



Could the metaverse be the future of remote working?

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Strengthening teamwork, stimulating creativity and combatting feelings of isolation are just some of the virtues being attributed to the metaverse. But what's the reality behind the hype? Can people work safely in new environments straddling the real and virtual worlds? And what are the short- and long-term risks to workers' health? Recent years have seen research starting to address these questions, with some concerning findings.

In October 2021, Mark Zuckerberg announced he was changing the name of the parent company of the social networking site Facebook. 'Meta' comes from the ancient Greek for 'beyond' and symbolises that there is 'always more to build', as its founder put it. In our contemporary context, it is primarily a reference to the metaverse, a virtual universe that can be accessed through a virtual reality (VR) headset. This is a genuine change of course for the American giant rather than just a rebranding exercise. Zuckerberg announced 10,000 new jobs in Europe to develop his metaverse, which he has christened *Horizon Worlds*. According to its 'Founder's Letter', it promises to be an immersive environment where 'you'll be able to do almost anything you can imagine – get together with friends and family, work, learn, play, shop, create'.

Although the announcement made huge waves, Zuckerberg is not the first person to venture into these waters. The term 'metaverse' first emerged in 1992. In his dystopic novel *Snow Crash*, American author Neal Stephenson describes the metaverse as a virtual way out of a gloomy world plagued by the mafia. Some 10 years later, the platform *Second Life* was released – a digital society with its own economy and currency where residents can purchase land or build property. Other virtual worlds were to see the day in the 2010s, including *Decentraland* and *The Sandbox* to mention just two of them. But interest in the platforms was low until GAFAM [Google (Alphabet), Apple, Facebook (Meta), Amazon and Microsoft] picked them up.

The tech giants invested colossal sums, fearing that they'd be left behind by the competition. Meta was first to dip its toe in the water, then in June 2023 it was Apple's turn to unveil *Vision Pro*, while Amazon and Google have been rumoured to be working on their own VR headsets. The media machine went into a frenzy over unlikely financial transactions such as the purchase of virtual land for more than 2 million dollars in *Decentraland* by the finance firm Token.com, or of another piece of digital real estate for more than 4.3 million dollars in *The Sandbox*, of the company Republic Realm. In her 2022 State of the Union Address, the President of the European Commission, Ursula von der Leyen, described the metaverse as a 'new digital opportunity' that Europe should seize.

1. Stanney K.M., Lawson B.D. and McMaster Oman C. (eds.) (2021) Cybersickness in virtual reality versus augmented reality, *Frontiers in Virtual Reality*. <https://www.frontiersin.org/research-topics/12692/cybersickness-in-virtual-reality-versus-augmented-reality>
2. Virtual Reality Neuroscience Questionnaire. <https://arxiv.org/ftp/arxiv/papers/2101/2101.08146.pdf>

where the graphics bore a resemblance to those used on *Second Life...* in 2003. The specialist press all talked of a huge fiasco to the extent that the competition edged away from the name ‘metaverse’, scarred as it was by Meta’s failure. Microsoft, Google and Amazon seemed to be employing delaying tactics, and the CEO of Apple publicly stated that he had no faith in the metaverse, deeming it a vague, ill-defined concept.

But the metaverse is not really dead and buried. The difference is that it’s no longer the buzzword for describing the

Not for everyone

Immersion in a virtual environment involves disparity between the information received by the vestibular and visual systems. The eyes sense movement, but the inner ear, which gives us our sense of balance, tells the brain that the body is still. This gap can trigger cyberkinetosis (‘virtual reality sickness’) which presents with symptoms similar to motion sickness, ranging from mild headache to repeated bouts of vomiting. Between 20% and 95% of users are thought to be

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new ecosystem. The emphasis is now on equipment, including the development of increasingly sophisticated headsets – and linked to this is a decidedly more work-oriented purpose. Full immersion in a parallel universe has given way to ‘augmented’ or ‘mixed’ reality where virtual elements are superimposed onto the real world, promising greater opportunities for the working environment. Apple’s CEO is now positioning the company’s headset as a productivity tool. Microsoft is also trying to find a place in this new niche with its app *Frame*, which enables a business to create its own metaverse in just a few clicks. Meanwhile, Mark Zuckerberg, counting on reviving interest in *Horizon Worlds*, is positioning it as a tool for professional development.

GAFAM are trying to reposition the metaverse as the next major evolution in the world of work. From teamwork to learning and development, via business culture, it will be the miracle solution to organising distance working. The metaverse will enable members of a hybrid team, whether working remotely or in the office, to move forward together in virtual premises. In the post-Covid era, it promises to re-establish the face-to-face engagement of a physical workplace and combine it with the flexibility of working remotely. While gushing over potential new levels of social connectivity, mobility and cooperation, GAFAM nonetheless remain tight-lipped about its risks.

affected, depending on the type of content, and simulations that involve more motion are more likely to induce it than static applications⁴. In some cases, symptoms last for several days after exposure and are felt as postural ataxia – a feeling of unsteadiness or drunkenness that is made worse by moving your head. It’s an open secret in the industry that VR sickness could significantly restrict immersive environments from catching on and coming into general use.

Photosensitivity has also proved to be a major contraindication, despite the lack of studies into this area. Epileptics are usually excluded from VR experiments for fear of a photosensitive epileptic seizure being provoked. According to a recent report by ANSES (the French Agency for Food, Environmental and Occupational Health and Safety), this is because of the high rate of modulation in the light emitted by VR headsets, in a frequency range of 79-90 hertz. ANSES also identifies other categories of potentially sensitive people, such as pregnant women and those who experience migraines or anxiety attacks.

Even in ‘non-sensitive’ people, wearing a VR headset can cause eye strain manifesting as sensitivity to light, dry eyes and blurred vision. The discomfort, long known as ‘computer vision syndrome’, may be worse in immersive environments. The screen is only a few centimetres from the eyes and covers a large proportion of the field of vision, and it greatly increases exposure to light, especially blue light, compared to a traditional screen. A recent study showed that, to prevent these symptoms, a VR immersion session should last no longer than 55-70 minutes².

Just a passing fad?

Two years later and it’s obvious that all is not well. Despite billions in investment, *Horizon Worlds* has attracted only 200,000 of the 500,000 users it had forecast by the end of 2022. More alarming still, the platform lost 100,000 users between February and October of that very year. The bad buzz kept coming, and the metaverse gradually became the laughing stock of social media. Only six surfers logged on for a virtual gala held by a European Commission department at the end of 2022. The event, which cost the Commission 387,000 euros, was supposed to promote the EU among younger Instagram and TikTok users. The French business grouping Carrefour also became the butt of surfers’ jokes following the recruitment exercise it held on *The Sandbox*,

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Poor ergonomics

VR headsets can be cumbersome and uncomfortable. Researchers have identified many potential ergonomic issues, but user studies are still in short supply. One of the challenges is that the actual tools used to analyse and design traditional office applications cannot be applied to immersive interfaces³. In fact, there are still no standards or guidelines either for developing immersive interfaces that meet user requirements or for evaluating the associated ergonomic risks. This applies not only to augmented and virtual reality but also to several emerging technologies with applications in the world of work such as exoskeletons or cooperative robotics. Although some bodies are trying to lay the foundations for standardising assessment procedures, the procedures themselves are sometimes unsuited to designers and even researchers, whose awareness of them is sometimes far too scant⁴. Moreover, standards are not always established in an inclusive manner and affected users may lack representation. Feedback is crucial, as it enables designers to identify problems and user requirements in order to develop better prototypes. This collective involvement is an essential prerequisite for building a normative consensus.

The top concern of researchers is neck strain caused by less than optimal weight distribution. The bulk of the weight in most headsets is borne by the brow and the nose, leading the user gradually to tilt the head forwards. Over time, this posture causes tension in the neck. Additionally, the narrow field of view in some headsets can result in more head movements. Prolonged use of a VR headset therefore poses a greater risk of musculoskeletal disorders of the neck and shoulders.

These concerns were heightened with the arrival of kinaesthetic 'haptic feedback', a technology that can create an experience of 'touching' objects in virtual environments. One example is the HaptGlove, which exerts pressure in real time on the fingertips to simulate an object's texture. Other devices rely on electrostimulation, or delivering an electric shock to make one or more muscles contract, simulating tactile feedback. Tomorrow's VR will therefore no longer be restricted to a visual and auditory experience but will allow people to touch and feel virtual objects. Yet research on the potential long-term effects of haptic technologies on users' health and safety is in extremely short supply.

A psychosocial minefield

The metaverse has also raised a host of psychosocial questions to which research has not yet provided all the answers. What are the potential mental health risks of prolonged immersion in a virtual work environment? What is its impact on work/life balance, social isolation and mental workload? The fear is that the metaverse will be added to the range of new tools used to strengthen managerial control. The sensor-covered headsets could increase the negative aspects of distance working, especially when it comes to the possibilities for monitoring and tracking workers' performance. The deployment of micromanagement practices of this kind often results in greater work intensity.

In 2022, a collaborative research project⁵ carried out by several European universities compared the experience of participants who spent one 40-hour working week in VR and another in a traditional office environment. The study used a

standard VR configuration available on the market today. The outcomes showed a 35% increase in perceived workload when work is performed in an immersive environment. Participants reported greater feelings of frustration (42%), anxiety (19%) and eye strain (48%). Two participants dropped out of the study on day one because of severe migraine, nausea and anxiety. Another significant finding was the cumulative nature of adverse impacts over the week, especially where workload and nausea are concerned. We are still a long way from the ideal of a metaverse as a productive environment, and there is still a great deal to be done to improve ergonomics and user immersion.

The development of increasingly realistic environments also poses risks, in particular with regard to unwanted contact. At the end of May 2022, the American NGO SumOfUs disclosed testimony from one of its female researchers who was the victim of inappropriate behaviour from another user who had simulated a sexual act on *Horizon Worlds*. Other users have reported similar experiences, forcing Meta to introduce

3. Domingues C., Otmane S. and Mallem M. (2010) 3DUI-EF: towards a framework for easy empirical evaluation of 3D user interfaces and interaction techniques, *International Journal of Virtual Reality*, 9 (1), 73–80. https://hal.science/hal-00450311v1/file/LAST_3DUIEF_21012010_corr_fred.pdf
4. Bastide S. (2021) *Adaptation du mouvement humain à de nouvelles dynamiques gravito-inertielles induites par l'interaction avec un exosquelette de membre supérieur actionné*, *Biomécanique [physics.med-ph]*, Université Paris-Saclay. <https://theses.hal.science/tel-03280380>, p. 36.
5. *Quantifying the effects of working in VR for one week*. <https://browse.arxiv.org/pdf/2206.03189.pdf>



↑ The metaverse: an entire universe accessed through a virtual reality headset. Photo: © Belga

a minimum distance between all avatars. The NGO's report used the word 'rape' although there was no real physical interaction. However, haptic technology could make this a reality in the years to come, with virtual contact between two avatars triggering physical sensation. Platforms will most likely face a dilemma because introducing protective measures may reduce the immersiveness of the experience.

Innovation outpacing safety concerns

Digital technology continues to expand quickly and permeate deeply, transforming entire sectors of the economy. Distance working is a perfect example. Many businesses now have videoconferencing rooms and a veritable armada of collaborative

software. Could the metaverse be the future of remote working? It's difficult to say. But this is the niche where the VR industry is positioning itself, accompanied by a fanfare of superlatives and revolutionary promises. Although it's far too early to assess the impact of the metaverse on the work environment, research is already sounding the alarm on the potential risks to occupational health and safety. Data on its long-term effects are in short supply, especially with regard to musculoskeletal disorders and the impact on the vestibular system. Usage is also a key issue and carries with it the danger of enhanced monitoring practices and remote micromanagement, which are vectors for psychosocial risks.

As ever, innovation is outpacing the consideration of health and safety questions. In the era of globalisation, organisations

are struggling to remain competitive on the world stage and are investing massively in research and development. Innovations are labelled 'bold' or disruptive' because they toy with the limits of the law and existing regulations, turning workers into unwitting guinea pigs along the way. And as long as it manages to whet some businesses' appetites for managerial innovation in the new world of work, the metaverse will most likely be no exception to this rule. ●