. Indeed, VR and AR technologies hold the potential to significantly influence consumers' mental states by altering their perception of reality or evoking strong emotional responses. If the feelings are positive and particularly powerful, they may affect the consumer's evaluation of the product. Such influence on consumers poses the risk that these technologies they may be employed to manipulate individuals' preferences, attitudes, and economic decision. However, in considering and preventing these hypothetical threats, the EU legislator must also consider that not every commercial practice deliberately aimed to influence and persuade consumer behaviour is illegal *per* se, and not every exploitation of consumers' irrationality violates the UCPD. Indeed, as explored in Section 3.1., one of the primary roles of advertising is to persuade consumers to buy products and services, since it would be against the widely shared normative intuition to even consider prohibiting many practices that are known to influence choice, such as cleverly designing the way in which options are displayed in a store or on a menu or the exaggeration of the quality of a product, which is mostly considered fair play in advertising. In the context of XR advertising, the key issue is determining when its influence should be regarded as manipulative, resulting in an unfair commercial practice, or persuasive, thus legally acceptable. In this regard, it should be stressed that the cognitive responses to AR and VR stimuli have similar, but not identical, effects on a wide range of consumers, and individuals may differently perceive the same XR advertising, despite experiencing the same immersive system in a VR context or the same AR content in an AR context[64]. Therefore, as XR advertising manipulation cannot be objectively assessed, as in the case of the material distortion of consumer economic behaviour through false or omitted information, it shall be regarded as a type of influence that – in certain circumstances - can interfere with the consumer decision-making process and, in accordance with the UCPD rules, Article 8 of the UCPD seems to be the most efficient provision for addressing this manipulative influence.

3.5.1 Aggressive XR advertising by 'undue influence' under UCPD Article 8

XR advertising may constitute an aggressive practice by 'undue influence' under Article 8 UCPD. According to Article 8, a commercial practice is aggressive when it significantly impairs or it is likely to significantly impair the average consumer's freedom of choice or

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[62] Martha A. Fineman, Equality, Autonomy, and the Vulnerable Subject in Law and Politics Fineman, (Routledge 2016), 17

[63] Massimo S. Giannini, 'Futurologia e diritto' in *Scritti. Vol 6 1970-1976* (Milano, 2006), 295.

[64] See Section 2.1.

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conduct ‘by harassment, coercion, including the use of physical force, or undue influence’. Article 2 (J) further clarifies the interpretation of ‘undue influence’, which must be regarded as the exploitation of a ‘position of power in relation to the consumer so as to apply pressure, even without using or threatening to use physical force, in a way which significantly limits the consumer’s ability to make an informed decision’.

Since XR advertising provides an influence that, in certain circumstances, may be exploited to target cognitive bias, feelings or emotional vulnerabilities, it may amount to undue influence if the impact on the consumer's decision-making is significant enough to cause confusion to consumers, interfering with their consumer decision-making process. The *Orange Polska* judgment[65] offers insight into the requirements for qualifying commercial practices as aggressive by undue influence. In that case, the CJEU was asked to determine whether concluding a contract in the presence of a courier without having received the contract beforehand constitutes an aggressive practice by undue influence, according to Article 8 and 9 UCPD. The CJEU acknowledged that undue influence is not necessarily impermissible influence (i.e., an influence that ‘bypass’ the target’s rational deliberation[66]) but, rather, an influence that through the application of pressure, actively cause the consumer to feel uneasy or disoriented with respect to the transactional decision at hand. Accordingly, constitutes an aggressive practice the unfair conduct of the trader the effect of which is ‘to put pressure on the consumer such that his freedom of choice is significantly impaired, such as conduct that makes that consumer feel uncomfortable or confuses his thinking concerning the transactional decision to be taken[67]. In other words, the interpretation of undue influence provided by the CJEU entails a trader taking advantage of their superiority over the consumer, significantly impeding the consumer's ability to make an informed choice without resorting to physical force or threats.

This case is highly relevant in the context of XR advertising, as it sheds light on the potential of UCPD to efficiently prevent XR advertising manipulation. According to the CJEU’s interpretation, when XR advertising is designed to induce or exploit vulnerabilities by leveraging cognitive biases, emotions, or emotional weaknesses and this exploitation significantly confuses the consumer when making a transactional decision, thus interfering with their ability to make a rational choice, then this type of influence can be considered 'undue' and prohibited as aggressive, even in the absence of evidence of economic compromise or trader negligence.

3.6 Conclusions

This essay aimed to investigate the interplay between XR technology and the UCPD, which is the principal EU regulation concerning unfair business-to-consumer commercial practices that harm consumers' economic interests. In Section 2, I argued that XR technology, with its distinctive features such as interactivity and immersion, offers traders the potential to influence consumer behaviour and mental states in ways that are not achievable with traditional digital advertising. As a result, both positive and negative outcomes can arise in terms of market efficiency and consumer welfare. On one hand, XR technology can improve the consumer experience of products and services by providing additional information, generating positive emotions and feelings, and increasing consumer confidence and awareness in purchasing decisions. Conversely, it can also be exploited to manipulate consumers by tailoring

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[65] C-628/17, Orange Polska (n 54).

[66] See Section 3.1

[67] C-628/17, Orange Polska (n 54) para 50.

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personalized advertising or communications to their inferred needs and vulnerabilities, exacerbating information asymmetry in market transactions and leading to unintended economic choices by consumers. By drawing on CJEU case law, it becomes clear that the UCPD is relatively future-proof and can prevent XR advertising manipulation by adapting to the development of technology. Indeed, in instances where XR advertising significantly affects consumer decision-making processes, making them feel uncomfortable or confusing their thinking, the UCPD offers potential remedies for manipulation by classifying it as a form of 'undue influence' and falling within the scope of aggressive commercial practices under Articles 8 and 9 of the UCPD.

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4

4. Data Protection in Virtual Worlds

Iris Kirchner-Freis

4.1 Introduction

The history shows that, whenever new technologies are introduced, it needs some time to adjust regulations. In the new virtual worlds of the metaverse, where users live as digital natives and experience alternative virtual lives, many types of new data - personal data and non-personal data - will be collected and processed via the internet. Users can interact with the digital virtual world, including other avatars, by wearing VR/AR devices, which have built-in sensors that are able to collect e.g. facial expressions, movements of the eyes, and biometric features such as vital signs. Personal data, in particular new types of data, will be shared with more actors in the metaverse as it is supposed to be interoperable. One of the fundamental legal questions in the context might be, whether and to what extent the European General Data Protection Regulation (GDPR)[1] is capable of ensuring data protection in the virtual and augmented worlds.

4.2 Applicability of the GDPR in virtual worlds

The right to data protection is a fundamental European right enshrined in Article 8 of the Charter of Fundamental Rights of the European Union[2]. The most important data protection law since 25 May 2018 is the General Data Protection Regulation (GDPR). It replaces conflicting or identical provisions of national law of the EU Member States within its scope of application as a directly applicable regulation. However, the GDPR contains numerous "opening clauses" that allow or even require national regulations for certain areas. The GDPR and the general national data protection laws are overlaid and in some cases superseded by a large number of specialised and sector-specific data protection rules in the European Union and individual Member State law, such as the specific provisions on electronic communications law

This chapter is dated: 4/11/2025.

[1] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L119, 4/05/2016, pp. 1-88).

[2] Charter of Fundamental Rights of the European Union (OJ C326, 26/10/2012, pp. 391-407).

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in the ePrivacy Directive[3].

4.2.1 Material scope of application

4.2.1.1 Personal data

The central object of protection in data protection law is personal data. The scope of application and the protective function of the GDPR only apply if personal data is processed. According to Article 4 (1) GDPR "personal data" means any information relating to an identified or identifiable natural person ('data subject'). Legal entities and groups of persons are excluded from the scope of protection.

A person is identifiable if the information alone is not sufficient to assign it to a person, but this is possible as soon as the information is linked to further information. Article 4 (1) GDPR stipulates that a natural person is identifiable if they "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". According to Recital 26 of the GDPR, it is irrelevant whether the person processing the data is themselves able to establish a link between the data and the data subject. For the purposes of identifiability, it is sufficient if a third party is able to do so, taking into account the costs of and the amount of time required for identification, additional effort, available technology and technological developments.4

4.2.1.2 Anonymous and pseudonymous data

Anonymous data does not constitute personal data. According to Recital 26 of the GDPR, the principles of data protection therefore do not apply to the processing of anonymous information, namely information which does not relate to an identified or identifiable natural person or to personal data that is anonymised in such a way that the data subject concerned is not or no longer identifiable. In order to determine whether a natural person is identifiable, reasonable means that are likely to be used should be taken into account, such as the costs and time required for identification, taking into consideration the technology available at the time of the processing and technological developments.

Anonymous use or payment is therefore to be assumed if the re-identification of a natural person is practically impossible as the personal reference can only be restored with a disproportionate amount of time, cost and effort.5 Anonymous use or payment should generally be excluded in virtual worlds such as the metaverse, as cryptocurrencies or NFTs are stored in a blockchain and the transactions or digital assets can be assigned to a specific person by linking them to additional information. Accordingly, anonymous use and payment are technically impossible. Nevertheless, it is a pseudonymous use. Pseudonymous data is a subset of personal

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[3] Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (Directive on privacy and electronic communications), (OJ L201, 31/07/2002, pp. 37-47) in the version of Directive 2009/136/EC of the European Parliament and of the Council of 25 November 2009 (OJ L337, 18/12/2009, pp. 11-36).

Although the GDPR itself does not contain any direct regulations for electronic communications, Article 95 GDPR declares that the rules of the Directive on privacy and electronic communications continue to apply under the conditions specified therein.

[4] See in particular Court of Justice of the European Union, Judgement of 19/10/2016 — Case 582/14, Patrick Breyer v Bundesrepublik Deutschland.

[5] Court of Justice of the European Union, Judgement of 19/10/2016 — Case 582/14, Patrick Breyer v Bundesrepublik Deutschland.

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data. "'Pseudonymisation' means the processing of personal data in such a manner that the personal data can no longer be attributed to a specific data subject without the use of additional information" (Article 4 (5) GDPR). With regard to the additional information, it must be ensured that it is stored separately and is subject to technical and organisational measures to ensure that the personal data can not be attributed to an identified or identifiable natural person. Unlike anonymous data, pseudonymous data is characterised by the existence of an assignment rule that assigns an identification feature of a person to the data collected under a pseudonym. As clarified in Article 32 (1) (a) GDPR, pseudonymisation is merely a security measure and does not remove personal reference.

4.2.1.3 Personal data in virtual worlds

(1) Data for registration
Operators of virtual reality platforms process personal data if the data generated on the platform by or about a user can be traced back to individual users, especially if they are linked e.g. to a user account. In order to use such platforms, users may have to register. Certain information is required for registration, for example user name, e-mail address, selected avatar, bank details if applicable. This registration and contract data is required by the platform operator in order to set up and manage the user account, to identify authorised users and to be able to offer the user the desired function. If this data is not provided, the platform cannot be used if registration is mandatory. If a clear name requirement applies in the virtual space, every interaction with users generally leads to the processing of personal data. The situation may be assessed differently if operators of such platforms do not require their users to register with a clear name and contact details, but instead allow the possession of an "anonymous" crypto wallet to suffice. However, according to the generous case law of the European Court of justice on personal references6, the processing of personal data can also be assumed if it is possible to trace the number string of a wallet ID back to the owner of the ID, for example, by using a search engine. The transparency of a blockchain contributes to an easier identification by enabling the tracking of transactions between wallets and can thus provide further evidence for identification.7

(2) Usage data
When a metaverse platform is accessed and used, the operator's servers generally store various technical data about the accessing system. This usually includes the operating system used, the IP address used, the date and time of access, as well as data comparable to this data. This usage and traffic data is collected regularly in order to make the platforms accessible, to recognise and rectify any technical problems that may occur, to prevent misuse of the offer and, if necessary, to be able to track it or to operate targeted advertising. Usage/traffic data is also personal data if and to the extent that it can be traced back to a natural person. For platform operators, this is, for example, the case with IP addresses.8

(3) Content data
In the virtual worlds of the metaverse, it is possible to interact with other users (e.g. using a chat function), purchase products or use services. Information that users transmit in this context to companies with a presence in the metaverse or to platform operators may include

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[6] Court of Justice of the European Union, Judgement of 19/10/2016 — Case 582/14, Patrick Breyer v Bundesrepublik Deutschland.

[7] See Wagner/Holm-Hadulla/Ruttloff, Metaverse/Hamann/Klar/Wegmann § 8 paragraph 578.

[8] Court of Justice of the European Union, Judgement of 19/10/2016 — Case 582/14, Patrick Breyer v Bundesrepublik Deutschland.

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communication content or details of purchases made or services accepted. The processing of these data will be considered in most cases as personal data.

4.2.1.4 Special categories of personal data
Special requirements apply to data processing in the metaverse if particularly sensitive data within the meaning of Article 9 (1) GDPR are processed. According to this regulation special categories of personal data are relating to persons which reveal racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership of a data subject. In addition 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 shall belong as well to the special categories of personal data.
The processing of special categories of personal data can be assumed, for example, when users transfer physical or psychological characteristics to the design of their avatar. This includes characteristics such as physical disabilities, which constitute health data.
User reactions that are recorded using VR glasses or other devices with sensors, such as pulse, breathing, pupil dilation, body movement or the user's mental state, are also special categories of personal data in accordance with Article 9 (1) GDPR.9
It is also conceivable that users authenticate themselves via iris recognition, vein scan or other biometric procedures in order to use virtual platforms or carry out transactions. In these cases, biometric data is processed in accordance with Article 4 (14), Article 9 (1) GDPR.[10]
Processing of special categories of personal data imposes strict requirements on its processing and is generally only permitted on the basis of explicit consent given by the data subject, unless the conditions of the exemption provision of Article 9 (2) GDPR are met.

4.2.2 Territorial scope

Whether the GDPR is also applicable in territorial terms is determined either according to the place of establishment according to Article 3 (1) GDPR or according to the so-called market place principle of Article 3 (2) GDPR. According to the establishment principle the GDPR applies insofar as the processing of personal data takes place in the context of the activities of an establishment of a controller or a processor in the European Union. This applies regardless of whether the actual data processing takes place in the Union or not, Article 3 (1) GDPR. The location of servers or other operating facilities of the controller or processor is therefore irrelevant.[11]
If the controller or processor does not maintain an establishment within the European Union, the provisions of the GDPR shall apply if, according to Article 3 (2) (a) GDPR, the processing of personal data of data subjects who are in the Union by a controller or processor is related to the offering of goods or services (market place principle). This also applies if the data processing is related to monitoring the behavior of the data subjects as far as their behavior takes place within the Union (Article 3 (2) (b) GDPR).
The offer of goods and services is aimed at data subjects who are in the Union if, due to the language used, the currency displayed, the place of contract fulfillment, users of the European market are to be addressed (Article 3 (2) (a) GDPR).[12]
If the user behavior is recorded in virtual spaces, for example on the basis of the end devices

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[9] See Bender-Paukens/Werry ZD 2023, 127 (128).

[10] Simitis/Hornung/Spiecker genannt Döhmann/Petri DS-GVO Art. 4 (14) paragraph 10.

[11] Simitis/Hornung/Spiecker genannt Döhmann/Petri DS-GVO Art. 4 (16) paragraph 8.

[12] Simitis/Hornung/Spiecker genannt Döhmann/Petri DS-GVO Art. 3 paragraph 26.

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used such as VR glasses or on the basis of the user's virtual activities for the purposes of profiling, marketing, etc., this constitutes monitoring within the meaning of Article 3 (2) (b), with the result that the scope of application of the GDPR is opened up.[13]
As a rule, it can be assumed that the GDPR applies because the controller operates an establishment within the European Union or because virtual offerings in virtual spaces are aimed at EU citizens or monitor their behavior.

4.3 Data protection responsibility of the parties involved

4.3.1 Controller

The obligations of the GDPR are addressed to the person responsible. According to Article 4 (7) GDPR “controller“ means the natural or legal person, public authority, agency or other body which, alone or jointly with others, determines the purposes and means of the processing of personal data. The reference to “natural or legal person” implies that both individuals and legal entities can be considered as controllers. A decision on the purposes means the "why" of data processing; a decision on the means, on the other hand, means the "how" of data processing. However, some more practical aspects of implementation ("non-essential means") can be left to the processor. It is not necessary for the controller to actually have access to the processed data in order to be categorised as a controller.[14] A decision on the non-essential means of processing exists if the service provider determines the technical means of data processing. However, if an actor determines which categories of data are processed, whose personal data are processed, how long the data are stored and when they are deleted and who has access to these data, it decides on essential means of processing with the consequence that this qualifies as a controller within the meaning of Article 4 (7) GDPR.

4.3.2 Joint controllers

In a complex and collaborative data processing such as the one in the virtual worlds of the metaverse, a large number of parties often works together to process data. This makes it often extremely difficult to determine who is involved in data processing. This shared form of processing can lead to the fact that not only one party is solely responsible for the processing, but that there is a joint responsibility. Joint responsibility exists in accordance with Article 4 (7) GDPR if two or more controllers are involved in determining the purposes and means of data processing. An important criterion is that the processing would not be possible without the participation of both parties, in the sense that the processing of each of the parties is inseparable, i.e. inextricably linked to each other.[15] It is harmless if not all actors have actual access to the processed data or if the contributions to the data processing are not of equal importance.

4.3.3 Processor

Processing by a processor (Article 4 (8) GDPR) is carried out on the basis of a contract (Article 28 GDPR). The processor processes the data only on the instructions of the controller. The

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[13] See Bender-Paukens/Werry ZD 2023, 127 (129).

[14] European Data Protection Board, Guidelines 07/2020 on the concepts of controller and processor in the GDPR, Version 2.1 (20/09/2022), page 3.

[15] European Data Protection Board, Guidelines 07/2020 on the concepts of controller and processor in the GDPR, Version 2.1 (20/09/2022), page 3.

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processor is only free to select suitable technical and organisational means to carry out the commissioned data processing. If the processor infringes the instructions of the controller or decides to process the data for its own purposes, its role under data protection law changes. For the processing phase in which it determines its own purposes and means of processing, it is no longer a processor, but a controller (Article 28 (10) GDPR).
As a rule, processing by a processor takes place in the virtual spaces of the metaverse when the technical provision of the metaverse platforms is guaranteed, statistical analyses on the use of the metaverse are created and services for fraud prevention or authentication are provided. This applies not only to the operators of the metaverse platforms, but also to companies that, for example, offer their goods and services on a virtual marketplace and in turn commission service providers for their technical provision.[16]

4.3.4 Parties involved in virtual worlds

4.3.4.1 Operators of platforms
If the metaverse is provided by a specific operator of a metaverse platform, such as e.g. the company Meta, this operator is responsible for the processing of personal data on the metaverse platform operated by it. In this case, the operator of the metaverse platform has control over the purposes and means of data processing. It can be assumed that the operator of the metaverse platform uses third-party service providers as processors, for example as hosting providers, for the technical provision of the platform or some of its functions.
If the metaverse were to be operated in a completely decentralised manner, whereby the metaverse and the associated data processing would not be controlled by a single entity but would be under the joint and equal control of its users, users and providers would probably have to be regarded as data controllers under the data protection law of the GDPR; this could cause major problems if these persons are in fact anonymous. In addition, the concept of responsibility under the data protection law of the GDPR would be pushed to its limits. If all users jointly decide on the processing of all their personal data, they are all joint controllers and simultaneous data subjects in relation to each other.
Between a classic centralised metaverse platform, such as Horizon Worlds from Meta[17], and complete decentralisation of the metaverse, there are also intermediate models in which a legal entity assumes central responsibility, but is itself subject to a certain degree of control by at least some of the users, such as Decentraland.[18] Decentraland is technically operated by a foundation and legally controlled by its bodies; it will be controlled by its users.19
Depending on the form of centralisation or decentralisation of the metaverse, it will have to be determined in each individual case who is the controller within the meaning of the GDPR.

4.3.4.2 Operators of presences
Companies acting as providers of presences may themselves be responsible for the processing of personal data. This presupposes that the configuration of the metaverse platform grants the provider decision-making powers regarding the purposes and means of processing personal data. Providers of virtual shops, offices or event organisers who process the personal data of their users for their own purposes — and within the scope of the metaverse platform's terms of

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[16] See Steege/Chibanguza, Metaverse HdB/Benedikt § 11 paragraph 37.

[17] Meta Horizon Worlds, https://www.meta.com/de/horizon-worlds/.

[18] Decentraland, https://decentraland.org/.

[19]Decentraland DAO (Decentralised Autonomous Organisation), https://decentraland.org/dao/.

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use — for example, to sell goods and services or to check access authorisation, can be controllers.
At the same time, joint responsibility may also arise between the operator of a metaverse platform and a company as the provider of a presence in the metaverse, for example, if the company receives aggregated registration and contract data about the visitors to its presence from the operator of the metaverse platform. In this case, it would not matter that the company itself does not collect any personal data. According to the standards set by the Court of Justice of the European Union in conventional social networks, the company could also be jointly responsible for the collection and aggregation of personal data by the metaverse platform operator.[20]
If the companies represented in the metaverse are to be regarded as jointly responsible for data processing with the operator of a metaverse platform a joint control arrangement must be concluded in accordance with Article 26 GDPR. This arrangement must regulate which of the parties involved fulfils which obligation under the GDPR. This concerns the possibility for data subjects to exercise their rights under Article 15 et. seq. GDPR and the information obligations under Articles 13 and 14 GDPR. Similar to the situation with social networks, it would make sense to assign these obligations primarily to the operator of the metaverse platform. The operator is much closer to the centralised data processing and, in case of doubt, better suited to providing the relevant information.

4.3.4.3 User
Users of the metaverse are usually "data subjects" in accordance with Article 4 (1) GDPR, whose data is processed by the other parties involved. However, users who do not only use their avatar in a private capacity, but rather within the scope of a commercial activity in the virtual spaces, such as small content providers or traders, can become controllers themselves.[21] In this cases the distinction between purely private use and professional or commercial use becomes blurred in the metaverse.

4.4 Lawfulness of processing

Controllers – and, to a certain extent, processors – must comply with the foundational principles detailed in Article 5 GDPR, namely lawfulness, fairness, transparency, purpose limitation, data minimization, accuracy, storage limitation, integrity and confidentiality, and accountability. Article 5 (1) (a) GDPR introduces the principle of “lawfulness,” which requires controllers to justify their processing operations using one of the six lawful grounds listed in Article 6 GDPR.
First and foremost, the GDPR refers to “consent“ (Article 6 (1) (a) GDPR) to the processing of personal data unless another legal reason of justification applies, in particular from the exhaustive list in Article 6 GDPR or subject to Article 9 GDPR, which refers to the processing of special categories of personal data.
The following legal basis are typically considered for data processing in the in the virtual worlds of the metaverse:

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[20] Analogous to the situation of a fan page operator who receives similar statistical data about the visitors to the fan page from Facebook: Court of Justice of the European Union, Judgement of 5/06/2018 — Case 210/16, Unabhängiges Landeszentrum für Datenschutz Schleswig-Holstein v Wirtschaftsakademie Schleswig-Holstein GmbH; see also Wagner/Holm-Hadulla/Ruttloff, Metaverse/Hamann/Klar/Wegmann § 8 paragraph 596.

[21] Article 2 (2) (c) GDPR: „This Regulation (GDPR) does not apply to the processing of personal data by a natural person in the course of a purely personal or household activity.“

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4.4.1 Consent

Subject to Article 6 (1) (a) GDPR the processing of personal data 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. Consent is defined in Article 4 (11) GDPR. The conditions for consent are set out in Article 7 GDPR. Effective consent requires that this has been given freely, in advance and in an informed manner. The data subject must be informed of at least the following circumstances of the processing[22]:

- the identity of the controller (Recital 42 of GDPR),
- the purposes of the processing for which the consent is required (Recital 42 of GDPR),
- the categories of processed data,
- the existence of the right to withdraw consent (Article 7 (3) GDPR),
- where applicable, information on whether automated decision-making (profiling) takes place in accordance with Article 22 (2) (c) GDPR.
- information on possible risks of data transfers, insofar as neither an adequacy decision pursuant to Article 45 GDPR nor appropriate safeguards pursuant to Article 46 GDPR exist (Article 49 (1) (a) GDPR).

Consent to the lawful processing of personal data may be given by the data subject in different ways such as by written statement, including by electronic means, an oral statement or by ticking a box when visiting an internet website. In addition to this, in the virtual worlds of the metaverse the data subject may give his or her consent through his or her avatar, as well as by the devices used, such as VR glasses or VR gloves, which clearly indicates the data subject's acceptance of the proposed processing of his or her personal data[23].

4.4.2 Performance of a contract

Personal data may also be processed on the legal basis of Article 6 (1) (b) GDPR if this is necessary for the performance of a contract to which the data subject is party or in order to take steps at the request of the data subject prior to entering into a contract.
Processing is necessary within the meaning of Article 6 (1) (b) GDPR if the contractual or pre-contractual obligations could not be fulfilled without the data processing.
It should be noted that the data subject must be a party to the contract. A contract that exists solely between the controller and a third party is therefore not sufficient to justify data processing.
The responsible person bears the burden of evidence and proof that an effective contract has been concluded and with what content. If the contract is concluded exclusively in the virtual world, this leads to new requirements for the authentication of the contractual partner and their legal capacity. It is therefore necessary to identify the contractual partner and check their legal capacity before entering into a contract, e.g. through a central authority or application.
Insofar as operators of metaverse platforms process registration or contract data in order to make the platform available to the user, this processing may regularly be based on the legal basis of Article 6(1)(b) GDPR, provided that the processing of this data is carried out to the extent necessary for the performance of the contract.
When processing technical usage or traffic data for the purpose of providing the platform or for troubleshooting or abuse control by the operator of the metaverse platform, Article 6(1)(b) GDPR can also be taken into account.

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[22] European Data Protection Board, Guidelines 05/2020 on consent under Regulation 2016/679, Version 1.1 (13/05/2022), paragraph 64.

[23] Recital 32 of GDPR; see Steege/Chibanguza, Metaverse HdB/Benedikt § 11 paragraph 42.

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If, on the other hand, user data is processed for individual tracking of user behaviour, profiling or tracking for advertising purposes in the metaverse, user consent in accordance with Article 6 (1) (a) GDPR will be required in most cases. According to consistent case- law, the use of web tracking tools is only lawful on the basis of informed consent within the meaning of the GDPR.[24]
Article 6 (1) (b) GDPR also applies as the legal basis for companies as providers of presences in the metaverse if this is necessary for the performance of a contract to which the data subject is party or in order to take steps at the request of the data subject prior to entering into a contract. This could be the case, if a company sells virtual products in the form of NFTs in the metaverse to a natural person. The associated processing of content and transaction data can be based on Article 6 (1) (b) GDPR.

4.4.3 Balancing of interests

Data processing can also be based on Article 6 (1) (f) GDPR, if processing is necessary for the purposes of the legitimate interests pursued by the controller or by a third party, except where such interests are overridden by the interests or fundamental rights and freedoms of the data subject which require protection of personal data. The provision of Article 6 (1) (f) GDPR is a "catch-all provision". The responsible person can never be certain whether the balance of interests will be in their favour or at their expense. In practice, it will therefore regularly be necessary in cases of doubt to check whether the consent of the data subject should be obtained after all. The following processing activities are generally permitted in the metaverse in accordance with Article 6 (1) (f) GDPR:

- data security measures,
- communication with users,
- fraud prevention,
- provision and implementation of a service,
- design of an avatar, as long as special categories of personal data are not affected in accordance with Article 9 (1) GDPR.

4.5 Rights of the data subject

Article 12 et seq. of GDPR contains various data protection rights for data subjects. These rights must also be observed when processing data in the virtual spaces of the metaverse. Of particular relevance are the right to information (Article 13, 14 GDPR), right of access (Article 15 GDPR), the right to erasure (Article 17 GDPR) and the right to data portability (Article 20 GDPR). Controllers in the metaverse must ensure that the data protection rights of data subjects are fulfilled:

4.5.1 Right to information

Under the GDPR, controllers have extensive information obligations to fulfill. According to Article 12 GDPR, the controller must inform data subjects about the collection of personal data in an understandable and easily accessible form and in simple language.
When data is processed on a website, the obligation occurs to provide information by providing so-called “privacy policies“ or “privacy statements“. The data subject does not have to “accept“ the data protection provisions or make any other declaration of intent to show agreement with the content. Nor is it necessary for the data subject to have read and taken note of the data

[24] Court of Justice of the European Union, Judgement of 1/10/2019 — Case 673/17, Bundesverband der Verbraucherzentralen und Verbraucherverbände - Verbraucherzentrale Bundesverband e.V. v Planet49 GmbH.

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protection provisions. The mere provision of information on data protection is sufficient.
The right to information where personal data are collected from the data subject is governed by Article 13 (1) and (2) GDPR. In particular, the controller must provide the following information at the time when personal data are obtained:

- the identity and the contact details of the controller,
- the contact details of the data protection officer, where applicable,
- the purpose of the processing,
- the recipients or categories of recipients of the personal data,
- the period for which the personal data will be stored and
- the right to lodge a complaint with a supervisory authority.

In the metaverse, the information obligations (Articles 12 - 14 GDPR) may be fulfilled in different ways. Operators of metaverse platforms can make their data protection information available in the App Store or directly in the App. If there is a joint responsibility between the operator of a metaverse platform and an entrepreneur in the metaverse, the companies operating in the metaverse must also inform about the collection of personal data. Entrepreneurs in the metaverse may "display" their privacy policies in their virtual space, whereby page-long privacy policies seem not to be practical in immersive spaces. It can therefore be challenging to inform users in a timely and understandable manner about data collection, which often takes place dynamically depending on avatar interaction or virtual location. A simple option might be the use of standardised icons with short explanations (Article 12 (7) GDPR). Another option to fulfill the information obligation might be a link to the privacy policy on the respective website. Depending on the design of the particular metaverse, linking to the data protection information outside the metaverse may be problematic if it is not or not easily recognisable with the means usually available within the metaverse. If, for example, a PDF document cannot be read or is very difficult to read by users with the glasses usually used, the link is not transparent information within the meaning of Art. 13 GDPR.[25]

4.5.2 Right of access by the data subject

If the data subject requests information about the processing of personal data concerning him or her in accordance with Article 15 (1) GDPR, the controller has to provide the following information in particular:

- the purpose of the processing,
- the categories of personal data concerned,
- the existence of the right to request form the controller rectification or erasure of personal data or restriction of processing of personal data concerning the data subject or to object to such processing,
- where possible, the envisaged period for which the personal data will be stored, or, if not possible, the criteria used to determine that period,
- the right to lodge a complaint with a supervisory authority and
- the existence of automated decision-making, including profiling, referred to in Article 22(1) and (4) and, at least in those cases, meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject.

It should be noted that pseudonymous data and conclusions drawn by the controller about a

[25] See Bender-Paukens/Werry ZD 2023, 127 (129).

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data subject must also be disclosed.[26] In addition, the controller must inform the data subject of the specific recipients to whom the data has been disclosed.[27]
The data to be provided must be made available to the data subject in the form of a copy in accordance with Article 15 (3) GDPR. Copy within the meaning of this provision means a faithful and understandable reproduction of all data that are the subject of processing.[28] To provide data subjects in the metaverse with a copy of their personal data, the metaverse could offer new options to the data subjects, for example, by viewing a duplicate of their avatar and retrieving their user history, communication data and characteristics in the virtual world.[29]

4.5.3 Right to erasure ('right to be forgotten')

The data subject shall have the right to obtain from the controller the erasure of personal data concerning him or her in accordance with Article 17 GDPR. It is often assumed that the right to erasure cannot be guaranteed when using blockchain technology. With blockchain-based platforms, the right to rectification (Article 16 GDPR) and the right to erasure can be in conflict with blockchain technology, which does not readily permit the modification of data once it has been generated and duplicated many times. One option being discussed is not to correct the original data, but to include a note in subsequent transactions indicating which data is obsolete and to what extent it will be corrected. Similar issues may arise with erasure requests pursuant to Article 17 (1) GDPR if processing is based on blockchain technology. This presents a dilemma between the "right to be forgotten" according to Article 17 GDPR and the blockchain's claim to integrity and protection against forgery. It should be noted in this context that the right to erasure does not apply in any case if anonymous data is stored in the blockchain and it is not possible to identify the data subject. Furthermore, the right to erasure is not guaranteed without restriction, as there are numerous exceptional cases under Article 17 (3) GDPR in which the controller can refuse to erase data, for example, for exercising the right of freedom of expression and information (Article 17 (3) (a) GDPR), for compliance with a legal obligation (Article 17 (3) (b) GDPR) or for the establishment, exercise or defence of legal claims (Article 17 (3) (e) GDPR). In addition Union or Member State law to which the data controller or processor is subject may restrict by way of a legislative measure the scope of the obligations and rights provided for in Article 17 GDPR (Article 23 GDPR). Finally, various technical options are discussed for removing older transactions in the blockchain by "pruning" (reducing the amount of data by eliminating transactions on older blocks) or technically "blackening" the data by forking (splitting off the blockchain).[30]
If it is not possible for the controller to identify the data subject when fulfilling data subject rights - e.g. the data collected cannot be assigned to individual users in the metaverse - Article 11 (2) GDPR may provide a solution. Accordingly, the rights of the data subject do not apply if the controller can prove that it is not in a position to identify the data subject. The application of this rule is being discussed in certain cases where the design of the technical system is intended to protect the anonymity of users, as this is the case for many blockchain-based

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[26] European Data Protection Board, Guidelines 01/2022 on data subject rights - Right of access, version 2.1 (30/05/2024), page 3.

[27] Court of Justice of the European Union, Judgement of 4/05/2023 — Case 487/21, F.F. v Österreichische Datenschutzbehörde and CRIF GmbH.

[28] Court of Justice of the European Union, Judgement of 4/05/2023 — Case 487/21, F.F. v Österreichische Datenschutzbehörde and CRIF GmbH.

[29] See Steege/Chibanguza, Metaverse HdB/Benedikt § 11 paragraph 62.

[30] See for these technical approaches Bechthold/ Vogt ZD 2018, 66 (70).

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systems.[31]

4.5.4 Right to data portability

The data subject shall have the right to receive the personal data concerning him or her, which he or she has provided to a controller, in a structured, commonly used and machine-readable format and have the right to transmit those data to another controller (Article 20 GDPR). In the metaverse the right can be of particular importance if users want to switch between different virtual worlds with their avatars and transfer their virtual assets.

4.6 Transfers of personal data

As part of data processing in the virtual worlds of the metaverse, personal data is regularly transferred to a third country. This applies regardless of whether the metaverse is centrally or decentralised, as data processing is regularly carried out by at least one party outside the scope of the GDPR. Data transfer occurs, for example, when a service provider in a third country outside the European Union or the European Economic Area is commissioned to process data, or when a controller with a branch in the European Union transfers personal data to a controller based in the USA.[32]

In the event of a data transfer to a third country, Article 44 GDPR must be observed in addition to the general requirements for a legal basis under Article 6 or Article 9 GDPR. Unless the European Commission has confirmed that the third country in question has an "adequate level of data protection" in accordance with Article 45 GDPR[33], the companies involved in the data transfer must themselves ensure "appropriate safeguards" within the meaning of Article 46 GDPR. In most cases, the "standard data protection clauses" adopted by the Commission of the European Union are used for this purpose[34], whereby the data recipient in the third country undertakes to comply with the data protection standards of the GDPR, submits to the jurisdiction of the EU data protection authorities and courts, and grants direct rights to the data subjects. However, according to the case law of the European Court of Justice, such contractual provisions alone are not sufficient for a lawful data transfer to third countries.[35] The parties involved must check whether the data recipient is able to fulfil its contractual data protection obligations in accordance with the legal situation in the third country and, if necessary, take additional protective measures. If the risk of data protection infringements, in particular due to disproportionate access to data by authorities in the third country, cannot be ruled out even with

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[31] See Wagner/Holm-Hadulla/Ruttloff, Metaverse/Hamann/Klar/Wegmann § 8 paragraph 623.

[32] European Data Protection Board, Guidelines 05/2021 on the Interplay between the application of Article 3 and the provisions on international transfers as per Chapter V of the GDPR, Version 2.0 (14/02/2023), Annex, Example 4 und 5.

[33] Adequacy decisions for non-EU countries: https://commission.europa.eu/law/law-topic/data-protection/international-dimension-data-protection/adequacy-decisions_en: Andorra, Argentina, Canada, Faroe Islands, Guernsey, Israel, Isle of Man, Japan, Jersey, New Zealand, Republic of Korea, Switzerland, the United Kingdom under the GDPR and the LED, the United States (commercial organizations participating in the EU-US Data Privacy Framework), Uruguay.

[34] Commission Implementing Decision (EU) 2021/914 of 4 June 2021 on standard contractual clauses for the transfer of personal data to third countries pursuant to regulation (EU) 2016/679 of the European Parliament and of the Council (OJ L199, 7/06/2021, pp. 31-61).

[35] Court of Justice of the European Union, Judgement of 16/07/2020 — Case 311/18, Data Protection Commissioner v Facebook Ireland Limited and Maximillian Schrems.

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such measures, the data transfer may not take place.[36]
If there is neither an adequacy decision pursuant to Article 45 GDPR nor appropriate safeguards pursuant to Article 46 GDPR, a transfer of personal data to a third country is only permissible under the conditions set out in Article 49 (1) (a) - (g) GDPR. This is the case in particular if the data subject has expressly consented to the data transfer (Article 49 (1) (a) GDPR), the transfer is necessary for the performance of a contract (Article 49 (1) (b) GDPR) or the transfer is necessary for important reasons of public interest (Article 49 (1) (d) GDPR). According to the data protection supervisory authorities, the exemptions in Article 49 GDPR must be applied restrictively. This means that, in particular, the regular and permanent transfer of data cannot be based on the user's consent.[37]
The most common basis for a data transfer to third countries are the adequacy decisions of the European Commission and the standard data protection clauses.
As the adequacy decisions of the European Commission have only been made in relation to individual third countries, it is advisable to agree on standard data protection clauses between the parties involved in the data transfer. The standard data protection clauses are model contracts that have also been adopted by the European Commission.[38]
By definition, the metaverse is a global borderless environment. The constant, spontaneous interactions in the metaverse lead to a constant, transfer of data across national borders. If compliance with the strict requirements for international data transfers (Art. 44 ff. GDPR) is realistic, seems to be hardly guaranteed in this dynamic environment.

4.7 Conclusion

Virtual reality (VR), augmented reality (AR) and extended reality (XR) — have become an integral part of the multimedia landscape in recent years. These technologies can allow people to learn new skills, explore new places and experience times and events in ways that otherwise would have been impossible. Although applications in the metaverse can be useful, they also pose major challenges and risks, making it essential to carefully examine these technologies. This also applies to data protection, which is crucial for the responsible use of these technologies.
The metaverse is a complex network of different actors working together processing data. The immersive nature and complexity of these virtual worlds give rise to new forms of responsibilities of data collection and data processing of a huge amount of highly sensitive data that goes far beyond what is collected on the traditional web and may allow detailed conclusions to be drawn about a person's emotions, attention, intentions and even state of health. But the compliance with GDPR obligations, which also apply in the metaverse, might be challenging in immersive and dynamic environments. Companies should therefore observe the GDPR already when creating and further developing a metaverse platform or participating in such a platform and integrate the data protection requirements accordingly. This protects them from high fines for violations of the GDPR and at the same time offers a high degree of fundamental rights protection for users. In addition, appropriate legal frameworks of the

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[36] Court of Justice of the European Union, Judgement of 16/07/2020 — Case 311/18, Data Protection Commissioner v Facebook Ireland Limited and Maximillian Schrems.

[37] European Data Protection Board, Guidelines 02/2018 on derogations of Article 49 under Regulation 2016/679 (25/05/2018), page 9.

[38] Standard Contractual clauses (SCC) for data transfers between EU and non-EU countries: https://commission.europa.eu/law/law-topic/data-protection/international-dimension-data-protection/standard-contractual-clauses-scc_en.

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European legislator would certainly make sense, which are tailored to the metaverse and facilitate application in order to guarantee the necessary legal certainty for companies without hinderance innovation in this area.

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5. Non-contractual liability in the AR-VR domain: an EU private international law perspective

Paola Ivaldi and Simone Carrea

5.1 Introduction

Several technological developments have recently challenged long standing rules (of law in general and of private international law in particular), by putting them to the test of new scenarios, which could not even be envisioned when such rules were initially drafted.

The establishment of the internet is perhaps the most recent and significant example of such phenomenon, since the creation of a space which is considered to be "nowhere and everywhere" raised many difficult questions about the capability of "traditional" rules to address and effectively regulate the activities taking place in such a new context.

The relation between the internet and the law was indeed the object of an extensive and very interesting debate, which can only be hinted at here, but might certainly be helpful also in understanding the impact of Augmented Reality (AR) and Virtual Reality (VR) [1].

Indeed, AR and VR pose a similar challenge, in so far as they appreciably impact upon the environment (the reality) where human behaviours take place, by altering its perception (AR) or by creating a new one altogether (VR).

As a matter of fact, AR adds the perception of digital contents to a person's vision of the real world (for example, AR glasses could be used to show, to the person wearing them, additional information about the surrounding objects), while VR creates new (virtual) worlds, where a (real) person can act (and interact) through an avatar, a digital alter ego which may (or not) physically resemble the person in question.

Even though, so far, such technologies have mainly been used for ludic purposes, they might also serve other functions. AR, for instance, might be used, for educational purpose, to "superimpose"

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[1] For a summary overview of the debate surrounding the relation between internet and law (especially private international law), see among others Stefania Bariatti "Internet e diritto internazionale privato: aspetti relative alla disciplina del diritto d'autore" (1996) AIDA 59; Jack. L. "Goldsmith, Against Cyberanarchy" (1998) 65(4) The University of Chicago Law Review 1199; Andrea Slane "Tales, Techs, and Territories: Private International Law, Globalization, and the Legal Construction of Borderlessness on the Internet" (2008) 71(3) Law and Contemporary Problems 129; Dan Jerker B. Svantesson *Private international law and the Internet* (3rd edn., Kluwer Law International, 2016); Tobias Lutzi "Internet Cases in EU Private International Law Developing a Coherent Approach" (2017) 66 International & Comparative Law Quarterly 687; Adelina Adinolfi "L'Unione europea dinanzi allo sviluppo dell'intelligenza artificiale: la costruzione di uno schema di regolamentazione europeo tra mercato unico digitale e tutela dei diritti fondamentali" in Stefano Dorigo (ed) Il ragionamento giuridico nell'era dell'intelligenza artificiale (Pacini giuridica, 2020) 13; Alessandro Morelli and Oreste Pollicino "Metaphors, judicial frames, and fundamental rights in Cyberspace" (2020) AJCL 616; Julia Hörle *Internet Jurisdiction Law and Practice* (Oxford University Press 2021); Benedetta Cappiello *AI-systems and non-contractual liability. A European private international law analysis* (Giappichelli, 2022).

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notions and information on the relevant (real) objects (such as pieces of art, stars, mountains, *etc*.) or, in a working environment, to make visible to the user important data (*e.g*. by alerting the operator of a complex machinery about the conditions of its functioning). VR, instead, makes it possible to create (realistic) training scenarios (*e.g*. in the context of military instruction) which would otherwise be very difficult or excessively costly to provide in the "real reality".
As far as the issue of non-contractual liability is concerned (which is the focus of the present contribution), the capability of such new technologies to give rise to damages cannot by all means be underestimated. To make just one remarkable example, *Pokémon GO*, to date one of the most successful (ludic) applications of AR, gave rise to quite a number of lawsuits in tort all over the world.
Indeed, the game basically consists in capturing Pokémon creatures which the developers of the software have made visible (only to the players using an AR device) in every part of the (real) world, thus turning "players' real-life surroundings into a virtual Pokémon-catching landscape on their smartphones"[2]. As a consequence, many players - distracted by the game -injured themselves and others or trespassed on private property. Lawsuits between the players and third parties and/or the developers of the application inevitably ensued.
In light of the above, the present paper will focus on the following issues (moving from the more general to the more specific): a) the identification of the main challenges that AR and VR pose for the law in general (§ 2); b) the impact of AR and VR upon the operation of private international law rules in particular (§ 3); c) finally and more specifically, the application of private international law rules on non-contractual liability to tort law situations arising in the AR-VR domain (§§ 4-6).

5.2 Augmented reality, virtual reality and the law: general considerations

The fundamental question regarding the relation between the law, on the one hand, and AR and VR, on the other hand, is how legal rules drafted to address "real world" situations should apply to behaviours taking place in the AR or VR domain.
This question, so far, has mainly been debated from the perspective of substantive law[3], but the private international law analysis can greatly benefit from such a discussion, which is useful with a view to identifying the different methodological (if not even philosophical) approaches that lawyers might have towards these new phenomena.
By way of a (perhaps extreme) summarization, those who concentrate on the *medium* employed (AR or VR) might be tempted to conclude that activities taking place in such new domains *should not* or *could not* be regulated by the law. More specifically, "should not be regulated" because AR and VR are "just a game" and do not deserve the "attention" of the law or "could not be regulated" because AR and VR are immaterial "spaces", unreachable by the commands of the law.

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[2] Sara Gold "When Pokémon GO(es) Too Far: Augmented Reality and Tort Law" (2018) (38) Whittier Law Review 161.

[3] See among others Neal Hoffman "Battery 2.0: Upgrading Offensive Contact Battery to the Digital Age" (2010) 1 Case W. Res. J.L. Tech. & Internet 61; Lim Hannah Yee Fen. "Virtual world, virtual land but real property" (2010) Singapore Journal of Legal Studies 304; Mark A. Lemley and Eugene Volokh "The Real Law of Virtual Reality" (2017) 51 UC Davis Law Review 51; Roderick O'Dorisio "Torts in the Virtual World" (2017) 94 Denv. L. Rev. F. 406; Woodrow Barfield and Alexander Williams "The law of virtual reality and increasingly smart virtual avatars" in Woodrow Barfield and J. Marc Blitz (eds) Research Handbook on the Law of Virtual and Augmented Reality (Edward Elgar Publishing, 2018); Mark A. Lemley and Eugene Volokh, "Law, Virtual Reality, and Augmented Reality" (2018) 166 University of Pennsylvania Law Review 1051; Paul S. Berman, Legal Jurisdiction and Virtual Social Life (2019) 27 Cath. U. J. L. & Tech 103; Richard L. Pate "Legal issues inside the unnatural world of metaverse" (2022) 43(5) Business Law Review 188; Chandler Horne "Regulating Rape within the Virtual World" (2023) 10 Lincoln Mem'l U. L. Rev. 159.

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At the opposite, those who focus on the behaviours taking place in the AR-VR domain (perhaps to the point of losing sight of the peculiarity of the *medium* involved or too much affected by their immersive and realistic character) might argue that such behaviours *should be* addressed by the law in the exact same way (and with the same consequences) as the corresponding "real world" situations.

In our opinion, all the above-mentioned approaches are unsatisfying and their inadequacy to address the phenomena at hand can be easily demonstrated by means of some practical exemplifications. Let us consider, for this purpose, the following situations: 1) an avatar kills another avatar in the context of a war game played in the VR; 2) an adult avatar (controlled by an adult) sexually harasses another adult avatar (also controlled by an adult) in a virtual environment; 3) an adult avatar (controlled by an adult) sexually harasses a minor avatar (controlled by a minor) in a virtual environment; 4) an avatar publishes slandering comments about a real person in a virtual environment; 5) an avatar reproduces in the VR copyrighted material without the permission of the copyright holder; 6) the inaccurateness of the information presented by an AR device leads to serious physical injuries on the part of the user.

It is self-evident that situation 1) cannot by all means be treated as a murder and it appears to be completely irrelevant from a legal standpoint.

Situations 2) and 3), instead, according to most legal systems, would not be qualified as rape (mainly because of the lack of physical contact between the parties), but at the same time it would be difficult to dismiss them as completely irrelevant from the legal point of view (all the more case 3, involving a minor). As a matter of fact, these are (in reality) upsetting and disturbing (although merely virtual) behaviours that could trigger the application of criminal law (*de iure condito*) or at least reasonably raise the attention of the criminal legislator (*de iure condendo*). In other words, situations 2) and 3), from a legal point of view, might be relevant, but in a different way and to a different extent than their "virtual" appearance might suggest.

Finally, situations 4), 5) and 6) are by all means legally relevant, and, despite their virtual setting, they should be treated in the exact same way as the corresponding "real life" behaviour.

It might be concluded, therefore, that the above-considered opposite approaches work sometimes but not all of the times.

Therefore, a (more) functioning theory would require, in our opinion, a shift in focus, as a consequence of which every AR-VR situation should be looked at not in itself, but from the specific perspective of the legal provision which comes to relevance on a case-by-case basis. In light of such different approach, the above-suggested examples could be easily rationalised: case 1) does not qualify as murder because it does not affect in any way the interest (real - and not virtual - life) protected by the provision of law punishing murder; cases 2) and 3), despite not qualifying as rape, might still be punishable because they might actually endanger (although to a lesser extent than the corresponding "real" behaviour) an interest (physical or psychological integrity, dignity and personal liberty of every person in general and of minors in particular) protected by the law; cases 4), 5) and 6) violate (through a virtual behaviour) the same interests (personal reputation, copyright, physical integrity) protected by the provisions applicable to "real life" situations and, as a consequence, they should reasonably trigger the same legal consequences.

In other words (and this is a conclusion particularly relevant also for the purposes of the private international law analysis, which will follow[4]), the lawyer should qualify each AR-VR situation by "wearing the glasses" of the applicable provisions of law. Indeed, this metaphor might even be pushed further by arguing that the law itself could be seen as a (more ancient and less refined from a technological point of view) AR system, insofar as it attaches virtual (legal) assessments and

[4] As further specified below, our analysis focuses on the (traditional) private international law reasoning. The expression "private international law" is understood in its broad and inclusive meaning: our reflection concerns the rules on both jurisdiction in civil and commercial matters and choice of law.

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consequences to human behaviours, irrespective of the environment (real or virtual) where such activities take place.
In this perspective, lawyers are called upon to "pierce the veil" of AR and VR in order to look at human conducts and relations "through the lenses of the law", by having regard to its wording and its rationale and without getting distracted by the realistic and immersive features of the new technologies at hand.
By way of an emblematic example, the jurist who would try, for instance, to apply property law to possessions of virtual property would fall into a dangerous temptation, similarly to a person walking into a *trompe-l'œil*, or talking to a realistic sculpture or (to remain in the AR-VR environment) falling off a cliff trying to capture a Pokémon. As a matter of fact, real property in the VR is not real, but is a merely virtual representation of assets, with which the VR user is only entitled to interact (in the virtual environment) on the basis (and at the specific terms) of the contractual agreement entered into with the VR service provider (which, by the way, falls within the domain of contract and not property law).
At the end of the day, and in light of the above, the well-known statement according to which "code is law"[5] should provocatively be reverted to "the law is the law" and lawyers should be reminded to continue "playing" the only "game" they should be really good at: the law.

5.3 Augmented reality, virtual reality and private international law

The analysis conducted in the previous paragraph, although focussed upon substantive law, has established two fundamental points which are extremely useful (also) for the private international law perspective: i) AR and VR generate sometimes the impression of phenomena whose "virtual appearance" greatly differs from their "legal reality"; b) with a view to seeing through such illusion, lawyers are required to look at every situation in the perspective of the specific legal provision that they are called upon to apply.
As well known, private international law is not concerned with the substantive solution of a social conflict, but with the identification of a) the jurisdiction vested with the power to adjudicate such dispute and b) the law applicable to it. These functions are mainly performed by private international rules through connecting criteria, which link the disputed situation to the law (or the courts) of a certain State, depending on the spatial distribution of its relevant elements[6].
In this regard, it can be seen that VR and AR might pose a significant obstacle to the application of private international law provisions, insofar as the adulteration - by VR and AR technologies - of the perception of spaces might mislead the appropriate localization of the elements which are relevant, according to the connecting criteria employed by private international law rules, for the identification of the competent jurisdiction or of the applicable law.
If - by way of example - ownership of an immovable property in a virtual environment was (mistakenly) qualified as a "right in rem", then a) according to art. 24.1.1 of Brussels Ia Regulation, the courts of the Member State in which the property is situated would have exclusive jurisdiction over the dispute and b) the law of the same State should apply, according to art. 4 of Rome I Regulation,[7] to the contracts relating to such right, thus leading to the following (very difficult if not

[5] Lawrence Lessig *Code and other laws of cyberspace* (New York, 1999).

[6] As already stated (*supra*, footnote 4), the analysis refers to rules of both jurisdiction in civil and commercial matters and choice law.

[7] Regulation (EC) No 593/2008 of the European Parliament and of the Council of 17 June 2008 on the law applicable to contractual obligations (Rome I) [2008] OJ L 177/16.

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impossible) questions: where is a virtual property situated? What law applies (and which courts have jurisdiction) in the virtual reality? Where is virtual reality physically located?
The solution would be more straightforward if – by looking through the realistic appearance of VR – the same situation was instead (appropriately) considered as a contractual dispute between the user and the service provider (as suggested *supra*), subject (as a general rule) to the law of the country where the service provider has his habitual residence (art. 4.1.c of Rome I Regulation) and to the jurisdiction of the courts of the State where, under the contract, the services were provided or should have been provided (art. 7.1.b of Brussels Ia Regulation[8]), unless the parties agreed otherwise (*electio iuris* or *electio fori*) in the exercise of their autonomy.

5.4 Private international rules on non-contractual liability: general overview

In light of the above and with a view to specifically addressing the tort law implications of AR (§ 5) and VR (§ 6), a general (although summary) overview is necessary with reference to the content of private international law provisions relating to non-contractual situations.
Such an overview will focus both on rules concerning conflicts of jurisdictions and conflicts of laws and will have specific regard to the framework of European Union private international law.
As is well known, since the Treaty of Amsterdam the "comunitarization" process of private international law has greatly accelerated and expanded, both in terms of sources[9] and contribution of the case law of the Court of Justice. When the context is "digital" or "virtual", however, many questions still remain debated or unresolved, including the delicate issue of determining the place(s) of damage(s).

5.4.1 Conflicts of jurisdictions

As far as conflicts of jurisdictions are concerned, reference has to be made to Regulation 1215/2012 (so called Brussels Ia Regulation), applicable to disputes in civil and commercial matters.
According to the general rule established by art. 4 of the Regulation, a defendant domiciled in a Member State shall be sued in the courts of such Member State. Alternatively, art. 7.2 of the Regulation provides a special rule concerning "matters relating to tort, delict or quasi-delict", according to which the defendant might be sued in the courts for the place "where the harmful event occurred or may occur" (so called *locus commissi delicti*).
For the purposes of the application of art. 7.2, the (residual) notion of "tort[10], delict or quasi-delict" must be regarded as an independent concept, covering all actions which seek to establish the liability of a defendant and are not related to a contract (which, in turn, presupposes the establishment of a legal obligation freely consented to by one person towards another)[11].
The criterion of the "*place where the harmful event occurred or may occur*" (*locus commissi delicti*) deserves further comments as well. More specifically, the European Court of Justice has offered an

[8] Regulation (EU) No 1215/2012 of the European Parliament and of the Council of 12 December 2012 on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters (recast) [2012] OJ L 351/1.

[9] On jurisdiction in civil and commercial matters, for example, Brussels I regulation 44/2001 was adopted, later recast by the (aforementioned) Regulation 1215/2012: it is the so-called "Brussels system".

[10] See *ex plurimis* case 189/87 *Athanasios Kalfelis v Bankhaus Schröder* [1988] ECR 5565.

[11] See *ex plurimis* case 249/16 *Kareda* [2017] ECLI EU:C:2017:472, par. 28.

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extensive interpretation of such criterion, which - in cases of "complex torts" (where the action giving rise to the damage and the damages are situated in different States) - includes both the place where the event giving rise to the damage took place (*locus actus*) and the place(s) where the damages occurred (*locus* or *loci damni*).
There is, however, a relevant difference between a) the competence of the court seized according to *locus actus* criterion, which is entitled to decide upon the totality of the damages suffered and b) the competence of the court(s) of the different *loci damni*, which can only decide with regard to the portion of damages suffered by the victim in the territory of each State.
In this latter connection, a remarkable exception was recognised by the case-law of the European Court of Justice with reference to the violation of personality rights occurring in the cyber context (*e.g.* online defamation). In this regard, the Court held that "the placing online of content on a website is to be distinguished from the regional distribution of media such as printed matter in that it is intended, in principle, to ensure the ubiquity of that content". Indeed, such "content may be consulted instantly by an unlimited number of internet users throughout the world, irrespective of any intention on the part of the person who placed it in regard to its consultation beyond that person's Member State of establishment and outside of that person's control" [12].
As a consequence, the special features of the situation (the universal distribution of the content, the impossibility to quantify the distribution of the damage throughout the different States from which the content can be accessed, together with the seriousness of the damage suffered by the victim of the defamation) called for an "adaptation" of the *locus commissi delicti* criterion, according to which the person who considers that his rights have been infringed should have the option of bringing an action for liability, in respect of all the damage caused, both before the courts of the Member State in which the publisher of that content is established (according to the general rule established by art. 4 of the Regulation) or before the courts of the Member State in which the centre of his interests is based (a *forum* that - being seized according to the *locus damni* criterion - should theoretically have jurisdiction only with regard to the portion of damage occurring in the territory of the *forum*).
A more restrictive approach was adopted, instead, as far as the violation of patrimonial rights (such as copyright) is concerned. In this regard, the ECJ held that the court for the place where the damage occurred (*locus damni*) has jurisdiction according to art. 7.2 of the Regulation provided that the right whose infringement is alleged is protected in the State of the *forum* and with exclusive regard to the portion of damages suffered in its territory.
Finally, according to art. 25 of the Regulation, the parties, regardless of their domicile, also have the possibility to prorogate the jurisdiction, by agreeing that the court of a Member State shall have jurisdiction to settle any dispute which have arisen or may arise in connection with a particular legal relationship.

5.4.2 Conflicts of laws

As far as the question of the applicable law is concerned, regard has to be had to Regulation No 864/2007 (so called Rome II)[13].
The Regulation provides a general rule (art. 4, par. 1), according to which the law applicable to a non-contractual obligation arising out of a tort/delict shall be the law of the country in which the damage occurs, irrespective of the country in which the event giving rise to the damage occurred

[12] See case joined cases 509/09 and 161/10 *eDate Advertising GmbH e a. contro X e Société MGN Ltd* [2011] ECLI:EU:C:2011:685, par. 45 ff.

[13] Regulation (EC) No 864/2007 of the European Parliament and of the Council of 11 July 2007 on the law applicable to non-contractual obligations (Rome II) [2007] OJ L 199/40.

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and irrespective also of the country in which the indirect consequences of the same event occurred. In this regard, it can be easily seen that art. 4 of Rome II Regulation departs from the criterion of *locus commissi delicti* employed by art. 7 of Brussels Ia Regulation and only makes reference to the *locus damni* (without attaching any relevance to the *locus actus*).
The general rule established by art. 4, par. 1, of Rome I Regulation, however, suffers two exceptions, according to the following paragraphs of the same provision. Par. 2, as a matter of fact, provides that, where the person claimed to be liable and the person sustaining the damage both have their habitual residence in the same country at the time when the damage occurs, the law of that country shall apply.
According to par. 3, where it is clear from all the circumstances of the case that the tort/delict is manifestly more closely connected with a country other than that indicated in par. 1 or 2 (for example, as expressly stated by art. 3, par. 3, due to a pre-existing relationship between the parties, such as a contract, which is closely connected with the tort), the law of that other country shall apply.
Rome II Regulation then establishes several specialized rules dealing with product liability (art. 5), unfair competition (art. 6), environmental damage (art. 7), infringement of intellectual property rights (art. 8) and industrial action (art. 9) and makes also room for the possibility that the parties, at the conditions laid down by art. 14, agree to submit non-contractual obligations to the law of their choice.

5.5 Private international rules on non-contractual liability in the AR-VR domain

5.5.1 A necessary preliminary distinction

In view of the preliminary discussion concerning the features of AR and VR, on the one hand, and in light of the summary overview of the relevant provisions of private international law, on the other hand, it is now possible to address non-contractual liability in the AR-VR domain from the specific perspective of conflicts of laws and jurisdictions.
To this end, AR and VR should be analysed separately, insofar as they pose different challenges to the application of private international law rules.
As a matter of fact, it has already been highlighted that the major difference between the two phenomena is to be found in their respective relation with the "real reality".
Indeed, AR "superimposes" virtual contents to the "real world", which means that torts arising from its use are - to a greater or lesser extent - connected to real spaces, to which the connecting criteria employed by private international law provisions might point to. If, for instance, a Pokémon seeker falls off a cliff while chasing a Pokémon which has been negligently placed (*rectius*: made visible through an AR application) in a dangerous spot, both the damage suffered and the place where it occurs will be found in real spaces, where it will be possible to identify a *locus damni* according to the relevant rules of private international law.
On the contrary, VR simulates virtual worlds that are "nowhere", "non-spaces" that might seem real to the physical sight[14], but are completely irrelevant in the "eyes of private international law", which cannot find there any useful *locus* for the purposes of identifying the competent jurisdiction or the applicable law.

[14] About the immersive character of VR see Mark A. Lemley and Eugene Volokh, "Law, Virtual Reality, and Augmented Reality" n 3, 1064.

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5.5.2 *Private international law rules on non-contractual liability in the AR domain*

As far as torts in the AR domain are concerned, some further important distinctions should be introduced.

First of all, particular attention should be paid to the proper characterization of the dispute, with a view to identifying non-contractual situations as opposed to contractual cases. As a matter of fact, if an AR user damages third parties while engaged in the use of an AR application, there will be few doubts about the non-contractual character of the dispute, irrespective of whether the damaged party intends to sue the AR user or the AR service provider. One might think, for instance, about the owner of a land trespassed against (and damaged) by a Pokémon seeker, who might choose to initiate proceedings against the developers of the application (responsible of "placing" the Pokémon within a private property) or against the user (responsible of trespassing against the property), with none of which, however, the damaged party has a contract.

On the contrary, since the relations between the AR user and the AR service provider are usually regulated by the terms of service (accepted by the user as a condition for accessing the application), the damage suffered by the user might derive from the violation of such contractual agreement, in which case the arising dispute should be qualified as contractual. One might think, for instance, about an AR user who suffers injuries due to the inaccurateness of the information made visible by the AR application (even more so if the AR service provider was contractually obliged to provide accurate information).

Furthermore, in this regard, the relevance of the distinction between contractual and non-contractual disputes might sometimes be blurred – at least as far as the identification of the applicable law is concerned – since, as already mentioned, art. 4, par. 3, of Rome II Regulation provides for the application (to the tort) of the law of the country with which the situation is manifestly more closely connected in light of a "*a preexisting relationship between the parties, such as a contract, that is closely connected with the tort/delict in question*". As a consequence, in the situation considered above (irrespective of its characterization as contractual or non-contractual), the regulation of the damage suffered by the AR user might straightforwardly be attracted to the application of the *lex contractus* applicable to the terms of service of the AR application.

Once established the (genuine) non-contractual character of a certain dispute involving AR, its elements should be carefully considered in light of the relevant private international law provisions.

Indeed, it has been said that - from the perspective of the real-virtual dichotomy - AR has a dual nature, insofar as it attaches virtual contents to real objects. Since - as already pointed out - the connecting criteria employed by private international law rules can only point to real spaces, the assessment, on a case-by-case basis, of the element (real or virtual) prevailing in each situation is all the more relevant for the purposes of a private international law analysis.

Since it is impossible to provide a comprehensive overview of all the possible situations that might arise in this context, the suggested approach will be exemplified by reference to a few cases, where the identification of the *locus actus* or the *locus damni* (according to the different private international law rules discussed in the previous paragraph) might prove difficult due to the involvement of AR.

Let us consider, for this purpose, the following hypothetical situations: 1) the (already mentioned) Pokémon seeker falls off a cliff chasing a Pokémon, suffers severe injuries and claims damages from the developers of the game, accused of having negligently "placed" the Pokémon in a dangerous spot; 2) in a less ludic context, the operator of a complex machinery is misled by the data (relating to the functioning of such machinery) made visible to him through AR googles, incurs in physical and material damages and claims relief from the "publishers" of such data; 3) a company invents an AR application which helps the users to choose a restaurant, by superimposing comments and reviews (only made visible to the users through AR devices) on the street signs. Such

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comments, however, are considered to be slandering by a restaurant owner, who claims damages for the loss of profit consequently suffered; 4) an AR application projects on real objects virtual contents (such as drawings, trademarks, texts, *etc*.) which are protected by copyright, without the permission of the rightholder.
In cases 1) and 2), it can be seen that the virtual element (the "positioning" of the Pokémon and the information made visible to the operator) does not appreciably affect the functioning of the *locus damni* criterion, since in both cases the damage (consisting of physical injuries and/or material damages) occurs in a real space.
On the contrary, it will be much more difficult to identify the place where the event giving rise to the damage occurred (*locus actus*), since both the actions in question ("placing" of the Pokémon and publishing the misleading information) are merely virtual behaviours.
In this regard, it has to be mentioned that - as the extensive debate about the application of private international law provisions in the cyber context suggests - it is not impossible to physically localize virtual conducts, since - despite their apparent dematerialization - they are performed by means of materially existing technical devices (such as computers, servers, *etc*.).
The uncertainties surrounding the physical localization of such devices, however, would undesirably compromise legal certainty in the identification of the competent court or of the applicable law. At this purpose, the ECJ, in the *Wintersteiger* case (concerning the placing on the internet of advertisements in alleged violation of trademark), held that – although "*the technical display process by the advertiser is activated, ultimately, on a server belonging to the operator of the search engine used by the advertiser*" – "*in view of the objective of foreseeability, which the rules on jurisdiction must pursue, the place of establishment of that server cannot, by reason of its uncertain location, be considered to be the place where the event giving rise to the damage occurred for the purpose of the application of Article 5(3) of Regulation No 44/2001*"[15].
Therefore, with a view to identifying the *locus actus*, the Court – instead of attempting to localize the server through which the disputed advertisements had been published – chose to rely on a *fictio iuris*, holding that "*the place of establishment of the advertiser is the place where the activation of the display process is decided*"[16], since this is a "*definite and identifiable place, both for the applicant and for the defendant, and is therefore likely to facilitate the taking of evidence and the conduct of the proceedings*".
This very same reasoning might fittingly apply also to the identification of the *locus actus* with reference to torts arising out of the placing of data made visible through AR devices, in which case the competent court according to the *locus actus* criterion would therefore tend to coincide with the court identified on the basis of the general rule (domicile of the defendant).
The principles developed by the case-law of the ECJ with regard to cyber-torts[17] might provide an adequate solution also for the situations where both the conduct and the damage are "dematerialized" (so that the virtual component of AR prevails), as it happens in cases 3) (where the placing of data on an AR application prejudices the reputation of the restaurant owner) and 4) (where the AR content reproduces copyrighted material without authorization).
As a matter of fact, as far as jurisdiction is concerned, the principles established in the *eDate* case might suitably apply to case 3) (involving a personality right), so that the restaurant owner should be able to initiate proceedings a) in respect of all the damage suffered, before the courts of the Member State in which the publisher of that content is established or before the courts of the Member State in which the centre of his interests is based; or b) before the courts of each Member State in the territory of which the disputed content is or has been accessible, only in respect of the

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[15] Case 523/10 *Wintersteiger AG v Products 4U Sondermaschinenbau GmbH* [2012] ECLI:EU:C:2012:220, par. 36.

[16] *Wintersteiger*, par. 37.

[17] See *supra* § 4.

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damage caused in the territory of *forum*. In this regard, it has to be mentioned that identification of the law applicable to case 3) would instead be far more complicated since Rome II Regulation does not apply to "non-contractual obligations arising out of violations of privacy and rights relating to personality, including defamation"[18], so for this purpose regard should be had to the (national) conflict of laws rules applicable in the State of the *forum*.
With regard to case 4), the patrimonial character of the damaged right would suggest that – according to the principles analyzed *supra* – proceedings could be initiated before the court of the place where the defendant is domiciled (general rule) or before the court(s) of the place(s) where the damage was suffered, provided that, in the latter case, the right whose infringement is alleged is protected in the State of the *forum* and with limitation to the portion of damages suffered in its territory. The applicable law should instead be identified on the basis of the special rule provided by art. 8 of Rome II Regulation, dealing with "*Infringement of intellectual property rights*", according to which "*the law applicable to a non-contractual obligation arising from an infringement of an intellectual property right shall be the law of the country for which protection is claimed*".

5.5.3 Private international law rules on non-contractual liability in the VR domain

When addressing torts in the VR domain, the risk of being misled by the realistic and immersive character of the virtual world where the tort takes place is even higher. Also in this regard, the necessary starting point should be represented by the relevant rules of private international law, in light of which the proper characterization of every situation should be performed and the relevant elements of each case identified.
With a view to providing some practical (although very general) guidelines, a distinction should be drawn among the following three situations: 1) real-world torts occasioned by the use of a VR technology; 2) VR torts with real-world consequences and 3) totally virtual torts.
As far as the first category is concerned (real-world torts occasioned by the use of a VR technology), the involvement of VR technology does not pose any particular problem. One might think, for instance, about physical injuries or material damages resulting from a malfunctioning device such as a joystick or a VR headset.
In these situations, the *locus damni* will be easily identified in the place where the (physical or material) damage occurs, which in most cases coincides with the domicile of the plaintiff, while the place of the event giving rise to the damage (*locus actus*) will be "*the place where the product in question was manufactured*"[19].
Depending on the specific features of the case at hand, (at least) two specialized rules might come to relevance as well. On the one hand, for the purposes of jurisdiction, the rules concerning "*consumer contracts*" established by Regulation 1215/2012 might apply, provided that i) a contract exists between the parties; ii) such contract can be qualified as a consumer contract according to art. 17 of the Regulation[20]; and iii) the contract provides warranties for the defective product that caused the damage. If this is the case, according to art. 18 of the Regulation, "*a consumer may bring proceedings against the other party to a contract either in the courts of the Member State in which*

[18] See art. 1.2.g) of the Rome II Regulation.

[19] Case 45/13 *Andreas Kainz v Pantherwerke AG* [2014] ECLI:EU:C:2014:7, par. 29.

[20] According to art. 17 of the Regulation a consumer contract is "a contract concluded by a person, the consumer, for a purpose which can be regarded as being outside his trade or profession" provided that "(a) it is a contract for the sale of goods on instalment credit terms" or "(b) it is a contract for a loan repayable by instalments, or for any other form of credit, made to finance the sale of goods" or "(c) in all other cases, the contract has been concluded with a person who pursues commercial or professional activities in the Member State of the consumer's domicile or, by any means, directs such activities to that Member State or to several States including that Member State, and the contract falls within the scope of such activities".

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that party is domiciled or, regardless of the domicile of the other party, in the courts for the place where the consumer is domiciled".
On the other hand, it should be reminded that Rome II Regulation provides a special rule on "*product liability*" (art. 5), according to which the law applicable to a non-contractual obligation arising out of damage caused by a product shall be: (a) the law of the country of habitual residence of the person sustaining the damage at the time the damage occurred; or, failing that, (b) the law of the country in which the product was acquired; or, failing that, c) the law of the country in which the damage occurred.
The above-mentioned connecting criteria, however, apply only if the product was marketed in those countries and if the person claimed to be liable could reasonably foresee the marketing of the product in those countries. Otherwise, the law applicable shall be the law of the country in which the person claimed to be liable is habitually resident.
Moreover, also art. 5 makes room for the application of the law of the country with which the tort is manifestly more closely connected, in light, for instance, of a pre-existing relationship between the parties, such as a contract, that is closely connected with the tort in question.
The second category considered (VR torts with real-world consequences) includes the situations where a conduct taking place in the VR causes damages that are not confined in the virtual world. As a matter of fact, not everything that happens in the VR "stays" in the VR. One might think, for instance, about the case, already considered, where an avatar makes defamatory statements in the VR against a real person. In this case, the conduct occurs in the virtual world, but the damage is as real as in every other case of defamation by press or by internet. Therefore, the solution for this second type of situations might very well be found in the established principles concerning cyber-torts, according to which – as far as jurisdiction is concerned – the *locus actus* is to be identified in the place of establishment of the publisher and the *locus damni* (or the *loci damni*) in the territory of the State(s) where the defamatory statements could be accessed from, keeping in mind that i) both the courts of the Member State of establishment of the publisher and the courts of the Member State where the centre of interests of the alleged victim is based have jurisdiction in respect of all the damages; ii) the other courts (identified according to the *locus damni* criterion*)* only have jurisdiction in respect of the damages caused in the territory of the respective States. With regard to the applicable law, instead, it should be reminded that defamation is excluded from the scope of application of Rome II Regulation, so national conflict-of-laws rules shall apply.
From a practical point of view, it should also be added that – although legal action might theoretically be initiated both against the VR service provider and the author of the defamatory statement (namely, the person controlling the avatar) – the most significant difficulties in this regard might derive from the fact that a) the author of the statement might not be easily identifiable (at least not without the cooperation of the VR service provider); b) both the author of the statement and the VR service provider might not be domiciled in a Member State of the European Union (in which case the situation would also fall outside the scope of application *ratione personarum* of the Brussels Ia Regulation).
Finally, the most problematic category is probably represented by totally virtual torts, *i.e*. situations where a conduct occurring in a virtual world causes damages whose effects are confined in the virtual world itself (*e.g*. an avatar in a VR scenario damages virtual assets belonging to another avatar). As a matter of fact, the most difficult question surrounding this type of situations – as already considered – concerns their substantive regulation and revolves around the question whether (and if so, to what extent) the legislator should take an interest in regulating them. On the contrary, private international law is not concerned with the legal consequences stemming from conducts occurring in the VR, but rather with the identification of the courts having jurisdiction to assess such consequences as well as of the law according to which such an assessment should be performed.
In this regard, from the perspective of private international law (and with specific regard to the rules concerning non-contractual liability), it should be reminded that a situation which, in the real world,

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would straightforwardly qualify as a tort, in the virtual world created by the VR technology will typically be governed by the terms of use of the VR application (as far as both the issues of jurisdiction and of applicable law are concerned).
As a matter of fact, liability in tort (also according to the autonomous notion of non-contractual liability established according to EU private international law) can only arise among parties which are not bound by a pre-existing contractual relation. On the contrary, every happening as well as any relation taking place in the VR (from the existence of the damaged asset to the relation of the user of the VR application with such asset, including the very possibility that the asset in question is damaged or stolen by other users) depends upon the programming of the VR application and upon the will of the service provider.
Moreover, even if a dispute involved only two or more users of a VR application (and not also the service provider) the terms of use agreed upon by the users could not be reasonably disregarded since, for the already mentioned reasons, they are inextricably tied to the very existence (or non-existence) of the supposedly damaged rights[21], so much so that it might even be argued that – also for the purpose of art. 4, par. 3, of Rome II Regulation – any relation among users of a VR application could be considered manifestly more closely connected with the law that applies to the contractual agreements existing between each user and the VR service provider.

[21] For instance, the Terms of Service applicable to Second Life, a well-known VR platform (which can accessed at the following link: https://lindenlab.com/tos) provide that "*no value, either express or implied, is guaranteed or warranted with respect to any content, including virtual tender or any other virtual goods and services*".

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6

6. AUGMENTED REALITY, VIRTUAL REALITY AND THE PROTECTION OF HUMAN RIGHTS

Lorenzo Schiano di Pepe and Francesca Maoli

6.1 Introduction

Each time a new technology paves its way into the world, issues are raised concerning its potential impact on humankind. Such impact can be analyzed from the perspective of social sciences and, in particular, from a legal one when the emerging technology has the potential to change the way in which individuals and communities interact[1]. It is well known that technological evolutions are proceeding fast and multiplying over time. They do not always move at the same pace as legal developments, which, in turn, do not easily keep up with societal change. What has just been observed is particularly true when it comes to human rights law: the tendency of human rights treaties to remain 'static' is accompanied by an evolutive interpretation by international courts and bodies, in the attempt to keep the instruments fit to address contemporary needs[2].
Virtual reality is defined as a non-physical space, where a real person can be "naturally involved" in the digital environment and act through a digital alter ego (an "avatar") which may or may not reflect his or her identity, eventually interacting with others[3]. The experience is therefore immersive, as it may block out the physical surroundings and also be supported by heptic devices allowing the user to experience the virtual world through all the senses, other than sight. As far as augmented reality is concerned, a digital content is layered over the real world. Using special glasses or, more

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[1] Among others, see Azeem Azhar *The exponential age: how accelerating technology is transforming business, politics and society* (Diversion Books, 2021); Roman Dremliuga, Olga Dremliuga and Andrei Iakovenko "Virtual Reality: General Issues of Legal Regulation" (2020) 13(1) Journal of Politics and Law 75; Crystal Nwaneri "Note, Ready Lawyer One: Legal Issues in the Innovation of Virtual Reality (2017) 30(2) Harvard Journal of Law & Technology 601. See also OECD, *Digital transformation and the futures of civic space to 2030* (2020) OECD Development Policy Papers 29, available at https://www.oecd-ilibrary.org/deliver/79b34d37-en.pdf?itemId=%2Fcontent%2Fpaper%2F79b34d37-en&mimeType=pdf.

[2] See James Crawford and Amelia Keene "Interpretation of the Human Rights Treaties by the International Court of Justice" (2019) 24(7) The International Journal of Human Rights 935; Pierre-Marie Dupuy "Evolutionary Interpretation of Treaties: Between Memory and Prophecy" in Enzo Cannizzaro (ed) The Law of Treaties Beyond the Vienna Convention (Oxford University Press, 2011) 123; Malgosia Fitzmaurice "Dynamic (Evolutive) Interpretation of Treaties - Part I" (2008) 21 The Hague Yearbook of International Law 101; Malgosia Fitzmaurice "Dynamic (Evolutive) Interpretation of Treaties - Part II" (2010) 22 Hague Yearbook of International Law 3; George Letsas *A Theory of Interpretation of the European Convention on Human Rights* (Oxford University Press, 2007); Pietro Pustorino *L'interpretazione della Convenzione europea dei diritti dell'uomo nella prassi della Commissione e della Corte di Strasburgo* (Editoriale scientifica, 1998).

[3] Fernando Luna Salas, Riccardo Perona and Yezid Carrillo de la Rosa "Impacto y límites de la inteligencia artificial en la práctica jurídica" (2023) 17(2) Via Inveniendi Et Iudicandi 234; Michael B. Spring "Informating with Virtual Reality" in Sandra K. Helsel & Judith Paris Roth (ed) Virtual Reality: Theory, Practice, and Promise (Meckler Publishing, 1991) 7.

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commonly, a device, users can see the surrounding environment as it appears, but they will also see digital images artificially superimposed over real objects. Thus, in the latter case, there is a forced coexistence between reality and virtuality, which only the specific user (or group of users) can experience. Between those two phenomena (the fully-real and the fully-virtual environments), a wide range of experiences exist, a whole spectrum of technological possibilities that can also be brought under the general term "extended reality".

Analyzing such different technologies from a human rights perspective poses multiple and heterogenous questions. It is clear that, under some circumstances, virtual and/or augmented reality may constitute a phenomenon which *supports* or *favors* the enjoyment of fundamental rights. For instance, virtual, augmented and extended reality may, on the one hand, play a role in improving freedom of expression, freedom of assembly, reunion or association, access to essential services, or they may drive transformations in education and health care. On the other hand, however, they may contribute to creating an environment in which human rights are more at risk to be compressed.

At the same time, there are other preliminary and transversal issues that should be addressed in analyzing the relationship between human rights, virtual reality and augmented reality.

Firstly, one should look into the possibility of human rights law to apply and operate in a context which is entirely or at least partially 'a-territorial' and 'non-material'. In other words, the question is whether a person may enjoy his or her fundamental rights in a virtual environment (even through his or her avatar(s)?), or whether acts or omissions producing their effects in the metaverse[4] can be considered immune from being qualified as acts violating or interfering with human rights. The approach must be different for augmented reality, since the latter consists in adding virtual elements to the (person's perception of) real world, which remains the main context in which juridical acts or omissions take place.

Secondly, at least as far as virtual reality is concerned (to be intended an immersive, entirely digital environment), the classic 'territorial' application of the instruments of International Human Rights Law (IHRL) would have to be adapted to the concept of metaverse and to the virtual space.

Thirdly, an additional issue concerns the determination of who is ultimately responsible for respecting, protecting and fulfilling human rights: the classic approach in which States hold the primary responsibility for what goes on within its territory is being challenged by the increasing role played by BigTechs and more in general by providers of the type of technologies which are at stake here[5]. Whilst clearly States cannot reasonably be "replaced" by private actors, the former's ability to "control" what goes on in a totally or partially virtual environment has to be questioned.

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[4] The term "metaverse" is often used interchangeably with the notions of virtual reality, augmented reality, extended reality, immersive reality, virtual worlds and similar. However, it seems more correct to align to a broad notion of "metaverse" (or "metaverses"), encompassing any virtual environment (including the one created by virtual reality) transcending the limitation of the physical world. See Isabelle Hupont Torres, Vasiliki Charisi, Giuditta De Prato, Katarzina Pogorzelska, Sven Schade, Alexander Kotsev, Maciej Sobolewski, Nestor D. Brown, Elisa Calza, Cesare Dunker, Francesca Di Girolamo, Mario Bellia, Juraj Hledik, Igor Nai Fovino and Michele Vespe *Next Generation Virtual Worlds: Societal, Technological, Economic and Policy Challenges for the EU* (Publications Office of the European Union, 2023) 10; Fatih Sinan Esen, Hasan Tinmaz and Madhusudan Singh (eds) Metaverse: Technologies, opportunities and threats (Springer Nature Singapore, 2023); Thomas Folsom "Defining Cyberspace (Finding Real Virtue in the Place of Virtual Reality)" (2007) 9 Tulane Journal of Technology & Intellectual Property 75. The European Parliament defines "metaverses" as "digital simulations of multidimensional spaces that can be based on visual, auditory, and tactile perception. They can simulate digitised reality, mirror worlds, digital twins, or be entirely decoupled from the physical layer and populated with AI algorithms": see Mariusz Maciejewski *Metaverse* (2023) 11 Study requested by the Policy Department for Citizens' Rights and Constitutional Affairs, PE 751.222.

[5] Kuzi Charamba "Beyond The Corporate Responsibility To Respect Human Rights In The Dawn Of A Metaverse" (2022) 30(1) University of Miami International and Comparative Law Review 110.

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6.2 Human rights violations in the metaverse and their effects in the real world: legal implications.

A discussion focusing on the application of human rights law to virtual reality cannot leave aside the consideration that we are dealing with a context which is entirely or at least partially 'a-territorial' and 'non-material'. We have therefore to enquire whether the avatar of a human being, whose natural environment is a virtual one, may or may not be eligible for the enjoyment of fundamental rights (or, for that matter, of any right) or whether such "virtuality" renders the relevant acts "immune" or "exempt" from the scope of application of human rights law as they are identified and protected at the international, EU and domestic level[6]. A minimalistic approach to human rights and virtual reality may tend to belittle or simply deny the relevance of human rights rules and procedures in totally or partially simulated worlds as a matter of principle, on the basis of the argument that what takes place in the metaverse is not happening *in reality*, *i.e.* is not happening in the real world and, consequently, should not be considered relevant from a legal point of view[7].

Leaving aside the different problems raised by augmented and extended reality, for which such a restrictive perspective may in any event work only to some extent due to the combined presence of real and fictitious elements[8], the minimalistic approach that has just been referred to is based on a comparison between virtual reality and works of fiction such as those that are performed, for example, on stage (live) or at cinemas (on film). In this vein, one should consider violations of human rights - such as freedom of expression or freedom of religion - occurring in the metaverse similarly to those represented by actors in front of an audience beyond the so-called "fourth wall". According to this line of thought, one should, in other words, question to what extent the representation of a human rights violation in a virtual world could also be said to have occurred in the real world.

That such a minimalistic view is not tenable is, from a general perspective, demonstrated by the circumstance that the mere existence of a digital platform that allows for the representation of a human rights violation may constitute in itself a human rights violation[9].

A good illustration of the above, validated by the European Court of Justice (ECJ) in the *Omega Spielhallen* case[10], is the one provided by the operation of a laserdrome at which participants were able to access a particular role-playing game whose purpose was to assassinate members of the opposing team. For that purpose, players were equipped with laser guns and special vests, sensitive to laser rays, thus keeping track of "successful" hits. Even if killings were only virtual, the ECJ

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[6] See Letizia Coppo "Fundamental rights and the metaverse: avatar–player relationships" in Larry A. Di Matteo and Michel Cannarsa (eds) Research Handbook on the Metaverse and Law (Edward Elgar Publishing, 2024) 79. Broadly on the legal issues surrounding avatars in the metaverse, Martin Ebers "Avatars and the Protection of Digital Identities in the Metaverse" (2024) MetaverseUA Research Paper #3, available at https://metaversechair.ua.es/working-papers/; Ben Chester Cheong "Avatars in the metaverse: potential legal issues and remedies" (2022) 3 International Cybersecurity Law Review 467.

[7] On the topic Gokce Cobansoy Hizel "Metaverse and Human Rights: Do We Need Metaversal Declaration of Human Rights?" in Fatih Sinan Esen, Hasan Tinmaz and Madhusudan Singh (eds) Metaverse: Technologies, Opportunities and Threats (Springer Nature Singapore, 2023) 219.

[8] One good example is constituted by right to privacy in an augmented reality context: see in this respect Andreas Kotsios "Privacy in an augmented reality" (2015) 2 Int'l J. L. & Info. Tech. 157.

[9] Those issues are the core of the debate around "digital constitutionalism", which raises the question of whether fundamental principles of constitutionalism – among which, fundamental rights – should be stablished in the digital world. See Giovanni De Gregorio *Digital Constitutionalism In Europe. Reframing Rights And Powers In The Algorithmic Society* (Cambridge University Press, 2022); Oreste Pollicino *Judicial Protection of Fundamental Rights on the Internet. A Road Towards Digital Constitutionalism?* (Hart Publishing, 2021).

[10] Judgment of 14 October 2004 in case C-36/02, *Omega Spielhallen- und Automatenaufstellungs-GmbH v. Oberbürgermeisterin der Bundesstadt Bonn* ECLI:EU:C:2004:614.

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approved, in principle, the decision of the Bonn municipal authorities, forbidding Omega from "facilitating or allowing in its […] establishment games with the object of firing on human targets using a laser beam or other technical devices (such as infrared, for example), thereby, by recording shots hitting their targets, 'playing at killing' people"[11] for being contrary to the principle of human dignity, a concept established in the first sentence of paragraph 1(1) of the German Basic (Constitutional) Law, even if this implied a restriction to the freedom to provide services at the time provided by article 49 of the European Community Treaty.

The case was referred to the ECJ by the Federal Administrative Court, which noted the constitutional nature of the principle of human dignity in Germany and described the ways in which such a principle may be infringed in a way that appear particularly relevant for the purposes of the present paper. The Court said, in fact, that an infringement may occur "either by the degrading treatment of an adversary" (which was not the case on point) "or by the awakening or strengthening in the player of an attitude denying the fundamental right of each person to be acknowledged and respected, such as the representation, as in this case, of fictitious acts of violence for the purposes of a game". It added, meaningfully, that "a cardinal constitutional principle such as human dignity cannot be waived in the context of an entertainment, and that, in national law, the fundamental rights invoked by Omega cannot alter that assessment"[12].

The Court, as it is well known, held that (*i*) there can be no doubt that the objective of protecting human dignity is compatible with EU law, regardless to the fact that in a Member State (Germany) the principle of respect for human dignity has a particular status as an independent fundamental right[13]; (*ii*) both the EU and its Member States are required to respect fundamental rights, which in principle may justify a restriction of the obligations imposed by EU law, even when a fundamental freedom guaranteed by the Treaties is at stake[14]; (*iii*) there is no need for there being a common conception, shared by all Member States, of a particular fundamental right for such right to be considered a legitimate interest[15].

Whilst the case is usually quoted as a precedent to stress the primary ("constitutional") nature of human rights protection in the EU legal order and how the relevant norms and principles interact with other primary norms such as those relating to the internal market, the judgment also demonstrates that EU law and indeed the legal systems of individual Member States do not consider to be outside the domain of reality, at least to some extent, what goes on in a context of fiction. In this respect, role-playing laser games appear a pertinent predecessor to virtual reality, thus rendering *Omega Spielhallen* a relevant precedent[16].

Some interesting additional remarks can be developed as a further elaboration of the considerations made so far.

First of all, if we look at the fundamental rights that are protected at the international and EU level, different categories thereof can be identified according to a variety of criteria.

A particularly relevant distinction for the purposes of the present paper relates to the material (as opposed to the immaterial) nature of the interest protected. Right to life is, on the one hand, perhaps

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[11] Par. 5.

[12] See Pasquale De Sena "Dignità umana in senso oggettivo e diritto internazionale" (2017) 3 Diritti umani e diritto internazionale 573.

[13] Par. 34.

[14] Par. 35.

[15] Par. 37.

[16] Among the comments to the judgment see, in particular, Mielle K. Bulterman, Herke R. Kranenborg "What if rules on free movement and human rights collide? About laser games and human dignity: the Omega case" (2006) Eur. L. Rev. 93; Gary Chu "'Playing at Killing' Freedo of Movement" (2006) Legal Issues of Economic Integration 85; Denys Simon "Ordre public et 'jouer à tuer': La simulation d'actes homicides peut être interdite au nom de la protection de la dignité humaine" Europe 2004, no. 407.

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the best example of a material human right, one that is inherently physical in the sense that its violation implies an interference with someone's body. On the contrary, freedom of expression belongs in principle to the category of immaterial human rights since (although its violation may require the restriction on activities such as publishing and broadcasting) in its primary form this right rests on the possibility of an individual to speak his or her mind and its violation on the prohibition of said activity[17]. The importance of such a distinction lies in the fact that violations of immaterial human rights are liable to occur in a computer-generated domain in a similar manner to what may occur in the real world, whilst the same may not be true in case of so-called material human rights, due to the fact that the victim of any such violation will be, in the metaverse, the avatar of a human being rather than a human being himself or herself. To put it differently, it is arguable that in a virtual reality only simulations of the violation of a material human right may occur, whereas immaterial ones can be encroached (by way of an example, killings may only be simulated whilst, as a rule, statements of a political or religious nature may be prohibited and sanctioned)[18].A different yet related reflection – as shown by *Omega Spielhallen*, but as it could easily be replicated in a present-day virtual reality case – concerns the circumstance that the violation of a particular human right in a virtual context (for example, the right to life) can translate into the violation of a different human right in the real world (for example, human dignity). This corroborates the view that, whilst it cannot be said that what happens in the domain of fiction or semi-fiction does not have repercussions in the physical world, the two domains are characterized by different sensitivities[19].

6.3 Protecting human rights in the digital sphere vis à vis the notion of jurisdiction and the scope of application of IHRL instruments.

The existing International Human Rights Law instruments have been conceived and drafted under the premises that human behaviors are taking place in the real, physical world. Starting from the 1948 Universal Declaration of Human Rights onwards, treaties and other documents of non-legally binding character have been developed with the intent to be applied to humans, since fundamental rights stem from the nature and dignity of the human being and are indeed, according to a common reading, inherent to human nature[20]. Such documents, accordingly, make reference to States as the entities that are primarily obliged to ensure the respect of fundamental rights due to their status of subjects of the international community, as it exists in the real world.
One of the possible issues arising from the regulation of virtual and/or augmented reality concerns the personal and territorial scope of application of IHRL instruments, which is often delimited

[17] As shown in legal literature, right to property may encompass both fields: see Joseph Carrafiello "No Trespassing: A Lawmaker's Guide to Protecting Property Rights in the Age of Augmented and Mixed Reality" (2019) 3 Ohio St. L. J. 583; Donald J. Kochan, "Playing with Real Property Inside Augmented Reality: Pokémon GO, Trespass and Law's Limitation" (2018) 2 Whittier L. Rev. 70.

[18] Right to quality is another case on point: for additional reflections and further references see Mary Anne Franks "The Desert of the Unreal: Inequality in Virtual and Augmented Reality" (2017) 2 Univ. Calif. Davis 499.

[19] As observed by David R. Johnson and David Post "Law and Borders: The Rise of Law in Cyberspace" (1996) 48 Stanford Law Review 1367, in the cyberspace "the relationship between the 'citizen' and the 'State' changes radically" and the law "will not, could not, and should not be the same law as that applicable to physical, geo graphically-defined territories".

[20] Jack Donnelly "Human Rights as Natural Rights" (1982) 4(3) Human Rights Quarterly 391.

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through physical elements and is based on the territorial borders of States[21]. Under Article 1 of the European Convention on Human Rights (ECHR)[22], "[t]he high contracting parties shall secure to everyone within their jurisdiction the rights and freedoms defined in Section I of the Convention"[23]. This principle traditionally limits the responsibility of States to human rights violations occurring within their jurisdiction and reflect the approach adopted by other IHRL instruments, such as the International Covenant on Civil and Political Rights (ICCPR)[24] and the Inter-American Convention on Human Rights (IACHR)[25]. As it is known, the general tendency is to include within the scope of State jurisdiction both persons who are on the territory of a contracting State and those otherwise subject to its jurisdiction, even if outside its borders[26]. In other words, the provision establishes the requirement of jurisdiction for a State party to be held accountable for a human rights violation.

Although the topic has interested further reflections and elaborations by the case law of international courts and other monitoring bodies, IHRL instruments are traditionally conceived to apply in the physical space and they encounter difficulties in being transposed to the metaverse, which is, by definition, an immaterial and transnational environment. Therefore, conceiving State responsibility for human rights violation occurred in the metaverse would necessarily imply considerations on the extraterritorial application of the aforementioned conventions or at least a new conception of territorial jurisdiction.

As a matter of fact, extraterritorial jurisdiction of States allegedly responsible for human rights violations has been exceptionally accepted by international courts and other bodies in selected circumstances, although representing a tendency which is more and more explored in the case law. The European Court of Human Rights (ECtHR) has stated that, in specific cases, the requisite of Article 1 ECHR would be fulfilled even for acts or omissions occurred – or displaying effects – outside the territorial jurisdiction of a State party[27]. On this basis, extraterritorial jurisdiction has been recognized *inter alia* in respect to acts committed in embassies/consulates, on board of aircrafts or vessels[28], or to acts committed in respect of persons who are located outside national

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[21] On the topic *ex multis* Simone Vezzani "Considerazioni sulla giurisdizione extraterritoriale ai sensi dei trattati sui diritti umani" (2018) 101(4) Rivista di diritto internazionale 1086; Karen Da Costa *The Extraterritorial Application of Selected Human Rights Treaties* (Brill Nijhoff, 2013); Marko Milanovic *Extraterritorial Application of Human Rights Treaties: Law, Principles, and Policy* (Oxford Academic, 2011); Deborah Russo "Nuove pronunce sull'applicazione extraterritoriale degli obblighi previsti nei trattati sui diritti umani" (2009) 92(3) Rivista di diritto internazionale 771; Fons Coomans and Menno T. Kamminga (eds) *Extraterritorial Application of Human Rights Treaties* (Intersentia, 2004); Pasquale De Sena *La nozione di giurisdizione statale e i trattati sui diritti dell'uomo* (Giappichelli, 2002).

[22] 1950 European Convention for the Protection of Human Rights and Fundamental Freedoms, ETS No 5.

[23] William A. Schabas *The European Convention on Human Rights: A Commentary* (Oxford Academic, 2015) 84; Raffaella Nigro "The notion of 'jurisdiction' in Article 1: future scenarios for the extra-territorial application of the European Convention on Human Rights" (2010) The Italian Yearbook of International Law 11; Giorgio Gaja "Art. 1 – Obbligo di rispettare I diritti dell'uomo" in Sergio Bartole, Benedetto Conforti and Guido Raimondi (eds) Commentario alla Convenzione europea per la tutela dei diritti dell'uomo e delle libertà fondamentali (Cedam, 2001) 23. See also the *Guide on Article 1 of the European Convention on Human Rights – Concepts of "jurisdiction" and imputability* (2022) available at https://www.echr.coe.int.

[24] Article 1 ICCPR.

[25] Article 1 IACHR.

[26] See ICJ *Legal Consequences of the Construction of a Wall in the Occupied Palestinian Territory* (2004) ICJ Reports 180, para 111. On territorial sovereignty in international law Riccardo Luzzatto and Ilaria Queirolo "Sovranità territoriale, 'jurisdiction' e regole di immunità" in Sergio M. Carbone et al *Istituzioni di diritto internazionale* (Giappichelli, 2021) 183.

[27] See Chiara Gabrielli "La nozione di giurisdizione extra-territoriale alla luce della recente giurisprudenza" (2012) 7 Studi sull'integrazione europea 603; Sarah Miller "Revisiting Extraterritorial Jurisdiction: A Territorial Justification for Extraterritorial Jurisdiction under the European Convention" (2009) 20(4) European Journal of International Law 1223.

[28] Among others ECtHR *Medvedyev and Others v France* (2010) App. No. 3394/03, para. 65; ECtHR *Hirsi Jamaa and Others v Italy* (2012) App. No. 27765/09.

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borders but nevertheless are in a territory on which a contracting State exercises an effective control[29], or who are under a coercive power of a national organ[30].
Moreover – with an approach that has recently emerged in the field of human rights violations in environmental matters – the ECtHR has stated on the admissibility of actions brought against a State, whose acts or omissions have produced detrimental effects abroad, subject to the need to establish a causal link[31].
In general, the Strasbourg Court has stressed that bases of jurisdiction different from the ordinary one expressed by Article 1 ECHR shall be considered exceptional, requiring a specific justification in the light of the particular circumstances of each case[32].
All the aforementioned situations, addressed by the ECHR's case law, are however not easily comparable to the virtual reality case. In this context, a person can be physically present in the territory of a State and at the same time suffer a violation of his or her fundamental rights online (in principle, on a platform which is managed from a country other than the one where the alleged victim is located). Thus, it would be necessary to determine whether a certain State has an effective control over the virtual world, a conclusion that would be far from straightforward considering the ubiquitous nature of the metaverse. In absence of a precise regulation of the virtual reality domain, a jurisdictional link could not be reduced to the presence of hardware or infrastructures supporting the functioning of an online platform in the national territory, to the fact that the company administering the platform is registered in a certain country, or to the mere circumstance that a person has the "possibility to access" an online platform from that place.
The construction of a new approach by the ECtHR (as well as by other international Courts and monitoring bodies) would need to be carefully evaluated and construed, possibly taking inspiration from the practice already existing at the national level, in order to build a new model of extraterritorial jurisdiction other than the ones already developed by the existing case law[33]. This may imply an in-depth reflection on what constitutes "sovereignty" in the cyberspace, according to the rules and principles of international law: however, as observed by the legal literature, there is no consensus on the applicability of the principle of territorial sovereignty in cyberspace[34].

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[29] ECtHR *Loizidou v Turkey* (1996) App. No. 15318/89, para. 52. See also ECtHR *Isaak v Turkey* (2006)App. No. 44587/98, para. 136; ECtHR *Pad and Others v Turkey* (2007) App. No. 60167/00, para. 53.

[30] ECtHR *Ilaşcu and Others v Moldova and Russia* (2004) App. No. 48787/99. On the topic Barbara Miltner "Broadening the scope of extraterritorial application of the European Convention on Human Rights" (2007) 2 European Human Rights Law Review 172.

[31] Most recently see the case law of the ECtHR on States party alleged failure to take adequate measures to protect them against the adverse effects of climate change on human lives and health, such as ECtHR *Duarte Agostinho and Others v Portugal and 32 Others* (2024) App. No. 39371/20, para. 184. On the topic Lorenzo Acconciamessa "Il contenzioso climatico davanti alla Corte europea dei diritti umani, tra aspettative, rischi e realtà" (2024) 2 Diritti umani e diritto internazionale 369.

[32] ECtHR *Banković and Others v Belgium and Others* (2001) App. No. 52207/99, para. 61.

[33] On the topic Holly Huxtable "E.T. phoned home... they know: the extraterritorial application of human rights treaties in the context of foreign surveillance" (2018) 28 Security and Human Rights 92; Eliza Watt "The role of international human rights law in the protection of online privacy in the age of surveillance" in Henry Rõigas, Raik Jakschis, Lauri Lindström and Tomáš Minárik (eds) 2017 9th International Conference on Cyber Conflict: Defending the Core (CCDCOE, 2017) 93; Marko Milanovic "Human Rights Treaties and Foreign Surveillance: Privacy in the Digital Age" (2015) 56(1) Harvard International Law Journal 81.

[34] See the Report "International Law and the Cyberspace" (2021) by the Study Group co-organised by the University of Bologna, University of Milan and University of Westminster realized with the support of the Italian Ministry of Foreign Affairs and International Cooperation, available at https://www.esteri.it/wp-content/uploads/2021/12/UNIBO_Applicazione-dei-principi-della-Carta-delle-Nazioni-Unite-nello-spazio-cibernetico.pdf.

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Similar considerations apply to the European Union law domain, although in the light of the specific features of the EU legal order and of the EU Charter[35]. As known, the latter does not contain a territorial jurisdiction clause: its scope of application is rather *ratione materiae* and is defined by Article 51(1), according to which the provisions of the Charter apply to the EU institutions, as well as to Member States only when they are implementing EU law[36]. In other words, the Charter's scope of application derives from the applicability of EU law: the defining issue concerns the scope of application of EU competences, and not the territorial or extraterritorial action undertaken by an EU institution or by a Member State[37].
At the same time, this does not negate the need for a member state to be held responsible for human rights violations that occur within its sphere of jurisdiction and control. Moreover, being the EU Charter the "shadow" of EU law[38], the first applies (only) when the second is applicable to a given scenario.

6.4 The role and responsibilities of private corporations in the protection of human rights in the metaverse

The possible threats that virtual reality or augmented reality may present for human rights pose the question on the duties and obligations incumbent upon corporations and more in general non-governmental business entities. In fact, the risks for human rights possibly emerging as a consequence of the development, implementation and application of new technologies are ultimately stemming from the exercise of economic activities consisting in the provision of goods and services. Almost all market shares are held by a few, large companies, which actually "govern" the digital space in a dominant position. This also supports the need to review the governance over those systems, re-thinking the suitability of the current (State-centered) international (and EU) legal framework for the protection of human rights.
The digital transformation has been driven by the huge resources that private companies have dedicated to the development of new technologies. In particular, the creation of the metaverse itself (or the metaverses themselves) has been possible due to large investments: the platforms to which users can experience virtual reality, as well as the devices giving access to augmented reality, are owned by few large private BigTechs "governing" the digital space and often being the primary subject having direct power over it[39]. Thus, the metaverse becomes a reality regulated by private standards, where the platform hosting the digital space defines the guidelines and rules which apply to the users' conduct. At the same time, in addition to establishing the rules of participation, private companies exercise an "enforcement" function, for instance by removing an online content or by blocking accounts[40]. Those are acts that are likely to have some impact on fundamental rights.

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[35] Charter of Fundamental Rights of the European Union [2012] OJ C 326/391.

[36] Eva Kassoti and Ramses Wessel "The Eu's Duty to Respect Human Rights Abroad: The Extraterritorial Applicability of the EU Charter and Due Diligence Considerations" (2020) 2 Cleer Papers 1.

[37] On the topic Violeta Moreno-Lax and Cathryn Costello "The Extraterritorial Application of the EU Charter of Fundamental Rights: From Territoriality to Facticity, the Effectiveness Model" in Steve Peers, Tamara Hervey, Jeff Kenner and Angela Ward (eds) The EU Charter of Fundamental Rights: a Commentary (Hard Publishing, 2014) 1700.

[38] Koenraad Lenaerts and José Antonio Gutiérrez-Fons "The Place of the Charter in the EU Constitutional Edifice", in Steve Peers, et al. (eds) The EU Charter of Fundamental Rights: a Commentary, cit., 1600, Oxford, Hart Publishing (2014), pp. 1600

[39] Kuzi Charamba "Beyond The Corporate Responsibility To Respect Human Rights In The Dawn Of A Metaverse", cit., 111.

[40] See Oreste Pollicino and Giovanni De Gregorio "The Quest for Balancing Rights in the Digital Age: Perspectives from the Metaverse" (2023) Medialaws.eu.

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Moreover, the margin for manoeuvring of corporations needs to be re-evaluated in the European Union context, where the law is already expanding at the expense of companies' freedom of governance. Reference is made to the legislative initiatives adopted in the field of digitalization, such as the Digital Services Act[41] and the Artificial Intelligence Act[42] (while the impact of artificial intelligence on metaverse is rapidly evolving and subject to scrutiny)[43].

In the light of the above, questions are raised by the emergence of the role played by those corporations in *i)* ensuring that human rights are protected in those contexts, but also *ii)* holding responsibility for violations of the aforementioned human rights[44].

As it is well known, States – as subjects of international law – are the main actors with the legal obligation to respect, protect and fulfil human rights. Private actors, on the one hand, do not have direct obligations under International Human Rights Law[45], since they are not holders of international legal personality. The main legal literature sustains this position, highlighting the role of the State to prevent fundamental rights violations by third parties[46].

On the other hand, this classic paradigm is being questioned over time, when a reflection on the possible role of corporations started to develop: in particular, it has been assumed that business enterprises are subject to a due diligence responsibility which is functional to the protection of human rights. This distinction has been elaborated in the UN Guiding Principles on Business and Human Rights (UNGPs)[47], according to which corporations have the duty to consider and manage the impact of their business activities to individuals' human rights. However, whenever a human rights violation occurs in the context of a business activity (or as a direct consequence of the latter), from an IHRL perspective, the responsible subject remains the State[48]. In other words, while the State bears the duty to protect individuals against human rights abuses by private corporations, the latter should act with due diligence. This is on the understanding that private companies are not

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[41] Regulation (EU) No 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market For Digital Services and amending Directive 2000/31/EC (Digital Services Act)[2022] OJ L 277/1. For a further reflection on other EU legislative instruments in the field, see Gianluca Contaldi "Il DMA ('Digital Markets Act') può contribuire alla protezione dei dati degli utenti online?" (2023) 1 Diritti umani e diritto internazionale 77.

[42] Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) [2024] OJ L 1689.

[43] Mona M. Soliman, Eman Ahmed, Ashraf Darwish and Aboul Ella Hassanien "Artifcial intelligence powered Metaverse: analysis, challenges and future perspectives" (2024) 57 Artificial Intelligence Review 1. See also the European Parliament resolution on *Virtual worlds – opportunities, risks and policy implications for the single market* (2022/2198(INI)) (2024) 3.

[44] Agnés Callamard "The Human Rights Obligations of Non-State Actors" in Rikke Frank Jørgensen (ed) Human Rights in the Age of Platforms (The MIT Press, 2019) 191.

[45] Robert McCorquodale "Non-State Actors and International Human Rights Law" in Sarah Joseph and Adam McBeth (eds) International Human Rights Law (Edward Elgar, 2009) 97; Israel De Jesus Butler *Unravelling Sovereignty: Human Rights Actors and the Structure of International Law* (Intersentia, 2007); Chris Jochnick "Confronting the Impunity of Non-State Actors: New Fields for the Promotion of Human Rights" (1999) 21 Human Rights Quarterly 56; M. Addo (ed), Human Rights Standards and the Responsibility of Transnational Corporations (Kluwer Law International,1999).

[46] Sergio M. Carbone "Caratteristiche e tendenze evolutive della Comunità internazionale" in Sergio M. Carbone et al *Istituzioni di diritto internazionale* (Giappichelli, 2021) 36; Marco Fasciglione *Impresa e diritti umani nel diritto internazionale* (Giappichelli, 2024) 42.

[47] UN Special Representative of the Secretary-General *Guiding Principles on Business and Human Rights: Implementing the United Nations "Protect, Respect and Remedy" Framework* 6 (2011) U.N. Doc A/HRC/17/31.

[48] ICJ *Reparation for Injuries Suffered in the Service of the United Nations*, Advisory Opinion (1949) ICJ Reports 4, para. 10.

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considered an "agent of State" when fulfilling their obligations: in other worlds, IHRL has not yet fully evolved in the sense of directly attributing obligations and duties to corporations.
As supported by the legal doctrine, the debate continues on whether corporations result directly to be directly subject to certain principles of international law relating to the protection of human rights[49]. This reflection should be further developed in the specific contexts of the metaverse, where the leading role of multinational corporations is evident. At the same time, numerous soft law instruments refer to the due diligence obligations of corporations with specific reference to the digital sector[50] and the very same principles already are subject to a process of incorporation into hard law[51]. A process which starts from the premises that, at the present moment, business enterprises are not directly bound by IHRL obligations, but may nevertheless be subject to national and international legislation aimed at greater protection of fundamental rights.
This approach is currently being promoted and sustained by the European Union. As reflected in the strategies developed by the EU institutions and recent legislative/soft law initiatives, the protection of fundamental rights in the digital space is a rule-making objective and is embodied in the adoption of acts that, within the EU competencies, enable the implementation of the rights and principles set forth in the EU Charter[52]. Thus, in the digital domain, the EU has shifted from a liberal approach focused on the enhancement of the internal market and fundamental freedom to a "regulatory activism" aimed at protecting fundamental rights and at limiting the extensive power of (large) private corporations. Strengthening the governance of new technologies implies the adoption of new instruments of secondary EU law – which is being done, mainly on the basis of Article 114 TFEU – as well as questioning whether the already existing legislation is adequate to respond the needs emerging with the digital evolution[53].
The strategy enhanced at the EU level, aimed at strengthening the regulatory framework applicable to corporations and private digital platforms and tools, does not exhaust the debate over the possibility to make private companies accountable for human rights violation in the digital sphere. While EU law, in its structure, complies with the primary role of States to respect, protect and fulfill human rights, it also confirms the fact that private companies offering digital services exercise a high degree of control over online spaces, which can be assimilated to the exercise of some form of authority over the final users.

6.5 Concluding remarks

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[49] Angelica Bonfanti *Imprese multinazionali, diritti umani e ambiente. Profili di diritto internazionale pubblico e privato* (Giuffrè, 2013).

[50] See for instance Council of Europe – Parliamentary Assembly Resolution 2578 (2024) *Risks and opportunity of Metaverse*, adopted 4 October 2024 (32nd sitting), which stresses "the need to address the rights and obligations of private companies providing metaverse services and infrastructure". See also the Recommendation CM/Rec(2018)2 of the Committee of Ministers of the Council of Europe to member States on the roles and responsibilities of internet intermediaries (2018) 7, according to which "the power of such intermediaries as protagonists of online expression makes it imperative to clarify their role and impact on human rights, as well as their corresponding duties and responsibilities".

[51] Chiara Macchi and Claire Bright "Hardening Soft Law: The Implementation of Human Rights Due Diligence Requirements in Domestic Legislation" in Martina Buscemi, Nicole Lazzerini, Laura Magi and Deborah Russo (eds) Legal Sources in Business and Human Rights (Brill Nijhoff, 2020) 218.

[52] On the EU action in the field of digitalization from a human rights perspective, see Adelina Adinolfi "Evoluzione tecnologica e tutela dei diritti fondamentali: qualche considerazione sulle attuali strategie normative dell'Unione" (2023) 15 Quaderni AISDUE 23.

[53] Natalia Menéndez González and Efe Bozkir "Eye-Tracking Devices for Virtual and Augmented Reality Metaverse Environments and Their Compatibility with the European Union General Data Protection Regulation" (2024) 3 Digital Society 1.

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The above considerations illustrate some of the the multiple and complex issues that arise as a consequence of the digital revolution and the development of technologies such as virtual and augmented reality. The protection of human rights in the metaverse – in the light of the existing and possibly future legal instruments – will require a rethinking of the traditional approaches and the development of new legal theories.

The minimalistic view, according to which what takes place in the metaverse is not happening in the real world, is no longer sustainable and it is not promoted by national and international actors. At the same time, the need emerges for an evolutive interpretation of IHRL instruments, which have been originally developed with the intention of applying them to human behaviors occurring in the physical domain. In particular, the present contribution has highlighted the fact that State responsibility for human rights violation occurred in the metaverse would necessarily imply considerations on the extraterritorial application of the aforementioned instruments or at least a new conception of territorial jurisdiction. At the same time, the protection of human rights would not be effective without a clarification of the obligations and responsibilities of private actors such as companies developing virtual/extended reality technologies and managing digital platforms, as evidenced by soft and hard law initiatives undertaken at the international and EU level.

The necessity to develop new approaches is being evident in the EU legal order, where the issue on the adequacy of the EU Charter for the protection of human rights in the digital domain has been raised. The adoption of the European Declaration on Digital Rights and Principles[54], while not having legal binding force, suggests the intention of the EU institutions to build an autonomous catalogue of "digital rights" to integrate the already existing one and to ensure the respect for the principle of equality between online and offline situations. This, alongside the above-mentioned "regulatory activism" which aims to provide a clearer definition of the duties and responsibility incumbent over private actors governing the digital space.

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7

7. VR, AR AND AUTONOMOUS SHIPPING

Carola Annitto

7.1 Autonomous ships – state of the art

The technological revolution has also taken hold in the maritime sector, in particular, manifesting itself in the development of automation in shipping.The current state of the art shows the existence of several levels of ship automation. The development of autonomous ships has been possible because of and has been growing side by side with the of augmented and virtual reality (AR and VR) technologies' progress.

Autonomous maritime vehicles, generically referred to as unmanned marine vehicles (UMVs), actually constitute a macro-category, comprising within it unmanned under water vehicles (UUVs),[1] and unmanned - water - surface vehicles (USVs).[2] The UMVs can be classified according to different levels of automation, thus, to a more technical point of view there are: 'fully autonomous' (the highest degree in which artificial intelligence once pre-programmed, thanks to the use of predictive algorithms, is able to take decisions autonomously, therefore, allowing the ship to sail without any human intervention), 'monitored', 'delegated', 'directed' and 'operated by human on board'.[3] In this Chapter, it will be used the term 'UMVs', 'unmanned ships', 'autonomous ships', or the acronyms 'MASS' (Maritime Autonomous Surface Ships)[4] as synonymous for ease of narration.

By a legal perspective, there is more interest on the one hand about fully autonomous ships and on the other on those generally considered as remotely controlled; the International Working

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[1] On the subject of UUVs, much thought has been given by the US scholars, due to the extensive development of such vehicles in the United States, especially for military use. See: Stephanie Showalter, 'The Legal Status of Autonomous Underwater Vehicles', (2004), The Marine Technology Society Journal, Vol. 38, No. 1, 80, 83; Andrew Henderson, 'Murky Waters: The Legal Status of Unmanned Undersea Vehicles', (2006), Naval Law Review, 53;

[2] Institutions regulating maritime sector and scholars dealing with the same subject matter mostly focus on the USVs rather than on the UUVs.

[3] Many different classifications of maritime vehicles' automation have been carried out by scholars and Institutions dealing with the subject matter. For the purpose of this Chapter, it will be adopted the classification drafted by the SARUMS (Safety and Regulations for European Unmanned Maritime Systems) in collaboration with the European Defence Agency (EDA) and contained in the 'Best Practice Guide for Unmanned Maritime Systems Handling, Operations, Design and Regulations' (2014). For details see: https://www.eda.europa.eu/what-we-do/activities/activities-search/unmanned-maritime-systems-(ums)-research, accessed May 30th, 2023. Another example of vessel automation's levels is formulated by Robert Veal, Michael Tsimplis, and Andrew Serdy, 'Liability for Operation in Unmanned Maritime Vehicles with Differing Levels of Autonomy', (2016), European Defence Agency, Brussels.

[4] The term 'Maritime Autonomous Surface Ships' (MASS) has been adopted by the International Maritime Organisation (IMO), as it will be specified below in this Chapter.

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Group (IWG) of the '*Comité Maritime International*' (CMI), in fact, in its Position Paper on unmanned ships, focuses its entire work on the two typologies of automation just mentioned.[5]

The remotely controlled ships are operated from a base on shore from which, through a computer and a joystick, the controller governs their movements, using a radio and satellite communication system[6]: he is able to have a live view of the ship's vision and of its progress, thanks to the installation on board of video cameras and ear sensors.

In the case of the autonomous ship, it is pre - programmed before navigation, during which there is no human interaction, made possible by an algorithmic predetermination applied to the software, and a radar sonar system.[7] The latter type of ship, may be also remotely supervised from a shore base, so it will be defined 'supervised', or it may not, thus, being called 'unsupervised'.[8]

Moreover, the two modes of vessel operation just described can also be combined, alternatively, even during the same voyage, the modulation being articulated according to the section's nature of the itinerary to be covered.

Opportunities of the use of augmented and virtual reality (AR/VR) on remotely controlled ships, where human intervention is required, is crucial and currently integrated to the MASS design as fundamental tools actually letting those ships to be considered as autonomous. In fact, the main issue raising on autonomous ships at the legal point of view, consists in the allocation and management of the human element.[9] The latter exists both off-shore, or within the programming of the algorithms predicting the ships functioning, thus, in anyway thanks to the supply of the AR/VR.[10]

Unmanned ships' technology is not new, it has already been used mainly in the military fields, the novelty, however, lies in the use of automation in the scientific research and commercial cargo sectors. Concrete examples of autonomous ships are currently represented by the Norwegian containership Yara Birkeland[11] and the Mayflower,[12] which carries out scientific research, and on June 30th 2022 it docked in Plymouth, Massachusetts, having crossed the Atlantic Ocean from Plymouth UK. Both of the abovementioned ships are electrically propelled, with no personnel on board, sailing partly fully autonomously and partly remotely controlled. There are also many other autonomous shipbuilding projects running around the world, worthy of mention are the multiple

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[5] The CMI's IWG 'Position Paper' published on 2017, and subsequent documents produced, are available at the following link: https://comitemaritime.org/work/mass/ accessed May 30th 2023. The Paper groups the two categories of autonomous and remote controlled ships, for sake of simplicity, under the generic term 'unmanned ships'. Furthermore, the IWG of the CMI took as a reference the SARUM automation levels' classification (n. 3).

[6] For the introductive part of this Chapter, it is used the generic expression 'remote controller', transposed from that used by the IWG in its Position Paper. Actually, this particular figure - in reality not necessarily represented by a single person, but more easily by a team of experts - will receive more attention in relation to the legal questions raised concerning the replacement of the role of the captain and the crew on board of the ship, at the subsequent Paras of this Chapter.

[7] IWG-CMI Position Paper, 1ff, (n. 5).

[8] Ibid.

[9] Erik Veitch, Ole Andreas Alsos, 'A systematic review of human-AI interaction in autonomous ship systems' (2022) Safety Science 152, 105778.

[10] Kjeld Dittmann and others, 'Autonomous Surface Vessel with Remote Human on the Loop: System Design for STCW Compliance', (2021), IFAC-PapersOnLine, Volume 54, Issue 16, 224-231.

[11] See the website dedicated to the vessel at the following link: https://www.yara.com/news-and-media/media-library/press-kits/yara-birkeland-press-kit/ accessed May 30th 2023.

[12] See the website dedicated to the vessel at the following link: https://mas400.com/, accessed May 30th 2022.

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plans carried out by the USA's shipowner Ocean Infinity,[13] which has launched the construction of the largest autonomous ships' fleet, whose first vessel had recently been constructed.[14]

7.2 Regulation of autonomous ships

7.2.1 Legal definition of ship and of autonomous ship

In order to place the autonomous ships in a clear legal framework, it is essential a prior reflection on the definition of the basic concepts generally used in shipping narrative, starting from the legal meaning of ship.

Indeed, the International Maritime Organisation (IMO), through its Maritime Safety Committee (MSC), while firstly facing the subject matter of unmanned ships, immediately addressed the issue on the definition of autonomous ship.[15]

With the purpose to solve this problem, it is necessary to deal with another related and long-standing concern: the lack of an unambiguous notion of a ship in international law.[16] In fact, a plurality of legal definitions of ship exist: some of them are dictated by practice, while others - sometimes - contained in the texts of maritime law International Conventions, however with different meanings according to the scope of action pursued by each of them.[17] Therefore, the notion of ship would possess more than one legal attribution, encompassing several aspects at once: in its material sense the ship constitutes a construction,[18] which, in the legal sense, it can be enriched with conventional meanings attributed by the legislator, such as that of ownership. Thus, the definitions provided by regulations attract to the ship a series of contractual relations linked to the agreements to be concluded for its building, sale, insurance, and so on.[19]

Furthermore, the ship as subject of a right represents an economic asset, so, the source of private interests; however, it may at the same time attract public interests when, for example, the master on board has to fulfil his obligation in order to render assistance, as required by the rules of

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[13] Ocean Infinity already built many sub – marine vehicles, for the purpose of scientific research. For more information see the company's website: https://oceaninfinity.com/, accessed May 30th 2023.

[14] Bartolomej Tomic, 'Ocean Infinity's First 78-meter Robotic Ship Hits the Water' (2022) Offshore Engineer: https://www.oedigital.com/news/496391-photo-ocean-infinity-s-first-78-meter-robotic-ship-hits-the-water, accessed May 30th 2023.

[15] MSC 98/23, 28 June 2017 'Report of the maritime safety committee', 78ff.

[16] Antonio Sciajola, 'La definizione di nave nel progetto di codice marittimo', Riv. Dir. nav. (1935) I, 249. The author describes the definition of a ship as 'assai delicata' (very delicate), as the legislator may 'correre una pericolosa avventura' (run a dangerous adventure) in attempting to give a legal notion of a ship, given the multiple consequences it entails.

[17] Juan Pablo Rodríguez Delgado 'The Legal Challenges of Unmanned Ships in the Private Maritime Law: What Laws would You Change?' in Massimiliano Musi (eds) 'Port, Maritime and Transport Law between Legacies of the Past and Modernization', Bologna (2018) 498ff.

[18] Marco Lopez De Gonzalo, 'Il regime giuridico della nave nel diritto interno, internazionale e comunitario', Il diritto marittimo (2013) 47: 'Una volta completata la costruzione, la nave si configura come bene complesso, o "*res connexa*", formata da un insieme di parti costitutive, oltre a pertinenze ed accessori' (once the construction is completed, the ship configures a complex good, or '*res connexa*', consisting of a set of constituent parts, as well as appurtenances and accessories). On the topic of ship as '*res connexa*' see also Dante Gaeta, 'Nave (Diritto della Navigazione)', Enc. dir., XXVII (1977) 646.

[19] Dante Gaeta, 'Nave (Diritto della Navigazione)', 646, (n. 19).

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public international law.[20] Ship, again, on a public international law perspective, represents a place considered by the State to which the ship belongs - through a *fictio iuris* – as a portion of national territory where the State jurisdiction is exercised and the law of the same State applies.[21] The list of legal shapes that the vessel can take is not exhaustive, if one thinks, once more, of the many purposes to which a ship can be designed to, such as transport, exploration of the seabed, to mention but a few examples. As a means of transport, the ship calls upon the relevant legal regulation, and the same applies to every other area in which the vessel is used.

Authoritative Italian scholar on the notion of ship in public international law has spoken of 'pluriqualificazione giuridica' (multiple legal qualification).[22] The term 'pluri-qualification' was used again, in the title of a work collecting articles of jurists of different nationalities, where the authors generally underline the difficult on finding a uniform definition of ship.[23] The editor of the work himself, notes that the contributions have one thing in common: a preference for a broad interpretation of the term ship, so that it can also include new generations of shipbuilding, which do not have an *ad hoc* discipline.[24]

The solution of an unchanging notion of ship, valid for all legal and technical areas in which it operates, seems to be reductive, and perhaps even unnecessary,[25] nonetheless it does not mean

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[20] Specifically it is provided by Para 1, Art 98 of the United Nations Convention on the Law of the Sea (UNCLOS): 'Every State shall require the master of a ship flying its flag, in so far as he can do so without serious danger to the ship, the crew or the passengers: (a) to render assistance to any person found at sea in danger of being lost; (b) to proceed with all possible speed to the rescue of persons in distress, if informed of their need of assistance (…)'; and by Reg 33, Chapter V, of the Convention for the Safety of Life at Sea (SOLAS), which states: 'master of a ship at sea which is in a position to be able to provide assistance, on receiving information from any source that persons are in distress at sea, is bound to proceed with all speed to their assistance, if possible informing them or the search and rescue service that the ship is doing so (…)'. The same concept of dual relevance, both on a private and public level of the ship, is affirmed by Dante Gaeta, 'Nave (Diritto della Navigazione)', 644ff, (n. 19). In particular, the author asserts that: 'nave e aeromobile sono anche beni privati d'interesse pubblico in quanto alcuni aspetti della loro disciplina sono preordinati alla tutela dell'interesse pubblico' (ships and aircraft are also private assets of public interest in that certain aspects of their regulation are preordained to the protection of the public interest). Still on the subject, see Giorgio Conetti 'Sulla nozione di nave nel diritto internazionale pubblico', Trasporti, Diritto, economia, politica, 80 (2000) 77ff, where he defines the ship as: 'una "fattispecie complessa" i cui elementi sono tanto materiali che di organizzazione e devono concorrere tutti per costituire la fattispecie di nave ammessa alla navigazione (…) il termine nave è impiegato in tre significati: si indica cioè il bene come tale, o l'insieme degli interessi nei confronti di questo bene, o ancora esso viene impiegato quale sinonimo di Stato' (a 'complex case' whose elements are both material and organisational and must all come together to constitute the case of a ship admitted to navigation (...) the term 'ship' is used in three meanings: that is, the asset as such, or the totality of the interests in this asset, or else it is used as a synonym for the State).

[21] Giorgio Conetti 'Sulla nozione di nave nel diritto internazionale pubblico', 78, (n. 21). The author mentions the theories formulated over time regarding the legal qualification of the ship, dealing with the oldest of them, attributable to the distinguished Swiss jurist Emer De Vattel, who describes it as follows 'si basa su una evidente finzione giuridica (…) nave come "*portion du territoire*"' (it is based on an obvious legal fiction (...) ship as a '*portion du territoire'*).

[22] Dante Gaeta, 'Nave (Diritto della Navigazione)', 643ff (n. 19). The author argues, in fact, that 'la nave e l'aeromobile sono riguardati dal diritto sotto così molteplici aspetti da costituire uno dei più cospicui esempi di pluriqualificazione giuridica della realtà' (the ship and the aircraft are covered by the law in so many ways that they constitute one of the most conspicuous examples of the legal multiple classification of reality).

[23] Massimiliano Musi (eds), 'The ship: an example of legal pluri-qualification', Diritto Marittimo – Quaderni, Bologna (2016) IXff.

[24] Ibid.

[25] Massimiliano Musi 'Nozione di nave', Bologna (2020) 175ff. The author advocates the use of a systematic approach in the interpretation of international conventions, in this specific case, of the rules governing the notion of ship.

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that one or more legal definitions of vessel should be dispensed with, as actually the maritime International Conventions, as seen above reality of the, demonstrate.[26]

The IMO has unofficially adopted the term MASS referring to the entire category of autonomous ships, albeit characterised by different levels of automation, and defined as: 'a ship which, to a varying degree, can operate independently of human interaction'.[27]

Other Institutions questioned about the definition of autonomous ships in order to find an adequate legal framework, for example the Maritime Unmanned Navigation through Intelligence in Networks (MUNIN)'s project, described at Para. 2.2.1 below, took as reference the following notion of autonomous vessel as a ship:

> 'equipped with modular control systems and communication technology to enable wireless monitoring and control, including advanced decision support systems and the capabilities for remote and autonomous operation'.[28]

7.2.2 Studies on the suitability of the legal framework currently ruling the manned ships to the autonomous ones

The IMO and EU institutions have been ready from the outset to accommodate MASS in their regulatory structures, assuming a preventive approach to potential legal gaps.

7.2.2.1 The MUNIN's Project

The first step taken by an institutional body, has been the Maritime Unmanned Navigation through Intelligence in Networks (MUNIN). MUNIN started in 2012 and ended in 2016, it consisted of a joint research project founded by the EU Commission in which a consortium of companies from both scientific and industrial fields worked together.[29]

The project aimed to deepen the concept of the autonomous ship from a technical, economic and legal point of views, in order to provide subjects such as investors, maritime operators, institutions, which might have to interact with such a new generation of ships, suitable knowledge tools in order to assess the practicability's aspects concerning an autonomous ship.

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[26] For a discussion on the unitary solution of the notion of ship, see: Lawrence Dardani 'The Definition of "Ship": a Question of Method', Massimiliano Musi (eds) 'The ship: an example of legal pluri-qualification', 7ff (n. 24). The author, furthermore, emphasises the importance of the economic impact assessment, which must be carried out prior to any reform of the law by the legislature in general, and in particular if it is intended to intervene in international law with regard to the notion of ship.

[27] MSC - 99/WP.9 'Annex 1' (2018), 3. The definition of MASS provided by the MSC is considered by it to be provisional and addressed only for the purposes of the RSE, see: MSC 99/22, (2018) Para. 5.5.

[28] The MUNIN has been part of the 'Seventh Framework Programme', now concluded, funded by the European Union Commission, which was aimed at stimulating the fields of research and innovation in the period 2007 - 2013, and then extended until 2020 under the name 'Horizon 2020'. More information are available at the following link: https://wayback.archive-it.org/12090/20191127213419/https:/ec.europa.eu/research/fp7/index_en.cfm, accessed May 30th 2023.

[29] A 'Final Brochure' has been produced at the end of each year since the MUNIN started. The most important 'Final Brochure' is the 2016's one, which reports the conclusions of the project; it can be found at the following link: http://www.unmanned-ship.org/munin/wp-content/uploads/2016/02/MUNIN-final-brochure.pdf, accessed 28 May 2022.

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The legal analysis carried out in the ambit of the MUNIN, has been founded on the so called 'goal – based' method.[30]

Worth of mention about the project's outcome is the identification of the most relevant regulations, which could affect the legal framework in which the autonomous ships will sail, among them, the Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs). In fact, according to Rule 2 of the Convention:

> '(a) Nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case. (b) In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger'.

Therefore, liability in ships with a crew on board lies with the owner, master or crew of the vessel; within the conclusions of the MUNIN, the members of the Shore Control Centre (SCC) of the unmanned ships should be subject to the same liability.[31]

Following, in Rule 8 of the COLREGs, they are provided the so-called 'positive actions' that the captain, or other in charge, must perform in order to avoid collisions and, therefore, damages. In the autonomous ships, the figure filling this role, as mentioned, may be the SCC, whose operators have the task, for example, of reducing speed in the event of sighting other ships on its route, and according to metrological circumstances, if there is a risk of a collision.[32]

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[30] Ibid. On the necessity to adopt the 'goal-based' method generally in the revision of the maritime legal framework within the autonomous ships' perspective, see Henrik Ringbom, Erik Røsæg, Trond Solvang, 'Autonomous Ships and the Law', London (2020), 56ff, where they affirm that: 'new rules on these matters should be more flexible and goal-oriented than current prescriptive requirements for ships'. After all, the EU Commission issuing the 'EU Operational Guidelines for Trials of Maritime Autonomous Surface Ships (MASS)', which will be deepened at Para 2.3 below, expressly adopted the 'goal-based' method. The same approach has been taken by the IMO-MSC within the 'Outcome of the Regulatory Scoping Exercise for the use of Maritime Autonomous Surface Ships', as it will be described at Para 2.4 below.

[31] MUNIN 'Final Brochure' (2016) 11, (n. 30). See also Fariborz Safari and Benedicte Sage (eds) '7.2: Legal and Liability Analysis for Remote Controlled Vessels' (2013), inserted within the final results of studies carried out in the different ambit, technological, economical, and legal, for the MUNIN project, available at the following link : http://www.unmanned-ship.org/munin/wp-content/uploads/2013/11/MUNIN-D7-2-Legal-and-Liability-Analysis-for-Remote-Controlled-Vessels-UCC-final.pdf accessed May 30th 2023. From the analysis of the legal aspects carried out by the two authors, the fundamental character of safety at sea (SOLAS) emerges: an element considered pivotal in all IMO instruments, which encompasses and is also present in two other unavoidable aspects of the rules of navigation such as collision avoidance (regulated by the COLREGs) and environmental protection (MARPOL). In this regard, see 11 ff of the above-mentioned document, in which each of the above-mentioned Conventions along with other relevant IMO instruments are discussed in detail.

[32] MUNIN 'Final Brochure' (2016), 24, (n. 30): 'In order to avoid collision at sea, based on the circumstances of the case and prevailing situations, the SCC must take in sufficient time any positive action. Taking into account all circumstances, any alteration of speed and/or course to avoid collision must be large enough to be readily apparent to another vessel observing visually or by radar. The effectiveness of the collision avoidance action must be carefully checked by the available systems until the other vessel is finally past and clear. These collision avoidance actions must, in practice, be such as to result in passing at a safe distance. As far as the time factor is concerned, to allow more time to assess the situation, if it is necessary for the prevention of collision, a vessel must reduce its speed or take all way off by stopping or reversing its means of propulsion'.

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In order to perform the positive actions, the SCC takes advantage of on-board and off-shore augmented or virtual reality technologies such as Automatic Identification System (AIS), Vessel Traffic Service (VTS), and anti - collision radar, to name a few.[33]

7.2.2.2 The SAFEMASS' study

Remaining within the EU area, the European Maritime Safety Agency (EMSA) conducted a study called SAFEMASS, started in July 2019 and concluded in March 2020.[34] The objective pursued by the Agency was to implement the knowledge of the different levels of automation that MASS can achieve.

The study analysed the technical and legal issues arising in relation to the unmanned vessels, in order to provide a suitable strategy providing a basis for current and future in-depth projects on the subject at the initiative of other EU institutions, Member States, and IMO.[35] The time of navigation that is considered most critical in terms of risks, is that which lies on the borderline between the manned and unmanned navigation modes. Such a situation is likely to cause emergency circumstances, namely: (i) an increased workload that the automated system is to bear, which could lead to an overload of information, notifications and alarms and, consequently, a system shutdown; (ii) inadequate intervention of on-board operators due to insufficient training, or to a lack of reliability of the computer system itself, or a delayed readiness in terms of sudden intervention, or even misinterpretation of signals coming from the automated bridge.[36]

Within the SAFEMASS study legal issues arisen on the examination carried out about the main International Conventions such as: COLREGs, Convention for the Safety of Life at Sea (SOLAS), International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW Convention), and International Convention for the Prevention of Pollution from Ships (MARPOL).

It has been discussed the possibility of the MASS to be compliant with the rules envisaged by the aforementioned Conventions. Generally speaking, the greatest challenge encountered in terms of meeting international standards is the replacement of human continuous monitoring, with the automation systems installed on board the new generation's ships.[37] In particular, the following provisions were identified as non-performing by MASS, and consequently they could not legally operate: COLREG, Part A, Rule 2 – Responsibility (and principle of seamanship); COLREG, Part B, Section I, Rule 5 - Look-out; STCW Convention VIII/2 - Watchkeeping

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[33] Ibid, 23ff: including the Automatic Radar Plotting Aid (ARPA), the Electronic Chart Display and Information System (ECDIS), and the Global Maritime Distress and Safety System (GMDSS).

[34] The study was conducted together with the contribution of the contractor DNV GL, which on September 2018 published the 'Class Guidelines on Autonomous and remotely operated ships' available at the following link: https://www.dnv.com/maritime/autonomous-remotely-operated-ships/class-guideline.html, accessed May 30th 2023.

[35] DNV GL, 'SAFEMASS, Study of the risks and regulatory issues of specific cases of MASS – Summary' European Maritime Safety Agency (EMSA), Report n° 0279 (2020) Rev. 0, Document n° 11GG2XH6 – 3, 1. The document is available at the following link: http://www.emsa.europa.eu/publications/reports.html, accessed May 30th 2023.

[36] Ibid, 2-3.

[37] Ibid, 77.

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arrangements and principles to be observed; SOLAS Chapter V/14 - Ship's manning.[38] The mentioned standards, are unfeasible to MASS, since they assume the human element being on board. The issue arises when the main functions of navigation, which the aforementioned Conventions attribute to man as indispensable and which contribute to decision making, are performed not by the personnel on board, but by a machine.[39] Therefore, it is still actual the importance in maintaining the human interaction within the conduct and control of the ship, albeit trough the augmented and virtual reality's tools.

The experts working to the SAFEMASS studies concluded for the adoption of a human-centred design, in other words: it will be necessary for technological development to always see man as a protagonist, and that the computer system is always configured for the human being as a means of aid, which can be used in a manner that is not excessively complex, and which does not pose itself as a total replacement for the former.

7.2.3 Guidelines issued for the testing phase of MASS

On 19 June 2019, the MSC issued the 'Interim Guidelines for MASS Trials'.[40] The Guidelines represent the first regulatory step provided by the IMO concerning the MASS. The legal method adopted has been the soft law one, however, despite its non-binding nature, it is provided that 'compliance with the intent of mandatory instruments should be ensured'.[41] Nonetheless, the term 'interim' suggests their inherent flexibility, which allows them to be updated, modified and improved on the basis of experience and knowledge gained in testing, so as to optimise the rules as much as possible in order to best guarantee the achievement of the stated objectives.[42]

The scope of the Guidelines is primarily to pursue the warranty that the MASS are as safe as (or safer than) manned ships.[43]

The Guidelines set out ten principles to be respected during the testing phase of the MASS, the most relevant of which, established in Par 2.3.1, consists in the preservation of the minimum manning requirement, that may be complied by the presence of human – as long as it is

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[38] Within the documents produced in the ambit of the CMI's IWG Studies (n. 5), see also 'Annex 2 – Consolidated analysis of LEG Conventions' in which it is carried out a deep analysis of each relevant articles of the International Conventions to the subject matter of autonomous vessels, in respect to all levels of automation.

[39] On this topic, see Henrik Ringbom 'Regulating Autonomous Ships—Concepts, Challenges and Precedents', *Ocean Development and International law*, Volume 50, Issue 2 (2019) 147ff .

[40] MSC.1/Circ.1604, 'Interim Guidelines for Mass Trials', 14 June 2019.

[41] Ibid, Par 2.2.

[42] Henrik Ringbom, Erik Røsæg, Trond Solvang, 'Autonomous Ships and the Law', 62, (n. 31). The authors state that: 'The Interim Guidelines on MASS Trials represent a first step toward legitimizing MASS before all necessary convention adjustments have been made. Several other guidelines will probably be necessary to provide some degree of consistency and harmonization of key safety matters'.

[43] 'Interim Guidelines for Mass Trials', 14 June 2019 (n. 41). The aim of the Guidelines is stated to be: 'assisting relevant authorities and relevant stakeholders with ensuring that the trials of MASS related systems and infrastructure are conducted safely, securely and with due regard for protection of the environment'. Following, Par 1.2.2. defines 'trial' as: 'an experiment or series of experiments, conducted over a limited period, in order to evaluate alternative methods of performing specific functions or satisfying regulatory requirements prescribed by various IMO instruments, which would provide at least the same degree of safety, security and protection of the environment as provided by those instruments'.

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'appropriately qualified' - both on-board or off-shore within SCC.[44] Concerning the latter option, Par 2.4 of the Guidelines recommends to adopt a human-system interface (including monitoring infrastructure), in fact, it is provided that 'for the safe, secure and environmentally sound conduct of MASS trials, the human element should be appropriately addressed.[45]

The harmonization between human centred design and automation is a key component of MASS. Finally, at Para 2.7 of the Guidelines, it has been provided, in order to ensure the security of the information delivered and communications, the need that the data exchange is supported by appropriate tools, including redundancy.

Furthermore, in 2020 the EU Commission issued the 'EU Operational Guidelines for Trials of Maritime Autonomous Surface Ships (MASS)'.[46]

The Guidelines are, again, an instrument of soft law, however, their aim is to set standards to be respected during the testing procedures, in order to make uniformity within the territory of the Union.[47]

In particular, the drafters of the EU Operational Guidelines call upon a review of the current regulations on vessel traffic monitoring and information[48], specifically focusing on the EU VTMIS Directive (Dir 2002/59/EC).[49]

It is asserted, in fact, that the new technological development of MASS will also raise questions in terms of how the role that equipment, providing communication services between ships and the currently performing services ashore - namely, the vessel traffic management (VTM) services, VTS, and the Mandatory Reporting System (MRS) - continue to act in the future.

An update of the rules on VTS services will be needed, especially in the view of foreseeable situations in which maritime traffic both traditional and autonomous will sail the same routes and call at the same ports.[50]

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[44] 'Interim Guidelines for Mass Trials', 14 June 2019, Par 2.3 (n. 41).

[45] Ibid. A reference is made to the Resolution A.947 (23) adopted on 27 November 2003 by the IMO's Assembly, 'Human Element Vision, Principles and Goals for the Organization'.

[46] EU Commission 'EU Operational Guidelines for Trials of Maritime Autonomous Surface Ships (MASS)' (2020) available at the following link: https://transport.ec.europa.eu/system/files/2020-11/guidelines_for_safe_mass.pdf , accessed May 30th 2023. An effective summary of the content of the EU Operational Guidelines for Trials of Maritime Autonomous Surface Ships is provided by the following online article by the law firm Siccardi & Bregante 'Linee Guida UE per realizzazione delle prove in mare su navi autonome in sicurezza' (2020) Assagenti news: https://www.assagenti.it/it/news/21085/Linee_Guida_UE_per_realizzazione_delle_prove_in_mare_su_navi_autonome_in_sicurezza, accessed May 30th 2023.

[47] EU Commission 'EU Operational Guidelines for Trials of Maritime Autonomous Surface Ships (MASS)' (2020), 4 (n. 47).

[48] Ibid, 3 ff.

[49] Directive 2002/59/EC of the European Parliament and of the Council of 27 June 2002 establishing a Community vessel traffic monitoring and information system and repealing Council Directive 93/75/EEC. Art 1, par. 1 stated the directive's purpose in the following terms: 'to establish in the Community a vessel traffic monitoring and information system with a view to enhancing the safety and efficiency of maritime traffic, improving the response of authorities to incidents, accidents or potentially dangerous situations at sea, including search and rescue operations, and contributing to a better prevention and detection of pollution by ships'.

[50] EU Commission 'EU Operational Guidelines for Trials of MASS', 3, (n. 48), where it is stated that: 'Developments towards MASS and adapted Vessel Traffic Control/Services are parallel and can support each other'.

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7.2.4 The Maritime Safety Committee's Regulatory Scoping Exercise

On 2017, the IMO's MSC started working on the Regulatory Scoping Exercise (RSE), which aimed to analyse the current regulations on manned ships, in order to determine where they would need to be amended or clarified so that they can also be applied to MASS.

The RSE consists of an important and complex examination of International Conventions in force with regard to their possible application to MASS.

The main topic addressed within the RSE was precisely the method of regulatory intervention. Following the presentation of various hypotheses, a hybrid solution has been opted for, consisting in the adoption of the hard law method, ie the adoption of specific amendments for each International Convention, which needs substantial changes.[51]

On 3 June 2021, MSC published the 'Outcome of the RSE' which essentially provides: (i) information for all degrees of autonomy for every instrument expected to be affected by MASS operations under its purview; (ii) the most appropriate ways of addressing MASS operations in those instruments, as appropriate; and (iii) identification of themes and/or potential gaps that require addressing.[52]

7.2.5 The role of the classification and certification societies

With regard to the legal gaps still existing in order to frame MASS, the role played by the relevant competent classification and certification societies is crucial. An example of an initiative already taken consists in the 'Class Guidelines' on the 'Autonomous and remotely operated ships' published by the Norwegian certification and classification and society DNVGL in 2018.[53] Furthermore, the British Lloyds Register has taken action in the same direction by producing the so-called 'LR Code for Unmanned Marine Systems'. [54] Both documents set out a detailed insurance scheme to ensure safety for MASS. However, it will be required a harmonisation of the Guidelines provided by each certification and classification society, in order to provide international legal uniformity.

7.2.6 Legal methods for the framework's revision addressing the MASS

Finally, the problem of the non-mandatory nature of the soft law arises. However, legal theorists rely on two important International Conventions.

On the one hand the 1969 Vienna Convention on the Law of Treaties (VCLT). Article 31 of the VCLT prescribes the interpretation of Treaties shall be carried out in good faith, taking into account the purpose, the object, the common sense of the terms used, the context, but also further

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[51] MSC 1 'Outcome of the RSE for the use of maritime autonomous surface ships (MASS)' Circ.1638 (2021), 1.

[52] Ibid.

[53] The Class Guidelines are available at the following link: https://www.dnv.com/maritime/autonomous-remotely-operated-ships/class-guideline.html, accessed May 30th 2023.

[54] The Code is available at the following link: https://www.lr.org/en/unmanned-code/#:~:text=The%20LR%20Unmanned%20Marine%20Systems,is%20acceptable%20to%20Flag%20States%2C, accessed May 30th 2023.

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practices followed by States in applying the Treaty in agreement with each other, which may assume binding normative significance.[55]

On the other hand, the United Nations Convention on the Law of the Sea (UNCLOS) seems to open a window in the same direction, ie with respect to the compulsoriness of regulations or standards if there is general acceptance by States.[56]

If this were the case, regulatory interventions concerning new technologies, such as those applied to the automation of navigation, namely the Guidelines for the testing phase of the MASS, could certainly take the form of more flexible instruments, and capable of not crystallising, but of continuously adapting in the most appropriate, in a sort of binging way, to new demands for law coming from reality.[57]

7.3 AR. VR technologies applied to autonomous shipping

First of all it could be useful to provide a technical definition of augmented reality, as:

> 'a technology that allows enriching the reality perceived by the human eye. [It] is a technology that increases the information content of the perceived reality of the user with additional digital objects and provides the user who uses it with a cognitive aid, but also with decision-support if digital objects are the result of an elaboration/processing of data and not a simple visualisation'.[58]

Within the maritime sector, AR and VR are considered useful to:

> 'increase the situational awareness of the ACC operators, in case of emergency, when need to command ships remotely. The goal is to train a system; using deep learning algorithms to recognise various situations; downstream of this recognition phase, the system provides the most suitable strategy to prevent a collision. Moreover, the most appropriate way to give the operator's processed information using virtual/augmented reality is considered. The artificial intelligence system based on deep learning algorithms allows thanks to the analysis of a considerable amount of heterogeneous data (data from onboard sensors, images, information relating to the context in which the boat is operating, etc.) to perform an extremely accurate object recognition even in non-optimal conditions of poor visibility for example'.[59]

Opportunities of the use of virtual and augmented reality on remotely controlled ships, where human intervention is required, is crucial and applied today to the MASS as described above in this

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[55] An interesting scholar contribution comes from Daniele Mandrioli, 'The rise of autonomous ships: towards an evolutionary interpretation of the IMO treaties on safety of navigation?', Il Diritto Marittimo (2022), I, 159 -177.

[56] On the evolutionary approach, see Markus Kotzur, 'Intertemporal law', in Max Planck Encyclopedia of Public International Law (2008).

[57] Henrik Ringbom, Erik Røsæg, Trond Solvang, 'Autonomous Ships and the Law', London (2020), 65 ff (n.31).

[58] Ronald Azuma, and others, 'Recent Advances in Augmented Reality', N.p. (2001). See also Uwe Freiherr von Lukas, 'Virtual and augmented reality for the maritime sector – applications and requirements', (8th IFAC Conference on Control Applications in Marine Systems, Rostock-Warnemünde, Germany, September 15-17, 2010) s. 2.5.

[59] Michele Martelli, Antonio Virdis, Alberto Gotta, Pietro Cassarà, and Maria Di Summa, 'An Outlook on the Future Marine Traffic Management System for Autonomous Ships', (2021), IEEE access, 9: 157316–157328, s. V, available at the following link https://ieeexplore.ieee.org/search/searchresult.jsp?newsearch=true&queryText=An%20Outlook%20on%20the%20Future%20Marine%20Traffic%20Management%20System%20for%20Autonomous%20Ships, accessed May 30th 2023.

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Chapter. However, the current state of art still lays in the automation level gap from remoted controlled to fully autonomous, and even in this last one level they may be necessary human interventions by decision making in substitution to the algorithms.[60]

In addition, virtual and augmented reality can help the training of operators employed in the remote control centres of autonomous ships, through simulation.[61]

For the use of automation in unmanned ships, it has been designed a system on the basis on the simulation system projected for the automation of cars, named CARLA.[62]

An example of the current use of simulators in the maritime sector, albeit within the manned ships, is occurring today in Italy: VR/AR technologies are being used for training purposes at the Merchant Marine Academy in Genoa. Trainee use these technologies to immerse themselves in on-board operations. From the experiments carried out so far, it appears that pupils, who have practised with gamification technologies, memorise the learned actions-reactions at a level of 80-90 %.[63] Emotional aspects are brought into play, which performed in static conditions, rather than in critical sailing conditions, can be better managed.

Furthermore, the human factor is considered to be crucial to the continuing development of the VR and AR technologies, because from the perception experienced by individuals using simulation instruments, the same can be improved in their accuracy.[64]

Finally, the AR and VR are operated as a support of the maintenance of the tools used within the simulation or the actual remote control of ships.[65]

7.3.1 Legal implications

In conclusion, the AR and VR constitute fundamental devices in autonomous shipping, being comprehended in their design. The legal issues linked to AR and VR applied to MASS are fully involved in the latter's. Therefore, the Outcome of RSE published by the MSC is to be taken in consideration also for the regulation of the AR and VR tools applied to MASS, in fact, International Conventions herein referred to, namely the STCW, COLREGs, SOLAS, are predicated

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[60] Mårten Lager, Elin Anna Topp, and Jacek Malec, 'Remote Operation of Unmanned Surface Vessel through Virtual Reality' (The Inaugural International Workshop on Virtual, Augmented and Mixed Reality for Human-Robot Interaction (VAM-HRI), March 2018, Chicago, United States). The authors designed a Graphical User Interface (GUI) to be used on remote controlled vessels.

[61] Erik Veitch, Ole Andreas Alsos, 'A systematic review of human-AI interaction in autonomous ship systems' (2022) Safety Science 152, 105778. See also Freiherr von Lukas, 'Virtual and augmented reality for the maritime sector', ss. 2.3 - 2.4 (n. 59).

[62] K. Vasstein, E. F. Brekke, R. Mester and E. Eide, 'Autoferry Gemini: a real-time simulation platform for electromagnetic radiation sensors on autonomous ships' (IOP Conference Series: Materials Science and Engineering, Volume 929, The 3rd International Conference on Maritime Autonomous Surface Ship - ICMASS 2020 - Ulsan, South Korea). On the simulating system designed for cars' automation, see: Alexey Dosovitskiy, German Ros, Felipe Codevilla, Antonio Lòpez, and Vladlen Koltun, 'CARLA: An Open Urban Driving Simulator', (CoRL 2017, 1st Conference on Robot Learning, Mountain View, United States).

[63] M.Z. 'Realtà virtuale per allenare gli equipaggi alle emergenze' (2022) 27, Il Sole 24 Ore, https://www.quotidiano.ilsole24ore.com/?anno=2022&day-from=01&day-to=31&mese=01&giorno=28 accessed May 30th 2023.

[64] Ronald Azuma, and others, 'Recent Advances in Augmented Reality', N.p. (2001), (n. 59).

[65] Freiherr von Lukas, 'Virtual and augmented reality for the maritime sector', s. 2.5 (n. 59).

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on seafarers being onboard the ship, as well as other Conventions finalised to regulate the technical aspects of automation in shipping.[66]

It is worthy of mention the efforts played by the IMO by publishing a plan for the implementation of E-Navigation, which covers both electronically exchange, analysis and presentation of information onboard, as well as on-shore for conventional vessels.[67] The abovementioned regulation opens a door also to the informatics communications occurring between the MASS and its SCC.[68] In particular, the RSE's Outcome listed, as one of its 'high-priority issues', the 'Remote control station/centre', described as 'a new concept to be implemented… and a common theme identified in several instruments as a potential gap'.[69]

Thus, similar concerns described for the legal framework mentioned for the MASS and still pending, must be applied to the specific AR and VR devices enveloped in an autonomous vessels.

7.3.2 The elephant in the room – civil liability

Finally, the deeper analysis of the most relevant International Maritime Conventions in view of the introduction of MASS, carried out by the RSE, reveals the fundamental institution of civil liability referred to by the expression of 'the elephant in the room'.[70] The configuration of the latter with regard to ships without a crew on board is difficult to resolve, however the hypotheses put forward by the doctrine seem to be clear. It remains, however, to await regulatory intervention - announced by the Outcome of the RSE - in this sense too, especially with regard to the important issue of the insurance. In relation to a new, or rather increased, risk concerning cyber security, remotely controlled ships and even more autonomous ships, fully rely on computer and telecommunication systems, thus, if a malfunction occurs, the entire navigation is compromised and this could lead to considerable damages.[71]

Today, civil liability arising from damage caused to third parties, unrelated to contractual relationships, takes on different nuances on the international scene, depending on the State granting nationality to the ship, the area in which the accident occurs, the nature of the accident, and the function for which the ship in question is intended. Most of national jurisdictions base the imputability of non-contractual liability on fault, in terms of negligence or breach of codified duties. A similar legal regime is also provided for at the international level in the context of collisions at sea by the Convention for the Unification of Certain Rules of Law with respect to Collisions

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66 They have been conducted studies on the design of the SCC, which would fulfil the STCW, see Kjeld Dittmann and others, 'Autonomous Surface Vessel with Remote Human on the Loop: System Design for STCW Compliance', (2021), IFAC-PapersOnLine, Volume 54, Issue 16, 224-231 (n. 11).

67 MSC 'E-Navigation Strategy Implementation Plan - Update 1', 1-Circ.1595 (2018).

68 Kjeld Dittmann and others, 'Autonomous Surface Vessel with Remote Human on the Loop' (n. 11).

69 MSC 1 'Outcome of the Regulatory Scoping Exercise for the use of maritime autonomous surface ships (MASS)' Circ.1638 (2021) 8 (n. 52). Furthermore, it was outlined that the qualification, responsibility, and role of SCC operators were among the 'most complex issues to be addressed'. On this topic see also Erik Veitch, Ole Andreas Alsos, 'A systematic review of human-AI interaction in autonomous ship systems' (n. 10).

70 Barış Soyer, 'Autonomous vessels and third-party liabilities. The elephant in the room' in Barış Soyer and Andrew Tettenborn (eds), *New technologies, artificial intelligence and shipping law in the 21st century* (2020), 105ff.

71 Ibid, 107. The author notes that if the liability aspect were to remain uncovered by a certain regime, this would greatly increase the damages and costs to be borne by both shipowners and manufacturers, due to an excessive increase in insurance costs, and consequently the two would not have incentive to invest in newly discovered technologies in application to shipping.

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between Vessels of 1910, however some other International Conventions provide for a strict liability on the ownership.[72]

Considering the legal regime applied today, which requires shipowners to monitor, inspect and supervise the products and installations they own, with regard to autonomous ships, certainly the ownership shall meet higher standards, which, however, are still to be determined. It would be complex to think of a simple application by analogy of the actual civil liability rules with regard to the subjects, namely individuals composing the SCC, involved in the MASS operation, although these new figures could take on the role of the captain and crew on board traditional ships.[73] Furthermore, it is unclear how and under what circumstances liability for damages to third parties can be imputed to those who design or manage the software installed on the MASS and whether such liability should be strict or based on fault.[74] Authoritative doctrine proposes that liability for damages to third parties caused by the MASS operation should remain on the shipowner.[75]

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[72] For example, the Nairobi Convention on the Removal of Wrecks, concluded on 2007, or to the International Convention on Civil Liability for Oil Pollution Damage concluded on 1992, which at Art. III provides that: '(…) the owner of a ship at the time of an incident (…) shall be liable for any pollution damage caused by the ship as a result of the incident'.

[73] IWG - CMI 'Position Paper on Unmanned Ships', 19, (n.5).

[74] Ibid.

[75] B Barış Soyer, 'Autonomous vessels and third-party liabilities. The elephant in the room', 107ff (n. 71).

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8

8. Computational Medicine: A Personal Perspective

Michele Piana

8.1 Introduction with definitions

This chapter deals with terms that "google" impressive amounts of results. Just to give some examples:

- 'Digital Twin': 540,000,000 results.
- 'Personalized Medicine': 424,000,000 results.
- 'Artificial Intelligence': 883,000,000 results.
- 'Digital Health': 3,870,000,000 results.

For sake of comparison, if you google 'democracy' you will find 838,000,000 items; the good old 'physics' will return 2,130,000,000; and you will need 'peace' to touch 2,310,000,000. Yet, 'Digital Twin', 'Personalized Medicine', 'Artificial Intelligence', and 'Digital Health' are still fuzzy concepts, and it is still questionable how to reasonably agree about their meaning. Therefore, in the following I will try and provide my very personal perspective on these topics, with the awareness that all what I am going to write can be used against me.

Starting from 'Artificial Intelligence' (AI), in my view a thoughtful definition of this concept should involve at least three aspects. First, humans learn from experience and therefore AI, in its machine learning connotation[1], essentially refers to those automated, computational procedures that utilize historical archives of data to either interpret or organize the incoming information according to their classification or prediction content. More technically, a machine learning algorithm is a set of mathematical recipes implemented in a computer program and characterized by a bunch of free parameters; in a preliminary training phase, these parameters are optimized by using the historical archive in order to maximize the ability of the algorithm itself to associate a label to the new data set when this is fed into the computer. Roughly speaking, machine learning exploits the past to predict the future, and therefore its effectiveness strongly depends on the size and quality of the historical database at disposal. But human intelligence also relies on idealizing simplified approximations of complex systems and therefore the second crucial aspect of AI is its ability to formulate in-silico models of reality that allows reliable simulations of the data formation process. To properly work, numerical simulation[2] needs a set of equations that mimics the mechanisms at the base of complex systems, and a computational method that performs a numerical reduction of such equations (this last step is one of the most computationally demanding efforts in the whole game of

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[1] V Vapnik, *The Nature of Statistical Learning Theory* (second edition), Springer, 2000.

[2] A Quarteroni and A Valli, *Numerical Approximation of Partial Differential Equations*, Springer, 2008.

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AI). The third aspect of AI is perfectly explained by Sherlock Holmes at his debut on the crime stage[3]: "Most people, if you describe a train of events to them will tell you what the result will be. There are few people, however that if you told them a result, would be able to evolve from their own inner consciousness what the steps were that led to that result. This power is what I mean when I talk of reasoning backward". Inverse problems theory is the branch of mathematics dealing with this detective-like attitude of human intelligence and its objective is to formulate computational algorithms that account for the intrinsic ambiguity of "reasoning backward", i.e., the fact that the same clues are compatible with different possibly guilty people. Mathematicians call ill-posedness this pathological side of inverse problems and have developed a whole computational corpus of algorithms, collected within the framework of regularization theory, to mitigate its effects[4].

In this broad sense of "machine learning plus simulation plus inverse problems", AI provides the conceptual framework and the methodological tools for the realization of Digital Twins of human conditions in both health and disease. A Digital Twin (DT) in medicine[5] is a virtual space that utilizes multi-modal data (including molecular, physiological, imaging and lifestyle measurements), AI tools (typically implemented in computationally efficient pipelines), and the technological support made of high-performance computing (and including smart data storage procedures), to construct in-silico models of real-life conditions of a specific patient. Therefore, in principle, aggregating DTs of several subjects may allow the generation of data repositories that, by instance, can be exploited to perform clinical trials as an alternative to lengthy (and costly) animal and human studies. Further, AI-based approaches can collect and process measurements recorded from a single individual, to construct a DT of a specific human being, i.e., a sort of digital avatar of each citizen that represents the idealized objective of the so-called 'Many-Ps-Medicine'.

Although the number of such 'Ps' is constantly increasing, we are currently stuck at six: indeed, we are chasing **P**recise diagnostic tools, **P**ersonalized therapeutic interventions, **P**rediction of the intervention follow-up, **P**revention of unfavorable outcomes, and even patients' **P**articipation to the whole pre-clinical, clinical, and post-clinical workflow. Let us focus on the 'P' that probably mostly matters for this modern vision of medicine. In fact, medicine personalization implies a process made of two ingredients and a single, specific objective. As said, the two ingredients are, first, a huge amount of multi-modal data extracted from a given human being and, second, the mathematical and technological ability of utilizing such data to figure out a diagnostic/prognostic picture of such patient. The specific objective is the one to formulate and implement a therapeutic intervention that, in principle, is specifically tailored on the patient as a consequence of such diagnostic/prognostic picture.

This in principle. Yet, the actual state-of-the-art is that DTs simulating, for example, either neurological or oncological diseases are still far from a systematic application in the clinical workflow. Further, despite the proliferation of databases containing genetic, iconographic, biochemical, psycho-physical, and clinical data, AI techniques are very seldom exploited to support the comprehension of the physiological mechanisms beneath these diseases. The reason of this impasse is probably two-fold. First, neurodegenerative diseases and cancer are characterized by significantly complex and heterogeneous etiologies, while measurements associated to them are often rather indirect representations of these physio-pathological mechanisms. Second, for several disorders the amount of available data is still rather limited, and the use of multi-center databanks

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[3] Arthur Conan Doyle, *A Study in Scarlet*, 1887.

[4] M Bertero and M Piana, Inverse Problems in Biomedical Imaging: Modeling and Methods of Solutions, in Complex Systems in Biomedicine, 2006.

[5] https://medicalfuturist.com/digital-twin-and-the-promise-of-personalized-medicine/.

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poses homogenization and standardization issues with no easy solution. The issue we should wonder at this stage, therefore, is whether computational medicine is leading or may soon lead to a breakthrough in the way every single patient will be treated during her/his clinical history; or whether the Many-Ps-Medicine is still likely to remain a dream of uncertain realization.

8.2 Computational medicine: scientific revolution or speculative bubble?

From a philosophical perspective the main issue is probably whether this flabbergasting development of AI (and, specifically, of medical AI) assumes what Thomas Kuhn would name a change of paradigm[6], i.e., the fact that life sciences are experiencing an anomalous condition that can be explained just within the framework of a completely innovated perspective of that world and its general laws. Or rather, that what we are actually experiencing is a sort of speculative bubble driven by the availability of an unprecedented amount of data and computational power, and by an accordingly unprecedented dose of aggressive advertisement.

The recent political choices made by the governments of the developed countries seem to support the first view. The whole concept of "Horizon Europe"[7] shapes a future of science and technology that is undoubtedly and completely AI-driven; in 2020 the US government enacted a specific "National AI Initiative Act"[8] to support what Anthony Blinken explicitly defined as "a global technology revolution". Even in Italy, the national implementation of the 'Next Generation EU' programme almost completely conveys its impressive financial support to research and development toward the digitalization of our society, with specific focus on medicine and clinical assistance. More than this, starting from some decades ago several old and wise people somehow foreshadowed the advent of a highly innovative fashion of making life science. Focusing by instance on neuroscience, in a prescient paper appeared in 1972 in the "Archives of Neurology" Howard Barrows and Kara Bennett[9] pointed out that for a clinical neurologist, problem-solving approaches should not be any longer a matter of "random art" but should be framed into a "rigorous discipline". Thirty years later, Rita Levi Montalcini and Pietro Calissano published a paper in BMC "Neuroscience" with the visionary title "The scientific challenge of the 21st century: from a reductionist to a holistic approach via systems biology"[10]. In that work the two Italian scientists argued that the reductionistic dogma at the basis of the 20th century biology was at its end, and that holistic approaches were the best possible strategy to integrate, in a comprehensible picture, the multi-modal data that the 21st century experimental practice would produce. Finally, in October 2019 "Cell" devoted one of its “Voices“[11] to ask several neuroscientists about their views on the advantages of forging collaborations across disciplines. All those scientists enthusiastically agreed that interdisciplinary approaches to neuroscience are "the right thing to do" for many different

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[6] T Kuhn, *The Structure of Scientific Revolutions*, University of Chicago Press, 2012.

[7] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en.

[8] http://ai.gov.

[9] H S Barrows and K Bennet, The Diagnostic (Problem Solving) Skill of the Neurologist, Archives of Neurology, 26, 273 1972.

[10] R Levi Montalcini and P Calissano, The Scientific Challenge of the 21stcentury: From a Reductionist to a Holistic Approach via Systems Biology, BMC Neuroscience, 7, 2006.

[11] https://www.cell.com/cell/fulltext/S0092-8674(19)31021-9.

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reasons and especially so given the intrinsic “interdisciplinary” way in which our own neural circuits work while simultaneously processing heterogeneous and complex data.

Yet, despite all this enthusiasm, the persisting discrepancy between the apparent unlimited potentialities of AI and the lack of a systematic transfer of knowledge from the realm of algorithms to the one of clinical workflow keeps on arousing some level of skepticism among insiders and stakeholders. In fact, starting from some decades ago other old and wise people warned us against the way of making science that is dominated by data accumulation and the fanaticism of data mining. Once for all, the 1992 Nobel Prize for economy Herbert Simon wrote that "information consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it"[12]. And, on the other hand, whoever makes our job since a reasonable amount of time, can frankly witness that AI has experienced other periods of great fortune that have been followed by a corresponding downsizing of its allegedly revolutionary program.

In January 2020, while the world was unwarily precipitating into the pandemic nightmare, I was at Houston, Texas, attending one of the most populated conferences on medical imaging at an international level. The program of that event included the course "From Analytic to Clinical Validation: Moving AI/ML into Practice", the workshops "Translation of Deep Learning Technology to the Clinic" and "Task-driven AI: Taking into Account the User’s Perspective", and the session "Deep Learning: Uncertainty and Quality". At the core of these events (and for many aspects of the whole conference) there were the evidence of a general unreliability of AI-based solutions for medical imaging and the urgency of a shared definition and implementation of validation paradigms for the outcomes of AI algorithms potentially appropriate for clinical solutions. I have thought long about the content (and the general mood) of those discussions and now I am starting to feel that this sort of skepticism of the clinicians with respect to solutions proposed by computational scientists might be significantly mitigated by a systematic and shared taking charge of some open issues that still affect several aspects of the AI world.

8.3 Some technical issues to account for

A practical issue that should probably be addressed once for all is related to ethical risks due to a lack of privacy and protection in the process of data sharing and exploitation. This problem has mainly legal implications, but my feeling is that we are probably overestimating it: patients are in most cases open to transfer the right of exploitation of their data to researchers, and the constraints imposed by the "General Data Protection Regulation (GDPR)" are maybe less strict than what hospitals' Data Protection Officers keep on telling us (in any case, there are European countries like Finland and Israel that have invested their respective Parliaments with the task of formulating a systematic legislation about such issues, with results that seem reasonable and effective for research and clinical applications).

Instead, I think that the so-called 'algorithmic accountability’[13] should be more incisively brought into the heart of legal thought concerning medical AI. Indeed, the whole process at the base of computational medicine is made of a set of complex and intertwined steps (from the design of the

[12] H A Simon, Designing Organizations for an Information-Rich World, in Computers, Communications, and the Public Interest, 1971.

[13] European Parliament Research Service (Scientific Foresight Unit), Artificial Intelligence in Healthcare - Applications, Risks, and Ethical and Societal Impacts, PE 729.512, 2022.

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algorithms to their implementation, from the deployment of software systems to their validation) and crucial lacunae exist in EU regulations concerned with the identification of responsibilities among the actors of this multiplicity of activities. This lack of clarity currently leaves clinicians in a particularly vulnerable position, also because AI models they are supposed to use are often not entirely transparent.

In my opinion, this lack of transparency is the crucial challenge at the side of the AI community nowadays. The fact is that in the last decade an overwhelming amount of open-source code repositories have become available to computational scientists and technologists, so that the use of these libraries as black boxes for immediate application is being transformed from a temptation to a common practice. As a consequence, this huge development of coding did not have, so far, the counterpoint of an equally systematic development of validation processes that should be conceived as a mandatory pillar in the construction of a transparent, reliable, explainable digital health. More than this, validation could in principle improve our ability to exploit AI to mitigate healthcare inequalities currently already existing in the EU healthcare systems. Instead, there are increasing concerns that, if not properly implemented and assessed, AI solutions could embed or even amplify such systemic disparities and replace human biases with algorithmic biases related, for example, to the unbalance of the datasets utilized in the training phase of the neural networks or to a limited accessibility to computational resources.

As a final remark, I would like to point out that a harmonic and reliable development of digital medicine cannot be separated by a new cultural awareness in the formulation of educational programs in both the life and computational sciences. Indeed, we have an urgent need, on the one hand, to significantly increase the mathematical literacy of biologists and medical doctors; and, on the other hand, to teach computational scientists that purely data-driven approaches should be replaced by algorithms able to better encode the sophisticated information provided by biological and physical models describing the data formation and acquisition processes. In other words, computational medicine should probably become the perfect testbed where to formulate and assess a new cultural approach to applied sciences, in which interdisciplinarity is the methodological core and Karl Popper's teaching - "There exist no disciplines, but just problems and the methods to solve them" - is the philosophical inspiration.

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