mtm

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Media literacy, immersive technology and the future

MTM research for Ofcom

About MTM

MTM is an independent research agency, specialising in technology, media, and entertainment. Our expertise helps businesses and regulators understand and adapt to a world that is digital-first and changing at pace.

Our team includes award-winning researchers, commercial strategists, analysts, and cultural trends experts, and our work guides organisations from insight to action. We shine a light on people's real-world use of technology, digital products, and services – the role they play, the problems they solve (or fail to solve), and how they fit into people's lives. The themes and questions we explore range from understanding what makes a winning app to defining the impact of diversity in digital media.

This project was carried out by our UX (user experience) and qualitative research teams and involved both exploratory observational research conducted in-home, and focus groups. Fieldwork had a focus on real-world usage of video games, VR, AR and Web3 platforms. The work was completed by Michael Thompson, Andrew Dodds, Archie Booth, Laura Fisher, Emma Morrison and Rafaella Dhelomme. The MTM team was supported by Professor Andrew Burn of the UCL Institute of Education and ReMAP, an expert on media literacy and digital technology, and Karl Hopwood, an independent e-safety expert and a member of a number of working groups at UKCIS (UK Council for Internet Safety).

This report was written by Michael Thompson and Archie Booth.

Ofcom Foreword

Ofcom has statutory duties to promote and research media literacy[1]. One of the ways we seek to fulfil this duty is through our Making Sense of Media programme, which aims to help improve the online skills, knowledge and understanding of children and adults in the UK.

The research conducted via our Making Sense of Media programme provides Ofcom and its stakeholders with a robust and innovative evidence base across the many facets of media literacy. Our tracker studies - our Adults' and Children's Media Lives qualitative projects, and our Media Use and Attitudes quantitative surveys – are long-established and provide rich insights into the ways in which people's media use and literacy has changed over time. To complement this work, we also commission stand-alone research projects which deepen our knowledge in specific areas.

This report is a stand-alone research project into the use of immersive technology and immersive platforms. Our aim was to understand the way that immersive technology is currently used and may be a part of people's lives in the future, and to identify the emerging media literacy challenges in this arena. This report illustrates, through in-home technology observations and online focus groups, the ways that immersive technology can be used and understood by people across society. It also examines the extent to which user-experience of immersive technology and platforms can enhance critical analysis, encourage the learning and development of new skills, and complement existing and new social relationships. While the benefits of using immersive technology and media literacy impacts are discussed throughout, the report also examines the challenges that were faced by participants.

This report provides an overview of the research findings and explores in detail how participants understand immersive technology; the intersection of immersive technology and media literacy; and participant reflections on the future of immersive technology in society. The insights in this report will inform our work with communities, stakeholders and platforms in this constantly evolving space.

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[1] See section 11 and section 14(6)(a) of the Communications Act 2003.

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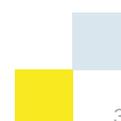
Summary

This report looks to understand the use of 'immersive technologies' such as video games, Virtual Reality (VR), Augmented Reality (AR) and Web3. Ofcom commissioned MTM to explore the role of immersive technology in people's lives, how this might evolve in the future and the potential media literacy challenges involved.

This research involved a total of 30 x 2-hour in-home observations and interviews carried out with users of immersive technology aged 13-59 as well as 2 x 90-minute focus groups carried out with parents of children aged 5-13[2]. Participants were recruited from across the UK and included people from a mix of life stages, socio-economic groups, genders and ethnicities.

User perspectives on Immersive technology

Participants identified a range of characteristics which differentiated immersive technologies (and the platforms they gave access to) from other forms of technology they used. They saw immersive platforms as being **co-creative**, enabling them to build avatars, environments and other objects which users could interact with. They found immersive platforms to be **highly social**, enabling them to have contact with large numbers of people in a relatively intimate way (e.g. through voice and text chat, shared gameplay and creative activities). Finally, they recognised that immersive platforms delivered **open-ended experiences** which were constantly evolving, incorporating new updates and features.

These characteristics provided participants with a wide range of reasons to use immersive platforms. Among other things, they were driven by a desire for competition, escapism, novelty and entertainment. However, continued use was often motivated by deeper social and psychological factors. These included:

- **Identity** – participants created environments, avatars and other objects that enabled them to express themselves and their identities
- **Status** – participants acquired social status through their use of immersive platforms, e.g. through their skill in the game or their ability to create environments which other people admired
- **Pleasure** – participants enjoyed the novelty of the experience; they found pleasure in exploring new worlds and in playing games
- **Belonging** – the intense sociality of immersive platforms gave participants a sense of belonging and many had developed strong bonds with other users
- **Safety** – neurodiverse participants said they felt safe using immersive technology; it was familiar and predictable and provided a controlled, virtual environment in which they found socialising easier

Users of immersive technology are a highly diverse group. This research identified three broad types of participant. Enthusiasts were using the greatest range of technologies and platforms, playing for the longest periods (often over two hours every day) and had the widest social networks. Intermediate users played for less time, had more limited networks and were less goal-oriented than Enthusiasts (i.e. succeeding in the game or experience was less important to them). Casual users played less (typically a few times a week), saw immersive technology as a pastime rather than a dominant interest and did not tend to have social interaction with users they didn't know in real-life (IRL).

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[2] The focus groups included one group with parents who used immersive technology and one group with parents who themselves did not use immersive technology.

Immersive technology and media literacy

Across these user profiles, the research identified six areas in which immersive technology had clear implications for media literacy – access, learning and skills, critical analysis, creativity, social interaction, and privacy and security. These are addressed below.

1. Access

The costs of getting started with immersive technology varied widely. Participants perceived certain technologies to be relatively inexpensive and accessible because they did not require users to purchase specific devices – they could use existing laptops and smartphones. The major barrier to access was the cost of newer and more advanced devices or devices specifically required to access immersive technologies such as consoles and VR headsets. In addition, parental expenditure was essential to children's access – and was often determined by the extent to which parents saw immersive technology as being a worthwhile investment. Some participants worried that this might exacerbate the digital divide.

2. Learning and skills

Some Intermediate and Enthusiast participants had been inspired to pursue STEM (Science, Technology, Engineering and Maths) subjects in education following their use of immersive technology. Participants who were still at school saw an overlap between the skills they learned in immersive technology and elements of coding, computer science and digital creativity they were being taught at school. Many parents also regarded digital creativity, coding and design as desirable skills which would be beneficial for their children's future education and employment opportunities.

3. Creativity

Immersive technology encouraged participants to engage their creativity, whether through building objects or worlds, creating games or solving challenges. Engaging creative thinking had clear benefits for participants – they had developed skills and often felt a sense of reward and recognition from other users when they created something that was considered interesting or impressive. Immersive platforms provided a 'safe space' for users to explore their creativity. Participants' sense of identification with their creations is a differentiating feature of immersive technology. These participants saw their creative output as a way to express themselves and their personalities.

4. Critical analysis

While many participants had a good working knowledge of immersive platforms (they understood how gameplay features worked and were sometimes able to inspect code and modify elements of the game), few took a critical perspective on the technology or analysed the ways in which games and experiences might influence them – for instance, by encouraging them to play for longer or spend money.

Participants often needed an outside point of view to help them see things from a critical perspective. This was typically provided by parents, teachers and other non-users who had some distance from the experience and were able to perceive the behavioural and commercial demands of the platforms used.

5. Social interaction

Immersive technology was often central to participants' social lives and friendships. Nevertheless, participants saw anti-social and abusive behaviour as a constant threat and

many regulated their interactions with other users. Participants did this either by setting rules around who they would chat with or by setting controls limiting their contact with other users. Use of controls was easier on more established platforms, where participants tended to be more familiar with them.

6. Privacy and security

While many participants were setting on-platform controls to stay safe, some were involved in potentially riskier behaviours such as profile sharing (sharing gaming profiles to take advantage of another player's skins[3], inventory, etc.). Overall, female participants were more cautious about their privacy than male participants and would not make their gender known to other players to minimise the potential risk of experiencing abuse and harassment.

The future of immersive technology

In future, participants believed that immersive technology would offer even more opportunities to create and interact with user-generated content. For some, this raised ongoing questions around the ownership of user-generated items (avatars, environments, etc.) and users' rights of access to their own creations.

The intimacy and scale of social contact in virtual worlds was something participants saw as increasing in future, with ever-greater numbers of users coming into ever-closer proximity with one another. In response to this, many participants wanted social controls and settings to be easier and clearer to access, reporting of anti-social or abusive behaviour to be easier and age-appropriate use of platforms to be monitored more closely and effectively.

Finally, Web3, the decentralized and user-centric future of the internet, raised some specific challenges for oversight. Participants had particular concerns around the security of cryptocurrency (they worried about the lack of safeguards if their coins were stolen or they made a mistaken transaction) and the efficacy of reporting other players for abusive behaviour. Web3 users generally believed that greater oversight of these platforms was required, whether by regulators or by platform owners.

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[3] A cosmetic item or customisation option that changes the appearance of a character, avatar, or object.

Introduction

Ofcom has a statutory duty to promote media literacy[4], as set out in section 11 of the Communications Act 2003, which includes taking steps or entering into arrangements calculated to bring about 'a better public understanding' of electronic media. Ofcom also has a statutory duty to make arrangements to carry out research into media literacy matters.[5]

'Immersive technologies' are products or peripherals (such as virtual reality headsets) which provide access to Virtual reality (VR), Augmented Reality (AR) and mixed reality environments. To assist and develop Ofcom's understanding of immersive technology's and platforms' current role in UK society, Ofcom commissioned MTM to explore its role in people's lives, how this might evolve in future and the potential media literacy challenges involved. Ofcom was particularly keen to identify the upcoming media literacy challenges in this area, to prepare for a future in which immersive technology and platforms might become more mainstream.

In this report, the environments to which immersive technologies provide access to are described as 'immersive platforms'. These platforms include but are not limited to video games, simulations, and virtual worlds. As well as being accessed through immersive technologies (e.g. virtual reality headsets), these platforms can also be accessed through non-immersive technologies such as computers and games consoles. This report will refer to immersive technologies and the immersive platforms to which these technologies facilitate access.

Definitions of immersive technology

Category	Definition
Video games	An electronic game in which players control images on a screen through a user interface (typically a computer or gaming console, although interfaces may also include virtual reality headsets).
Virtual Reality (VR)	A computer-generated simulation or interactive environment that immerses users in a 3D artificial world. Scenes and objects can be viewed, as well as interacted with, through peripherals such as controllers, and by using spatial and motion-tracking technologies. Some video games employ VR as a means of access.
Augmented Reality (AR)	A technology that superimposes digital content onto a real-world environment. Digital content might include any combination of sound, video, text or graphics.
Web3	A set of technologies, protocols and standards that aim to decentralise the web and enable peer-to-peer interactions. This is achieved using blockchain and other distributed ledger technologies, which allow for transparent and secure record-keeping.

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[4] Media literacy is "the ability to use, understand and create media and communications in a variety of contexts", see Making Sense of Media - Ofcom.
[5] As set out in section 14(6)(a) of the Communications Act 2003.
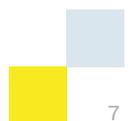
Objectives

In order to promote and research media literacy, the objectives of this project were to:

- Explore experiences of immersive platforms, focusing on what attracts users to these platforms or services and makes these experiences unique
- Identify the benefits of using immersive platforms and the potential risks and harms experienced
- Understand the media literacy touchpoints within existing platforms:
  - Identifying the levers being used by participants, parents, communities and the platforms themselves (as identified by participants) to promote media literacy and appropriate behaviour
  - Exploring participant perceptions of the perceived efficacy of these touchpoints and potential gaps where people feel they are potentially more exposed
- Explore current participant understanding of how these learnings may be transferred into 'metaverses[6]', and its perceived risks and benefits.

Methodology

The project involved 30 in-home immersive technology observations and interviews, each lasting two hours. Each interview was preceded by a screening questionnaire and pre-task capturing details of their immersive technology and platform usage. Participants were aged 13-59. To understand the experiences of younger children, there were two 90-minute focus groups with parents of children aged under 13. One of these focus groups was with parents who were also users of immersive technology and platforms and the other was with parents who themselves were non-users but their children were users of immersive technology and platforms.

The in-home observations and interviews took place in London, Cardiff, Glasgow, Birmingham and Manchester. Focus groups were carried out online and participants were drawn from across England, Scotland, Wales and Northern Ireland. Participants in Wales were given the option of a Welsh language interview, if desired. Recruitment was designed to include a mix of ages (13-59), genders, ethnicities and socio-economic groups.

Fieldwork was carried out in February and March 2023.

The table below shows the full range of platforms observed in the research, with the number of sessions for each ('n') provided. The range of platforms reflects natural fallout across the research sample and is not designed to represent the UK's use of immersive technology. When discussing immersive technology and immersive platforms in this report, we will not focus on the experience of individual titles but on the broad categories of technology used and the broad characteristics of the platforms studied, as perceived by participants. The platforms studied included a mix of the following types of games and experiences: creative, action, role player, simulator, social, gambling, sport and media. The platforms named in the table refer only to platforms observed during the in-home technology observations.

Platforms observed in the research

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[6] Metaverses, in their broadest sense, are persistent 3D virtual spaces in which users can interact with computer-generated environments and other users. They can be viewed through conventional interfaces such as mobile phones, TVs and monitors, but also through immersive technologies such as augmented and virtual reality (AR and VR).

Category	Platform observed
Video games	Roblox (n=4 observations), Minecraft (n=8), Fortnite (n=6), Second Life (n=1), Grand Theft Auto (n=4), Rainbow Six Siege (n=2), Valorant (n=2), After the Fall (n=1), Overwatch 2 (n=1), World of Warcraft (n=1), Genshin Impact (n=1), Marvel's Avengers (n=1), Foxhole (n=1), Escape from Tarkov (n=1), New World (n=1), Fallout 76 (n=1), Microsoft Flight Simulator (n=1)
VR	VRChat (n=4), Horizon Worlds (n=1), PokerStars (n=3), Tiltbrush (n=1), The Golf Club (n=1), Hyper Dash (n=1), Dota 2 (n=1), Minecraft (n=1)
AR	Pokémon GO (n=5)
Web3	Decentraland (n=3), The Sandbox (n=1), Odysee (n=1)

MTM worked with Ofcom and Professor Andrew Burn of UCL Institute of Education and ReMAP to develop the criteria for media literacy used in this report to comment on participants' interactions with immersive technology. Our starting point was Ofcom's definition of media literacy as 'the ability to use, understand and create media and communications in a variety of contexts.' Based on this and our research interactions, this report focuses on media literacy from six perspectives:

- **Access** – the ability to access and use immersive technology and platforms
- **Learning and skills** – the development of skills and capabilities
- **Critical analysis** – taking a critical perspective on the technology and platforms
- **Creativity** – the ability to use immersive platforms as a creative outlet
- **Social interaction** – the role immersive technology and platforms play in social interaction
- **Privacy and security** – consideration of risks and the ability to stay safe
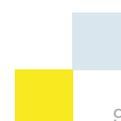
Understanding immersive technology

Participants recognised the characteristics of immersive platforms they used which differentiated them from non-immersive platforms. Participants however did not see clear connections between their different manifestations – in video games, VR, AR and Web3. This point of view was strengthened by the fact that most participants only had experience in one or two different types of immersive platform and so could not easily draw parallels between them to identify an all-encompassing definition.

The characteristics that participants felt were distinctively 'immersive' were quite consistent across the different types of technology studied and included:

- An emphasis on co-creation
- An active community of users
- An open-ended structure
- Non-linear gameplay
- An evolving, 'work-in-progress' (WIP) platform

We will look at each of these characteristics in turn and discuss the different ways in which immersive platforms were felt to be distinctive from other types of experience.

An emphasis on co-creation

Participants' ability to create avatars, worlds, games, and objects differentiated immersive technology from non-immersive technologies**.** Participants saw co-creation as being a core aspect of immersive technology. Using immersive platforms, they could create their own avatars, worlds, games, and objects. This felt future-facing to most participants. They were no longer limited to playing games or exploring environments that had been rendered for them from beginning to end. They were able to introduce their designs, interests, and personality into the experience.

Co-creation can be more limited or more extensive, depending on the desires and capabilities of the user and the limitations of the immersive technology. All participants for this research were designing and personalising their avatars, or (depending on the platform) choosing skins. Some were designing and creating buildings and objects of different levels of complexity, e.g. on platforms such as Minecraft and Decentraland. A step beyond this, others were creating whole worlds, often using coding in their designs (i.e. writing computer code to make modifications to the game). Finally, a few participants were also involved in creating games using platforms such as Roblox Studio and Unity.

Co-creation has several implications for the user experience of immersive technology, as well as for media literacy. It encouraged participants to identify with the platform as they had invested their time and energy into the experience and created something unique. It gave them a sense of ownership over the platform, as they often felt that their creations belonged to them. It created a feeling of shared history with the platform, as users typically had access to their backlog of creations. Finally, it created a sense of novelty, as the release of new tools, skins, etc. stimulated participants' interest, and continued engagement with the platform.

"With [world building game] in particular, it's open code, it's open for everyone to change it and so different members of the community can build, create, share their creations etc. There's always something new or different to do or see" – M18, Video Games, 18-24, Male, Manchester

Active community of users

Immersive technology provided participants with an intensely social experience compared to non-immersive technology. Participants rarely played on their own and were usually in close contact with other users. The nature of this contact was highly varied and included:

- Shared gameplay (in competition and on the same team)
- Building and creating with other platform users (i.e., co-creation in real-time)
- Chat (voice or text, in or out of game experience)
- On and off-platform (in-game contact vs. other messaging / social channels)

Overall, the social experience of immersive technology was characterised by intimacy and scale. Users were often thrown into intimate contact with other users and their avatars. For instance, their avatars might touch each other or fight one another, and conversations might be held among a few users at close quarters in which users could converse in a similar manner to in real life (IRL) group conversations. Simultaneously, the avatar could also be visible to large numbers of players, for instance, through large-scale simultaneous gameplay or off-platform messaging groups.

"I think one of the motivations for playing it is helping other people, seeing what they're doing and figuring out looking at the whole picture what I can do to help the team" B3, Video Games, 18-24, Male, Birmingham

Open-ended structure

As participants found their experience to be creative, it did not usually have a final destination and could continue indefinitely. This open-ended experience differed by the platforms observed in the study, for instance:

- Sandbox games and Web3 platforms do not have an ultimate endpoint and are not time-bound as they are spaces for users to create
- Purposive, time-bound games such as Fortnite's Battle Royale mode are less obviously open-ended but contain features, such as environment, skins and inventory, which are always evolving, and may also facilitate creative modes of play
- Some immersive platforms such as Roblox or VRChat contain a constantly evolving repertoire of user-generated games and experiences which facilitate open-ended, ongoing engagement with the platform

Immersive technology provides users with open-ended experiences that don't have a clear point of completion and can be returned to again and again. The nature of the experience is always evolving and is never the same twice. This was an attractive quality for participants and distinguished immersive technology from other types of gaming or digital experiences.

"If you wanted to log on and just chop trees or do quests for 2 hours you can do. It's up to you" – L10, Video Games, 25-29, Female, London

Non-linear gameplay

Connected to the open-endedness of immersive technology, participants also commented that it was non-linear. Experiences were not usually confined by prescriptive gameplay that required them to complete tasks in a specified sequence. They were able to switch from one activity to another, for instance from gameplay to chatting with friends to viewing content to creative activity. On some immersive platforms, users could adopt their own style of play and did not have to follow a prescribed storyline.

Work-in-progress

Participants commented that immersive platforms were 'works-in-progress' that were constantly developing. At the furthest point of development, some video games and VR platforms hosted games and experiences that are created by users. Participants were aware that these were always changing and being updated so that new experiences were frequently available. They enjoyed the variety this provided but also accepted the developmental and unpolished nature of some of these games / environments.

"The thing is about this kind of Web3 environment is there's no overarching level of control, it's not restricted to one developer it's more the community that's building it and maintaining it." - C2, Web3, 25-29. Male, Cardiff

Motivations for using immersive technology

Participants found great pleasure and enjoyment in using immersive platforms. Their reasons for using it focused on a wide range of factors including: a desire for competition; creativity and mastery of the game; the opportunity to learn; escapism; an appetite for novelty; a source of friendship and company; a desire for control; stimulation; exploration and entertainment.

The reasons for continuing to use immersive platforms over time often went deeper than the immediate drivers described above, however. Motivations for continued use typically coalesced around five psychological/social categories: identity, status, pleasure, belonging and safety.

Participants often saw immersive technology as fitting with or shaping their **identity**. Creating worlds or games might reinforce their sense of self as a creative person and their skill and ability might reinforce their sense of themselves as a capable and competent player.

They also acquired social **status** through their use of immersive platforms. If they were highly capable, friends and other users might ask for their advice, enhancing their self-esteem. Similarly, if they created something other people valued, used, or visited, this would boost their sense of self-worth.

Most participants simply found **pleasure** in the experience of playing games and using immersive technology. The novelty of the experience, the ability to explore the environment as well as the sensory stimulation and the pure entertainment value provided by the game or experience were enjoyable and invigorating.

The intense sociality of immersive platforms gave users a sense of **belonging**. They had become familiar with the environment and also had strong bonds with other users, whether these were people they knew IRL or whom they had met and developed friendships with within the game.

Some participants said that immersive platforms provided them with a sense of **safety** and that this was one of their motivations for using them. This was particularly the case for neurodiverse participants who, in some cases, felt safer socialising in a controlled, familiar and predictable environment than they did IRL.

Types of immersive technology user

We encountered three broad types of immersive technology user in this research. These were **Casual, Intermediate** and **Enthusiast** users.

Casual users tended to view immersive technology as a light-touch pastime activity. They were usually using a relatively narrow repertoire of immersive platforms, investing limited amounts of time and were less likely to be socially connected to other users. They typically had lower skill levels in terms of device / platform useability than other user types and were less goal-oriented.

Intermediate users had a strong interest in immersive technology and were willing to dedicate significant amounts of time to it but were less likely than Enthusiasts to feel that it provided them with life goals or core social relationships. Nonetheless, the development of skills required to become a good player was still important to them.

Enthusiast users saw immersive technology as one of their main interests in life. They were using a wide repertoire of immersive platforms, often across different technologies (video games, VR, AR, Web3) and investing a great deal of time in them. People they met via platforms were a significant part of their social lives and the development of skills / achievement of goals in immersive platforms contributed strongly to their sense of themselves and their talents.

Typology of immersive technology users

Behaviour	Enthusiast	Intermediate	Casual
Range of games played	Using 5+ immersive games on up to 4 modes (video games, VR, AR, Web3)	Using 5+ immersive games on up to 3 modes (video games, VR, AR, Web3)	Using less than 5 immersive games on 1 or 2 modes (video games, VR, AR)
Amount of time invested	Playing for extended periods (2hrs+) almost every day	Playing for extended period (2hrs+) a few times a week	Playing for extended periods (1hr+) a few times a week or less
Focus on developing skills	Highly focused on developing skills and capabilities to progress and succeed in games, and to be regarded as a good player	Want to develop skills and capabilities to progress and succeed in the game	Do not see development of skills or capabilities as a major aim, just want to be good enough to enjoy the game
Aims and purpose	Have strong ambitions within the games they play, and often have plans and strategies for achieving them	May have ambitions within the game and give thought to how they will accomplish these	Immersive technology is a pastime, they do not have significant ambitions or goals within the game
Range of social connections	Large network of online friends, including close friends (may regard online friends amongst their closest friends)	Play with online friends as well as IRL friends (unlikely to regard online friends as being as close as IRL friends)	Play with IRL friends, are unlikely to have online friends who they play with consistently

The following case studies show each type of participant and how immersive technology fits into their lives.

Participant case studies

Type	Case study
Casual	Participant L2 was a young professional with limited time to spend playing games and using immersive technology. He was interested in VR and had acquired a headset to try it out. He was disappointed that more of his IRL friends hadn't done so, as he would have preferred to play with people he knew IRL, rather than users he did not know outside of the technology. L2 used VR mainly for individual exercise, through games such as Beat Sabre. He was less interested in collaborative / multi-player games but did play VR golf and poker. Typically, when playing these games, he did not interact verbally with other users and chose environments that were relatively quiet and that he believed did not include younger players. He enjoyed the adult-oriented environments of PokerStars and was more open to interacting with other users in these environments. While he was not hugely focused on developing his skills, interactions with other players had helped him to learn poker and develop his abilities. He did not use multi-player immersive platforms more than two or three times each week. *"I'll also use PokerStars probably once a week...You've got eight people around the table chatting, even if I'm not actively participating, there is sort of a sense of community, it feels nice to hear an actual conversation happening live" L2, video games, 18-24, male, London*
Intermediate	Participant L1 was a keen Roblox user and enjoyed playing with IRL and online friends. He also played a range of other PC-based games but for financial reasons did not have access to a console or VR headset. He enjoyed the variety of games Roblox had to offer and liked trying new things. He was not particularly concerned with winning / being the best but did want to be seen as a skilled and competent player. L1 had an acute sense of the types of games he enjoyed playing and knew how to identify high-quality games on the platform through interrogation of publisher details, game rating scores and downloads. He had a sense of discernment and focus on his use of the platform. Gaming was a topic of conversation amongst his friends and being able to talk knowledgeably about Roblox and other games helped him to stay current and be a trusted source of information within his peer group. *"There's just so many things to try out and explore with friends. Building roads, interacting, or competing, there's so many different games / options to get involved with" – L1, VR, 25-29, Male, London*
Enthusiast	Participant M19 was a regular Minecraft player who loved playing both on her own and with a group of friends who she had met online.

She primarily played Minecraft for the creative elements and found that playing the game had significantly improved her mental health, helping her to wind down, switch off and immerse herself in the virtual world.

Over time she became more invested in the game, watching other users on Twitch / YouTube, reading Reddit and eventually chatting with other players on Discord.

The connections she made with other players through Discord were strengthened over time as they shared and engaged in each other's creations in Minecraft.

"I've made many of my closest friends through using Minecraft, friends from across the UK who actually came to my wedding day, because we became such close friends through playing online together" – M19, Video Games, 25-29, Female, Manchester

Immersive technology and media literacy

MTM and Ofcom worked with Professor Andrew Burn of UCL and ReMAP to identify and define the most relevant aspects of media literacy for immersive technology. This starting framework was developed as the project progressed, informed by the interviews and evidence gathered. Based on our analysis and discussions, MTM identified the six components below as being most critical to understanding the implications of immersive technology for media literacy:

- **Access** – the ability to access and get started with immersive technology, including consideration of cost, technological skills and availability of support from others
- **Learning & skills** – the ability to engage successfully with immersive technology and the process of acquiring the skills necessary to do so
- **Creativity** – the ability to develop creative skills within immersive technology and the dependencies involved in this, including education and access to information and guidance
- **Critical analysis** – the critical thinking required to assess why / how immersive technology works the way it does and the potential impact of this on users
- **Social interaction** – the role and significance of socialising through immersive technology, considering the impact of social interactions on the user and any benefits and risks
- **Privacy & security** – the impact of immersive technology on privacy and security and the ability of users to manage the technology in order to stay safe, secure and maintain their privacy

ACCESS

The ability to access and get started with immersive technology, including consideration of cost, technological skills and availability of support from others.

Participants used devices already available in their home to access some immersive technologies...

The costs of getting started with immersive technology varied widely. Participants perceived certain technologies to be relatively inexpensive and accessible because they did not require users to purchase devices specifically to access the technology. Video games did not necessarily require high-cost consoles. Participants were playing immersive video games on relatively low-cost laptops, or on smartphones. Similarly, AR was also accessed by participants using their smartphones. Most Web3 using participants were accessing Web3 platforms via PC or laptop which were purchased for non-immersive purposes.

"I just use my old laptop. It's a bit slow but I can play Roblox and Minecraft no problem. It's not the best experience but it works." – L1, Video Games, 25-29 Male, London

...however, this did not apply to all immersive technologies and affordability could be a barrier to access

Most participants saw the financial implications of getting started as significant. While laptops and phones were either not prohibitively expensive for participants or already available to them, the major barrier to access for participants was the cost of newer, more advanced, or up-to-date devices or devices specifically required to access immersive technologies. The access costs for VR and new games consoles, for instance, were seen as a major disincentive to take up by those who would otherwise be enthusiastic adopters of

immersive technology. Certain video games required users to have access to expensive consoles or gaming PCs first, especially if participants wanted to play the latest games release in a high-resolution format. Some participants were therefore playing on older consoles or laptops than they would have preferred or did not have the right devices for all the games that interested them. This was especially true of lower SEG households, where purchasing the latest tech was simply not an option on some occasions. Participants worried that financial accessibility might encourage or exacerbate the digital divide between those who were able to access new technology and those who weren't.

Some participants (typically Enthusiasts and Intermediate users) had made financial sacrifices to be able to afford their devices and were willing to do this at the expense of other areas in their life, such as not spending money on other social or leisure activities, because gaming was their main hobby.

"I've spent a lot of money on this set-up over time, but it is my main interest really, it's the thing I spend my money on. I want to have the best experience and the fastest service." – L11, Web3, 18-24, Male, London

Participants did not see high starting costs as being specific to immersive technology and most already owned a games console or PC for non-immersive activities. They did, however, recognise that the range of platforms was unique and that accessing all of them could be very expensive for individual users. This made it difficult for most participants to consider using more than one or two types of immersive technology (i.e., across video games, VR, AR, Web3). With VR, the requirement for virtual reality headsets added a barrier to entry compared to other types of immersive technology.

"I don't think it's more expensive than other technology, it just includes a lot of different stuff – video games, VR. I'd like a VR set but I can't afford it right now." – L1, Video Games, 25-29, Male, London

Access to VR was also constrained by non-financial considerations. Participants often felt the amount of time they used VR was restricted due to the discomfort of wearing the headset.

Beyond device access, immersive technology could also involve significant ongoing costs

Ongoing costs included the cost of subscriptions, and microtransactions for items such as battle passes, avatars and skins. While these were optional, they were considered a crucial part of the user experience and costs could quickly accumulate. The ongoing costs of immersive technology were typically higher for Enthusiasts. Overall, Enthusiasts said they found it harder to control their spending on immersive platforms than Casual users. Extended use meant that they were more exposed to opportunities to spend, and they often found it easier to justify spending due to how much time they spent using these platforms. Managing these costs and not over-spending was a constant challenge for many participants.

"There's always pressure to buy things – in [3D video game] you can buy the game but then there's different packs, add-ons etc. and if you don't buy them then he can't do certain things so it limits what he can do. And then if his friends all have the new outfit (i.e. skin) then he wants to have it and he needs more [in game currency] to do it and that'll often cause us a headache. We'll try and turn it into an incentive like if you do well in school this week you can have the outfit" – Technology forum, Parents who don't use immersive technology

Having supportive family members and friends who could show new users how to get started with immersive technology was also an enabler of access

Households where parents and carers used immersive technology were the most encouraging and supportive of their child accessing these platforms. They recognised the benefits of the technology, in terms of creativity, socialising and entertainment, and were happy for their child to experience these as well. Older siblings using immersive technologies would be a gateway for younger siblings in deciding to use immersive platforms.

"I've picked up a lot from watching my brothers play and seeing what they do, trading tips." – L13, Video Games, 13-17, Male, London

Lack of encouragement from parents, carers or siblings was a potential barrier to access. Households where parents were not users of immersive technology, tended to be less willing to purchase devices for their children and less able to help them get started. They also didn't necessarily recognise the potential benefits of using the technology or to guide children towards aspects of it they might enjoy such as social interaction, creativity, and teamwork.

LEARNING & SKILLS

The ability to engage successfully with immersive technology and the process of acquiring the skills necessary to do so.

Becoming skilled or accomplished in using an immersive platform was often integral to participants' enjoyment of immersive technology

The skills required to use different immersive technologies varied significantly. With video games, participants' primary focus was on understanding how to complete the objectives of the game. With VR, participants placed greater emphasis on learning how to use the devices effectively, for example how to navigate the VR space using physical controllers and their body. With Web3, there was a greater focus on understanding the purpose and intention of platforms and their future potential, such as how cryptocurrency works and how one buys and sells on the platform.

Some platforms were better than others at equipping users with the knowledge and skills required to successfully navigate the experience. For instance, some games and experiences offered participants a tutorial or guided tours. A number of the observed platforms also featured practice environments where participants were able to train and hone their skills by trying out functionalities or engaging in gameplay against AI-controlled bots before moving into online gameplay space with other real-life players.

Many Enthusiasts and Intermediate users had a good working knowledge of the immersive platforms they used. They understood how these platforms worked, had highly developed gameplay skills and were able to create objects, worlds etc. to a high standard. Some were also able to inspect and read code and consequently develop modifications (mods) to the game. As with the development of skills, Enthusiast and Intermediate users were investing large amounts of time in learning how to accomplish creative tasks (from learning about different building tools and components, to learning how to code commands and mods).

Overall, participants reported that more established video games seemed most supportive of participants as they started to learn and develop skills. This was partly due to the presence of in-game tutorials and tips but also because there was a large community of support and advice around these games on social media services. Developing skills on VR and Web3 was more difficult than on video games because participants had a less obvious or easily accessible community of support available to them.

"I'm definitely better at the game than when I first started. It takes a while to pick up the aiming / shooting, especially in VR but you learn through practice and by playing over time." – M16, VR, 18-24, Male, Manchester

"It's not overly intuitive. I've been away from it for a while and it's not that easy to jump back into it. The more traditional games with a joystick or controller seem a lot easier to manoeuvre" C2, 25-29, Male, Cardiff

Immersive technology had generated an interest in some participants to study subjects in STEM, in particular learning to code

Some intermediate and Enthusiast participants had been inspired to pursue STEM (Science, Technology, Engineering and Maths) subjects at school or university following their use of immersive technology. Participants who were still at school saw an overlap between the skills they learned in immersive technology and elements of coding, computer science and digital creativity they were being taught at school. This was particularly true of those who were creating / using mods to alter how games played. At least two participants had considered STEM subjects to pursue in further education because of their interest in gaming. One participant saw clear parallels between his interest in immersive technology and the content of his undergraduate degree in engineering, while another used a world building immersive platform to develop and test designs in support of their Architecture degree.

"I think most of the coding is within the game's development, so for the building and clothes making it's quite straightforward. But I've created an obstacle course game with Scratch software and I do like HTML and Python stuff" G2, 13-17, Female, Glasgow

Many parents recognised the overlap of skills with STEM subjects and were supportive of this. One child attended an after-school club where they played Minecraft and learnt to code while another parent said that their child asked for private coding lessons which they supported. They also regarded digital creativity, coding and design as desirable skills which would be beneficial for their children's future in terms of educational and employment opportunities.

"It's like people say that the younger you learn a new language the more it stays with you, so I think it's great. Down the road we'll have kids who are 8, 9, 10 doing some incredibly complex coding" – Technology forum, Parents who use immersive technology

Learning was also not limited to being applied in digital scenarios. One parent noted that their child used a flight simulator which helped them develop their piloting skills which they were able to successfully apply to their real-world flight lesson at a local flying school.

"My son is passionate about flying and we got him a flight simulator from Logitech. After spending some time playing, he said he was ready to be a real pilot so I called his bluff and took him down to a professional flight school. He was amazing, he could control all these different things and the teacher was speechless. He said by 20 he will have better knowledge than some of the other pilots" – Technology forum, Parents who use immersive technology

"It's actually incentivised me to learn how to do Excel sheet coding from playing the game. I've got a real interest in logistics now and that's from the game" – B3, Video Games, 18-24, Male, Birmingham

CREATIVITY

The ability to develop creative skills within immersive technology and the dependencies involved in this, including education and access to information and guidance.

Creating digital worlds and games in immersive platforms was rewarding and created a sense of achievement for participants

Immersive technology encouraged participants to engage their creativity, whether through building objects or worlds, creating games or solving challenges. Engaging creative thinking had clear benefits for participants – they had developed skills, such as spatial thinking and often felt a sense of reward and recognition from other users when they created something that was considered interesting or impressive. Immersive platforms provided a 'safe space' for users to explore and improve their creativity. One participant had progressed to building complex and distinctive worlds on Minecraft, using his coding skills, this had led to other users inviting him to co-create with them and some had even approached him to build worlds for them in exchange for money. This gave him a sense of achievement and recognition.

"I like building worlds in Minecraft and letting other people see them. They want to come and see what I've made and people have asked me to build worlds for them." – L13, Video Games, 13-17, Male, London

Part of the problem-solving appeal of immersive technologies such as VR and creative building platforms was that participants had to learn how to play the game. Sometimes gameplay instructions were not present or obvious and users had to work through the various controls and functions for themselves to understand how to navigate the platform. This was part of the appeal for some participants while for others it was a barrier to engagement.

"With [creative building platform], new games pop up all the time and you don't know what they're going to be like. So you have to learn to play them from scratch … which is fun." – L1, Video Games, 18-24, Male, London

Participants' creations were seen as an outlet to express themselves in a digital space

Participants' sense of identification with their creations is a differentiating feature of immersive technology. Creations could often reflect participants' real-world values and interests. Because of this, they took pleasure in creating and crafting objects. For example, one user took great care in personalising her avatar because she had an interest in fashion and wanted her avatar to reflect this. As a result, participants often identified closely with and were proud of their creations.

"When you create an avatar, that's a representation of you, that's you in the game. You want it to represent you and who you are as much as possible." – C3, Video Games, 50+, Female, Cardiff

"If I'm in that cat avatar people will just shout oh my gosh you're a cat" – L9, Video Games, 13-17, Female, London

Some participants also observed inappropriate content such as sexualised avatars or age-inappropriate media; these were more common in VR or Web3 where more user-generated media and content were available and platform owners were perceived to do less to regulate or moderate content.

Another differentiating feature was the collaborative and co-creative nature of immersive technology. Some platforms, such as creative building platforms, allowed users to create and publish their own worlds, games and experiences and even allowed them to make significant

changes to how platforms worked through use of modifications (mods). This openness to community input promoted a culture of creativity and cooperation where developers and the community worked together. If a community-developed feature was popular enough or added significantly to the experience, developers might decide to incorporate it into the platform as standard. Digital 'property' creations within immersive platforms are often seen as the user's property or assets.

"You're not just playing games made by [gaming studio], you're playing games made by all the different developers, big and small. So it feels like a community of users and developers." – L1, Video Games, 18-24, Male, London

Due to the open-ended nature of the technology, some participants inadvertently spent long periods perfecting their creations

The development of skills to produce a creative output is an ongoing process which requires a significant investment of time. Due to the open-ended nature of the technology, some participants felt that their creations on immersive platforms rarely reached a point of completion. There was always something to develop, tweak or adjust and this could make it hard for participants to identify an endpoint. The desire to surpass their last creation drove users on and coupled with a sense of 'perfectionism', could lead to high volumes of time spent in the game.

Some participants also had negative experiences where their creations were damaged or vandalised. As they could spend hours or even days creating, such behaviour could be quite upsetting and taken personally. One participant had been very upset when other users he had invited to view one of the worlds he had spent several hours building was vandalised and destroyed. However, such behaviour had led to a development of critical analysis in the participant, and after this incident he was more selective in who he invited to explore and engage with his creations.

"It might take you five hours to build something and you almost get it right and someone could come and destroy it" - G3, Video Games, 18-24, Female, Glasgow

CRITICAL ANALYSIS

The critical thinking required to assess why / how immersive technology works the way it does and the potential impact of this on users.

A feature of media literacy is the ability to critically analyse information, e.g., to understand sources, intentions, and biases. In the context of immersive technology, critical analysis can work in two ways. Firstly, it can be used to understand the way the platform works, its features; structure; code; the location of controls, etc. Secondly, it can be used to understand the ways in which the platform tries to influence the user for instance to get user attention, keep users playing and using the technology, or to get users to spend money on immersive technology. Overall, participants displayed better understanding of the first of these, than the second.

Participants identified gaming mechanics which were designed to maintain their attention

Some participants, ranging across the three typologies of user, were able to reflect on and respond to the ways in which immersive platforms sought to influence them. Some participants showed awareness that games had in-built mechanisms designed to hold their attention and keep them playing for as long as possible. The incentive of collecting coins, objects, skins or content that had been created in partnership with a brand such as a music

or fashion brand were features considered by participants to motivate play over longer-than-expected periods of time. Time-limited events where access to environments or features were available for a limited time, or in-game seasons or cycles such as day/night cycles within a game, were also seen by participants as mechanisms that might encourage continued play so that gamers encounter different experiences.

Encouragements to continue playing beyond personal limits were provided by platform developers releasing new content, avatars, skins, patches[7] and game modes, which increase the scope of the player experience and provided a constant flow of new things for participants to interact with. In addition, new content added by the wider community of users (in the form of new environments, games, modifications, etc.) might also encourage extended periods of use. This was particularly true of some immersive platforms which integrated community creations or games into the player experience.

"They all have lots of really good updates, there's always new skins / outfits etc. that come out after launch … It encourages you to keep playing." – L10, Video Games, 25-29, Female, London

A key feature of immersive platforms was their open-ended nature and the lack of any point of completion. From a learning and skills perspective, this meant that full mastery of the game was never achieved and that users could continue building and developing their abilities indefinitely. While this had enhanced participants' enjoyment of the technology, it had also motivated them to play for more time than they had wanted to, with some participants spending many hours a day using immersive technology. Participants identified the open-ended, non-linear quality of immersive experiences had also led participants to invest more time into a platform than they had originally intended. Several participants said they had spent more time on certain platforms than they would have wanted because there was always a new goal to aim for, a new task to complete, a new mission or accomplishment to strive for. As expected, Enthusiasts tended to have a better working knowledge of immersive platforms than Intermediate users – and Intermediate users had a better working knowledge than Casual users. However, this did not necessarily give them a clear critical perspective or enable them to understand the ways in which immersive platforms might try to influence them (e.g., by investing more time or spending more money).

Enthusiasts were not always well-placed to judge these things. They were often too immersed in the game or experience to be able to step back and understand its influence on them. Critical perspective was often determined more by age, experience, and education than usage (e.g., parents often had a clearer critical perspective than users of immersive platforms).

This was often encouraged and compounded by off-platform activities on social media and social video services related to the immersive technology.

"Addiction started happening. I would play [video game] for 10 hours a day. I would spend hundreds of pounds on the game, for a month at least." … "There have been times when I've had to step back and say, 'no, I'm spending too much time [gaming]', because that's what the developers want you to do, they're trying to encourage you to keep playing." – L6, Video Games, 13-17, Male, London

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[7] Software update or modification released by game developers to address existing issues or introduce new content to the game

Parents were a source of critical analysis as they try to manage the time spent by children on immersive technology

Most participants however did not have a well-developed critical perspective on immersive technology and were not able to analyse the ways in which the technology attempted to influence them. A well-developed critical perspective was often determined more by age, life experience and social influences than by usage. Participants who were older, or who were having conversations with people that provided an outside point of view on their use of immersive technology were more likely to take a critical perspective and to interrogate its potential drawbacks.

Parents were particularly well-placed to take a critical perspective on the impact of immersive technology. Many said they had struggled with the conflict between allowing their child to pursue their interest in immersive technology and preventing their use from becoming addictive or all-consuming. Several highlighted situations where children had used immersive technology to excess and where their favourite games or platforms had become dominant within their lives.

In these situations, parents would implement time limits to their child's use. These were usually set manually / interpersonally within the household (i.e., rather than using controls or technological solutions). However, both parents and children commented on how these limits and restrictions could become a source of conflict and argument within the household. The management of device time was not seen as easy or comfortable, either by parents or by children. In addition, the situation was exacerbated by the multitude of adjacent social media and social video services where content relating to immersive technologies being used were being viewed or immersive technology was discussed, which competed for children's attention.

"There have been times where it's hard to get him to leave the house, where it's hard to get him off the games. It's having an impact on being able to get the appropriate sleep for school" – [Parent of] L6, Video Games, 13-17, Male, London

Participants felt they are investing time to explore how these immersive technologies worked and were developing

The difficulty experienced by participants in being able to stand back and critically analyse their immersive technology behaviour may be accounted for by how new the technology is. Users of VR and Web3 in particular, were trying to understand the purpose of the platforms they were using – and saw them as evolving, works-in-progress that had not yet come to maturity.

"I was initially looking at buying but now I think I'd rather have a look around because it gives you a preview or what's there. It's got that sort of sandboxy curiosity" C2, Web3, 25-29, Male, Cardiff

None of the participants mentioned having discussions about politics or current affairs on the immersive technology platforms they were using, and most were focused on the objectives of the games rather than conversing about wider societal issues. Even where participants were using social media platforms as an adjacent forum to explore and discuss their immersive technology interest, there was no mention of exposure to social or political debate, and any experience of misinformation was not raised.

SOCIAL INTERACTION

Participants frequently formed, strengthened and maintained social circles through immersive technology

Participants generally believed that social interaction made immersive platforms more fun and engaging. While they found creative satisfaction in playing games, building worlds and objects, the real value of immersive platforms came from being able to share and demonstrate these creations to other users, both known and unknown. Enthusiast and Intermediate users typically spent large quantities of time discussing creative activities with other users whether in person or via social media services and other messaging applications.

The focus on community and cooperation on immersive platforms helped to build strong bonds between users that sometimes extended into the real world. Several participants highlighted how real-life relationships, including romantic relationships and strong friendships, had begun on immersive platforms. One participant had met some of her closest friends through playing Minecraft. Having met in the game, she got to know them better on a social media service and eventually became so close that many of them attended her wedding.

Among adults, immersive technology had also provided an avenue to maintain social bonds. As they had grown up, left school and moved away from their local area, immersive technology had provided a medium through which they could maintain their social connections remotely and stay in touch.

"It's just something I do for fun. I might play for an hour or so after work, it's a nice way to stay in touch with some friends who no longer live here." – M6, Video Games, 30-39, Male, Manchester

Family bonding and socialisation were also maintained using immersive technology. Parents highlighted the positive social effects of immersive technology on children. For instance, in one case, two siblings who played Minecraft together had stayed in touch via the platform when the older sibling moved out to attend university.

Some participants found social interactions in virtual environments were easier compared to social interactions in the real world. For instance, participants with learning disabilities or social anxiety felt more comfortable interacting with other people via immersive technology than in real life. The game environment provided familiarity and modes of communication were relatively limited, making the experience feel contained and manageable from their point of view.

"Especially in lockdown when I was struggling and just not able to speak to people normally, it [the VR environment] really was great for that." - B4, VR, 40-49, Female, Birmingham

Pokémon GO was the only AR platform observed in this study. This had many of the advantages of video games, in terms of goal-orientation, connection with real-life and virtual friends and the development of skills. However, Pokémon GO was also perceived to have real-life social benefits, with friends coming together outdoors to play the game.

"There are definitely benefits to mental health, just keeping you focused on one thing and achieving that thing…There's also the social side, just last Sunday we had a big family dinner with seven or eight nephews / cousins etc. and we're all talking about Pokémon GO." – M20, Video Games, 30-39, Male, Manchester

Users of VR often did not know many other VR users (due to limited take up of VR at this stage) and so had less social motivation to play than when using video games.

"I play with friends on the Xbox a lot but not a lot of people have this [VR Headset] so I do more stuff with people I meet online" C1, VR, 30-39, Male, Cardiff

Socialising through immersive technology lacked the nuance experienced in real world interactions

Participants were able to interact at scale, with a potentially huge number of other users, for instance through large-scale simultaneous gameplay. This was unlike social interactions mediated via other kinds of technology. However, socialising through immersive technology such as video games often lacked the nuance of real-world interactions and restricted participants to more limited forms of communication such as emojis and text chat. Participants were rarely confronted with the variety and complexity of real-world interactions – including the range of non-verbal cues and body language that go with them - however elements of these are present in VR. Participants commented that this currently held interactions back from feeling truly 'immersive'.

Inappropriate behaviour was experienced by nearly all participants

The intense sociality of immersive platforms opened the door for participants to engage and interact with users they did not know. This presented ongoing risks for encountering inappropriate behaviour. Almost every participant taking part in this research could recall experiencing a negative or unwanted interaction that had taken place with another user or group of users. Some of these negative behaviours were observed by the participants rather than directed towards the participants, such as observing the use of profanity or abusive language either through text chat or voice chat. This was especially commonplace in a video game context. But there were also instances where participants experienced inappropriate behaviour directed towards them. Receiving 'verbal' abuse and direct threats was more common within video games, especially where there was a competitive element and where participants may have been considered to have negatively impacted a team's performance.

VR avatars brought social interaction a step closer to real world interactions

One of the most distinctive features of immersive technology was that it offered more intimate social interaction. Participants identified closely with their avatars, as they saw their avatars as a reflection of themselves (see creativity section). Participants often experienced intimate contact with other people and their avatars, especially in VR, where avatars might engage in very realistic physical and spoken interactions and were perceived as more physically 'real'. Given the level of identification with avatars, abusive or upsetting encounters were amplified by the immersive nature of social interaction and therefore felt more personal and real. Receiving 'physical' harassment, such as following, 'touching', crowding around an avatar etc., was particularly harmful within VR where the harassment could feel more intimate. A female participant noted the negative impact behaviour from male users could have on women's participation in immersive technology.

"My entire life, personal life and my work life are all based around technology, so I understand the way people are and I'm old enough to know how they are in real life, so I don't feel bothered by it. I do think this can't be good for another woman, who's walking around and just gets killed, she's going to feel maybe she can't play that game." – C3, Video Games, 50+, Female, Cardiff

Parents of children who used immersive technology were particularly alert to negative social interactions involving their child

Many of the parents in this research had observed negative or inappropriate interactions involving their child. In these instances, they had taken steps to protect their child including: encouraging their child to be open and honest with them if they'd seen or heard something that had made them uncomfortable; being present when their child was playing the game so that they could make sure nothing inappropriate was taking place; checking their account and messages for inappropriate interactions with other users; or stepping in where needed to take action where an event had caused distress.

"Our oldest daughter had some quite negative interactions with strangers … where they were sending inappropriate messages. Now we monitor her [sibling's] internet usage and her gaming much more closely so that we're on top of anything like that." – Technology forum, Parents who use immersive technology

Overall, participants who were open to making friends online often had personal strategies on how they would do this in a safe manner. They might only connect with a user they had met a few times or who had earned their trust through playing the game in a responsible and reliable way. They might avoid or actively block people who used abusive language or who insulted them online.

Age restrictions were not always considered to be well observed on immersive platforms

Most participants (including children) acknowledged that age restrictions were not well observed in accessing immersive platforms. Parents/guardians interviewed reported that their child had accessed games and experiences that had an age rating of 18+. These included games with graphic violence and gambling. In some cases, the video games were purchased with their parents' permission.

Some participants saw the observation of age restrictions and the protection of children as being the main challenge for immersive platforms. Areas of perceived risk included the use of age-inappropriate avatars and imagery in under-18 games, children being exposed to age-inappropriate language in U18 games, children being exposed to age-inappropriate films and other content in VR and children taking part in age-inappropriate activities such as 18+ games with graphic violence and virtual gambling.

"There are sign-up rules that say you have to be over a certain age to participate, but I've seen someone streaming adult content that anyone can join and watch" – L2, Video Games, 18-24, Male, London

PRIVACY & SECURITY

The extent to which users consider privacy and security within immersive technology is influenced by their age, gender and experience.

Younger participants often had a better awareness of risks and were more aware of privacy mechanisms due to education from school and parents

Participants aged under 16 were often more aware of and engaged with privacy mechanisms than adult users, primarily because their parents had taken an active role in controlling their settings or in encouraging them to do so themselves. Teenagers in this research (13-17), were more likely to have been taught about the potential harms and risks of online interactions at school. As such they were typically quite aware of different strategies for managing their privacy and security, for instance not using their real name, avoiding in-game chat with strangers or simply reaching out to their parents when they felt necessary.

When it came to the better known video games, participants tended to have a good knowledge of the touchpoints and controls they could use to maintain their privacy and safety. These included the following:

- **Pre-emptive** – allowing users to control their exposure e.g. setting their interaction controls to private, being able to mute or block other users, offering public / private worlds or servers
- **Automated** – automatic processes or systems in place e.g. filtering out abusive language, automatic bans or player labelling for disruptive / inappropriate behaviour
- **Monitored** – on-platform moderators to observe interactions to ensure compliance with the rules
- **Reporting** – routes to escalate privacy or security risk on-platform e.g. reporting other users, flagging inappropriate content

"I don't know how far the safeguards go. The more [popular platforms] seem to have a better security network. Some of the newer ones still have good safeguards in place, but it's not clear. I don't know, fundamentally, how these things work." – C1, VR, 30-39, Male, Cardiff

Enthusiasts were more likely to share personal immersive platforms accounts with other users which in some instances resulted in account abuse

Awareness of privacy and security risks amongst younger participants did not always keep them safe from harm. Under-16s encountered insulting and abusive language and behaviour in immersive games just as much as adults did. Furthermore, younger Enthusiast participants sometimes exhibited risky behaviour, such as sharing their identity inappropriately to receive in-game benefits. Two participants under the age of 16 had shared their profile information with another player so that they could use one another's inventory in a particular game. This had resulted in one participant being banned when the person he was sharing with used the participant's account to make racist comments. The other lost money when the person he was sharing with, whom he knew from school, made in-game purchases on his account without his knowledge. Despite this, the first participant mentioned above was still sharing his account details with other players to take advantage of their inventory.

"He had allowed someone to sign into his account and they made racist comments then told their friend to report the racist comments. He got banned for twelve days ... I don't trust anyone else anymore." – [Parent of], L6, Video Games, 13-17, Male, London

Female participants were typically more cautious about their privacy and about sharing information about themselves than male participants due to perceptions of the heightened risk of abuse or harassment they could experience as a female. As a result, they often avoided speaking to other players in-game to mask their gender.

Participants discussed specific physical safety precautions they took when interacting with people not already known to them while using AR platforms outside the home. As a result, participants were cautious about who they played with out-of-home as a result.

"I always take care with who I message and who I meet up with to play Pokémon GO, because you're actually interacting with them in real-life." – M20, Video Games, 30-39 Male, Manchester

Parents felt that it was not clear to children that in-game add-ons were paid for purchases

Many parents had concerns about their children making in-game purchases. Some felt the risk of losing money through inappropriate or unauthorised purchases by children was heightened by the way immersive platforms were designed – particularly video games, where paid-for battle-passes, inventory, skins and other content were offered at frequent intervals.

Parents had various strategies for managing this but in some instances, these measures were implemented after an incident of unauthorised payment occurred. Some set rules with their children, others set in-game controls such as the requirement of passwords before approving payment, and others removed or did not link their bank cards to their child's account so that purchases could not be processed without the child reaching out to them. Parents felt that the different options for controlling payment could be much clearer and simpler on immersive platforms.

"It would be good if the controls were simpler. I don't really know where to go to set up restrictions on payment." – Technology forums, Parents who do not use immersive technology

Web3 users also had additional concern around the security of digital purchases. There were concerns over illegal activity and the 'unpoliced' nature of Web3 being a driver of interest in the technology, but participants also raised concerns over what recourse they could take if they were a victim of digital theft or fraud.

Participants felt less secure in VR and Web3 spaces as availability of safety mechanisms were less clear

Participants saw VR and Web3 as being riskier propositions than video games or AR – and as presenting new risks specific to immersive technology. With VR, the player-to-player experience was seen as more lifelike than with video games, and any abuse or upset encountered was felt more personally by the user (see social interaction). Participants felt less well protected in VR and Web3 because safety measures were less familiar and obvious to them, for instance, participants found it harder to locate how to block or report other players in VR and Web3 than they did on video games.

Web3 was seen as presenting some specific risks. For instance, users were aware that Web3 platforms were decentralised and largely anonymous. As a result, they sometimes believed they were not subject to oversight, regulation or moderation by the companies involved in their development. They were not always aware that it was possible to report other players or to block them – and where they knew this, they believed it was easier for a user to be readmitted under a new profile than it would be in a video game. As a result, they were often more cautious about who they interacted with and the personal details they were willing to share.

"I think it needs more regulation. You don't know on [Web3] who the other users are. They're anonymous so it's difficult to block them if they do something bad. You can block them but it's easy for them to create a new profile and come back. Everything's anonymous." – Web3, 40-49, Male, London

"The problem with these decentralised wallets is...in the decentralised world there isn't anyone you can ask for help if something goes wrong, more regulation is needed." L11, Web3, 18-24, Male, London

Participants were also concerned with the stability of Web3 as digital purchases made in Web3 are based on speculation and an assumption that their value will increase as Web3 platforms become more mainstream; there's an inherent risk therefore that platforms do not develop in this way and that users lose out financially.

"It's sometimes hard to say what [Web3 platform] is all about. People buy property and build houses, but they might not have any real value in years to come." – L11, Web3, 18-24, Male, London

Ultimately Web3 was still viewed as experimental and therefore carried security risks (both personal and financial) which users realised they needed to be conscious of and respond to for instance by not over-investing or by taking care with the personal information they share with other users.

"At the moment [Web3 platform] is just something new and different, it's something fun to try out … but it's also good practice for the future when there may be more of a metaverse."
– Web3, 25-29, Male, Manchester

Reflections on the future

Limitations in understanding

Most participants had quite a limited comprehension of future-facing concepts such as metaverses and Web3, and did not have a clear sense of the future direction of travel of the immersive technology they were using. Most perceived video games, VR, AR and Web3 to be quite distinct technologies and didn't necessarily see them developing in consistent ways.

Participants tended to see future trends align with the technologies they were most interested in and regarded their preferred platforms as being at the forefront of technological progress. For instance, VR users often saw virtual reality as defining the future, making experiences more immersive and realistic / sensorily powerful. In contrast, AR users often saw the blending of virtual and real-world experiences as most futuristic, enabling immersive technology to reach out beyond the home and into the world more generally. Web3 users tended to be more sceptical as to its future role, but some made the case that freestanding, self-regulating worlds and currencies might comprise at least one aspect of the internet of the future.

"I think virtual reality is just going to become more accessible and become a larger part of everyday life. I imagine in the future most households will have some kind of VR" – G2, Video Games, 13-17, Female, Glasgow

"It's up to the software developers to come together and come up with a framework for how this all works in the future. It needs to be easy and simple to use" – Web3, 40-49, Male, London

This perhaps emphasises the extent to which immersive technologies differ from one another. Participants sometimes struggled to identify continuities and similarities between them and did not have a sense of their shared future.

Similarly, the perspectives of Casual, Intermediate and Enthusiast users were quite different. Most starkly, Casual users often did not have a perspective on the future development of immersive technology, while Enthusiasts tended to be more cognisant of their potential growth and evolution. For instance, Enthusiasts tended to be more aware of the potential for VR to encompass many areas of daily life, including education and training as well as entertainment, socialising and gaming. They were also more mindful than other users of potential risks around Web3, citing that they perceived the lack of centralised control, moderation and regulation (they did not identify whom they felt could carry out these duties). Enthusiasts also envisaged a potential for developments in AR through smart glasses linking the real world with virtual elements e.g. notifications and messages, ads, art and entertainment-based activations.

Future characteristics of immersive technology

Participants also saw immersive platforms developing in line with the core differentiating factors identified earlier in this report. These were: an emphasis on co-creation, an active community of users, an open-ended structure, elements of non-linear gameplay, an evolving 'work-in-progress platform'.

Co-creation

Participants felt that co-creation would be a major aspect of future immersive technologies. Immersive experiences would involve significant elements of user-generated content, enabling users to build avatars, objects, environment and games, express themselves and share content in myriad ways. The trend towards co-creation and curation of the environment was not perceived to be limited to immersive platforms but also in digital technology more widely, e.g. in social media.

As we have seen, co-creation encourages greater identification with the virtual environment and gives users a sense of ownership of it. The following themes were identified during discussion with participants around the future use and regulation of the virtual environment:

- The ownership of the user-generated items within it (including avatars, objects or the world itself)
- The rules governing these user-generated items (e.g. the rules governing interaction between avatars, use and destruction of user-generated content, etc.)
- The rights of access and retention that users should have over the content they have created

Community of users

Participants saw interaction with an active community of users as being central to the future of immersive technology. They would continue to play games, build and create, chat and interact with users – and to do this both on and off-platform. In future, the range of users may grow and platforms likely to be able to host an ever-greater number of simultaneous users. We have seen that social interaction on immersive technology is defined by intimacy and scale, and participants anticipated that this would be a significant feature of these platforms in years to come.

Managing social interactions in immersive technology can currently be challenging and the experience of antagonistic and upsetting behaviour was common among participants. This raised questions about how user-to-user interactions on immersive platforms might develop in future. Participants discussed the following:

- Making it easier to set controls around social interaction e.g. microphone and sound controls, chat functions, friend permissions
- Making it easier to report and ban abusive users and making reporting mechanisms more transparent and effective
- More active regulation and policing of platforms to ensure use by age-appropriate players only
- Providing greater protections to children, so that they could avoid abuse on immersive platforms
- Enhancing parental controls to enable parents to control and regulate their kids' use and keep them safe

Open-ended / non-linear gameplay

Immersive technology is defined by the open-ended and non-linear structure of its gameplay and experiences. This was seen as a feature of immersive technology that would further develop into the future, whether through world-building games and environments, creative modes of play or the availability of a constantly evolving repertoire of games and experiences. The open-ended, non-linear quality of immersive technology prompted participants to consider the following:

- Getting started – it can be hard to get started on open-ended games and this can discourage new or inexperienced users; participants felt that in future, immersive platforms would need to make onboarding easy and user-friendly to remain and broaden accessibility
- Developing skills – open-ended, non-linear games often required a high investment of time for users to develop skills and become competent players; participants felt that different tiers of gameplay might be required in future to encourage new / less skilled users to take part
- Managing time – given the high investment of time required and the lack of a clear ending, managing time in open-ended games could be difficult and participants felt that users might need additional support with this in future through prompts, nudges and time limits

Work-in-progress platforms

We have seen that some immersive platforms were looked at as works-in-progress, undergoing rapid development and change. While participants reported enjoying the experimental nature of these platforms, they were sometimes viewed as being less well-regulated than established games and platforms. Given this, participants wondered whether more oversight might be needed to keep users safe and allow them to report problems or abusive behaviour. More developmental platforms might need even clearer, better signposted and more prominent controls and reporting functions to make it as easy as possible for people to use them.

"I think some of the VR games need more regulation. You get kids on adult games and it's easy to wander into rooms where they might be playing films that should really be for an adult audience. It's not very well policed." – L2, VR, 25-29, Male, London

Future social impact of immersive technology

Participants had concerns about access to immersive technology in future. Some worried that in the future a two-tier society might emerge in which some had immersive technology skills and others did not. As more and more activities moved onto immersive technology, this might create a gap between users and non-users e.g. in relation to access to services.

Enthusiasts and participants engaged in tertiary education felt that immersive technology would have a big impact on education in future. They believed it would be used increasingly as a teaching tool, both in and out the classroom, for example to help students experience different geographies, periods in time and engage with learning tools, materials and stimulus. One parent went further than this and envisioned a future where children wouldn't need to leave the house to go to school as they would attend school via VR.

Those who were working and those in tertiary education also believed that immersive technology would have major implications for the world of work, with a greater number of work activities taking place in virtual environments. Colleagues would be able to work in virtual spaces and work on tasks together virtually. Training and resources could be hosted in virtual environments, rather than real-world locations.

Given the potential impact on education and work, working participants and those in tertiary education wondered whether a skills gap might emerge between users and non-users of emerging technology. They worried that those without technological skills would fall behind in terms of education, employment and social participation.

While immersive technology provided rich and stimulating social interaction for its users, some mainly Intermediate and Casual users and parents were concerned that in the future this might detract from real-life contact, with virtual interactions becoming the norm. Most were happy with the idea of having blended social lives in the future but found the prospect of a purely virtual social future dispiriting and dystopian.

Ofcom Afterword

This research has provided a detailed understanding of how the use of immersive technology intersects with the development of media literacy skills, the challenges faced by users of immersive technology and contemplations on what the future may hold within the immersive space.

The following themes emerged within this research, ordered by media literacy area:

- The ability to **access** immersive technology often centred around affordability, and household attitudes. Those who are unfamiliar with immersive technologies may not engage with it, resonant of attitudes observed ten years ago towards being online more generally. For instance, some people may not see this technology necessary for their day to day lives or consider the technology purely for gaming which they may not be interested in. Others may fear the prospect of having to learn how to use a new technology, especially for those who do not feel familiar with devices such as smartphone and computers.

- Immersive technology can enable participants to **learn** new skills and improve their media literacy by learning skills to navigate their experience on immersive platforms. Some participants developed a working knowledge of the technologies and platforms they used by engaging with additional materials such as social and video services to improve their understanding. We also saw examples of participants inspired by their use of immersive technology going on to pursue STEM subjects in their education and careers.

- **Creativity** can enhance and complement other media literacy skills. Participants were seen to create worlds, avatars, and objects, often utilising coding skills. By actively engaging in the creative process some participants developed a sense of identity with their creations, with creations reflecting real-life hobbies and interests. Identifying closely with creations could result in immersive technology users developing a deeper understanding of media elements and their impact.

- We saw participants exercise their **critical analysis** capabilities through their working knowledge of immersive platforms, and awareness of how immersive platforms could encourage participants to spend money or invest their time. However, some participants did not have a well-developed critical perspective, and parents relayed concerns over children's critical understanding, and the impact this had on their behaviour and screen-time. The open-ended nature and constantly developing nature of immersive platforms can result in addictive behaviours: the absence of a conclusion can make a game feel never-ending and difficult to switch off.

- **Social interaction** played a significant and largely positive role in immersive technologies. Some participants formed real-life relationships while others found it easier to socialise in a controlled, online environment. However, not all social interactions were positive, with some participants experiencing abusive behaviour.

- Understanding and implementing **privacy and security measures** is important in today's digital landscape. Immersive technologies can differ from other online environments as they allow a sense of intimacy, making people feel like they are physically present in a digital space despite being physically apart. This perceived intimacy can make interactions, including upsetting encounters feel more real. Younger participants displayed better awareness of risks and were more aware of privacy mechanics,

additionally we found that female participants were more cautious about sharing their personal information online.

- When reflecting on the future, participants saw immersive technology evolving and developing. Some raised questions around future regulation of the immersive space, citing concerns around child safety and protection from bad actors. Concerns around property rights may also grow in relation to digital assets, we saw that participants felt a sense of ownership and identified with items and worlds created in immersive technologies. As immersive technology evolves and collaboration amongst technology users continues, so might questions around intellectual property rights, particularly with co-created materials.

These themes alongside the wider findings in this report helped identify the potential media literacy challenges in immersive technology. They serve as a reminder of the benefits of immersive technology and the skills that immersive technology can aid in advancing, while highlighting the risks which can be experienced by children and adults.

As such, the research complements our current wider Making Sense of Media Activities. Our Making Sense of Media Annual Plan 2023-24 is focused on the 'only Ofcom can do' elements of media literacy in the UK – as our contribution to addressing the UK's online media literacy challenges. This research sits in a suite of media literacy research and will help inform Ofcom's media literacy and wider online safety research activity through the identification of media literacy benefits and challenges in immersive technology.