



# Virtual Immersive Workplaces: The New Norm? – A Qualitative Study on the Impact of VR in the Workplace

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**Abstract.** Since the 1970s, telecommuting has generated significant interest among scholars and practitioners alike. However, the topic of flexible working arrangements has never been more relevant than lately, in the face of COVID-19 pandemic. As digital technologies evolve different aspects of today's world, immersive workplaces enabled by technologies such as virtual reality (VR) become more appealing. Therefore, the main objective of this paper is to study the phenomenon of virtual immersive workspaces and the generated impact in the organizations. Conducting semi-structured expert interviews, this study provides insights to better understand the trends driving subsequent immersive technologies, fostering competitive advantages in the web3 era, but also relevant roadblocks organizations face in this context. Our results identify the key benefits, as well as the limitations pertaining to the implementation of VR in the workplace. Moreover, our findings address the importance of purposefully designing a toolset for telecommuters to inspire further debates on the future of work for academia and in practice.

**Keywords:** Telecommuting · Virtual Workspace · Immersiveness · Virtual Immersive Workplace · Virtual Reality · Organizational Behavior

## 1 Introduction

Recently, the COVID-19 pandemic induced the need for social distancing and minimized physical presence at work. Consequently, many organizations were forced to use tools such as videoconferencing, cloud services, and virtual private networks, on an unprecedented level, forming a “new normal”. Moreover, throughout the evolution of web, coined as webvolution [1], focus has shifted from access and find (Web 1.0), share, participate, and collaborate (Web 2.0) to immersive collaboration and co-creation (Web 3.0) [2] on a larger scale. Accordingly, new interfaces – defined as means of communication between user and computer or any electronic device [3] – need to be explored in order to establish a sustainable and effective “new normal” for work environments [4].

Considering the alternative workplaces, telecommuting has generated significant interest from scholars and practitioners alike, since its inception in the 70's. Varying terms and conceptualizations, such as remote work, distributed work, virtual work, etc.,

have been introduced since then [5]. Focusing on the work experience and employee outcomes, existing research on telecommuting has uncovered a number of predictors, mediators and moderators as follows: (1) the characteristics of the work itself, autonomy, schedule control and task interdependence [6], (2) the level of trust, social isolation, influencing knowledge sharing among employees which is critical to the development of social capital, and organizational effectiveness, and (3) information technology induced factors and the ability to transmit social cues [7]. According to the Media Richness Theory [8], different media or forms of communication have different levels of richness in the information that they provide. For instance, tools such as e-mail lack social richness as gestures and emotions are difficult to transmit, hence the success of video tools that can convey some social cues [8]. Indeed, the type of medium used to communicate with the user is just as important as the content presented by the medium itself [9]. However, as the traditional ways of communication have been disrupted due to the rise of new interfaces, the academic research, to this date, lacks the focus on the technological infrastructures within telecommuting, spotlighting “immersiveness”. Therefore, this paper combines research on telecommuting and immersiveness through technological solutions of Virtual Reality (VR), and draws on studies from a broad range of fields, with a main focus on management, computer sciences and psychology. More specifically, we explore the adoption of VR in organizations, and study the impact of digital immersiveness in the workplace by answering the following research question: *How do immersive environments impact the work experience in organizations?*

The main objective of our research is to gain a deeper understanding of the perceptions of immersiveness in the workplace. Therefore, we apply a qualitative research approach through an explorative literature review. Semi-structured expert interviews are then conducted to answer the aforementioned RQ within a real-life context. Our study contributes to the body of knowledge on immersive tools, especially VR, by exploring the driving reasons to accelerate the adoption and suggesting approaches to measure the success as well as investigating the significant limitations of this technology in organizations. Moreover, our results indicate that the user experience is pivotal and involves all the key benefits, but also drawbacks, of VR adoption in workplace.

The remainder of this paper is organized as follows: The literature review provides an overview of the academic theoretical framework of telecommuting and a depiction of the benefits and drawbacks identified so far. This is complemented by expanding on the growing demand and macro trends driving the conversation on the future of work. Section 3, describes the methodological approach. Finally, the results and discussion section reveals the major findings and the concluding section addresses the limitations as well as future research.

## 2 Literature Review

Workplace, defined by Jackson and Suomi (2002) as a social entity [10], is not only merely the sum of elements of production, processing and outcomes but also an extensive social environment, where colleagues share interactions affecting each other, and ultimately, the quality of the work produced [11]. Reflecting on Organizational Behavior (OB) – defined as a field of study devoted to understanding, explaining, and ultimately

improving the attitudes and behaviors of individuals and groups in organizations [12] – a key component of workplace experiences is communication, through which much of the work in a team is accomplished [13].

In the context of telecommuting, the effectiveness of communication is critical and can be influenced by the competence of the sender and receiver as well as noise, information richness, and network structure [13]. Evidently, virtual teams often have limited communication bandwidth, requiring employees to invest more effort compared to human regular communication patterns, which are transferred through body language and non-verbal cues [14]. Meanwhile, as the economy shifts from a manufacturing to an information economy, the number of telecommuting work possibilities is growing consequently [15]. Therefore, with the rise of new computer interfaces, communication sciences need to be further developed so that organizations can facilitate communication efficiently, through choosing the right media [16].

Considering the multifactorial and complex impact of telecommuting, in this paper, we follow the definition of telecommuting as an alternative work arrangement in which employees can replace or substitute work environments, away from a central workplace, through the use of information communication technology, for at least some portion of their work schedule [5, 17, 18]. Implications of telecommuting for employees have been studied, ranging from work-family issues, attitudes, and work outcomes (including job satisfaction, organizational commitment and identification, stress, performance, wages, withdrawal behaviors, and firm-level metrics) [5]. Examples of benefits are as follows: (1) significantly lower work-role stress and work exhaustion [19], (2) reduced commute times, (3) positively associated job performance and productivity [17] and (4) better-suited workforce as the most qualified individuals can be recruited [20]. However, a number of potential drawbacks have also been identified, such as reduced face-to-face communication [17], increased experience of loneliness [21], social and professional isolation [22], decreased knowledge sharing [23], unclear boundaries between work and family roles [5] or even negative career consequences [24]. In addition to the academic interest, telecommuting has also generated great public debates due to the COVID-19 pandemic-induced need for social distancing and minimizing physical presence at work [25]. Companies with a high level of IT endowment, output-oriented coordination, and experience in providing flexible working hours adapted better to the quarantine and social distancing measures introduced in many countries under the influence of the pandemic [26]. The rapid adaptation of teleworking strategies globally showed how the concept boosted team productivity and creativity with many team managers reporting positive experiences [26]. Evidently, new business practices are needed to establish a sustainable and effective new normal [4]. Indeed, developments in ICTs facilitate more suitable equipment for employees to work outside office spaces [27]. However, higher demands of ICT applications and an reduced rate of face-to-face interactions between team members might impact the subjective work experiences of employees and their motivation to participate in that given team [28]. As a possible solution to these issues, immersive virtual reality technologies, metaverse platforms, and the usage of 5G technologies may enhance teleworking experiences.

The idea of virtual reality arose in the mid-1960s, as a window through which a user perceives the virtual world as if it looked, felt and sounded real and in which

the user could act realistically [29]. Varying definitions have been formulated since then, however, all definitions emphasize three common characteristics of virtual reality systems: immersion, presence, and interaction with that environment [30–34] which have a significant impact on the user experience [35, 36]. Today VR is successfully employed for a rather vast range of applications, due to its ability to induce significant improvements and increase effectiveness in various fields such as engineering, medicine [37], design, architecture [38] and construction, education [39], learning and social skills training [40], arts, entertainment, business, communication, marketing, military, and exploration [41].

### 3 Methodology

In order to understand the current state of research on the impact of immersive technologies on the workplace, we adopted an explorative approach. Starting with a brief review of related works, semi-structured expert interviews were conducted to approach the main topics from different viewpoints and expand the data collection by providing time and format for crystallization on practical insider knowledge [42], thus enriching the research [43].

We applied a purposeful sampling strategy to recruit interview partners (Table 1), including the perspectives of technology providers, consultants and researchers who work with VR and experience or study the implications.

**Table 1.** Overview: Interview partners.

Interviewee	Position	Type of Company
IP 1	Global Lead - Go To Market Strategy	Software developing
IP 2	Strategy, XR & Metaverse	Consulting
IP 3	Founder & CEO	Software developing
IP 4	Managing Director: Innovation/AI & Emerging Technology Lead	Consulting
IP 5	Strategic Account Executive	Software developing
IP 6	Founder & CEO	Software developing
IP 7	Head of Sales	Software developing
IP 8	PhD Candidate on User Experience of Virtual Reality	Research

All participants are currently working on implementing VR in the workplace and were approached through personal contacts or reaching out to industry leaders via LinkedIn. In total, 8 semi-structured interviews were conducted online, in English, lasting 20–56 min. All interviews were recorded, transcribed, and coded accordingly.

### 3.1 Data Analysis

In order to interpret our data, we applied qualitative content analysis [44] and coded each sentence [45]. Thereafter, we used Gioia methodology to categorize codes into 1st-order concepts, distilled into 2nd-order themes, and finally creating aggregate dimensions, turning the full transcript into manageable units [46]. The coding process was supported by ATLAS.ti, which is a qualitative computer software package to manage textual, graphical, audio, and video data. Figure 1 illustrates our data structure as follows.

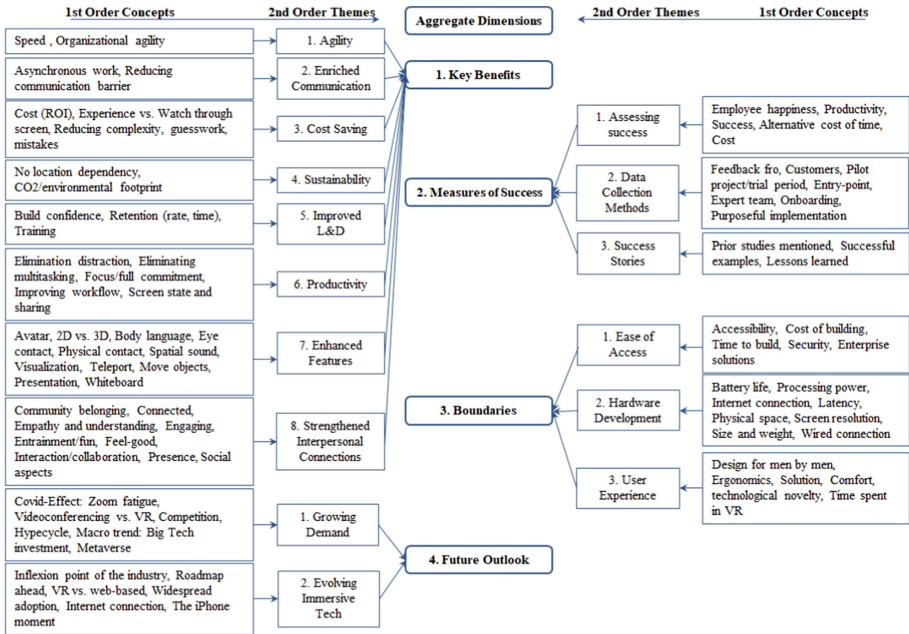


Fig. 1. Data Structure.

## 4 Finding and Discussion

Following the Gioia method in our data analysis, we identified four aggregated dimensions regarding virtual immersive workplaces as following: key benefits, measures of success, limitations and future outlook.

### 4.1 Key Benefits

**Agility.** Virtual immersive workplaces provide organizations with the capability to respond and adapt to changing circumstances in a quicker and more resourceful manner. Participants pointed out the opportunity to foster the business agility as a solution for maintaining competitive advantage: “*You are actually faster, then if you work in 2D, you actually arrange information better.*” (IP 3)

This becomes increasingly relevant in times of uncertainty and complexity, such as the COVID-19 pandemic [47].

**Enhanced Communication.** Experts highlighted the relevance of having the option of working and communicating both synchronously and asynchronously in teams. The virtual space saves progresses, remembers exactly where team members left the work and the project can carry on 24/7. This finding is consistent with literature that considers virtual environments supporting synchronous and asynchronous collaboration to increase the quality of communication, knowledge sharing and interactions among different stakeholders and multidisciplinary teams [48–50].

**Sustainability.** Participants elaborated on the benefits of virtual environments replacing physical settings for conducting business by not being bound to a specific location: *“If you don’t take flights, you’ll do something that’s better for people, better for the environment and better for our cost base.” (IP 4)*

Consequently, the ecological footprint of businesses decreases through the reduction of travelling. Moreover, companies can address issues of work-life-balance and wellbeing of the employees through flexible working arrangements enabled by virtual workplaces. Azeem and Kotey (2021) identify these issues as critical for employee’s motivation and job satisfaction to fulfill company’s long-term objectives [51].

**Cost Savings.** Experts emphasized VR-driven financial rewards ranging from savings on travel costs, infrastructure, or product design lifecycle-activities where a great amount of cost to the organization incurs. Moreover, the pure cost efficiency has been mentioned multiple times through examples of reduced training time.

**Improved Learning & Development.** Participants explained that trainings can be tailored for each individual targeting specific skills and knowledge they seek, in a much more concise and efficient manner and timeline. This is coherent with previous findings, suggesting that due to the possibility to safely simulate real contexts and experiences, VR may advance the effectiveness, safety and accessibility of training [52–54]. Experts highlighted that virtual environments can provide a repeated practice possibility without many trade-offs in the real world such as injuries, waste of material and extra costs. Participants also pointed out that the actual knowledge retention takes place involving a number of senses leading to deeper formed memories: *“Designed to train people usually in dangerous jobs, jobs that if they fail in the real world, people die. So now they can do it safely.” (IP4)*

**Productivity.** All participants underlined productivity, as one of the main benefits stemming from purposefully replacing the real world environment with stimulating VR, which is distraction-minimizing. This finding represents important motivating factors to further tap into the potentials of VR in the workplace, as productivity is directly related to the ability of a system to generate profits [55]. Unlike teleconferencing, VR users benefit from the feeling of co-presence, a sense of being together, a simulation of being in the same room. Thanks to more “psychological connection of minds” [56] this can lead to improved teamwork and productivity as well: *“I’ve never spent 45 min- 1 h on a resourcing activity like that with my full attention.” (IP7)*

*“The number one reason for VR being effective is that you can’t be distracted. You got a headset on, you can’t be doing your email. You can’t be doing a deck, right? You can’t be texting your friends or watching YouTube.” (IP4)*

**Enhanced Features.** Experts emphasized elements such as handshakes, virtual hugs, gestures, eye contact, and representation through an avatar. Next to body gestures, facially communicated information is centrally important in real life social interactions [57]. Studies have shown that direct stare “evokes” the perceiver’s full attention instinctively [58–60]. These observations can explain why the ability to keep eye contact and see the direction of gaze caught special attention to our participants.

**Strengthened Interpersonal Connections.** Strengthened Interpersonal Connections. Results show that in a virtual environment people do feel connected and also understand each other to a greater extent. As unique identities and avatars are visually displayed in 3D virtual environments, a sense of empathy is built among the participants during a virtual meeting [61].

## 4.2 Measures of Success

**Assessing Success.** Experts highlighted, the usefulness of a virtual environment is generally assessed in terms of practical success, such as knowledge transfer and achievement goals, or the measurable return on investment. The reason behind this is the feasibility of measuring these impacts. Furthermore, experts highlighted the transformative impacts, such as generating long-term competitiveness and the power of transformative technology in the long run: “*It would, of course, depend on the reason why it is implemented and the success metrics of the unique company.*” (IP8)

**Data Collection Methods.** As stated above, the question of what is a success metric varies according to the business objective of the specific company; hence the form of collecting information varies as well. However, our experts suggested both quantitative and qualitative approaches: (1) retrieving figures from the past that can be compared with current figures to evaluate the impact, such as the cost of an error or cost of travel, (2) measuring the progression over time, for example performance applying a specific skill which is acquired through VR, (3) collecting open and honest feedback through anonymous questionnaires and qualitative interviews investigating how employees perceived the use and usefulness of the technology.

**Success Stories.** Interviewees mentioned many real-world success stories as examples and inspirational ideas to measure the return on VR adoption in the organization. One of the respondents described an example from the Architecture, Engineering and Construction industry (AEC) in which through adding an extra dimension to the digital model reviews, new errors in both construction and model are frequently discovered: “*Instantly within 20 min, they found like 20 errors that they couldn’t see when they came onto the screen.*” (IP1)

These are errors that occur in large projects, which would otherwise only be discovered later in the process. Extra costs incurs quickly, especially if the error is not detected before the job is done physically on the construction site. The ROI of the implementation of VR arguably pays itself off already after the first use. One of the experts from the consulting world stressed to look at the cost of travel compared to the cost of a headset. As the infrastructure of VR becomes more and more affordable, a virtual conference in



VR can pay off already in the first meeting. Likewise, in the field of learning and development multiple examples of success have been mentioned. In an insurance company, employees have been divided into two distinct groups, training in a traditional setting versus VR. This took place over a 24-month period of time, and the results showed that the people that were trained in VR performed 20% better than those that were trained traditionally. Similar scenarios illustrate that VR training could achieve three times higher productivity and enable senior employees to return to work sooner, hence decreasing revenue loss of the organization.

### 4.3 Boundaries

**Ease of Access.** According to the experts, although the Covid-19 pandemic created an increased demand to adopt VR, it also led to government-imposed lockdowns of manufacturing and other facilities. Furthermore, the workplace usage of VR bears different needs than consumer use cases, as some of the interviewees stated. In addition to the hardware issue, mainstream adoption has been hampered far by the limitation of building software solutions. Despite the fact that many software packages are available off the shelf, many firms tailor software to their specific needs. This process might both take long and become comparably expensive. Moreover, enterprise adoption is challenged due to concerns of security. In specific, there is a limitation towards securing data after they are introduced onto their network environments.

**Hardware Development.** Interviewees noted that in order to achieve large scale adoption, headset development is crucial. Noteworthy recurring variables mentioned were: battery life, tracking, processing power, latency, screen resolution, size, and weight (IP1, IP5, IP6).

*“Hardware has to catch up. Hardware has become more comfortable and has become more powerful. The battery life has to be better”. (IP5)*

Beyond that, it has been underlined that the technological advancements in tracking largely contribute to the perceived feeling of users. Tracking allows recording the position and orientation of real objects in physical space and transferring it to VEs, so that there is spatial consistency between real and virtual objects. The more accurate the tracking is, the better the interaction in a VE is [62].

**User Experience.** One of the most mentioned complaints has been the subjective experience of discomfort while wearing the headsets. According to our participants, current adaptors often experience discomfort due to wearing the head mounted display. Moreover, the mental phenomena side of comfort, the so-called “feel-good” factor, has been highlighted as secondary selection criteria of any VR technology. Experts pointed out that although in technology solution selection process organizations primarily evaluate tangible aspects such as features or security, at the final stage of the selection, the feelings associated with the experience play a crucial role (IP3, IP6). The UI/UX paradigms of 3D spatial computing are still new to users and hence the dynamics still to be learned impose another layer of challenge to the users. The majority of employees tend to be novice users, meaning they are inexperienced using the skills and knowledge required to



seamlessly operate in VEs. Another factor of limitations imposed by human character is the reluctance to change. In the words of one of our experts: “*people don’t like change.*” (IP 1).

Researchers have been studying the number of reasons why various symptoms including nausea, difficulty concentrating, dizziness, headache, sore/aching eyes, and etc. [63] arise both during and after the VE experience, often referred to as cyber sickness. However, as of today, there are no definitive answers due to human complexity and a number of individual factors such as gender, age, illnesses and position in the simulator that all can influence the usability of the technology [64]. Furthermore, our results pointed out the user experience in terms of user resistance and acceptance involve every key benefits, but also drawbacks, as well as measures of success and future outlook of immersive technologies in the work place. This finding is consistent with the Unified Theory of Acceptance and Use of Technology that holds to factors such as Gender, age, experience, and voluntariness of use to moderate the impact on usage intention and behavior of users towards an information technology [65].

#### 4.4 Future Work

**Growing Demand.** According to the experts, demand has been shaped by organic growth and by external shock. Due to technological advancements in recent years, there are already industries such as the simulation industry, where the gains of adoption are so evident that it becomes a necessity to maintain competitive advantage rather than an opt-in option: “*People have invested so much in these remote tools and they’ve gotten so used to being able to work remotely, and there is now a demand by many employees that they can have the flexibility for where they work. I think it has fundamentally changed how people perceive these types of technologies.*” (IP6)

Another expert pointed out: “*Everybody has felt the pain and everybody is kind of aware that this new technology isn’t so niche gaming anymore.*”(IP3)

However, due to the Covid-19 pandemic, the industry observed a sudden surge of organizations looking to solve the lack of social interactions, engagement, and videoconferencing fatigue.

**Evolving Immersive Technology.** The experts agreed that the adoption will be fueled by technological advancements and compared this evolution to the adaptation of computers. However, the adoption of extended reality technologies is still in the early stages, where the actors today can be categorized as early adopters. Nevertheless, the inflexion point is nearing, and once the industry arrives at the so called “iPhone moment” it will take less than 10 years to have full enterprise saturation, similar to the current situation with smartphones (IP4). Experts see new entrants to further drive the market in short-term, increasing the competition, and providing new solutions with possibly faster release cycles. In the long run, participants foresee solutions that can respond to the aforementioned limitations and foster wide scale adoption through mixed reality seamlessly interweaving in our everyday lives.

## 5 Conclusion, Limitations and Future Research

The findings of this research contribute to a greater understanding of virtual immersive tools such as VR in the workplace. As the flexible working arrangements are becoming increasingly relevant, the role of information technologies in organizations evolves further in the context of telecommuting. A brief overview of the academic theoretical framework of telecommuting and a depiction of the benefits and drawbacks are provided with a focus on immersive workplaces enabled by VR. Furthermore, the growing demand and macro trends driving the conversation on the future of work are identified. Moreover, eight representatives with different backgrounds and expertise in the field of VR were interviewed, offering their insights and outlining the adaption of immersive tools in the workplace. At this point, the Gioia data structure and developed aggregate dimensions shed light on the impact of immersive environments on the work experience in the organizations from four aspects of key benefits, measures of success, boundaries and future outlook. In a nutshell, immersive virtual environments enable more engaging communication and collaboration, and provide users with capabilities to achieve higher productivity, in a cost-effective way. However, while the demand for such technology is rising, the provider side must catch up and address the limitations regarding the user experience that are holding back wide-scale adoption. Importantly, the expert interviews indicated that the “VR revolution” in the workplace is only at the early adoption phase and that changes in the years to come will be paramountly fueled by technological advancements that have long been awaited. Thus, the research sets out those organizations, especially employing knowledge workers, already have a wide range of possibilities to benefit from this technology. Conclusively, organizations are recommended on a case-by-case basis; actively engaging in evaluating the implications of such technology in their field of business and workplace.

This research, like research in general has certain limitations. First, the research was limited to eight interviews with experts in the virtual reality industry. Future empirical evidence from employees, and organizations already using virtual reality technology would allow more generalization. Furthermore, building upon the results provided herein, future research may narrow down the technology and its impacts on the specific industries to develop deeper insights into potentials and challenges. Finally, considering the exploratory nature of this study, in-depth surveys and analyses can be conducted to confirm the findings. Besides, as this study primarily focuses on the technological aspect of telecommuting, the future research could link the impacts observed with different managerial approaches to better capture the complete picture of beneficial potentials of flexible working arrangements rather than conventional office work.

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