Inclusive Metaverse

How businesses can maximize opportunities to deliver an accessible, safe, inclusive Metaverse that guarantees equity and diversity.

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> A quarter of people living on Earth will be spending at least an hour a day in the Metaverse and 30% of the organizations in the world will have products and services ready for the Metaverse[1].

This study comes at a time when several companies have pledged to heavily invest in designing immersive technologies that will lead the development of the Metaverse.
The opportunities that the Metaverse will create in the future are almost limitless.
Notwithstanding the rise of limitless opportunities, it is important to define a baseline of understanding on how the Metaverse will provide safe, inclusive, accessible experiences for billions of people.
This is the reason behind we believe that this study is fundamental as inclusion, diversity, equity and accessibility will impact the design, use and implementation of the Metaverse.
The study was completed in February 2022 and shares the views collected from tech industry experts across the world about the design of an accessible, safe, inclusive Metaverse that guarantees equity and diversity.
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement N° 846284 and was led and conducted by Dr. Matteo Zallio and Prof. P. John Clarkson from the University of Cambridge, Engineering Design Centre, Inclusive Design Group.
All the figures, data and findings reported in this technical paper are produced by the lead researchers, if not differently named and have been gone through prior ethical approval from the Ethical Committee at the Department of Engineering at the University of Cambridge.
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Table of content

> The Metaverse, a digital immersive environment in which people interact by using immersive technologies, is shaping a new way people interact and socialize.

1. Why this research?

People have an innate need to communicate with other individuals to develop social interactions[2].
Nowadays the society is experiencing a transition from digital technologies to immersive technologies that facilitate interactions, socialization and communication between people across the world.
These immersive technologies have the potential to shape an entirely new user experience and to generate new interactions between people, technology and spaces.
Notwithstanding that Digital twins, Virtual twins, and 3D immersive experiences have been around for more than a decade, recently several tech companies invested a considerable budget to develop user-friendly digital, virtual, immersive environments, named as the Metaverse[3], the Omniverse[4], or the Multiverse[5].

The Metaverse, currently known as a set of digital spaces, including interconnected immersive 3D experiences[6], allows people to be virtually represented by avatars in a digital immersive environment where they can connect, socialize, work, and explore 3D immersive spaces with others who are not physically present.
There are different nuances that currently characterize the Metaverse as it can provide new sensorial experiences, cognitive feedback, and even more to what people can currently experience with smartphones, tablets, computers, and other mainstream consumer electronics.

The boundaries for what the Metaverse could be and what people could do with it and in it are just set by human's abilities of imagination.
Whilst many opportunities are rising, several challenges appear as well.
Recently, the Institute of Digital Fashion, in partnership with the Circular Fashion Summit, reported that avatars are failing to represent the identities of users want to express[7].
Considering behavioral and social aspects of Inclusion, Diversity, Equity, Accessibility and Safety (IDEAS) in the digital world this research explores with a qualitative study the social impact that the Metaverse will have on human beings and what directions business have to take to maximize opportunities to deliver an accessible, safe, inclusive Metaverse that guarantees equity and diversity.

We carried out a qualitative ethnographic study with industry experts to explore through the lens of inclusion, diversity, equity, accessibility and safety the social impact of the Metaverse.

Image showing a person with a VR headset on a bike
Photo by Tima Miroshnichenko from Pexels

2. What is the Metaverse?

The Metaverse is not a recent concept.
In 1992 Neal Stephenson wrote a science fiction novel, Snow Crash, in which the term Metaverse appeared for the first time as a virtual urban environment that runs around the circumference of a spherical planet[8].
Almost a decade later, in 2003, Linden Labs, a San Francisco-based company, created Second Life, a digital, virtual environment in which people could create avatars and immerse themselves in a digital life through the use of an Internet connection and a computer[9].

Following these early attempts to build digital immersive environments, investments from the gaming industry, including Roblox, Active Worlds, Epic Games and many other businesses, provided a fertile ground from which the Metaverse and its correlated applications started to be developed.

In recent years other tech businesses approached the Metaverse with a different interest. With a rebranding effort, the well-known social media company Facebook pivoted its brand to Meta, as a way to "bring together Facebook apps and technologies under one new company brand and focus on bringing the Metaverse to life by helping people connect, find communities and grow businesses"[10].
Microsoft similarly invested in the immersive environment business by acquiring the gaming company Activision Blizzard[11] and by implementing early-stage developments of avatars and digital immersive environments in their popular Microsoft Teams platform with Mesh[12].
NVIDIA with the Omniverse promoted an easily extensible open platform built for virtual collaboration and real-time physically accurate simulation for creators to connect major design tools, assets, and projects to collaborate and iterate in a shared virtual spaces[13,14].

In this period in history, which can be named as the immersive technology renaissance, the Metaverse, or its counterparts, cannot be defined only as a single digital immersive environment owned by one company. There will be different digital worlds, exactly as there are currently different social media platforms, online meeting services, productivity software, online e-commerce environments and many more.

Other than agreeing on the fact that there will be several digital immersive environments that will be owned, run, or administered by various companies, and that those environments will allow their users to be immerse in a range of known and unknown experiences, it is too early to define the Metaverse with a unique, stringent definition.

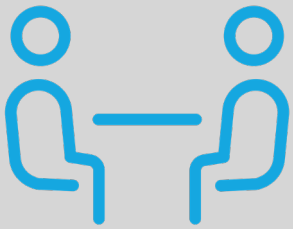
> We are now experiencing the immersive technology renaissance.

Image showing a person wearing a VR headset
Photo by Artem Podrez from Pexels

3. Who cares about the Metaverse?

To find answers, trigger new questions and lighten up fresh directions this research explores through the lens of Inclusion, Diversity, Equity, Accessibility and Safety (IDEAS) the social impact that the Metaverse and its correlated applications have on people's life and behavior.
Through in-depth, semi-structured interviews we collected opinions expressed by tech industry experts working in companies that are currently shaping future digital immersive environments.
The key goal of the interviews was to explore challenges and opportunities and to identify key trends to inform the development of best practices for designing digital immersive environments that guarantee Inclusion, Diversity, Equity, Accessibility and Safety (IDEAS) for all.

Several tech industry experts with experience in design, 3D and immersive technology development and project management were recruited across some of the largest technology corporate businesses of the world (e.g., Google, NTT, Panasonic, HTC, Meta, etc.).
Participants were contacted via email or direct message on social media platforms (i.e., LinkedIn, Twitter) to illustrate the purpose of the study and were asked to submit their interest to participate in this research.
After approval from the Ethical Committee at the University of Cambridge, a panel of experts took part in the study.
Interviews were scheduled between January and February 2022 and started with a verbal introduction to the aim of the study, followed by a series of open-ended questions.
The questions focused on understanding more about awareness and knowledge people have of the Metaverse, on the impact of privacy, integrity, and ethics, on the prominence of safety and wellbeing, and brainstorming best practices to guarantee Inclusion, Diversity, Equity, Accessibility and Safety (IDEAS) in the Metaverse.



A panel of experts from the tech industry with experience in design, 3D and immersive technology development and project management.

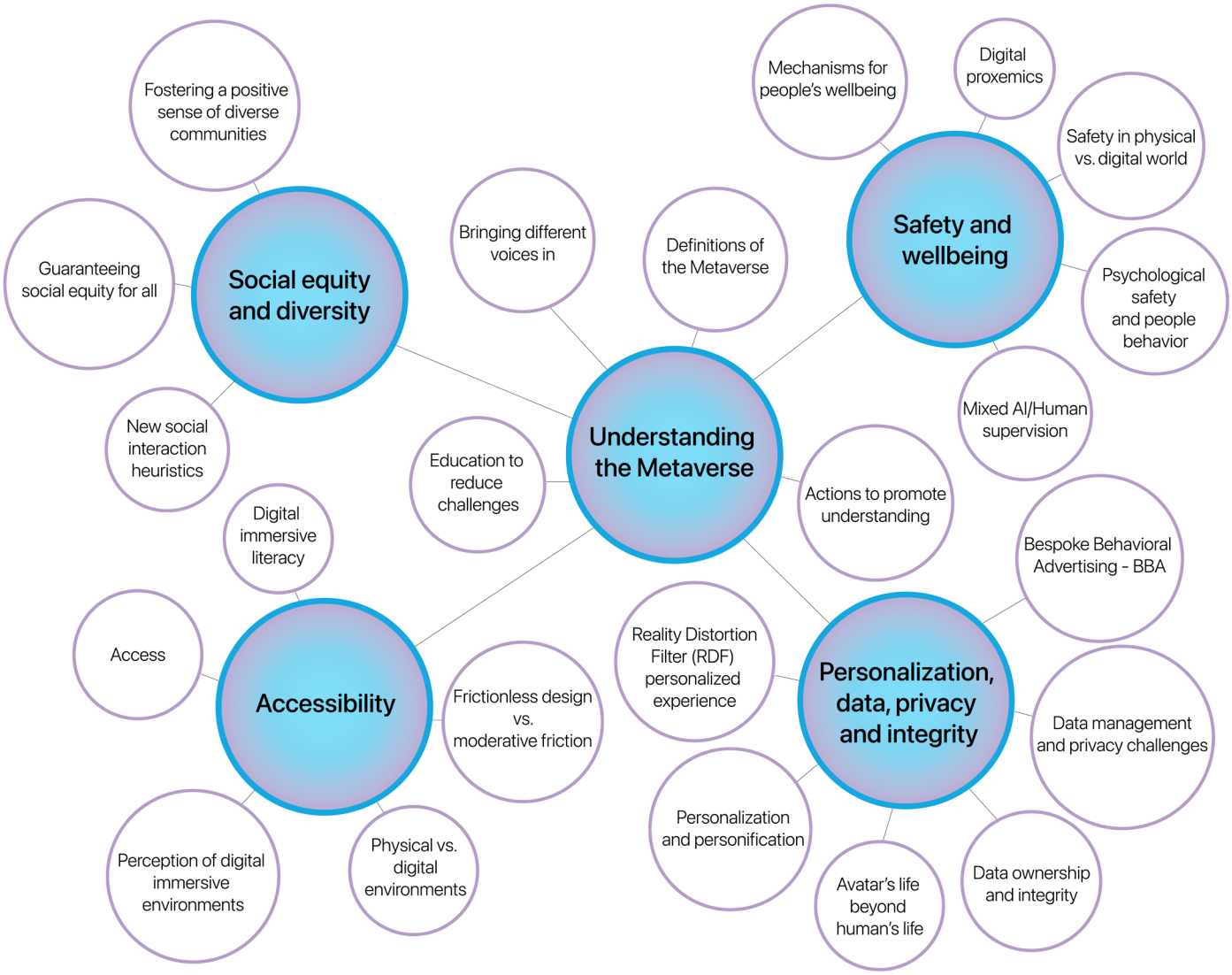
Researcher Matteo Zallio and its avatar meeting a friend in the Breakroom Global Village

University of Cambridge

4. Where are the opportunities?

Data from the interviews were analyzed through an evidence-based procedure by coding interview notes and recordings. During the analysis a series of patterns emerged and five themes with subsequential subthemes were described.

One focused on the central topic of promoting an understanding of the Metaverse.
A second focused on the impact of people's safety and wellbeing.
A further important theme focused on personalization and the impact of data, privacy and integrity.
A fourth focused on the accessibility of physical and digital immersive environments.
The last, but not least focused on the impact of social equity and diversity and the opportunities to attract representations of diverse communities.



Theme Subtheme

Overview of identified themes and subthemes from the interviews

4.1. Understanding the Metaverse

What emerged from the conversations is that the Metaverse will be an entirely new world where people will spend time differently than in the physical world, where a new language and new heuristics will be developed, and new interaction paradigms will have to be designed.

The Metaverse can be imagined almost like a "layer on top of the real world that doesn't replace the real world" which could enable users to better understand the real world by disclosing emotions, feelings, ideas that with only human senses might be difficult to capture.
The variety of feedback collected about the definition of the Metaverse allows to consider it as an evolving entity which hasn't been clarified yet to experts and neither to the final customer.
What appears to be certain, is that there will be not just one Metaverse, but there will be different digital immersive environments who will constitute a galaxy of Metaverses.

Once the concept of the Metaverse will be more clearly understood, it will be important to create a series of learning and educational actions to ensure users understand what it is and what avenues and opportunities it will create.
To share the message about the Metaverse it is important to have different voices to talk about it, let people with diversity of background and ideas to seat at the table, embed them in the design process, let them to try the technologies, and create learning support, material and knowledge about the Metaverse by building analogies with what users already know.

Creating awareness, developing knowledge, and designing digital literacy programs for users of all ages, gender, culture, and abilities is fundamental to reduce the missteps people made in the past with the launch of certain technologies.
To prevent an undesirable impact on people's life there is a need to enlighten the concept of access, use and benefits of the Metaverse for a variety of users from different parts of the world, with particular emphasis on vulnerable groups and underrepresented communities. This process can be done by starting from securing access for people with different age and abilities, to guaranteeing socio-economical access for people from developing countries, to improve its use in K-12 educational, working or entertainment contexts, and address the needs of historically marginalized communities versus non-underrepresented minorities.

It is not only a conversation about how big the door to access the Metaverse is, but more about how the door could be opened by different people by emphasizing the sense of belonging and help them to understand how they can be part of something new.

"A digital world empowered by metaphors like a body extension"

"A dystopian depiction of what people imagine now"

"Do everyone should be exposed, and everyone should be able to use the Metaverse?"

4.2. Safety and wellbeing

When people use different devices to access the Metaverse it is easy to experience physical discomfort or even to get physically hurt by hitting real-world objects in the surrounding space, as there is a lack of feedback of the surrounding physical environment when the person is fully immersed in the Metaverse.

Similarly, the ergonomic configuration and the excessive weight of VR headsets or other wearable devices can constrain movements or carry muscular discomfort if worn for excessive time.
Analogously, the proxemics in the physical environment, which refers to the amount of space that people feel necessary to set between themselves and others, will transition in the Metaverse as the digital proxemics.

"We have to be mindful that the Metaverse is real, is a true space in which people can feel, experience emotions and develop ideas"

When considering mental and cognitive safety there are first social challenges to investigate, rather than purely technological challenges.
When entering the Metaverse excessive noise, overwhelming information, behavioral, verbal, or visual harassment, can lead to a variety of emotions such as fatigue, depression, embarrassment, which could carry loss of self-confidence or even more impactful consequences for the user.
While the Metaverse can be outlined as an immersive, digital, almost surreal environment, the human dimension will have to prevail. Therefore, by creating a digital, immersive world where information about avatars, real-time behavior tracking, and potentially digital twins of human beings are created and stored, there might be possibilities that this information can affect the psychological, physical, and biological sphere of human beings participating or even the ones not joining the Metaverse.

Psychological, physical, and biological behavior will undoubtedly inform the study and development of safeguarding mechanisms.
Several participants claimed that there should be a safeguard mechanism composed of AI-based algorithms and human beings' supervision with a "human in the loop process" able to discern with a case-by-case approach what is acceptable from what is tolerable.
Others pointed out to the creation of digital filters, friction processes, or shields systems, that will reduce, temporarily flag, and suspend or permanently block the activity of avatars.
Others expressed the prospect of creating a body of third-party evaluators and safety officers who can check and evaluate the digital, immersive environment and the content generated to be safe, inclusive and accessible.

"We will not lose what makes us humans, we should not lose our behavior and actions we do in the real world, just because the world we're in is different"

What is certain is that an emergent need to empower the user of the Metaverse with a new language and new heuristics while guaranteeing people's physical and cognitive safety and overall wellbeing is of great importance for designing a good Metaverse.

4.3. Personalization, data, privacy and integrity

What people see in the Metaverse, but also how they see things, what feelings and biological responses are triggered constitute rich data that can be collected, stored, and managed.
Data will have a bigger magnitude and several layers of complexity and can be used to build very precise user personas and to create new metrics that forecast behaviors (e.g., tendency to aggression, tendency to get irritated, tendency to hurt others, etc.).

The content and data created in the Metaverse could also be used to add an informative layer to provide users with more information both in the digital and physical worlds.
Both the content created in the Metaverse, as well as the data generated by the technologies people will use to access the Metaverse, can be used to offer new enriched experiences with more meaningful information but can also generate profitable assets for businesses. These layers of content generated inside and outside the Metaverse, as well as behavioral and biological data from the users, will impact new strategies of Bespoke Behavioral Advertising (BBA) which could support businesses to create personalized advertisement and offer users services and products answering their future needs.
The Bespoke Behavioral Advertising (BBA) strategy will be more effective than what is in place with current web cookies. To guarantee a human-centric Bespoke Behavioral Advertising (BBA) strategy there is a need to create a universally agreed code of conduct helping to manage privacy, ethics and integrity across different digital immersive environments and raise awareness across the community by persuading businesses to develop informative tools based on shared principles.

Content personalization is strongly correlated with representation of individuals, communities, and AI-based systems and it raises concerns regarding manipulations and ethical data management. As an example, there will be a need to understand if a content, an avatar or simply the environment in which an avatar is present at a specific moment has been hacked or manipulated.
A systematic lack of depth in analyzing this challenge and associated risks and not providing with ethical solutions, might lead to create a Reality Distortion Filter (RDF) which can mine users' safety inside and outside the Metaverse.
On the other hand, as in the Metaverse it will be a lot about the point of view, the Reality Distortion Filter (RDF) represents a massive opportunity to create an added value for users that can see the appearance of objects and content differently than other users or observers perceive.
For example, if two avatars are playing chess, and both want to use black chess pieces, an external audience attending the virtual event could use a Reality Distortion Filter (RDF) to see the black and white pieces to differentiate players.
The RDF could offer endless opportunities to personalize content.
Personalization appears to be an important factor for a good Metaverse, as it can allow different people to access the technology, the services and can raise the quality bar of the content to be delivered.

"Who really owns the avatar: the user or the platform?"

"Freedom with limitations: it is the digital world, but the interactions will be with real people"

"What you see in the virtual world, changes the way you are wired and the way you think as much as the real world"

4.4. Accessibility

In physical environments the force of gravity is one of the most evident impediments that constrain people with physical impairments to not fully access the physical world. In the Metaverse we have a great opportunity to reduce physical accessibility barriers as there is no force of gravity.
Will this opportunity allow the architects of the Metaverse to design chairs, tables and furniture without legs?

This and many other questions will help to shape not only the Metaverse but how people perceive and what they desire from it.
An important part of the perception of accessibility concerns with the comfort of certain technologies people with different needs experience.
For instance, how to seamlessly adjust the distance between pupils, how people can wear eyeglasses with VR headsets for extended hours, how to cope with different syndromes like labyrinthitis, mental fatigue or cyber sickness will affect the access and the perception of the Metaverse.

A further example of accessibility relates to the fact that most VR headsets are currently designed for adults, without considering the needs of people in the K-12 age group. This challenge leads to exclude a large audience from a potential use of digital immersive environments.
The same applies for people with physical or sensory disabilities, but also for who has low digital literacy skills or no access to expensive devices and technologies that are currently available in the market.

When talking about accessibility, it is important to remember that the Internet wasn't intentionally designed to be accessible for all from the start, however when the Internet became more popular, and only after the rising requests from advocacy groups to make it accessible for all, developers and designers started to improve it. Several best practices, regulations, including the Web Content Accessibility Guidelines (WCAG), tools and technologies (e.g., screen-readers, high contrast mode, voice control, etc.) were developed to allow people to access the web in different ways.

Nowadays with the Metaverse we are at a different point in history and there is more knowledge of Inclusive Design, more understanding of DEI practices and regulations on accessibility, therefore the design community has no excuses to not design a Metaverse and its technologies that will be truly inclusive and accessible for all from the start.
Tech companies are best positioned to understand how they build products to be more inclusive and to offer more equitable opportunities to the widest number of people.

Image showing a kid wearing a VR headset
Photo by Jessica Lewis Creative from Pexels

"The Web was born without developers asking that there would have been accessibility problems for people with disabilities or with less opportunities"

4.5. Social equity and diversity

As the culture of DEI (Diversity, Equity, Inclusion) grew prominently in different companies due to several societal facts, it is clear that the access to a technology or a service can create a baseline of social equity.
What people experience in the physical world can reflect a similar experience, somehow in an amplified form, in the digital world. If a child is excluded from playing with another group at school because of ADHD, a similar or even an amplified experience can happen in the Metaverse.
If someone walks up towards a group in the physical world, people are conscious of each other and turn to include the new entrant or put in place behaviors that won't allow the person to join the conversation. Will this be the case in the Metaverse? What heuristics will be developed to guarantee inclusion and an equitable experience for all in the Metaverse?

As the boundaries of DEI are becoming blurred when talking about digital immersive environments there are several layers of complexity to facilitate positive human interactions. For example, the human sense of belonging to the Metaverse will drive different perceptions of inclusion and exclusion of people of different gender, culture, age, ability, religion or language.
The richness of diversity of people and businesses that can create and access the Metaverse will spark new solutions, scenarios, and experiences, however there is a high risk of concentrating the availability of the resources only to a reduced number of individuals. This practice can lead to a profound exclusion process that, despite the effort to create an inclusive Metaverse, the socioeconomical and educational barriers, together with accessibility barriers, will potentially reduce the effort to create a Metaverse based on the principle of inclusion by design.

Designing a Metaverse that embraces DEI is not only about creating a sense of belonging and respect in the digital space, but starts ahead in the process, by having more diverse voices to join the conversation about the concept of the Metaverse and have inputs to shape what the future of a good Metaverse will be.
The Metaverse offers a great opportunity to overcome so many challenges people face in the physical world. From physical disabilities limiting the access to places, to social exclusion due to lack of exposure to diversity of human beings, to opportunities to enable new sensorial experiences for people who have sensory or cognitive impairments.

The big question

How much the Metaverse will provide opportunities for diminishing accessibility barriers and increasing inclusion, by guaranteeing safety, diversity and equity?

*"Once I am in that [Metaverse], do I feel that I belong there?
It is not a problem about the Metaverse, is a problem with its inhabitants"*

Image showing a kid wearing a VR headset
Photo by Julia M Cameron from Pexels

5. How should we design the Metaverse?

The Metaverse appears as a digital, immersive environment in which not only tridimensional scenarios will be developed, but potentially any type of service can be ideated as in the physical world.

However, the speed in which real world alike services are replicated in the Metaverse is faster than their development process in the physical world. It took years, excessive budget, and the effort of thousands of people to develop successful social media platforms or online marketplaces which rely on goods and services in the physical world, whereas only a few weeks to develop similar services in the Metaverse (e.g., Parcel).
This example allows to think deeply about the questions to define design principles for a good Metaverse, its services, and correlated technologies.

Narrative and educational effort about the Metaverse has to be developed to promote an honest conversation, definition and promotion across different communities. Conversations will spark ideas on how the Metaverse will be organized, what shape will have and how it will be managed. Some argue that it could become like a monarchy, with a sovereign authority governing it, others like a democracy with different layers of authority, others a decentralized, almost anarchical system.

Once people will start accessing, using and spending time in the Metaverse a series of deeper questions regarding mental and physical safety and wellbeing will rise. People will have to be aware when they are entering an environment and understand its measures for safety.
Designers will have to create systems to protect users from risks and privacy issues by inventing shields, boundaries, filters to define what is real and what is not, so people can be safe in both worlds despite of what is happening in the physical or digital immersive environments.

Virtual Personal Protected Space (VPPS) will become an essential measure to prevent harassment, unwanted behavior, or simply to offer avatars a break from an intense cognitive or physical activity in the Metaverse, exactly as it happens in modern office spaces with sensory rooms for relaxation and stress-relief.
Content personalization and user's self-expression will be driven by safety and privacy in the Metaverse.
While people can personalize their avatar and its behavior, would the content be so personalized that could also affect the life of people in the physical world?
Different avatars will be able to populate the Metaverse and personalize their aspect according to other avatars or real human beings. On the other hand, bot-avatars, or AI-based avatars can be created and populate the digital immersive environment and potentially create a distortion of what a humanly populated Metaverse could be.

This and other dynamics, such as the use of a Reality Distortion Filter (RDF) to alter the perception of certain users about what they experience in the digital space, could lead to new opportunities but also challenges including physical and mental safety concerns and potential harm for the users and the system.

VPPS: Virtual Personal Protected Space

Is a new strategy that allows users to secure a shield instantly protecting them from safety and security issues in the Metaverse.

RDF: Reality Distortion Filter

Is a new strategy that allows to alter the perception users have about what they see, feel or experience.

5. How should we design the Metaverse?

Data, privacy and integrity will be key aspects for a good Metaverse.
When people will populate and personalize the Metaverse with any sort of digital entity, questions regarding data protection and ownership will emerge.

Content created in the Metaverse, including visual art, sounds, music, verbal content, and many more, during a meeting, a party, a social event, a gathering, will be considered owned by the Metaverse, the hosting business, the avatar(s), the humans behind (if any) a decentralized system or who?
What will happen to the information about the user and the surrounding environment collected by the personal devices used to access the Metaverse?
The variety of content generated and data collected inside and outside the Metaverse will become even more valuable than current data generated with Internet browsing and new strategies of Bespoke Behavioral Advertising (BBA) will be developed. With Bespoke Behavioral Advertising (BBA) there will be new opportunities for engaging users in more meaningful experiences, as well as new business development ventures.

Data protection and governance can be guaranteed by intertwined technologies, services and strategies that are supervised and driven by humans: the data generated and its management policies, the software and its deployment, technologies and their inclusive design and the AI-based algorithms that feed the Metaverse are part of a whole ecosystem that lays its foundations on a human-centered approach.
While the data and content generated in the Metaverse will help to shape a new language of interaction and new heuristics, different avatars and entities will populate the Metaverse and help define new behaviors and needs.

During the design of the Metaverse several answers to these questions will be created, but one that is connected to the legacy of social media platforms underlines the importance of friction, a concept embedded in the Slow Internet.
Slow Internet, almost like the concept of Slow Food[15] allows users to consume content of higher quality, rather than numerous content. It is about quality versus quantity.
Therefore, it appears that rather than pushing viral content in the Metaverse, context could offer a more nuanced option to approach clarity, ethics, integrity, and safety.
The designers of the Metaverse will be particularly excited about developing an entirely new set of principles and heuristics to drive the future design practice.

Designers will create for users of the Metaverse new proprioception interactions to enhance the human perception of its body, space, and people around.
The use of new technological prosthetics such as VR or AR glasses, wearable haptic garment, and intra-body sensors will convey users a completely new physical, sensorial and cognitive experience.

BBA: Bespoke Behavioral Advertising

Is a new strategy that uses user's behavioral and biological data to customize advertising and content in the Metaverse.

Image showing a person wearing a VR headset
Photo by Eren Li from Pexels

6. A manifesto for inclusion, diversity, equity, accessibility and safety in the Metaverse

Ten principles for designing a good Metaverse

1 Is open and accessible

2 Is honest and understandable

3 Is safe and secure

4 Is driven by social equity and inclusion

5 Is sustainable

6 Values privacy, ethics and integrity

7 Guarantees data protection and ownership

8 Empowers diversity through self-expression

9 Innovates responsibly

10 Complements the physical world

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6. A manifesto for inclusion, diversity, equity, accessibility and safety in the Metaverse

While some readers might expect to receive clear answers and detailed information on how to design a safe, accessible and inclusive Metaverse from this study, they might feel disappointed after reading this report.
The main goal of this qualitative ethnographic study is to inspire businesses and designers by offering an overview of thematic areas to further investigate and nuanced information difficult to capture with a quantitative study.
This report and its correlated scientific publication, rather than offering clear answers, aims to spark conversations, enlighten the imagination of new scenarios, stimulate critical thinking and develop inspiring questions.

Do the architects of the Metaverse will only care about aesthetics, appearance and form given the fact that the necessity to satisfy basic human needs such as toileting, eating, sleeping, transportation and many more is not needed in the Metaverse?
Will the Metaverse become the place in which designers can practice a discipline that lays in between engineering, product design and art?
Will the Metaverse be the place of anti-design?
Will the Metaverse be the place where a new design culture will be developed?
Will the design of the Metaverse shape new ethical principles – Metavethics[16] – that will clarify what an avatar is, who is eligible to create an avatar and for how long an avatar will be able to exist?
What happens if the company owning one of the Metaverses will stop the service and all the avatars, the houses, the content will disappear?

As the society is rapidly moving towards addressing the Sustainable Development Goals for all human beings, Inclusion, Diversity, Equity, Accessibility and Safety (IDEAS) are becoming fundamental pillars upon which rebuild the physical world and design the Metaverse.

Image showing a person playing videogames with an astronaut helmet
Photo by Erik Mclean from Pexels

The next start.

Designing the Metaverse is an activity that needs to be done by people and with people.
Designing the Metaverse will have to bridge knowledge and expertise from people who designed the real world, buildings, neighborhoods, cities, services, and learn from most of what has been done so far to guarantee representation and a culture of diversity, equity and inclusion[17,18].
Designers of the Metaverse will have to learn from the past to reduce the opportunities for potential pitfalls in the future.
Designers will have to remember that the Metaverse doesn't substitute the physical world, it complements it.

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Technical report ENG-TR.013 by Dr. Matteo Zallio and Prof. P. John Clarkson, University of Cambridge, Engineering Design Centre, Inclusive Design Group. The scientific rationale, method, data and results are in publication in an academic journal.

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