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(CSPLA)**

**REPORT BY THE MISSION
ON VIRTUAL REALITY AND AUGMENTED REALITY**

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Synthesis

The French term "*réalité virtuelle*", an approximate translation of the English virtual reality, or its French counterparts, "réalité de **synthèse**" or "réalité artificielle", refers to technologies that give the user the feeling of entering a synthetic world, real or imaginary, within which he can move and with which he can interact. **Augmented** reality makes it possible to enrich the perception of reality visually with information or images generated by a dedicated accessory. **Mixed** reality combines these two technologies, which have two essential characteristics in common: **immersion** in an artificial world and real-time **interaction** with it.

Immersive technologies enable the creation of immersive **objects**. Are these objects works which can be protected by intellectual property law and if so, by which of the existing legal regimes and with how much relevance? This is the subject of this report, which aims to demonstrate that intellectual property law cannot ignore the rise of immersive objects, which are now widely used by the general public and professionals alike.

The **first part** of the report first describes the emergence of immersive technologies since the 1950s, their gradual spread within the professional world and their affirmation among the general public from the 2010s onwards, thanks to the fall in prices making the tools more affordable and the fact that those tools had finally become effective (headsets in particular). All of this was made possible both by advances in optics and screens (influenced by developments in smartphones) and by the significant improvement in computer performance.

It then illustrates the spread of these technologies, first in the professional field and particularly in the area of augmented reality: military applications (flight simulators now used in amusement parks or combat experience simulators), a wide range of industrial uses in the automotive, railway and pharmaceutical sectors enabling impressive productivity gains, medicine (initial student training, learning of operating techniques and even the operations themselves), education and vocational training, trade and logistics, real estate, architecture and design, and heritage.

Next, immersive technologies broke through to the general public: this included video games but also, more broadly, the cultural and *entertainment* industries: audiovisual (with Arte and the CNC playing a leading role in France), cinema (with festivals dedicated to VR in Cannes, Tribeca and Venice), cultural institutions (virtual tours of museums and exhibitions), amusement parks, dedicated arcades and virtual reality *escape games*.

However, despite their remarkable potential, immersive technologies do not yet seem to have been widely adopted by the general public, and the often optimistic population coverage forecasts regularly fail to come true. The price of the tools of course remains a major obstacle, even if this factor is diminishing as technical progress spreads; the situation is also explained by the insufficient amount of quality content, even though the production cost of works remains high and the production sector is still relatively unstructured in France. Above all, the killer app is missing, in other words the tool or use that would prompt the general public to use these technologies on a massive scale.

The **second part** of the report shows that, while the legal regime of immersive objects is not yet stabilised, in particular the nature of the protection offered by intellectual property law, which may slow down the development of this promising sector, no consensus is

emerging to make it evolve in a given direction, in the context of an absence of litigation over the classification and protection of works.

According to the Mission, there is little doubt that the status of a work protected by literary and artistic property law should be recognised, whether the immersive object is created *ex nihilo* or derived from a capture of reality. On the other hand, the moment when the work comes into being is a more complicated matter, since the multiplicity of actors and the segmentation, both material and temporal, of the creative process differs from traditional processes.

Elements of different natures often coexist within an immersive object, each benefiting from its own legal regime: literary, musical, graphic and/or audiovisual works linked together by software and databases to ensure their reciprocal interaction, but also by the implementation of geolocation technologies and the use of technological tools (headsets and gloves, for example), which may be protected by patent law.

The simultaneous presence of multiple works of different legal natures entails as a minimum the concurrent, distributive protection of multiple rights, according to the 2009 Cryo case law of the Court of Cassation: each facet of the immersive object is subject to the specific legal regime governing it. Should we go further and recognise that the immersive object itself is a work in its own right, to be protected in a unitary manner? This is in any case the position taken by the Court of Justice of the European Union with regard to video games. Moreover, it is difficult to decide between the statuses of collaborative or collective work and no judge will be impressed by the parties' classification of the works, as only their nature matters.

However, the legal uncertainties surrounding the immersive work classification may, if not block, at least slow down the development of the sector in France, as they do not allow

for complete clarity on the essential questions of ownership of rights, **remuneration** or **legibility** and relevance of the applicable legal regime.

Therefore, based on the model recommended in the report by a CSPLA commission for multimedia works, the Mission proposes to facilitate the recognition and identification of authors by means of a **presumption** based on **participation in the decisive tasks** involved in creating the work, even if it means referring the precise definition of these tasks to the sector, given the changing nature of immersive creation. Similarly, facilitating investment in the sector while ensuring that authors receive the fruits of their creative work could involve the institution of a **presumption**, not of initial ownership of rights, but of **automatic transfer of exploitation rights** to the studio or publisher. Under certain conditions, the transfer could be accompanied by a flat fee.

A consultation phase would enable the parties to agree on a **good practice guide** describing the tasks of those involved in the process of creating immersive works, facilitating the recognition of those who will be vested with ownership of rights by virtue of the presumption of authorship. The **professionals**, using a consensual grid, would be responsible for defining what contributions are sufficiently decisive to benefit from an adapted protection regime, as well as what adjustments to the traditional remuneration methods might be appropriate due to the economic realities of the sector.

It is then easy to make provision in the contract for the automatic transfer of economic rights to the investor. The aim is thus to strengthen and reassure investors or entrepreneurs by recognising a right of their own over the work, "enhanced" by the benefit of a presumption of transfer of the rights of the presumed authors, as well as the rights of any others who may come forward.

When the practice has reached a sufficient degree of maturity, an assessment will determine whether it is appropriate to move on to a second stage, legislative this time, to confirm definitively what the professionals themselves have created.

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Introduction

A "dark light which falls from the stars". With this oxymoron¹, Rodrigue in *Le Cid* by Corneille describes the beginning of his victorious battle against the Moors to the King². The term **virtual reality** also appears to be an oxymoron, for what could be less virtual than reality?

In French, *réalité virtuelle* is an approximate translation, unfortunately perpetuated, of the English term "virtual reality", popularised in particular by the book of the same name by Howard Rheingold³, which at the time described a virtual reality in the sense of a world similar to reality [whereas in French the term *virtuel* has the meaning of "fictitious"]. As the French Language Enrichment Commission recommended in 2007, it would be preferable to use the term "**réalité de synthèse**" ["synthetic reality"], defined as the environment created by a computer and giving the user the sensation of being immersed in it, or alternatively, "**réalité artificielle**" ["artificial reality"].

In other words, virtual reality characterises all the technologies and systems that give the individual the feeling of entering a synthetic universe (a recreation of the real world or a totally imaginary setting), of stepping into a virtual world modelled in three dimensions where he can look around, move about and interact with that world⁴.

Augmented reality, for which no terminological recommendation has been made, augments the **perception** of reality: it visually enriches reality with information or images generated by a dedicated accessory⁵. More than reality itself, it is the perception of reality that is augmented.

¹ A figure of speech that juxtaposes two terms (noun and adjective) with opposing meanings in an apparently contradictory phrase.

² *Le Cid*, Corneille, act IV scene III: "We were five hundred, but with swift support – Grew to three thousand as we reached the port...".

³ Yet the first author to use the term was Jaron Lanier, a virtual reality pioneer.

⁴ CSA, July 2016, report entitled "*état des lieux du marché de la réalité virtuelle*".

⁵ Cf. the CSA report or Philippe Fuchs, "*théorie de la réalité virtuelle. Les véritables usages*", Presse des Mines.

Thus, while virtual reality immerses the user in an artificial world with which he interacts and can therefore offer a complete sensory experience involving sight, hearing, touch and even smell, augmented reality simply adds virtual elements to a real world in order to augment the perception of it. **Mixed reality** sometimes combines the characteristics of both technologies: the user sees digital information superimposed on top of his environment (augmented reality) but the environment can be virtually recreated (virtual reality).

Despite the contribution of mixed reality, these two technologies are not yet completely merged in terms of their functions and uses or the tools that serve them. However, they have in common two fundamental characteristics which distinguish them from other technologies: **immersion**⁶ in a virtual world and real-time **interaction** with that world. Thus, 360° cinema is not really a virtual reality technology, as the viewer cannot truly be active and interact with what is projected (apart from turning his head). The same goes for 3D modelling or computer-aided design. Nevertheless, it is unlikely that a true virtual reality "experience", including all the senses, is today within the reach of the general public, for whom the term instead refers to the use of headsets allowing limited visual immersion and restricted tactile interaction.

Immersive technologies and the tools used to access them, such as headsets, glasses, sensors and gloves, have been widely developed over the last fifteen years in the corporate world and, for the general public, in a sector naturally inclined to immersion and interaction: video gaming. They have also attracted the interest of artists, who see them as offering new spaces and new creative possibilities. At the intersection of these areas, the heritage sector⁷ seems to be the ideal place to use them for the conservation, maintenance or recreation of its common goods. Like multimedia objects, **immersive objects**, the products of immersive technologies, combine several types of production

⁶ Ph. Fuchs distinguishes proprioceptive immersion, in other words a global bodily and visual immersion (in particular by capturing position, movement and force) from other, more limited immersion phases, including exteroceptive immersion, which is dependent on receptors located on the user.

⁷ In a broad sense, including buildings.

depending on their purpose: images, sounds, other works, software connecting everything, and patents.

Intellectual property law cannot therefore ignore the development of these technologies and the fate of these objects, especially as a sector is trying to structure itself⁸ and reflections on the **economic and legal model** have begun in France: should we adopt a video game-type model, where a legal entity (the studio) considers itself to be the owner of the rights *ab initio*⁹ and where the employees find other forms of reward than copyright over the works in which they have participated? Or should we on the contrary adopt a more traditional model centred on the protection of the author, or a mixed model like the audiovisual industry, in order to strike a balance between the desire to protect the creation and the needs of exploitation?

Finally, it should be pointed out that France is not lagging behind in the development of these technologies: it is a pioneering player and is very present on the market, particularly in the area of content creation. It is home to many players, albeit of very different sizes: from large companies such as Renault, PSA, Airbus or Dassault, which use augmented reality for their internal industrial purposes (training, maintenance, design of models or various types of piloting), to start-ups and self-employed entrepreneurs, sometimes set up for a single project. It also has specialised researchers¹⁰, dedicated websites¹¹, festivals dedicated to content production (Cannes, Arles, Paris) and powerful public sector support (aid from the Centre national du cinéma et de l'image animée - CNC¹²). However, it is less advanced on the actual technical level, which remains dominated by the Americans and Asians, even if certain industrial niches (for example in optics) can occasionally provide it with a particular competency.

⁸ The Association française de réalité virtuelle (AFRV), which originated in the research world, has thus merged with the Uni-XR association, which was founded in the production world, forming the AFXR to better represent the diversity of actors and industries involved in immersive technologies.

⁹ By transferring them entirely to the publisher who finances the project.

¹⁰ See for example Philippe Fuchs' research at Les Mines Paris Tech and the volumes of "Traité de la réalité virtuelle".

¹¹ The Laval Virtual exhibition first created in 1999 <https://www.laval-virtual.com/fr/accueil/>.

¹² See the CNC's digital creation website: <https://www.cnc.fr/creation-numerique>.

For the purposes of this report, the Mission interviewed numerous personalities whom it thanks wholeheartedly for their availability, helpful explanations and interesting proposals. It has drawn two conclusions from them: on the one hand, the **paradox** of the fact that while immersive technologies seem destined to inundate our daily and professional lives, they are still struggling to find their audience (1); on the other hand, **regret** over the fact that while the legal regime for immersive objects is not yet stabilised, in particular the nature of the protection offered by intellectual property law, which may slow down the development of a promising sector, no consensus is emerging to make it evolve in a given direction (2).

Unless there is a need to distinguish between augmented, virtual or mixed realities for the sake of clarity, reference will be made to **immersive technologies**, encompassing at once the **technologies** strictly speaking, the **tools** which are their medium and the immersive **experience** itself. The products resulting from these technologies will be called **immersive objects** and, where appropriate, **immersive works** if they meet the criteria set by the French Intellectual Property Code and case law.

1. Immersive technologies seem destined to inundate our daily and professional lives... but they are still struggling to find their audience

It has taken a long time for immersive technologies to become established (1.1.). Although they have not yet won over the general public, despite all the hopes, false starts and disappointments, they seem on the other hand to have been spreading widely in the business world for many years (1.2.).

1.1. Technologies that seem destined to inundate our daily lives

Two qualitative and quantitative studies conducted in April 2019 by the CNC and the trade association Uni-XR show that virtual reality has now become established as part of the French cultural landscape. Thus, although 40% of people have already experienced it, mainly in public places (museum, cinema, leisure park etc.) rather than via technological tools used at home and still not widespread, the **awareness rate** of virtual reality is much higher at around 90%, which is also the case elsewhere in Europe. This recognition of these technologies is explained by their widespread distribution in all fields (1.1.2.) despite a chaotic history (1.1.1.).

1.1.1. A brief history of immersion and its technologies

1.1.1.1. *From the first painting and the first architect's plan to virtual reality arcades and beyond*

Transcribing reality, or one's perception of it, onto a medium (artificial or real) is an activity known to us since prehistoric times. Are not cave paintings the first attempt at virtual reality? Are not the first painting, the first architectural drawing, the first geographical map or the first spoken narrative all expressions of humankind's need to depict (and freeze) reality in a durable (and storable) format?

However, "Cro-Magnon" had no knowledge of the thing that has led to the emergence of immersive technologies today: the development of information technology, in particular computer performance and advances in screen quality.

Although some people trace the first manifestations of immersive technologies and tools to the post-war period (see for example¹³ the "Sensorama" device developed by Morton Heilig, which attempted to create a visual and auditory immersion experience in a previously filmed scene), the first practical applications were the flight simulators used by the American air force in the 1960s (and

¹³ https://fr.wikipedia.org/wiki/R%C3%A9alit%C3%A9_virtuelle.

gradually adopted by the aviation world¹⁴), whereas the first virtual reality headsets were created in the 1970s and there were multiple attempts at immersive experiences between the 1970s and 1990s.

The 1990s – 2000s were a turning point marked by a certain enthusiasm for virtual reality, with the launch of 3D games by *Sega* with the "*Sega VR*" headset or the "*Sega VR-1*" (in *SegaWorld* arcades) and *Nintendo* (with the "*Virtual Boy*" console). However, it failed to catch on due to the technological limitations of the time: insufficient computer performance and the poor quality of the existing tools (the headsets' optical lenses, motion sensors, etc.) meant that the "user experience" was still very disappointing, while prices remained unaffordable to most people.

It was not until the mid-2010s that the world became aware of the benefits of immersive technology, finally made possible by progress in miniaturisation, increased computer performance (thanks in part to video games) and advances in screen technology (via the democratisation of the smartphone). Despite the failure of "*Google glass*" in 2012, 2016 can be seen as the real turning point, when the whole sector accelerated spectacularly. *Facebook* bought the *Oculus* headset manufacturer for \$2 billion, showing an interest among the American new technology giants ("*GAFAM*") in these tools, while *Microsoft* entered the augmented reality market with its *HoloLens* glasses and *Google* participated in the funding round for the *Magic Leap*¹⁵ company. Alongside this, several manufacturers launched powerful and relatively accessible virtual reality headsets ("*PlayStation VR*" by *Sony*, the "*Gear VR*" headset by *Samsung* (combined with *Oculus*), the "*HTC Vive*" headset etc.) and sold 400,000 headsets in that year; Hollywood (*Disney*) and the big sports leagues (*NBA*) showed an interest in the sector.

There was a proliferation of places to create and market short films: the Cannes, Venice, Tribeca and Sundance festivals all had a session dedicated to immersive creation; cultural institutions made

¹⁴ Some amusement parks have copied the principles.

¹⁵ Magic Leap (<https://www.magicleap.com/experiences>) recently raised the sum of \$2 billion for new developments from major investors including NTTdocomo.

immersive tools available to their audiences, as did the world of education. Not a single sector of the economy seemed to have escaped the grip of immersive technologies (see 1.1.2).

Although the buzz seems to have died down somewhat today (see below), the specialist press continues very regularly to report on launches of new tools¹⁶, new developments¹⁷ and new capital participations.

1.1.1.2. *To deliver their benefits, these technologies still rely on tools, which are essential accessories for using them.*

While immersive technologies require different tools and accessories, they do not all demand the same degree of intensity. The works of Philippe Fuchs¹⁸, for example "*théorie de la réalité virtuelle*", to which the reader can refer for further and more detailed information, describe perfectly the senses that must be mobilised for the virtual reality experience to be complete, as well as the technologies and tools that will make this mobilisation possible.

According to this author, the purpose of virtual reality is to allow a user to **act** physically in an artificial environment which is digitally created so that it can be modified. A true virtual reality experience therefore implies immersion in this artificial world (created *ex nihilo* or based on reality) and the possibility of acting physically on it through certain senses, which are not only sight, but also hearing, touch and smell. This explains why the mere fact of turning one's head to view 360° images does not, strictly speaking, constitute a truly immersive and active experience (see above, introduction).

¹⁶ E.g. a headline from the *360° natives* site in March 2019 announcing the release (in May 2019) of the new "*Oculus Rift S*" headset equipped with new lenses and 5 tracking cameras replacing external sensors to detect the user's movements.

¹⁷ E.g. a headline from *L'Usine digitale* on August 6, 2019: "*Apple renforce son équipe en charge de la réalité augmentée*" ("Apple strengthens its augmented reality team") reporting on the American company's constant but previously discreet interest in augmented reality glasses and headsets. Moreover, in July that site announced that the company had filed a patent "*concerning a new type of mixed reality headset where commands would come from facial expressions. There are indications that the company is working on this solution to make it compatible with smartphones.*"

¹⁸ <https://www.eyrolles.com/Accueil/Auteur/philippe-fuchs-44383/>.

While **visual interfaces** (between the user and the virtual world) exist systematically (via a headset most of the time but also a CAVE¹⁹ or a smartphone), other interfaces must be added to make the experience successful. These can be **sensory** interfaces (tactile and audio, and why not olfactory), **motion** interfaces (joysticks, data gloves, walking mats, simulators on actuators) or even "**sensorimotor**" interfaces (which allow the user to send and receive perception feedback)²⁰. However, most consumer uses are far from being able to mobilise all of these senses in both directions, and a great deal of time and development will most likely be needed before these tools become commonplace.

Technological progress has nonetheless made it possible to create lighter headsets with greater autonomy²¹, improve their optical tools and integrate geolocation functions; but additional tools are still needed at this stage to mobilise the other senses, in particular touch (in both directions).

There are also several examples of augmented reality technology, which differs from virtual reality in that it does not isolate the user from the surrounding world with which he interacts. For example, one of the Mission's interviewees distinguished between **substituted** reality (the "sofa version" or indirect vision reality, where the real scene is first filmed and then later restored on a screen with overlaid virtual images) and **augmented** reality itself (where the image is superimposed on reality in real time, *in situ*).

Augmented reality is easier to achieve without additional tools since it can easily be "intermediated" by a smartphone (cf. *Snapchat* filters or the "*Pokémon Go*" game); however, glasses allow more images and information to be embedded and superimposed on the real world, compared

¹⁹ CAVE or "*cave automatic virtual environment*", or 3D immersive cube. This is a set of screens forming a cube of 4 to 6 sides, initially used in the automotive industry but, despite its cost, popularised in tourism, leisure, architecture and construction.

²⁰ "Force feedback interfaces allow you to manipulate virtual objects by feeling their weight or inertia."

²¹ In terms of battery life but also computing power, transferring the largest volumes of data to the cloud. However, for an optimal experience, a headset still needs to be connected to a PC, which is an obstacle to user autonomy. Additionally, the spring 2019 release of the "*Oculus Quest*" headset marked a turning point as it was the first headset operating without a computer to track the user's position on six axes, in other words it allowed users to move freely in a room and tracked their hand movements.

to a smartphone that requires back and forth eye movements. Similarly, head-up displays²², especially in cars, allow drivers to see traffic or accident information directly on their windscreen without having to look away from their GPS navigation system.

Augmented reality and virtual reality are becoming part of everyday life but in a relatively segmented way, depending on their specific uses.

1.1.2. A massive presence today in all fields, from science to real estate, including culture

On a daily basis, specialist publications²³ are brimming with announcements and examples of the use of immersive technologies in all areas of economic and social life, which they are truly inundating. An ethical reflection on good practice and the limits of the use of these technologies is in the process of being structured, a sign of the importance they have taken on in our daily lives and the correlative need for safeguards²⁴.

Given their specific characteristics, there is a certain differentiation in the market between augmented reality, which is used more by professionals, and virtual reality, which is better suited to the general public; however, this distinction should not be exaggerated because these technologies are often complementary (for example, simulations of use in virtual reality following on from maintenance or construction operations in augmented reality) and because uses are being found for augmented reality among the general public (in tourism, for example), just as augmented reality can be used by the professional world (in architecture, for example).

²² HUD: head-up display.

²³ See for example the websites L'Usine Digitale (<https://www.usine-digitale.fr/>) or Réalité Virtuelle.com (<https://www.realite-virtuelle.com/>).

²⁴ Les Echos, Tuesday 10 December 2019, "Jusqu'où peut aller la réalité virtuelle", p. 12.

1.1.2.1. *The professional field is still the main sector where these technologies are in use today*

In the **military** field, flight and driving simulators have been used for several decades by air forces and aircraft manufacturers for pilot and driver training purposes. The simulator is perhaps one of the most complete immersive tools available today, since the cockpit's mobility can be used to add physical impressions to the visual sensations. Simulators are on the boundary between industrial tools and leisure (cf. amusement parks). More widely, virtual reality has been adopted in the military to simulate combat or interventions in a safely reconstructed environment, just as augmented reality is used to supplement soldiers' equipment by offering them information on the ground in addition to their direct view of the battlefield.

In the automotive, railway and pharmaceutical **industries**, applications (especially augmented reality) to simulate complex interactions, study the positioning of an object in a given environment, or manipulate complex molecular structures help make production safer while reducing development costs. One of the Mission's interviewees reports impressive productivity gains linked to the reduction in design times: in September 2018, *Boeing* announced a +45% increase in productivity thanks to the use of these technologies (time saved on aircraft wiring). *Bell* is said to have cut its development times from seven years to six months. The "*L'Usine Digitale*" website states that at the last Paris Air Show, the companies *Airbus* and *Microsoft* signed a strategic partnership so that the American company's headset could be used for several of the European company's operations aimed at optimising design or maintenance. At the Vivatech show in Paris, Bosch presented augmented reality glasses designed to facilitate car maintenance (the repairer visualises the parts and the steps in the repair process). While car manufacturers have long used dedicated rooms for vehicle design²⁵, they are now disseminating more mobile immersive tools in offices for collaborative uses that significantly reduce design time.

²⁵ Immersive rooms called CAVEs made up of several walls with 3D videos projected onto them.

Medicine is a powerful outlet for virtual and augmented reality, for initial student training (remote courses) as well as learning operating techniques or even performing the operations themselves (ensuring the safety of an operation using virtual teleoperation), patient rehabilitation or the fight against Alzheimer's disease²⁶. During a seminar at the Collège de France in 2014²⁷, Professor Jacques Marescaux presented the advances in "cyber-surgery" made possible by robotics (for surer hand movements) and digital imaging. Thus, the doctor's "augmented eye" can see the patient transparently and operate on what is normally invisible or infinitely small using a 3D model of a clone of the patient (based on scanner or MRI data). During an operation, the surgeon can also see the information he needs appear in real time in augmented reality²⁸.

Likewise, **education** (especially higher education) and **professional training** are natural outlets for immersive technologies nowadays. Thus, the creation of avatars or holograms makes it possible to duplicate the interlocutor (a teacher or trainer) in as many classrooms or individual homes as the technology allows, and lets him interact with each student or trainee. In a recent editorial, the honorary senator René Trégouet²⁹ mentioned the case of a large pharmaceutical company at an exhibition on the industry of the future, presenting a virtual reality training module in which its agents, equipped with headsets, could familiarise themselves with their future production tool in a factory even before it was built. The daily newspaper "Les Echos" of 18 April 2019 cites the case of the start-up *Uptale*, which offers various manufacturers (PSA, Danone etc.) immersive management training modules (on PC, phone or headset) that place employees in real-life situations, for example to support the transition of a factory from internal combustion engine to electric engine. Similarly, the website "L'Usine Digitale" mentions the case of the American retail giant *Walmart* which tests applicants for

²⁶ <http://www.seaheroquest.com/site/fr/> is a virtual reality mobile game in aid of global research into dementia.

²⁷ https://www.college-de-france.fr/media/nicholas-ayache/UPL7941464305596590491_Re_sume_J_Marescaux_Chirurgie_du_futur_guide_e_par_l_image_numerique.pdf

²⁸ Cf. L'usine digitale, May 2019: "Hospitals in the Spanish Basque Country are studying the use of augmented reality in order to improve the planning of lung lesion biopsies. By directly superimposing medical images on the patient's anatomy, surgeons can better visualise the trajectory to be followed and avoid having to take multiple samples."

²⁹ <https://www.rtflash.fr/realite-virtuelle-va-faire-entrer-l-humanite-dans-nouvelle-ere/article>

management positions using scenarios deployed in virtual reality headsets. The use of these technologies in professional training offers obvious advantages: concentration of trainees, possibility of immediate feedback and iterative learning, lower costs.

One of the interviewees told the Mission about the role of virtual reality in perpetuating the **artistic trades** of tomorrow. For instance, it is much easier for a trainee stonemason to familiarise himself with the basic techniques of the trade using virtual reality, before a journeyman completes his training in more specific areas.

In **commerce**, the impact of purchasing an accessory (glasses for example) can be simulated with a computer recreation of the accessory on a photo of oneself in real time; at the Vivatech trade show, the *LVMH* group presented a virtual reality experience allowing people to walk around the shop of one of its Italian brands and point out the products on offer. In **advertising**, augmented reality can be used to overlay advertising on films or reports, according to the target audience³⁰. In a recent article on augmented reality, the Harvard Business Review³¹ mentions the case of the *DHL* company, which uses it in the field of **logistics** to improve the efficiency and accuracy of storage operations, thus considerably reducing errors and increasing productivity.

In **real estate**, it is now possible to view apartments for sale or houses under construction in virtual reality, or to project a new development project onto the existing building in augmented reality. More broadly, **architecture** and **design** are industries where the use of immersive technologies is widespread (after the building has been created in CAD, virtual reality can be used to test its ergonomics and conduct viewings).

The same is true of **heritage**, where the use of virtual reality undoubtedly produces the most spectacular effects. By completely digitising places and sites, immersive technologies can be used to

³⁰ <https://www.mirriad.com/>

³¹ <https://www.hbrfrance.fr/magazine/2018/03/19430-quest-realite-augmentee/>

recreate their exterior envelopes and their complete interiors (making it easier to restore or rebuild a damaged or destroyed building) or to model the total configuration of a site that is difficult to access.

Many people interviewed by the Mission cited the case of the remarkable "*Age Old Cities*" exhibition at the Arab World Institute (IMA)³², which featured a reconstruction of destroyed cities in Iraq, Syria and Libya, and even made it possible to locate an Assyrian temple beneath an ancient site that had itself been destroyed. This type of work was also done for public and private sector entities by the Art Graphique et Patrimoine³³ company, which digitised Mont St Michel amongst other things (and the applications are numerous: virtual tours as well as maintenance and restoration, observation of climate phenomena, etc.).

Lastly, when used by some **local authorities** for development projects (e.g. the Ile-de-France region with the regional town planning workshop), immersive technologies can help citizens to embrace and participate usefully in the projects presented, following a "co-construction" approach. Virtual reality is becoming a new tool for democracy, sharing, acceptance and construction, in addition to being a significant factor in saving public money.

The impact of immersive technologies on production structures and more broadly on the economic and social model is therefore considerable. The Harvard Business Review argued that augmented reality "*enables a new information delivery paradigm, which [...] will have a profound impact on the way data is structured, managed, and delivered on the internet. Though the web transformed how information is collected, transmitted, and accessed, its model for data storage and delivery—pages on flat screens—has major limits: It requires people to mentally translate 2-D information for use in a 3-D world. That isn't always easy, as anyone who has used a manual to fix an office copier knows. By superimposing digital information directly on real objects or environments, AR*

³² <https://www.imarabe.org/fr/expositions/cites-millentaires>; now on tour.

³³ <http://www.artgp.fr/>: the company is a member of the historic monument restoration company grouping and is in charge of coordinating the development of the BIM (building information modelling) model of Notre-Dame Cathedral in Paris.

allows people to process the physical and digital simultaneously, eliminating the need to mentally bridge the two. That improves our ability to rapidly and accurately absorb information, make decisions, and execute required tasks quickly and efficiently".

1.1.2.2. The recent breakthrough of these technologies among the general public, especially in the cultural industries and in particular in video games

The use of immersive technologies among the general public has undoubtedly made a significant leap in recent years, even if it sometimes seems more like an obligatory "gimmick" than a proper tool for enhancing the economic value of an existing activity.

The first, and still the most popular, use of virtual reality among the general public is in the **video game** sector, for which the fantasy of immersion remains prevalent. This sector, which is doing well in France where 2/3 of the population plays occasionally and where the proportion of men and women is more or less balanced, but with an average age of 34 years old today³⁴, sees itself as having facilitated the general public's acculturation to virtual reality as well as the democratisation of access to its tools, by lowering prices and spreading the technologies. Its bridging role (see below) does not however seem to be enough to ensure a permanent popularisation of virtual reality among all audiences.

The image sector (in the broadest sense, in other words including **audiovisual and film**) also naturally welcomes works made using these technologies, in particular virtual reality **creations**. The big film festivals (Cannes³⁵, Venice, Tribeca or Sundance) now offer a dedicated space for screening immersive works (virtual reality short films) as well as a place of exchange and funding for the main players (creators, producers, investors, distributors, festival planners and technology leaders). The

³⁴ Figures from the trade association SELL show 2017 sales of €4.3bn, up +18% on 2017, with 77% of French people also considering video gaming as a leisure activity for the whole family and 80% deeming that games are created by artists.

³⁵ See for example the article "5 pépites VR présentées à Cannes XR": <https://www.cnc.fr/creation-numerique>

New Images festival of digital creation and virtual worlds held its 3rd edition in spring 2019 at the Forum des Images in Paris, with five days of immersive work screenings, debates about virtual reality and professional gatherings. In 2019, the photography festival Les Rencontres d'Arles held the 4th edition of its virtual reality extension, the VR Arles Festival, where 18 immersive works were presented³⁶. **Live performance** also makes use of immersive technologies, especially dance³⁷, where choreography has long been captured for educational and pedagogical purposes.

We could cite many more examples, given the apparent proliferation of initiatives dedicated to immersive works. This is in fact the area where **public sector support schemes** are most numerous in France, after a time spent focussing on cross-media works and web documentaries: over €10m has been invested in 3 years by the CNC, in particular via the digital experience aid fund which can intervene throughout a project, from writing to production. Other institutions offer financial aid for digital creation, such as the *SACD* which funds a grant for innovative and immersive writing³⁸ with *Orange*.

The **audiovisual** sector is also attempting to capture new audiences with immersive experiences. The pioneer and the most constant player in France is *Arte*³⁹ with its *Arte 360* application, since the channel is a leader in the production of virtual reality works and particularly "native" works, that is, works designed directly for that format.

France Télévisions experimented with a series of 360° captures at the French Open tournament, and *TF1* tried out a show with *Endemol*, "*The Voice*",⁴⁰ in virtual reality on a dedicated app in 2017, then offered a virtual box for the football World Cup with FIFA in 2018; both trials were a great success

³⁶ https://www.cnc.fr/creation-numerique/actualites/5-experiences-a-decouvrir-au-vr-arles-festival_1018368

³⁷ See for example Blanca Li's description of her project for an immersive choreography show in virtual reality based on *The Merry Widow* https://www.cnc.fr/creation-numerique/videos/lambitieux-projet-vr-de-blanca-li_985897.

³⁸ <http://beaumarchais.asso.fr/2019/07/26/bourse-orange-xr-2019-les-candidatures-sont-ouvertes/>

³⁹ <https://www.arte.tv/sites/webproductions/category/vr/>: see "*Accused #2 Walter Sisulu*", screened at the *New Images* festival, or "*Notes on blindness*".

⁴⁰ Accessible on headsets for Oculus and Google Daydream as well as iOS and Android smartphones, taking account of the low level of glasses ownership.

in terms of downloads. Despite a relative lack of interest in virtual reality (see below), traditional media continue to invest in certain segments of immersive technology: for example, TF1 makes extensive use of augmented reality overlays in its newscasts.

Most **cultural institutions** are now experimenting with these technologies as mediation tools for their audiences, beforehand to prepare for the visit or *in situ* to supplement it (which can also be done afterwards, after the visit), but also sometimes as a substitute for visiting⁴¹. However, several people who spoke to the Mission noted that while the impact in terms of image among users seemed positive, museums had not yet found an economic role for these technologies, while their use could pose problems of congestion, access and security for already limited spaces.

The *Réunion des musées nationaux – Grand Palais (RMN-GP)* thus tested several virtual reality visiting options. These included co-producing a virtual reality documentary with *Arte* to accompany visitors at the Gauguin exhibition in late 2017-early 2018, providing augmented reality "*Google glass*" sets for the Velasquez exhibition in 2015 and the Picasso exhibition in 2016, etc., all of which have shown that there is public support for the occasional use of these tools. The *Bibliothèque nationale de France (BnF)*, which does not conduct virtual tours of its building, installs virtual reality stations in its exhibitions (cf. the "*bibliothèques la nuit*" exhibition where visitors can walk through the rooms of destroyed libraries such as the one in Alexandria; the institution is examining the possibility, for its future museum in the Richelieu Quadrilateral, of visualising the ceiling of one of the reading rooms using 3D stations).

Augmented reality allows visitors to a museum or a château to learn more about the history and previous configuration of the room they are in using a tablet or smartphone: these are the tools provided, for example, by the *Histoverly*⁴² company for visiting the Conciergerie, the Palais des Papes or the Château de Chambord. In a slightly more industrial way that is a little different from the true

⁴¹ As physical frequentation remains central to museums' economic model, online virtual visits can only ever be marginal

⁴² <https://histoverly.com/>

immersive technologies, the *Google Street View* app allows users to walk along all the world's streets virtually, including in 3D, based on photographs of the streets. The *British Museum* has made use of this to enable people to visit its collections.

More generally, but without going into detail, **tourism** provides a very natural outlet for immersive technologies, both in augmented reality (a walk in the street with augmented reality glasses identifying places to visit, restaurants⁴³, etc.) and in virtual reality (ahead of or instead of a visit, which could also provide an interesting remedy for the drawbacks of mass tourism). The popularity of virtual reality tools is such that some cities are apparently already equipped with virtual reality bars where stressed-out executives can take a rest...

Immersive technologies are therefore powerful tools for economic and cultural development. They also have a significant knock-on effect through the research and development they generate, as the smartphone did before them. Furthermore, they are an interesting medium for artistic creation and, as such, a source of growth for the entertainment industries. The constant interest shown by the "net giants" is, in this respect, indicative of immersive technologies' potential. However, today they are struggling to interest the general public, no doubt due to the lack of a "miracle" use that would ensure their popularity.

1.2. But which are still struggling to find their audience and a satisfactory commercial outlet

There is an apparent paradox: immersive tools, whose obvious benefits, growing development and adoption by many sectors of economic life were shown in the first sub-section, seem to be

⁴³ For example, on 12 August 2019, the CNET website announced that *Google Maps* would soon be available in augmented reality on smartphones: the app uses the phone's camera to superimpose information on reality.

shunned by the general public. Several links in the chain are undoubtedly missing, in particular the application or use that will trigger the technology's irrevocable adoption by the general public (1.2.1.). However, the general public's lack of interest must be put into context since new uses, other than those initially anticipated, seem to be emerging (1.2.2.).

1.2.1. In search of the "Killer App?"

1.2.1.1. Despite undeniable potential, consumer use is struggling to emerge

Industry observers are regularly surprised by the limited appeal of immersive technologies, particularly to the general public. The penetration and usage forecasts regularly fail to come true and have to be revised downward, as was the case previously with forecasts for other technologies that were not as successful as expected, such as 3D television. Most of the people interviewed by the Mission confirmed this observation, expressing disappointment: despite undeniable potential and relative penetration in the world of video games, immersive technologies have not yet found their audience among the general public.

A CSA report in July 2016⁴⁴ mentioned several analyses (by *Goldman Sachs*, 2015⁴⁵ and the *Digi-Capital* advisory company) evaluating the potential market by 2020-2025 as fluctuating in a range between \$100 and \$150 billion (€130bn) but underlining the difficulty of counter-examining such figures, due to the lack of transparency on the methodologies used. Three years later, the penetration rates of these technologies, particularly headsets, seem to be much lower than forecast and, at the very least, the promised success does not seem to have been achieved.

⁴⁴ CSA, July 2016, "*État des lieux du marché de la réalité virtuelle*" and interview by the Mission.

⁴⁵ "*Virtual & Augmented Reality, understanding the race for the next computing platform*", Goldman Sachs, which developed 3 scenarios, a basic one (with a total turnover of \$80bn), an accelerated one (\$182bn) and a delayed one (\$27bn), and use of these technologies in nine dominant sectors.

The daily newspaper "*Les Echos*" thus confirmed on 11 April 2019, upon the launch of the "*Oculus Quest*" and "*Oculus Rift S*" headsets, that "(...) *the IDC forecast [for headset sales] in 2023 (68.6 million units delivered) is far lower than the figure that same agency in vain hoped would be achieved in 2021 (81.2 million units delivered). Despite the price reductions offered by manufacturers, the VR market has been truly disappointing, so far*".

As manufacturers do not disclose their sales⁴⁶, it is difficult to form an accurate idea of the various immersive tools' penetration rate. The statistics website *Statista*⁴⁷ estimates that although there were less than 200,000 active users of virtual reality products in 2014, there were more than 170 million in 2018, and that sales of virtual reality headsets totalled \$6.5bn, dedicated accessories \$1.4bn and content \$14bn. In France, the CNC estimates that the percentage of households owning a headset has reached a ceiling of 7%, despite the clear drop in prices (an "*Oculus Go*" headset, admittedly of lesser quality than its "*Quest*" or "*Rift*" counterparts, now costs €200).

Today, this disappointment is all the more acute as it contrasts with several years which saw a proliferation of product announcements, capital participations and content, and it has led to a certain "wait and see" attitude in response. Thus, in an interview by the daily newspaper "*Le Monde*" with the head of the *Oculus* game catalogue on 5 August 2019, the newspaper stated that the Electronic Entertainment Expo in Los Angeles ("E3") had passed without any major virtual reality projects being announced by manufacturers or video game studios, even though hardware sales were said to have started to rise again. Similarly, some cultural industries (especially in the audiovisual field) seem to have temporarily suspended investment in the sector.

The situation is the same for virtual reality as for augmented reality. One person who spoke to the Mission said that *HoloLens (Microsoft)* seems to be redirecting its efforts towards the professional

⁴⁶ With the exception of Sony with the PlayStation VR, which sold over 4 million. According to a study published in June 2019 by the market intelligence firm IDC and quoted by the daily newspaper *Le Monde* on 27 November 2019, "*only 7 million virtual reality headsets are expected to be sold this year, admittedly up significantly from 2018 (+25%)*".

⁴⁷ <https://fr.statista.com/themes/3357/la-realite-virtuelle/>

sector⁴⁸, as is *Magic Leap*, which is admittedly continuing to invest in glasses for the general public but is also developing a professional business line. *Google* seems to have paused its efforts in the area of virtual reality⁴⁹.

The projections remain optimistic, even though they are regularly updated. In an infographic dating from late 2018, *IDC* estimated that the average annual growth of the virtual and augmented reality market between 2017 and 2022 would be + 85% with a clear shift towards professional uses (the consumer share declining from 71% to 32% in a growing market), and a more balanced distribution between hardware, software and services. The aforementioned article in "*Les Echos*" in April 2019 explained that *"until now, the limits of the technology had greatly slowed the market's progress. (...) But IDC analysts believe that upcoming innovations could allow the industry to break through the glass ceiling... According to the market research firm, brands will deliver 8.9 million AR/VR headsets in 2019. This compares with more than 40 million connected watches and 1 billion smartphones sold annually. According to SuperData, arcade sales and rentals of headsets and immersive games brought in \$3.6bn in 2018"*.

1.2.1.2. Multiple factors explain the general public's limited interest

What are the reasons for this disappointment, and will it only be temporary?

The **price** of the tools, in particular headsets or glasses and their accessories, remains an obstacle: the considerable progress made since the 1990s in terms of computing power and optical performance has certainly made some technologies accessible, but developing elements to create a quality experience (lenses, headset autonomy, integration of modules for reproducing sensations, geolocation, etc.) remains complex and therefore expensive. It is possible that the issue of price will

⁴⁸ As evidenced by its website showing ways to use the new "HoloLens 2" glasses, mainly designed for professional use <https://www.microsoft.com/fr-fr/hololens>.

⁴⁹ To focus on future augmented reality products perhaps, like *Apple*?

become secondary as the technologies become more widespread, but it is also likely that despite the progress made, we are still a long way from a true virtual reality "experience" that would involve all the senses.

The insufficient amount of quality **content** offers another explanation for the general public's lack of enthusiasm. This is undoubtedly not due to any inadequacy of the creative sector, particularly in France, but rather to the production sector being poorly structured and very heterogeneous. There are admittedly a few champions, but the sector is still dominated by numerous small companies, sometimes concentrated on a single project, even though the development and implementation of these technologies require expensive technical processes, with no guarantee of an outlet. Despite many interesting initiatives, the sector remains atomised and has not yet achieved the firepower of the video game industry. Professionals are therefore still unconvinced of the benefits of investing in content adapted to these technologies⁵⁰.

Above all, what some people call the killer app is missing, in other words the tool or use that would prompt the general public to use immersive technologies on a massive scale, as the "*iPhone*" did for smartphones. It seems that video gaming has not had a sufficiently strong knock-on effect on other consumer uses, despite its role as a bridge between different worlds and different uses. Moreover, even its penetration in the world of virtual reality can be put into perspective, as shown by the absence of major publishing successes in this category. Nor can we rule out the possibility that certain unfortunate virtual reality experiments (such as *Google's "cardboard"*) may have led to a loss of interest in these technologies among some of the public.

At the same time, according to some people who spoke to the Mission, what is also lacking is an intermediate link in the chain that would provide dissemination or distribution so these technologies could be industrialised on a large scale. In this respect, it is possible, if not probable, that the **uncertainties surrounding the classification of immersive works** and therefore the resulting legal

⁵⁰ A 30 min film can cost €800K.

regime (see below) are one of the reasons, not directly for immersive technologies' lack of popularity with the general public, but at least for the difficulties in structuring a creative sector that is currently fragmented and in creating this essential link.

The lack of interest from the general public explains the relative lack of interest among the main audiovisual media, at least in France, after two or three years of inconclusive experiments. In the United States, on the contrary, the *NextVR*⁵¹ platform broadcasts NBA or NFL games live or recorded in augmented reality with exceptional viewpoints⁵². The companies *YouTube* and *Netflix* also offer content which they call virtual reality, but which is more akin to 360° content. *Arte* is a special case, however, as the channel continues to offer new virtual reality content; the model remains experimental, however, given the high cost of producing quality content. The channel is now a pioneer and publisher, not just a broadcaster, with an interactive publishing label, in partnership with major headset producers such as *HTC*, *Oculus* and *Sony*.

Thus, unlike the video game sector, whose technological development remains limited to its own needs and which has its own particular economic and legal model, virtual or augmented reality does not yet seem to be an established and mature market among the general public, unlike in the industrial world.

1.2.2. However, usage seems to be shifting from individual to collective practices, at least among the general public

Pending the arrival of one or more "killer apps" that will enable immersive technologies to catch on with the general public, some new collective uses, which had not necessarily been foreseen, are beginning to emerge among consumers.

⁵¹ <https://www.nextvr.com/>

⁵² Yet audiences undoubtedly remain marginal, given the scale of the American market.

Many people who spoke to the Mission indeed mentioned the very clear trend towards the socialisation of virtual reality in **public places**, which makes it possible to pool resources and therefore makes it profitable to buy expensive high-performance devices, as well as making it easier to afford land prices at attractive locations.

Amusement parks have long been leading the way in offering immersive experiences to their customers⁵³. Urban venues specifically dedicated to immersive technologies are now following suit.

It is of course the traditional **arcades** that are diversifying to offer virtual reality games to new customers interested in immersive technologies. These include the *La tête dans les nuages*⁵⁴ arcade in Paris and Lyon (with a "*Raving Rabbids*" attraction on actuators developed by *Ubisoft*), the *Sparkling*⁵⁵ arcade in Paris St Lazare, and *VR World* or the *VR Bar* in New York⁵⁶. Arcades, which were previously aimed exclusively at a specific audience, can now open up to new consumers in a more family-oriented format, for new uses and to attract a clientele interested in forms of entertainment other than video games (which at the same time makes the land and equipment more profitable).

There are now also virtual reality *escape games* (see "*Illucity*" in Paris La Villette⁵⁷) and a whole collection of immersive experiences in the *MK2 VR*⁵⁸ room in Paris (on the site of the BnF), which offers equipment not available to private homes.

Collective experiences are also offered by museums and cultural institutions, as mentioned above. For instance, an immersive screening is available at the Atelier des Lumières in Paris and Les Baux-de-Provence, and is coming soon to Bordeaux, Dubai and New York.

⁵³ The "*Star tours*" attraction at *Disneyland Paris* simulates a space flight experience in a cabin very similar to that of a flight simulator (without a headset); the *Sébastien Loeb Racing Xperience* attraction at *Futuroscope* in "VR 5D" combines an electrodynamic simulator articulated on 6 axes, an HTC Vive headset, real 360° images etc.

⁵⁴ <http://latetedanslesnuages.com/>

⁵⁵ <https://www.sparklingvr.com/>

⁵⁶ <https://vrworldnyc.com/>; <http://www.vrbar.nyc/>

⁵⁷ <https://illucity.fr/fr/>

⁵⁸ <https://mk2vr.com/#regdl=categories>; see for example "*Being an Astronaut (Dans la peau de Thomas Pesquet)*" which offers a journey through space and time with a 360° film based on real-life footage shot in space.

These examples show that immersive technologies are finding a **new, collective outlet**. It is difficult to predict what the future might hold for these technologies, although the next steps seem to indicate a steady improvement in headset performance, in particular autonomy, computing power, optical quality and sensor equipment, and improved interaction with the outside world. But, just like the cinema a century ago, this collectivisation of virtual reality experiences is an opportunity to test the technologies to see if monetisation, and therefore a commercial future, is indeed possible.

At a crossroads between these new collective practices and the more traditional uses of immersive realities, it is worth mentioning the recent announcements by *Facebook* and its *Facebook Horizon* initiative, which aims to create in the very near future, for an estimated one billion users, "*a totally digital reproduction of a real world in which internet users equipped with a virtual reality headset can immerse themselves in order to 'Explore. Play. Create. Together.'*"⁵⁹ and which does not seem too far removed from the world imagined by Steven Spielberg in his film "Ready, Player One". Are we going to see the long-awaited "killer app"? Will the advent of 5G, which will give headsets the computing power they need to function optimally, also be a game-changer?

**

Interaction and immersion can revolutionise our daily personal and professional lives. To meet its own needs, industry has been using immersive technologies for a long time and they are starting to penetrate the consumer market, albeit with difficulty, via video games, audiovisual, cinema, tourism and heritage. If new uses are created, new needs emerge alongside them, notably a need for legal protection of those who create objects intended for immersive tools. Intellectual property law cannot therefore ignore this subject: what status should be given to immersive objects? What protection should be conferred upon contributors? What guarantees should be offered to investors?

⁵⁹ Les Échos, 28 November 2019, page 24 "*La réalité virtuelle, le futur "Horizon" de Facebook*"

All the same, the legal implications of these technologies have not yet been the subject of much literature. This is of course because the phenomenon is relatively new⁶⁰ but also perhaps because it has not been considered very complex, due to being perceived as involving concepts and solutions that are already known and tested, particularly in the field of literary and artistic property, assuming that they are relevant. The absence of litigation, or even the absence of claims, could be evidence of the sector's desire not to modify a law that adapts (or is adapted by contracts) to the reality of economic needs.

However, the absence of litigation does not mean the absence of a subject, either for the classification of works or for the ownership and management of rights.

2. The legal regime for immersive objects is not yet stabilised, in particular the nature of the protection offered by intellectual property law, which may slow down the development of a promising sector, but no consensus has yet emerged to make it evolve in a given direction

The interviews conducted by the Mission have highlighted two things: firstly, the interviewees were unanimous in their belief that the objects produced by or for virtual or augmented realities should be granted some form of intellectual property **protection**, as yet undefined, and secondly, the majority of interviewees were in favour of a **legislative status quo**. The interviews also revealed the absence of litigation concerning the classification of these works or the status of contributors. But this absence does not mean that all doubts and weaknesses have been removed: as with the status of multimedia works in their day, uncertainty still surrounds the **exact legal regime** for immersive works, the vesting of rights and the regime for their transfer by authors.

⁶⁰ However, the appearance of the Sensorama (VR) dates back to 1962 and the EyeTap (AR) to the 80s. Flight simulators appeared in 1966 within the US Air Force, the first VR headsets appeared in the 1970s and the first virtual gloves in 1977.

The second part is therefore intended to highlight the analyses and questions surrounding the legal status of the immersive object with regard to intellectual property law, unfortunately leaving aside, insofar as they do not directly involve copyright, questions raised by the implementation of immersive technologies, which constitute important **economic** and **sovereignty** issues.

The question of **digital property**, both public and private, will thus not be addressed directly: who owns the digitised double of an object, a gesture, or a drawing, when this double has been created for use in augmented or virtual reality? Who owns the point cloud used to produce this digital double, when the capture is carried out to order by an external service provider with its own tools? What should be done when a "*Pokémon Go*" player breaches a police regulation or trespasses on private property⁶¹? On the other hand, intellectual property law concerns this same player when he encounters protected works on his route that he modifies virtually, by superimposing an image on a work and modifying it digitally.

Similarly, the issues of **image**⁶² exploitation or **public ownership** of movable and immovable property⁶³ will not be analysed here, but they are part of the overall legal regime to which immersive objects are subject.

This second part will therefore endeavour to show that there is no doubt that the **immersive object**, which is indeed likely to benefit from classification as a work within the meaning of the Intellectual Property Code, should be given a minimum level of protection, even if its scope remains to be debated (2.1.), but that there is still no consensus on the need to move towards a dedicated status, although that would certainly be feasible (2.2.).

⁶¹ On these policing or property issues, see for example "*Pokémon Go et le droit : quel cadre juridique pour la réalité augmentée*" (multi-author), LPA 18 August 2017 p. 5.

⁶² See the judgment of the plenary assembly of the Court of Cassation of 7 May 2004, SCP Hôtel de Girancourt vs. SCIR Normandie *et al.*, RTD civ, [Revue trimestrielle de droit civil] 2004 p. 528

⁶³ For the movable public domain, see the decision of the Council of State of 29 October 2012, municipality of Tours (341173) and for the immovable public domain, see the assembly decision of the Council of State of 13 April 2018, public establishment of the national domain of Chambord as well as Article L. 621-42 of the Heritage Code with regard to the use for commercial purposes of buildings constituting the national domains.

2.1. There is no doubt that immersive works should receive a minimum level of distributive protection, but the scope of this protection is still under debate

It is generally recognised that an immersive object is a work that can be protected by literary and artistic property law, whether it is created *ex nihilo* or comes from a capture of reality (2.1.1.). On the other hand, it is harder to say if the minimal distributive protection granted to these works is sufficient and adapted to their specific economic and legal constraints (2.1.2.).

2. 2.1.1. Recognition of the immersive object as a work?

3. 2.1.1.1. *Breakdown of the creation process: from production of the image to creation of an immersive object*

An immersive object usually merits classification as a work and the protection of intellectual property law because in most cases it exhibits a degree of originality.

Although this point is seldom debated, the question of the **moment** when the work is born and the right is created can be debated, as the **multiplicity of actors** participating in the creative process is important and the **segmentation of this process** differs from the classic procedures. In short, with immersive technologies, the contributor about to create something is somewhat removed from the solitary painter in front of his easel or the writer in front of his blank page.

Some of the Mission's interviewees tried to break down the process of creating their immersive works, which is characterised by a high degree of differentiation between **tasks** and **functions**, although these can be performed by the same **people**.

Thus, and this is not an exhaustive list in a constantly changing field, creating a new immersive work requires the following functions to be performed as a minimum: writing of the computer code (by a virtual reality engineer/developer), creation of three-dimensional (3D) graphics, animation of

characters and creation of their costumes, set design, sound, virtual reality experience design, and integration⁶⁴. Some or all of these functions may be subcontracted to specialist studios.

In the same way, for immersive objects requiring the prior digital capture of points (of a site, a building, a work of art with a view to a virtual visit or a reconstruction), the digital capture itself takes place, then the assembly and "texturing"⁶⁵ of the points, followed by the more traditional stages of creation, production and post-production which transform the point cloud into an immersive object, sometimes combining music, photos, video games, other existing works etc.

The performance of all these tasks is part of the creation of the work, but in the final analysis, although all the participants may be classified as **contributors**⁶⁶, only those who originate the object and imbue it with their personality (or at least if this object is the result of their personal effort) merit the classification of author, subject to the work belonging to the "partnership" categories provided for by the code and distinguishing between collective, collaborative or composite works (cf. 2.1.2 below), or belonging to a particular sector.

In addition to the technical and intellectual segmentation of tasks, there is also their **temporal segmentation**.

Thus, does the act of capturing the myriad of digital points of a building constitute a creative choice that qualifies as a work? Is the formatting of this point cloud with a view to creating a faithful reproduction of the captured building's image sufficiently original to merit classification as a work within the meaning of the Intellectual Property Code?

It could be argued that the mere act of installing the devices for capturing the points certainly constitutes **technical know-how** but that this does not reflect any originality capable of conferring the

⁶⁴ Integration platforms such as Unity (<https://unity.com/fr>) make it possible to bring together all the elements of a virtual reality project.

⁶⁵ Treatment of pixels in order to recreate the image at an acceptable level of graphic quality.

⁶⁶ Or recognise this quality for themselves.

status of a work⁶⁷. It could also be argued that the faithful recreation of the image of the building from the cloud of captured points is, by definition, just as devoid of originality. The status of the work could only be recognised if these points were processed in such a way as to reconstitute the image of a building that had been destroyed or altered by the passing of time, since in order to carry out such a reconstitution, the author(s) would have to make original choices, particularly aesthetic choices, and interpretations based on existing historical sources.

However, this is not the opinion of some of the Mission's interviewees, for whom each gesture, even a technical one, is the result of an arbitrary choice and different digital captures depending on the contributors and their perception and interpretation, objective facts, or even the client's requests. Thus, deciding whether to capture the image of a building in the morning, afternoon or evening, in fine weather or rain, in summer or winter, or according to a specific drone flight plan or the particular position of the devices used, necessarily has an influence on the characteristics of the point cloud's definition and, ultimately, on the representation of reality by the resulting image. Likewise, the virtual tour of the building reconstituted digitally in this way follows an original scenario chosen by the authors of the immersive object produced.

When the immersive object is totally fictitious and derived entirely from the imagination of its authors, it easily qualifies as an original work, at least in the Mission's opinion; on the other hand, when this object is a copy of reality, the question of the boundary between what is purely scientific and what is artistic is complex⁶⁸ but seems to be dominated by the **fact that any digital capture and any reconstitution are above all the result of choices**, which would seem to indicate the possibility of a person-specific perception and recreation, and therefore the possible existence of an original work. To put it another way, the use of a technical process to reconstitute a work does not by itself exclude it from qualifying as a work: as soon as there is know-how and aesthetic choices are made, the imprint

⁶⁷ Like satellite images or topographic surveys.

⁶⁸ The question could be, what falls into the category of simple conservation/preservation which "just" reproduces without interpreting, and what could be classed as outreach, which tells a story and interprets things?

of an author's personality can reveal itself at each stage of the creation process. The history of intellectual property law on photographic art teaches us this.

4. 2.1.1.2. *The simultaneous presence of several works of different legal natures entails at least the concurrent protection of several rights*

The essential difficulty linked to the existence of an immersive object, especially one not created *ex nihilo*, is that as with **multimedia works**, elements of different natures often coexist within an immersive object, each benefiting from its own legal regime: literary, musical, graphic and/or audiovisual works linked together by software and databases to ensure their reciprocal interaction, but also by the implementation of geolocation technologies and the use of technological tools (headsets and gloves, for example), which may be protected by patent law.

The immersive object is therefore undoubtedly a **complex multimedia object** which, at the very least, can benefit from "**distributive**" protection: each aspect of the immersive object is subject to its own legal regime, with all of these strata wrapped around the object. Thus, classic copyright will apply to each part of the object analysed as a literary, musical or graphic work, and copyright specific to software will govern this interface linking the various elements within the immersive object, just as the particularities affecting audiovisual works will apply where appropriate, or patent law may even apply if the immersive application is a new invention, demonstrating inventive activity and having an industrial application.

The application to immersive objects of these different layers of protection according to the nature of the works that coexist within them results from the "Cryo" decision of 25 June 2009 by the First Civil Chamber of the Court of Cassation, ruling on the protection to be granted to video games. The Court ruled that a video game is "*a complex work that cannot be reduced to its software dimension alone, regardless of its importance, so that each of its components is subject to the regime applicable*

to it according to its nature", which led to the distributive application of different legal regimes for a game's components.

Should we go further and recognise (or provide) that the immersive object is itself a work in its own right and, if it is original, must be protected as such in a **unitary** manner? In this respect, as some authors note⁶⁹, the classification will be different depending on whether the immersive object features a totally imaginary environment, in which case unitary protection will be attached from the outset to the original work as such, or whether it virtualises a pre-existing reality, in which case the stratification of distributive protection will be more likely to apply⁷⁰.

This was in any case the previous position of the Court of Cassation with regard to multimedia works (Cass., Civ¹, 28 January 2003), which are not defined by the Code but were recognised by the Court as benefiting from global protection. This is also the position of the Court of Justice of the European Union with regard to video games⁷¹, to which it has granted full protection under ordinary copyright law and not the specific protection afforded to software.

This subject (distributive protection vs unitary protection of the immersive object) has not yet been ruled on by the judge, due to the absence of litigation; but some of the Mission's interviewees stressed that the **legal uncertainties** surrounding the classification of immersive work may, if not block, at least slow down the development of the sector in France, as they do not allow for complete clarity on the essential questions of remuneration⁷² or the legibility of the applicable legal regime⁷³, compared

⁶⁹ See Dalloz droit d'auteur, chapter 2.1.1. "*Œuvres multimédia et droit d'auteur*", André R. Bertrand.

⁷⁰ NB: The two systems are not necessarily incompatible: unitary protection can be added to the various strata of distributive protection without replacing them entirely.

⁷¹ 23 January 2014, case C-355 : 12, Nintendo. <http://curia.europa.eu/juris/document/document.jsf?text=nintendo&docid=146686&pageIndex=0&doclang=FR&mode=req&dir=&occ=first&part=1&cid=8854377 - ctx1>

⁷² Apart from flat-rate remuneration, how can financial rights be calculated when they relate to digital experiences that have barely been commercialised?

⁷³ Each stratum has its own legal rules, which are sometimes contradictory. For example, remuneration for private copying does not apply to the software aspect of the object, but may apply to its other natures.

with the simplicity of other regimes like that of *copyright*. In 2.2., the Mission makes recommendations with the aim of dispelling these uncertainties.

The creators of an immersive work are therefore entitled to claim the benefit of protection of their creation by literary and artistic property law when they intend to assert their rights. However, given the complexity of the immersive object, they must themselves be careful about the **rights of authors of pre-existing works** when they incorporate a protected work into their creation, so as not to risk infringement proceedings (for example, a virtual tour of a site showing a building constructed by an architect who is alive or has been deceased for less than 70 years).

The subject is not theoretical this time: when the "*Pokémon Go*" game was released, architects and sculptors took legal action against the operating company *Niantic* (a subsidiary of *Nintendo*) which had not obtained permission to reproduce their works, thus disregarding their representation and reproduction rights, even though the various exceptions were not invocable, in particular the panorama exception provided for in 11° of Article L. 122-5 of the Intellectual Property Code, due to the presence of legal entities and a lucrative commercial context.

Moreover, the question remains open as to what is at stake for the **moral rights** of authors of protected works when users are offered the technical possibilities (in augmented reality in particular) of modifying or even destroying these works in the **digital world** without the author's permission. Such modification is clearly contrary to the right to respect for the creation⁷⁴ and even to the right to paternity, but as long as it remains virtual, eminently reversible and occasional, it does not pose the same difficulties, particularly in the context of private use, as a genuine unauthorised misappropriation of a work in the physical world.

There is also the question of the **rights of users** of these technologies when they give them the ability to use the tools provided to create elements that can be exported (outside of the virtual reality

⁷⁴ Article L. 121-1 of the IPC (Intellectual Property Code).

headset) and in some cases **monetised**. The question seems theoretical at this stage, even though some video games already offer the possibility, outside of any established scenario, of creating a character (*avatar*) within the game and exporting it⁷⁵.

It is above all the classification of the immersive work that is the subject of debate, since such a work requires its own legal regime, which can have both advantages and disadvantages.

5. 2.1.2. Are the current categories adapted to the economic and legal constraints specific to immersive works?

6. 2.1.2.1. *Is the immersive work, a "partnership-based" creation, a collaborative, composite or collective work?*

Recognising the immersive object's status as a work only removes some of the legal doubts about its status. As discussed above, insofar as the production of the immersive object is most often the result of cooperation between many players, the immersive object has yet to be included in the categories of works resulting from a creation that could be described as "partnership-based"⁷⁶, recognised by the Intellectual Property Code, in order to **identify the owner of the rights** and to ascertain the resulting legal consequences.

A **collaborative**⁷⁷ work is one to which several natural persons have contributed; it is the common property of the co-authors. As Professor Nicolas Binclin reminds us⁷⁸, a collaborative work is characterised by teamwork between several authors, operating on an equal footing, without any hierarchical relationship between them but without them necessarily all having the same contributory share in the creation of the work; inspired by the same subject, authors participate together and indivisibly in the creation of a unique work. Determining who is a co-author requires a **factual** analysis,

⁷⁵ The creation of e-sport competitions and the possibility of organising a video game tournament without its publisher's permission raise a similar question.

⁷⁶ When this is not the case, recognition of authorship is easy: "*Authorship belongs, in the absence of proof to the contrary, to the person or persons under whose name the work is disclosed*" (Article L. 113-1 of the IPC).

⁷⁷ Articles L. 113-2 (paragraph 1) and L. 113-3 of the IPC.

⁷⁸ In his handbook "Droit de la propriété intellectuelle", 5th edition, LGDJ.

distinguishing between "*inspirers*" and "*executants*": for the former, the originality of their contribution is the criterion that separates them, since an idea can never be appropriated by copyright (a sponsor, such as the producer, will not be a co-author); for the latter, the personality of the contributor is the most important criterion (a painter working on a building following the instructions of a visual artist is not a co-author, but a sculptor shaping a work under the direction of another artist who is unable to work with his hands may be a co-author). Of course, the indivisible nature of the rights of co-authors of a collaborative work, which implies unanimity in the decision-making process for the exercise of pecuniary rights, does not facilitate the management of these rights and seems rather incompatible with rational economic exploitation.

Audiovisual⁷⁹ works are a special category of collaborative works by determination of the law, for which the legislator⁸⁰ also provides for a (refragable) presumption of ownership since five participants are presumed to be co-authors: the author of the screenplay, the author of the adaptation, the author of the spoken text, the author of the specially created musical composition and the director. The latter plays a major role since it is he who defines the final version of the work with the producer⁸¹, who in turn benefits from a **presumption of transfer** of the authors' economic rights when signing the contract of employment⁸².

This regime aims to strike a certain balance between authors and investors by providing for several presumptions and simplifications (suspension of the exercise of moral rights during the making of the work, as long as the work is not considered to be completed). However, this category has not met with the expected success, while its recognition by the courts appears to have been a source of complexity.

⁷⁹ Including cinematographic and televisual works, and videograms.

⁸⁰ Article L. 113-7 of the IPC: "*the natural person or persons who intellectually create an audiovisual work shall have the status of author of that work*". Of course, other collaborators can provide proof of their authorship if their contribution is original.

⁸¹ Article L. 121-5 of the IPC.

⁸² Article L. 132-24 of the IPC.

A **collective**⁸³ work is one that is created on the initiative of a natural or legal person who publishes and discloses it under his/her/its direction and name and in which the personal contribution of the various contributors participating in its preparation merges into the whole work for which it was conceived – while remaining individualisable (newspaper, encyclopaedia), without it being possible to attribute to each contributor a separate right within the whole work produced; the work is the property of the natural or legal person under whose name it is disclosed, unless proven otherwise, and this person is, by determination of the law, vested with the copyright over the whole work.

As Professor Binctin points out⁸⁴, "*unlike a collaborative work, a collective work is not the joint property of the natural persons, co-authors, who have allowed the intellectual property to emerge, but is the property of the person, natural or legal, who has taken the initiative and the risk of creating the work... This classification allows copyright to arise directly in the estate of the businessperson, without assignment...*". This regime is often found in the case of works created under an employment contract, where employees participate in a creative process under the direction of the employer.

However, the application of the collective work regime does not negate the rights of authors over individual contributions that form part of the whole. The exploitation of these individual contributions must have been transferred to the owner of the rights to the collective work, except in special circumstances, and except in the case of transfer or presumption provided for by law (e.g. press publication), with the authors retaining the rights for separate exploitations, except where there is a contractual commitment.

As the CSPLA report on the legal regime for multimedia works reminds us⁸⁵, **a collective work** thus has the advantage of directly attributing the economic rights to the work to the publisher (at least for its initial exploitation and excluding moral rights) and its regime provides for the possibility of a flat

⁸³ Articles L. 113-2 (paragraph 2) and L. 113-5 of the IPC.

⁸⁴ Cf. aforementioned handbook, p. 104-105.

⁸⁵ CSPLA, commission on the legal aspects of multimedia works, 26 May 2005. Chairs V.-L. Bénabou and J. Martin, Rapp. O. Henrard.

fee for authors and various adjustments to moral rights. Despite some limits to the application of these derogation provisions, this category is of **real economic interest** to studios and publishers, who frequently adopt it, since it "*allows a unitary apprehension of the work through its development process*". However, the derogation-based nature of this regime and its frequent adoption, regardless of the true legal nature of the work, pose a significant risk of **reclassification** of contracts and therefore of legal uncertainty, particularly because individual contributions do not remain individualisable, as already noted in the report by the Deputy Patrice Martin-Lalande for the parliamentary mission on the legal regime for video gaming⁸⁶.

Finally, a **composite**⁸⁷ work is a new work into which a pre-existing work is incorporated without the collaboration of the author of the latter; it is the property of the author who created it, subject to the rights of the author of the pre-existing work; it may be a collective work or a collaborative work depending on its mode of creation.

Classification as an immersive work is therefore not insignificant, since it has consequences in terms of **management** (a collaborative work is managed in joint ownership by the co-authors), the method of **remuneration** of the co-authors⁸⁸ and the **transfer** of rights (a collective work makes it possible to dispense with the rules governing the transfer of rights in respect of the work as a whole, since a single person is vested *ab initio* with those rights⁸⁹). Similarly, the classification of these works in one of the particular categories recognised by the Code (literary, cinematographic or musical works in particular) entails the application of rules specific to that sector.

⁸⁶ National Assembly, parliamentary mission on the legal regime of copyright video gaming, report by Mr Patrice Martin-Lalande, 30 May-30 November 2011.

⁸⁷ Articles L. 113-2 (paragraph 3) and L. 113-4 of the IPC.

⁸⁸ Article L. 131-4 of the IPC setting the principle of **remuneration in proportion** to the revenue from the sale or exploitation of the rights transferred in whole or in part and determining the cases where it can be, by way of derogation, fixed at a **flat rate**.

⁸⁹ The video game world's desire for this classification can be explained by the fact that the studio believes it is vested with all the rights, remunerates its collaborators in the form of salaries (sometimes with profit-sharing) and, if applicable, transfers the exploitation rights to a third-party publisher who takes the financial risk.

The interviews conducted by the Mission did not result in a **shared doctrine** as to the "right" status of the immersive object, which in any case depends on a factual analysis of the conditions of its production and the role of each participant. Thus, depending on the **modes of production** of the immersive object, it can be seen, in the case of multiple participants, either as a collaborative work (if, of course, the co-participants are not mere subcontractors who only perform technical acts), or as a collective work.

It is therefore the players in the sector themselves who, where appropriate, will classify the work in the contract governing their cooperation, according to their analysis of the creative process but also according to the advantages or disadvantages they perceive in each regime. Yet as mentioned above, such classification is never likely to impress the judge, who has complete freedom to reassign to a work the status that the law recognises, regardless of the parties' intentions.

As with the overall regime of the work (unitary or distributive), the **legal uncertainties** concerning the classification that the judge might attribute to the immersive object certainly do not facilitate the structuring of a powerful and high-quality production sector in France. In any case, they provide an incentive to take **great caution** in the drafting of contracts⁹⁰ and to start thinking about the meaning of any normative changes.

7. 2.1.2.2. The diversity of contracts at the root of these objects' creation does not facilitate the recognition of a unique status

The interviews conducted by the Mission revealed the great diversity of contracts used by immersive technology players to govern their relationships with their **sponsors, service providers** or **employees**, with each player tending to reproduce the model of contract used in the sector from which he comes and with which he is familiar.

⁹⁰ Even when an immersive work can be classified as a collective work because of the way it is produced, express transfer of rights clauses are sometimes added as an additional precaution, although they are not necessary.

Thus, the creation of immersive objects on behalf of public sector institutions, in particular cultural ones, for example to allow the digital capture of a work, building or site for a virtual tour of a building or an exhibition, can follow the **public procurement** models, which benefit from the reference to the general administrative conditions (CCAG)⁹¹ applicable to public contracts for intellectual services. In this case, the public entity is generally the copyright owner under the contract, by means of transfer and remuneration. Of course, the public entity must first ensure that it does indeed hold the rights to the objects captured (for example, a protected movable property for which an application for exploitation must be made).

However, public procurement does not exclude the conclusion of **co-production agreements**, based on the audiovisual model, which in this case do not necessarily include a transfer of rights but contain a formula for authorising exploitation and a valuation of each partner's contribution (the funding and technology for the service provider partner and the object to be digitised for the public entity). There are also more occasional partnership agreements in which certain stakeholders make immersive tools available.

Outside of the public sector, it is not uncommon to find **audiovisual production contracts**⁹² since some players in the immersive technology sector, with the exception of video game publishers, come from the audiovisual world. As in the audiovisual sector, there are executive producers who do not produce content and sign **executive production** contracts with other companies. Some of the Mission's

⁹¹ Cf. for example Article 25.1.1. (Option A) of the CCAG/PI [France's general administrative conditions of public works contracts/intellectual property]: "*The contract holder shall grant the contracting authority and the third parties designated in the contract, on a non-exclusive basis, the economic literary and artistic property rights relating to the results, for the needs arising from the subject matter of the contract. / This assignment of rights shall cover the results from the time of their delivery and under the resolutive condition of receipt of the services, for France and for the legal duration of the copyright or rights related to copyright. / These rights shall include, **with due respect for moral rights**, all economic rights of reproduction, representation and distribution, and in particular the right to use, incorporate, integrate, adapt, arrange, correct and translate the results, in whole or in part, as they are or as they have been modified for the needs arising from the subject matter of the contract, in accordance with the provisions of the Intellectual Property Code*". The CCAG even provides that the source codes and the documentation necessary for the implementation of the rights to software delivered under the contract must be delivered simultaneously with the object code. Option B (alternative) provides for the transfer of rights from the contract holder to the contracting authority.

⁹² Articles L. 132-23 et s. of the IPC.

interviewees said that executive producers often finance the research and development of immersive works without actually owning the rights to the works, which are held by the authors of the codes to which a copyright is attached, which can pose a problem of financial sustainability for the development of the sector.

Contractual practices are therefore very diverse and reflect the **heterogeneity** of the immersive work production sector, both as regards the sponsors (public sector players, private audiovisual channels, film production companies, the leisure industry, etc.) and in terms of intermediaries and authors.

They also combine with the legal uncertainties weighing on the **overall regime** and the protection of the immersive work (unitary vs. distributive), on its **status** when several participants are involved and on the ownership, management and transfer of copyright.

Even if there is no known pending litigation, these doubts certainly provide a good reason to begin reflecting on the matter in order to secure current practices.

8.

2.2. The creation of a dedicated status could be envisaged but there is no consensus yet on this, in the absence of litigation

Changing the law is not a trivial act; it must meet a strong social need and the changes thus introduced must be useful without having a knock-on effect on other sectors; the change must also be effective: countless clarifications or changes have been introduced into the legislation to deal with a specific need, but have ultimately raised more new questions than they have solved supposed problems. The choice must be informed by a reflection on the **structuring of the sector** and its **economic model**: do we want to protect authors (in this case, facilitating the recognition of a collaborative work, possibly with presumed transfers of rights) or publishers (in this case, the status of

a collective work where the ownership of rights is recognised *ab initio*, supplemented by a presumption of transfer)? With this reflection in mind, the video game world is following its own procedures for managing intellectual property rights, which it deems ill-suited to its economic model⁹³.

The subject has been explored in the report on multimedia works, and some of the paths it suggests could be looked at again (2.2.1.); however, there is no clear consensus on these reforms, which is an argument in favour of at least negotiating some paths within the sector (2.2.2.).

2.2.1. The report on multimedia works paved the way for a controlled change in the legislation

This report was written against the backdrop of a crisis in the multimedia sector in France, the causes of which included (amongst other things⁹⁴) an unsatisfactory legal framework that did not provide clear protection for authors or sufficient legal security for investors because of the uncertainties surrounding the regime for these works. The commission responded to the uncertainties raised by the report as to the regime and classification of these works, which are the same for immersive works, by proposing a **specific and balanced regime** that recognises the authors' participation in the creation of the works as well as the need for studios and publishers to ensure prior control of the exploitation rights.

2.2.1.1. The report proposed the creation of certain presumptions facilitating the recognition of a multimedia work and adapted to its economic and legal needs

The report first defines a **multimedia work** as one that meets **five** cumulative criteria (combination of elements of different genres, indifference to the question of the medium and the mode of communication, interactivity, the work's own identity as a whole distinct from its components⁹⁵, and management of the whole by software).

⁹³ Cf. on this subject the developments documented in the report by the parliamentary mission on the legal regime of video games in the field of copyright, cited above.

⁹⁴ The cost of labour or "tax/social wedge" could also, beyond the legal dimension, be a contributing factor.

⁹⁵ Which makes it possible to distinguish a work from a simple multimedia product or databases compiling pre-existing elements.

It then points out the **inadequacy** of the existing categories with regard to the need for legal security for investors and recognition of the work of authors in multimedia works.

Thus, the **software regime** offers the advantage of automatic devolution to the employer of the economic rights over interfaces created by employees under an employment contract⁹⁶, a flat fee⁹⁷ and limitation of the author's moral rights⁹⁸; however, the scope of application of this derogation-based regime remains limited (musical compositions or texts remain subject to ordinary law) and presupposes that the benefit of remuneration for private copying is waived. Above all, there is far more to a multimedia work than just its "software" component.

The regimes for collaborative and collective works are not entirely satisfactory either, as recalled in Chapter 2.1.2.1 above.

In order to facilitate recognition of the **author** of a multimedia work, which is complicated by the large number of participants, the report proposes the creation of a (simple) **presumption** in favour of **contributors** whose contribution is **decisive** for the identity of the work considered as a **whole**, which does not exclude another contributor from providing proof of his contribution, nor does it prejudge the authorship of the various contributors on the basis of their individual contributions. This character would be determined by **participation in four essential creative functions**⁹⁹: direction¹⁰⁰, creation of the interactive scenario, graphic design and special creation of the musical composition.

This report also seeks to make the management of rights more secure by providing for a **presumption of transfer** of rights: unlike in the case of collective works, ownership of the economic rights over the work would not be vested *ab initio* in the estate of the investor (studio or publisher)

⁹⁶ Article L. 113-9 of the IPC.

⁹⁷ Article L. 131-4, 5° of the IPC.

⁹⁸ Absence of right to repent or withdrawal and limitation of the possibility to oppose a modification: article L. 121-7 of the IPC.

⁹⁹ As in immersive works, the process of creating a multimedia work implies that the same person can take charge of several tasks and that the same task can be shared between several participants, which makes a list of presumed co-authors inapplicable in audiovisual matters.

¹⁰⁰ Even if there is not always a director, there is necessarily one or more people carrying the project and coordinating or managing the creative activity.

but, as in the case of audiovisual works, the individual author would be presumed to have transferred his or her rights for the exploitation of the work, without any express contractual provision to that effect. The individual author would therefore remain the initial owner of the rights over the work, which is in line with ordinary intellectual property law, but the management of the rights and legal security would be strengthened by presuming the automatic devolution of these rights to the investor. The report also proposes that the transfer, which would be exclusive, should cover both the main exploitation of the work in its original domain and exploitations outside multimedia which would constitute the necessary accessory to the primary exploitation, while secondary exploitations would require further negotiation.

The rest of the legal regime for multimedia works remains governed, in the spirit of the report, by ordinary law: proportional remuneration, except in exceptional cases, exercise of moral rights by the author within the limits set by the law and case law, but no remuneration for private copying as for software.

2.2.1.2. Adaptation of these recommendations to immersive works

The recommendations of this report seem particularly appropriate for immersive works, whose mode of production and nature differ little from multimedia works (except for the immersive dimension itself, which presupposes the presence of particular tools that do not change the nature of the work itself, but also of particular "talents" involved in immersive writing, both narrative and visual).

The aim is then to preserve and strengthen authors' rights and secure investment.

Thus, facilitating the recognition of authorship and identification of the author by means of a presumption based on **participation in the decisive tasks** in the creation of the work seems to be a good policy, even if it means leaving the precise definition of what these tasks are to the sector, given the evolving nature of immersive creation.

Similarly, facilitating (major) investment in the industry while ensuring that authors receive the fruits of their creative work could be achieved by establishing a presumption, not of initial ownership of rights, but of automatic transfer of exploitation rights to the studio or publisher.

It is likely that the remuneration system will have to be adapted, given the limited distribution of immersive works at present, the multitude of participants in the production chain and the difficulty of measuring the turnover thus produced. It would therefore be simpler to provide that, unless there is an exception, the transfer entails the application of flat-rate remuneration, either by amending Article L. 131-4 of the IPC or by clearly applying the exception set out in 1° of this article.

However, some of the Mission's interviewees considered the possibility, different from that put forward in the report on multimedia works, of a regime similar to the collective work, in which ownership of rights would be conferred from the outset on the legal entity, so that the latter would be responsible for redistributing the sums earned from exploiting the immersive work to the participants in the chain.

9. 2.2.2.2 There is no consensus yet on how the legislation should be adapted

10. 2.2.2.1. *The absence of litigation or clear demands from the sector are preventing a consensus from being reached at this stage*

The many interviews conducted by the Mission have highlighted a certain paradox: this diverse sector, despite being aware of the relative fragility of its practices, which often stem from the different areas in which participants exist and function (audiovisual culture or video game culture, public and parapublic sector or private sector etc.) and have been shown by previous developments to be subject to caution according to the options chosen, does not seem to feel a need for substantial normative change, with only a few exceptions.

The current legal framework, which is well known, indeed seems to many to be sufficiently flexible to meet all parties' needs. The best proof of this (supposed) absence of problems is the non-

existence of litigation before the courts, for example between contributors whose moral or economic rights have been disregarded and publishers who have appropriated such rights without the conditions of the transfer having been clearly defined and fairly remunerated. Nor have the public authorities been approached by professionals about problems requiring clarification of standards or doctrines.

This absence of litigation could reflect the existence of a consensus in favour of a legislative *status quo*. At least, that is the overall assessment the Mission was able to draw from the interviews it carried out.

However, as the preceding developments show, the current absence of litigation does not guarantee a similar state of affairs in the years to come, nor does it mean that there are no existing problems with classification and legal status.

Studios, publishers or producers who, following the example of the practices in effect in the video game sector, would indiscriminately and systematically resort to the collective work regime under the conditions described above and under which they consider that ownership of the rights is immediately vested in the publisher, run the risk of having their contracts reclassified by the judge, since the system applied does not allow for the recognition of individualisable contributions and the individual rights of the authors must, in any case, be effectively transferred, since the publisher only has rights of his own to the collective layer of the work¹⁰¹.

Consequently, the concern with achieving a satisfactory balance between investors' legitimate need for legal security and the imperative of protecting authors' rights, enabling the immersive reality sector to develop in France, cannot be achieved without changes, whether professional or legislative.

11. 2.2.2.2. In the absence of legislative changes, the industry would do well to agree to seek out and establish good practices to combine the protection of authors with the economic balance of the sector

¹⁰¹ Even though case law has been tolerant on some occasions, accepting presumptions of implied transfer in view of the circumstances.

It seemed to the Mission that, without necessarily deciding whether an immersive work is, or should be, more of a collaborative work or more of a collective work, the balance mentioned above could usefully be achieved by instituting the two presumptions of ownership and then of transfer of rights mentioned in point 2.2.1.2.

An amendment to the Intellectual Property Code, the terms of which remain to be discussed¹⁰², would ultimately appear to be the most reassuring in this respect.

However, if the legislative path is not open, due to a lack of real consensus and/or available parliamentary time, there is nothing to prevent the sector from coming to an agreement, not so much on what qualifies as an immersive work but on the institution of these presumptions by establishing **good practices**, taking the form of **guides** and likely to result in standard contracts, insofar as contractual freedom is compatible with the spirit of the law.

A consultation phase could thus begin, in which the parties, for example within the Association française des réalités virtuelles (AFXR), which is intended to bring together the entire immersive reality sector¹⁰³, would agree first of all on a **good practice guide** to describe and define participants' tasks in the process of creating immersive works, flexibly and taking account of their professions and needs, so they could easily recognise those who would be vested with the ownership of rights by virtue of the (not irrefragable) presumption of authorship, a presumption that the contract would have to validate. It is therefore the professionals themselves who, by means of a consensual grid, would be responsible for defining the nature of those contributions that are sufficiently decisive to benefit from an appropriate protection regime. These same professionals should also provide for the adjustments to the traditional remuneration methods required by the economic realities of the sector.

Once the authors have been identified using the grid, it will be easy for the contract to provide for the automatic transfer of economic rights in favour of the investor. The aim is thus to strengthen

¹⁰² Should the presumptions be inserted into the section of the code dedicated to collective works, the section devoted to collaborative works, or their own dedicated section?

¹⁰³ Cf. footnote on page 3 on the merger of Uni-XR and AFXR.

and reassure investors or entrepreneurs by recognising a right of their own over the work, "enhanced" by the benefit of a presumption of transfer of the rights of the presumed authors, as well as the rights of any others who may come forward.

When the practice has reached a sufficient degree of maturity, if applicable, an assessment will determine whether it would be appropriate to move on to a second stage, legislative this time, to confirm definitively what the professionals themselves have created.

12. Conclusion

On the strength of the many informative interviews it has conducted, the Mission is convinced that immersive technologies represent undeniable potential in economic and heritage terms, and that France has a great deal to offer in the ongoing global competition, even though the sector still suffers from being too small and inadequately structured.

The obstacles that might be slowing down the emergence of a solid sector probably include the uncertainties and legal immaturity discussed above, as well as funding difficulties that are not unrelated to these uncertainties.

So the time is right to help national players in the sector to remove these uncertainties and develop, especially since the immersive reality world is continuing to evolve: although the technological battle to see national players emerge is perhaps already behind us, the creative world remains very much open and our country certainly has a place in this competition.

The Mission feels that certain sectors, such as general and technical education, heritage and creation, are particularly promising in France and that it is essential to secure legal practices so that investors can contribute to their development with confidence. However, it notes that the absence of major national players will inevitably raise questions of sovereignty in access to immersive

technologies: how can we ensure the durability of access to and use of an immersive work when the medium depends on foreign technologies or production that can stop at any time?

13. List of interviewees

- Mr Roei AMIT, Head of Digital, **Réunion des musées nationaux – Grand Palais** (RMN – GP)
- Ms Pauline AUGRAIN, Head of Digital and Head of the Technical Industries and Innovation Department, and Mr Vincent FLORANT, Head of Innovation, Video and Technical Industries, **Centre national du cinéma et de l'image animée** (CNC)
- Mr Stéphane BORDAS, Assistant to the Head of the Audiovisual and Multimedia Office, Digital Economy Department, **General Directorate for Enterprises**, Ministry of Economy and Finance
- Mr Morgan BOUCHET, Chair and Mr Fabien SOUFFI, Head of Development, **Uni-XR / AFXR association** (accompanied by Mr Julien Brunet and Mr Karine Riahi (**Spring Legal firm**))
- Mr Philippe CADRE, Director of Operations and Ms Vicky ROUSS-DOUCHY, **Institut national de la propriété industrielle** (INPI)
- Mr Harold CODANT, Head of the Legal Department, **Bibliothèque nationale de France** (BnF)
- Mr Christophe COUSIN, Director of Studies, Economic Affairs and Forecasting and Ms Sophie SALUN, Content Officer, **Conseil supérieur de l'audiovisuel** (CSA)
- Mr Philippe FUCHS, Professor of Virtual Reality, **Institut Mines Paris Tech**
- Mr Bernard GIRY, office of Ms Péresse, **Ile-de-France Regional Council**
- Ms Maryline GUIRY, Deputy Director and Mr François REPIQUET, Deputy Administrative and Financial Director, **Centre des monuments nationaux**
- Mr Gaël HAMON, Director and Ms Chiara CRISTARELLA ORESTANO, Director of Development and Communication, **Art Graphique et Patrimoine company**
- Ms Chloé JARRY, General Secretary and Mr Jérémy POUILLOUX, Treasurer, **PXN association**, producers of digital experiences
- Mr Anthony LEVEL, Director of Digital Regulatory Affairs and Mr Guillaume ESMIOL, Innovation Division, **TF1 Group**
- Mr Jean-Sébastien MARIEZ and Mr Georgie COURTOIS, lawyers, **De Gaulle, Fleurance et associés**
- Mr Nicolas MAZARS, Director of Legal and Institutional Affairs, **Société civile des auteurs multimédias** (SCAM)
- Ms Alexandra MENDOZA-CAMINADE, Vice-Chair of the European and International Relations Service, Professor at **Toulouse 1 Capitole University**
- Mr Daniel MESTRE, Research Director, Etienne-Jules Marey Institute of Movement Sciences, Aix Marseille University / CNRS, Vice-Chair of the **Association française de toutes les réalités virtuelles** (AFXR)
- Mr Jean MIZRAHI, Chair of the **Ymagis group** and Illucity
- Mr David NAHON, Director of Immersive Virtuality (IV), **3DS, Dassault Systèmes**
- Ms Marion OECHSLI, Financial, Legal and Resources Director and Ms Valérie GAME, Deputy Director of Legal Affairs and Public Procurement, **Musée du Louvre**
- Mr Nicolas ORSINI, Head of the **Digital Innovation Department**, Ministry of Culture
- Ms Deborah PAPIERNIK, SVP, new business development, technology and strategic alliances, **Ubisoft**, accompanied by Mr Emmanuel MARTIN, Executive Officer, **Syndicat des éditeurs de logiciels de loisirs** (SELL)
- Mr ROSSI, Deputy Director, Ms ROBIN-RASCHEL, Head of the General Commercial Law Office and Ms COLNET, Sub-Directorate for Economic Law, **Directorate of Civil Affairs and the Seal**, Ministry of Justice
- Mr Axel SCOFFIER, Deputy Executive Director, **Unifrance**
- Mr Alain THILLAY, Head of the Office for Innovation and Applied Research Support, **Digital Education Directorate**, Ministry of Education
- Mr Hubert TILLIET, Director of Legal Affairs and Audiovisual Contracts, **société des auteurs et compositeurs dramatiques** (SACD)
- Mr Pierre ZANDROWICZ, Co-founder, Atlas company, Ms Camille DUVELLEROY, Scriptwriter and Director of Interactive Stories, and Ms Judith GUEZ, Artist and Researcher in Digital Art.

14. Brief bibliography (to explore the subject further)

General works on immersive reality

- Bruno Araldi, Pascal Guitton, Guillaume Moreau (dir.), "*Réalité virtuelle et réalité augmentée : mythes et réalités*", Iste editions (London)
- Philippe Boyer, "*Nos réalités augmentées : ces 0 et ces 1 qui envahissent nos vies*", éditions Kawa
- Philippe Fuchs, "*Théorie de la réalité virtuelle. Les véritables usages*", Presse des Mines
- Philippe Fuchs (dir.), "*Le traité de la réalité virtuelle*" (vol. 1 to 5), École des Mines de Paris
- Philippe Fuchs, Malik Mallem, "*Réalité virtuelle, réalité augmentée*", Hermès science publications : Lavoisier
- Goldman Sachs, "*Profiles in innovation / virtual and augmented reality, understanding the race for the next computing platform*", 2016
- Thomas Michaud, "*La réalité virtuelle : de la science-fiction à l'innovation*", L'Harmattan

Legal books and journals

- Nicolas Binctin, "*Droit de la propriété intellectuelle*", 5th edition, LGDJ.
- Rose-Marie Borges & Simon Berthon, "*Pokémon et réalité virtuelle : des droits d'auteur bien réels*", European Union Review 2017 p. 85
- Julien Brunet, "*La réalité virtuelle et le droit*", Juris art etc. 2017 n° 52 p. 35
- Laurence Calandri, Céline Castets-Renard, Émilie Debaets, Alexandre Mendoza-Caminade, Valère Ndior, Emmanuel Netter, Jessica Eynard: "*Pokémon go et le droit : quel cadre juridique pour la réalité augmentée*", Les petites affiches, 18/08/2017 n° 164-165
- Christophe Caron, "*la Cour de justice de l'UE s'intéresse aux mesures techniques de protection*", Communication commerce électronique n° 3, March 2014, comm. 26
- Christophe Caron, "*L'interactivité chasse l'œuvre audiovisuelle*", Communication commerce électronique n° 4, April 2003 2014, comm. 35
- Christophe Caron, "*Qualification distributive pour le jeu vidéo, œuvre complexe*", Communication commerce électronique n° 9, September 2009, comm. 76
- CSPLA, report by the commission chaired by Ms Valerie-Laure Benabou et Mr Jean Martin : "*Le régime juridique des œuvres multimédia : droits des auteurs et sécurité juridique des investisseurs*" (report by Mr Olivier Henrard)
- Marie-Hélène Fabiani, "*Les contrats de la réalité virtuelle*", Revue pratique de la prospective et de l'innovation, n° 2, October 2018, dossier 13
- Patrice Martin-Lalande, report by the parliamentary mission on the legal regime of copyright video gaming, National Assembly, 2011
- Marie Soulez, "*La réalité virtuelle confrontée au droit d'auteur / optimiser la protection des applications de réalité virtuelle*", INPI – la propriété intellectuelle et la transformation numérique de l'économie, p. 123
- Anne-Laure Villedieu & Thomas Livenais: "*Réalité augmentée : un monde virtuel mais pas sans règles*", Dalloz IP/IT, p. 644, December 2017
- Philippe Yolka, "*La chasse aux Pokémon*", AJDA 2016 p. 1833