Metaverse: Emerging Trends and Its Regulation

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Setting the scene

As often happens science fiction offers an insight of the cyber world in different movies anticipating what science and cyber technology will offer later. Several science fiction movies have dealt with these topics. The original version of Tron[1] (1982) introduces the dynamic of relations among different characters that populate computer architecture, the operating system trying to capture some rebels. The Lawnmover Man[2] the movie that made virtual reality popular. The Matrix[3] proposing a metaverse directly connecting real and virtual, and why do not mention the 13th Floor[4] a matryoshka of virtual worlds where no one apparently knows if his reality is the "real" one. Wargames[5] provides an insight on AI and much more ML as well as later Eagle Eye[6]. In the near future, it might happen that AI will take control of homeland security and defence system and decides to kill supposed enemies or capture and imprison "future" criminals as showcased by the science fiction movies "Minority Report" or launch attacks to other countries.

Metaverse and parallel universes

The concept of Metaverse probably dates back in the 1990s when Bruce Damer[7] introduced the Digigardener the Avatar of a gardener remote controlled by humans, more recently the movie Avatar[8] outlined this idea to create digital "proxies" operating in a cyber universe.
In the nineties Interactive Virtual Reality already embraced the "Metaverse" sometimes even more advanced than todays' approach the key limitations at that time were due to technology and the lack of big key players investing relevant resources to make the "Metaverse" dream come true.

Metaverse and virtual reality are intertwined, but they are not the same. The metaverse is a platform that is still under development and its final form is unclear, it could improve or even replace the Internet, while virtual reality is a known technology that allows you to live and experience virtual worlds.

Metaverse today offers a simplified representation of the "reality" as conceived by programmers, of course many times very astonishing, it is actually accessible thanks to personal computers, tablets and smart phones via virtual reality and even enhanced reality. One of the technologies often merging with metaverse is NFT (Non fungible tokens) the blockchain based shared "property" of digital "objects" as it is foreseen for Web 3.0. If, as it seems, metaverse will succeed, we will face parallel universes with rules and citizens …. recreating typical issues of societies. Some thirty years ago, we remember Habbo Hotel social game, players can store assets as in a kind of digital Monopoly

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[1] Tron is a 1982 American science fiction action-adventure film written and directed by Steven Lisberger.

2 The Lawnmower Man is a 1992 science fiction horror film directed by Brett Leonard

3 The Matrix is a 1999 science fiction action film written and directed by the Wachowskis.

[4] The Thirteenth Floor is a 1999 science fiction neo-noir film written and directed by Josef Rusnak, and produced by Roland Emmerich

[5] 1983 American science fiction techno-thriller directed by John Badham.

[6] 2008 American action-thriller film directed by D. J. Caruso

[7] Avatars: Exploring and Building Virtual Worlds on the Internet https://www.digitalspace.com/avatars/book/

[8] 2009 American epic science fiction film directed, written, produced, and co-edited by James Cameron

game, even in this scenario thief use to act stealing virtual furniture and cloths. So, in case this new universe will become a relevant "reality" we must start thinking the extension of the existent laws or new cyberlaws. We already faced and still face relevant problems due to the need to extend or set new rules to properly manage the digital domain.

Long time ago, in the cyber time scale, virtual reality was considered the way to escape from physical reality and create its twin, several other technologies from videogames to shared universes and platforms like Second Life offered something similar. Sometimes these technologies were even applied to cultural heritage as it happened in the case of the Forbidden City by IBM. Product in between digital movies and videogames offered the opportunity to play some action movie scenes and save the video clip as a shoot of a real movie, reality blurring the border with virtuality.

There is an increasing interest in promoting the metaverse as a kind of "new frontier" a territory potentially rich of opportunities for the forerunners / settlers. Key players[9] are putting their flags on this territory in a kind of gold rush. Not only software players but even hardware companies are investing in this new opportunity and the range of involved firms is not limited to traditional cyber hardware producers, more than twenty-five years ago Zeiss developed an enhanced reality platform supporting car services, world class sunglasses companies like Ray Ban are entering this market starting with intelligent glasses taking pictures reacting to voice commands and more.

Recent evolution of Ocolus[10] HMD offers immersive experiences to video-gamers or added value services to tour operators and real estate companies.

In 2018, the US military awarded Microsoft a $ 480 million contract to create a prototype of advanced smart glasses, called the Integrated Visual Augmentation System (IVAS). These smart glasses look like Microsoft's commercially available HoloLens augmented reality (AR) headsets. The military demanded that IVAS do much more. The United States Army wants to bring together several technologies into a single platform that its soldiers can use to train, test and fight. This requires the headset to incorporate high-resolution sensors for night, thermal and on-board soldier vision to increase situational awareness and target engagement, while machine learning capability paired with AR must provide a similar training environment to life. On the occasion of the field test some problems arose such as the limited field of vision and peripheral vision when wearing the IVAS and the restriction of the soldier's movements due to the size and weight of the device.

There will be probably continuity among the different parts of the metaverse. Virtual goods can be owned, created, and purchased. The foreseen evolution of the Metaverse in the field of commerce requires the clear identification of the counterparts both the human and the machine this even in case of machine-to-machine transactions, so it is needed to assign a digital identity not only to the humans, as it is already done, but even to software modules and avatars. On the side of the cybershop the system must identify the customer thanks to his/her digital ID checking the picture with the capture image of the face of the customer, this check must be iterated through time during the session to ensure that the buyer is still the same person. This hard real time task if usually in charge to an AI module connected with a computer vision module extracting the features from the video image of the customer and comparing it with the one on the digital ID. This need to certify the identity of the counterpart is of course needed in different services including government, health and more.

Some "historical" application of IVR recreated relaxing scenarios like remote tropical islands very similar to the touristic cyber-locations proposed by another science fiction movie Total Recall[11], will the future development of Metaverse offer relaxing vacations in such cyber environments?

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[9] Like Microsoft, Apple e Facebook/Meta

[10] Typical devices are: SteamVR, Oculus Home e Viveport

[11] 1990 American science fiction action film directed by Paul Verhoeven

This is a short description of the potential applications of Metaverse but let's consider even the potential impact and, why not, drawbacks. Accordingly with the actual perspective the Metaverse will progressively create a clone of our environment, but it will not be limited to this goal creativity will extend this universe without limits apart from imagination. One of the foreseeable risks is a kind of addiction to this "second life" training users to shift from real to Meta-life blurring the border between them, this may happen as much as the number of services and duties will be transferred on the other side of the Alice's mirror.

Meta-life can propose a new normal that once accepted in the Meta-life might be accepted in the real life. The same of course is valid for information and opinion dynamics, especially if perceived as real and thrustable.

Interactive immersive realities for creative and artists.

Now we will approach another aspect once more connected with the virtual world, immersivity. After the extraordinary success of online communication technologies, many times fostering a one to one or one to social media interaction, it is foreseeable a potential coming cultural revolution due to immersive "communicative experience" many to many. It happened several times that technologies lie parked for years till they get on stage, think about the Internet, AI, RFID, Neural Networks, mobile phones, and more.

In 1979 the artist Monika Fleishman[12] disclosed a cutting-edge technology, virtual reality, long time before explored by Ivan Sutherland[13] and Morton Helig[14]. This was the origin of the exploitation of both Artificial Reality[15] and Virtual Reality - on one side Myron Kruger[16], on other side Jaron Lanier and Thomas Zimmerman[17] (1985). In the 1990s Virtual Reality was considered a potential pervasive technology offering benefits in different fields from human computer interaction to culture. Flight and drive simulators together with maritime simulators found an incredible diffusion offering even the opportunity to upload to the system real case study.

That kind of experiences were addressed to single users or at least small groups let by one "guide". A significant number of virtual reconstructions of archaeological sites and historical buildings were recreated in Interactive Virtual Reality many times not simply limited to offer virtual walkthrough but enabling additional levels of interaction like virtual restoration or anastylosis. Similar virtual interactive environments ware broadly experimented, even in the field of surgery adding some extra interfaces providing force feedback and other haptic feedback.

Nevertheless, the ghost of a new virtual drug and its attempt to destroy social relation was several times evocated. Many times, a limited application of IVR was successful, typically interactive walkthrough in virtual scenarios, even if the potentialities of interactive virtual reality were incredibly wider using virtual sensors, autonomous behaviours of digital objects, enhanced interaction among entities and more. From the merge of virtual reality and artificial life incredible experiences were generated, like "live" aquariums enjoyable not wearing a scuba mask but a head mounted display offered the opportunity to swim with autonomous fishes moving in flocks and escaping from predators.

Let's say that in the ninety's technology was the constraint but creativity reached incredible heights. Using behavioural rules, sensors, virtual actuators or "stargate" to parallel universes.

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[12] In the 1970s Director of the Department of Computer Art at GMD Institute for Media Communication, Bonn http://cmm.cenart.gob.mx/doc/doc/artis/fleisch.html

[13] MIT, Turing Award, The sword of Damocles (1968), Sketchpad (1963)

[14] Telesphere Mask (1957) and Sensorama (1960)

[15] term coined in 1975 by Myron Kruger at Videoplace

[16] Myron Kruger https://www.historyofinformation.com/detail.php?id=4234

[17] Jaron Lanier and Thomas Zimmerman https://www.historyofinformation.com/detail.php?entryid=4081

As it often happens interactive virtual reality succeeded in some fields and was considered not enough mature in others. Consequently, IVR reached the so-called "calm phase", and another potential pervasive technology came of stage the "World Wide Web".

Nowadays powerful devices are in the pockets or on the desktop of citizens, display devices ranging between cartoon "googles" and affordable cost head mounted displays offer the opportunity to feel immersed in a virtual 3D scenario[18].

We need to specify the meaning of "immersion", does it mean "emotionally involved", "blurring reality with virtuality"? There are different experiences that can be labelled "immersive", reading a book, watching a movie, attending a concert or opera, experiencing wild nature, spiritual experiences and more. The ability to feel "immersed" differs from person to person some people are unable to feel immersed even if they experience the most immersive situation, they still keep the two environments separated.

In the last decades we experienced different public space digital exhibits such as Uffizi Virtual Experience[19], Van Gogh: The immersive experience[20], Galileo all'Inferno[21], or Virtual Zoo 7D[22] and more all of them in some way providing an invite to feel immersed in the "beauty" without the chance to interact with it.

Advances in immersive technologies may represent competitive advantage to the media industry (e.g., eXtended Reality) and are an important driver for the experience economy, enhancing breadth, depth and intensity of artistic performances or the visitors' experience at arts and cultural institutions.

Yet, advanced immersive solutions are usually neither readily available nor broadly accessible:
   a) they require specific developments that can hardly be carried out by most institutions;
   b) they are usually confined into a virtual or actual close space where conditions, either human or environmental, can be fully mastered;
   c) they are usually limited to cinematic experience in which bystanders play little or no role;
   d) the inherent affordance of immersive propositions, which sometimes rely on complex software interfaces and expensive equipment, is questioned by the currently evolving world health situation.

A relevant step forward can be done thanks to the exploitation of large interactive virtual reality theatres in public spaces, where citizens can experience both media companies' products and creatives' artefacts. This option will foster the opportunity to share the experience together with other citizens breaking the cyber loneliness typical of digital interaction. In such public spaces citizens can interact with the application even in connection with other citizens located in public spaces pertaining different countries and cultures.

There is a need to create a global framework for Cultural Creativity, by designing and developing efficient, cost-effective software and hardware (projectors, computers, cameras, and detectors), multi-user, multi-site, multi-platform non-invasive immersive and interactive users' experiences. What does it mean? No more only a single "guide" in immersive scenarios but each participant can interact even from other theatres, the immersive application will be based on open-source code adaptable to different hardware platforms in addition citizens will be able to enjoy the experience without the need to wear specific devices like head mounted displays or data suit and gloves.

Both software and hardware need to be optimised to offer users a hassle-free, less costly sustainable and enhanced immersive experience to favour the approach to culture as an

18 Some devices are sold by Facebook, HTC, Valve, Sony
19 Uffizi Virtual Experience https://www.centrica.it/digital-exhibitions/
20 Van Gogh, The immersive experience https://vangoghexpo.com
21 Galileo all'Inferno https://www.youtube.com/watch?v=rxan29oMB_U
22 Virtual Zoo 7D https://www.youtube.com/watch?v=noDLH7XzN7Y

emotionally engaging "communicative experience" in public spaces. Concurrently following academic and industrial approaches, it relies on theoretical and experimental research, open-source software, and hardware development together with challenging case studies and onsite beta testing implementations. To ensure both easy maintenance and wider impact, such applications / SDK must in addition offer an easy customisation interface, allowing for the development of extension modules.

All the above already represent an ambitious goal, but there are several challenges to be considered; first, the all-in-one immersive solution should be easy to install and calibrate, work indoors and even outdoors; it should be non-invasive, avoid information distraction and overload, and finally, support and blend with the networked social activities.

These platforms must be ready to be used both by creatives without specific cyber knowledge or to be enhanced by developers and augmented by third parties' contributions.

In the near future some pilots will showcase the potential of immersive experiences to boost creativity as a driver of innovation and competitiveness using impact assessment and measurement techniques. Furthermore, pilots will provide evidence on the role of the cultural and creative actors as drivers of innovation in other economic sectors such as Citizen's engagement in public space, Art & Creativity in Public Spaces, Innovation in Art and Experience, and Tourism and advertising of cultural events like a global social sculpture. Minorities can take full advantage from these technologies to express their own culture and history.

The key assumption is that immersion needs to be triggered not only in a circumscribed space where visitors have to come but throughout the digital network between institutions and people using different platforms, not only within their own "bubble" but together, not only with dedicated equipment but also using capturing sensors for a minimally-invasive collective and social experience either in the public space or remotely to gather the citizens and to cope with potential confinement and distant cultural access. This immersion paradigm shift – in which passers-by, visitors, or Internauts take part – will improve the institutional flexibility and cultural offering, stimulate cultural consumption, increase revenue, and enhance social impact. This will require arts and cultural institutions to establish corresponding business models and foster new cultural consumption patterns to meet the upcoming needs (remote 3D interaction,) of the public digital usage.

The key idea is the introduction of a paradigm shift in the type of experience that immersive exhibits give rise to. Interactive immersive open space must be designed to impact every aspect of the Cultural and Creative Industry, from the financial, to the creative, the experiential, but especially the communicative dimensions of exhibits. This immersion paradigm shift consists in designing open spaces for cultural creativity, both for new conceptions, and for innovative new curations of existing cultural artefacts, in immersive spaces that come alive, because interactive. Combining open spaces with immersive technological environments that interact (non-invasively) with the participants, both individually and collectively, takes the potential of cultural experiences to a new level of possibilities; adding fresh opportunities for artistic and curatorial innovation engenders new types of cultural experience that will become the norm of cultural engagement across cultural domains, platforms, and institutions. The new norm...

To conclude

Interactive immersive open spaces represent one of the appropriate use of ICTs for development and for inclusivity both at local and global level. Artists and cultural operators can take advantage from this "social theatre" to express and share their creativity interacting with other citizens, collecting their contributions and feedbacks in a kind of virtual Agorà extended even beyond the borders of the country. The impacts of digital exclusion are now seen upon individual citizens, but also upon international markets, financial institutions, and regional economic development. The

challenges for the upcoming years are the ways to sustain the humanitarian part and the inviolable right to freedom and personal privacy in an era of unlimited supply of information, many times mainstream information, and technological ventures. Once again, the need to find a proper balance between humanities and technologies is omnipresent. Social sciences and humanities must establish a tight cooperation in designing or co-creation of cyber technologies always keeping humans in the loop.