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# Meetings in the Enterprise Metaverse: How Virtual Reality Affects Scaled Business Agility

Nilusha Aliman  
Thorsten Hennig-Thurau  
André Henke



Niedersachsen. Klar.



## Authored by:

### **NILUSHA ALIMAN (M.SC.)**

Nilusha Aliman is Research Executive at the XRLab@MCM. She is a Ph.D. student at the Chair of Marketing & Media Research at the University of Münster. Her research focuses on the value of immersive technologies for organizations and society.

*nilusha.aliman@wiwi.uni-muenster.de*

### **PROF. DR. THORSTEN HENNIG-THURAU**

Thorsten Hennig-Thurau is Professor of Marketing and holds the Chair of Marketing & Media at the University of Münster. He serves as Academic Director of the XRLab@MCM, which aims to explore various facets of how experimental realities influence the way people work, consume, and live. “ProfTHT” explores the digital and virtual economy and has been honored with a number of awards for his research, including a Lifetime Award for Published Scholarly Contributions from the UCLA and the JAMS Sheth Foundation Best Paper Award in both 2015 and 2018.

*tht@wiwi.uni-muenster.de*

### **ANDRÉ HENKE (DIPL.-ING.)**

André Henke is the Head of digitalization public administration at the Ministry of Internal Affairs and Sports of Lower Saxony and Head of Testbed Extended Reality (Metaverse) Germany at the GovTech Campus Germany. He is a specialist in scaled agile program management and led the agile events within this research project.

*andre.henke@mi.niedersachsen.de*

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### **UNIVERSITY OF MÜNSTER**

Marketing Center Münster  
Lehrstuhl für Marketing & Medien  
Am Stadtgraben 13-15  
48143 Münster

### **XRLAB@MCM**

Website: <https://xrlab-mcm.space/>

Phone: +49 (0) 251 / 83 250 88

Email: [xrlab-mcm@wiwi.uni-muenster.de](mailto:xrlab-mcm@wiwi.uni-muenster.de)

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# Does Taking the “Blue Pill” Boost Organizations’ Agility?

Team meetings have been at the heart of businesses worldwide for a long time, regardless of industry and region. They not only provide a platform for team communication and collaboration, but also facilitate problem-solving and decision-making in an engaging and interactive atmosphere. In 2007, employees spent an average of six hours per week in meetings, while senior managers met with colleagues an average of 23 hours per week.<sup>1</sup>

The environment in which such team meetings are carried out, however, has been challenged by digitalization and globalization. While traditionally the clear majority of team meetings were face-to-face (F2F) meetings, where managers got together in person, with telephone conferences serving rather as an exception, collaborative working environments have changed substantially over the last years. Today, organizations are often spread across the world, with offices and branches in different countries and continents, making it enormously costly for distributed teams to get together physically. Even before the COVID-19 pandemic, organizations had begun to explore the option of digital meetings via videoconferencing platforms such as Skype, Zoom or Microsoft Teams, a trend that has been massively expanded when the spread of the pandemic hampered personal meetings or prevented them completely. Today, videoconferencing has become a “new normal” for collaborative meetings. The average employee nowadays spends up to 12 hours a week in online meetings, twice the time compared to 2007 and capturing more than 25% of the average total work week.<sup>2</sup>

However, with the rise of videoconferencing has come substantial criticism questioning the effectiveness of such technology-mediated meetings, which have been identified as cause for phenomena such as “videoconferencing fatigue”, often referred to also as “Zoom fatigue”, giving to the widely used platform. These findings have not only led to calls for the reduction of home office time and the return of physical meetings,<sup>3</sup> but they have also sparked the quest for better technology-mediated meeting alternatives and, specifically, the use of high-fidelity virtual reality (VR) for that purpose. While VR technology has been around for quite some time, its use for social interactions such as meetings was traditionally restricted by limited processing power and display quality of headsets.

However, today’s stand-alone, mass-market VR devices offered by firms like Meta (formerly Facebook), HTC, Pico (from TikTok parent company Bytedance), and soon Apple open new possibilities for team meetings. Specifically, the use of VR devices promises to provide computer-simulated environments in which employees and employers can meet and work together represented by their avatars. The argument is that gathering in such an “enterprise metaverse” will enable F2F-like meeting experiences that make use of the cost advantage of digitalization, but also counteract the disadvantages of videoconferencing by boosting productivity while generating less fatigue among those who participate.

**“Today’s stand-alone, mass-market VR devices  
open new possibilities for team meetings.”**

<sup>1</sup> Rogelberg, Steven, Cliff Scott, and John Kello (2007), “The Science and Fiction of Meetings,” *MIT Sloan Management Review*, 48, 17-21.

<sup>2</sup> Chew, Debbie and Mahsa Azizi (2021), “The State of Video Conferencing 2022,” *Dialpad*, (accessed August 15, 2023), [available at <https://www.dialpad.com/blog/video-conferencing-report/>].

<sup>3</sup> Sherman, Natalie (2023), “Zoom Orders Workers Back to the Office,” *BBC News*.



Beyond industry reports (which are usually biased by their authors’ interest of either facilitating the enterprise metaverse or preventing its spread), little is known whether virtual-reality technology is indeed a worthwhile alternative to established videoconferencing meeting formats for remote collaboration. Initial scientific research that has empirically studied meetings in the enterprise metaverse<sup>4</sup> points at counteracting powers, with the advantages resulting from higher levels of so-called social presence among meeting participants being opposed by higher levels of effort and exhaustion of participants. **Which effect dominates in real-world conditions remains unclear yet.**

The research reported herein aims to shed light on this issue that affects not only global leaders in information technology, but also the way meetings should be held remotely in the future across industry. Should managers and team leaders, using a critical crossroads from the visionary metaverse movie “The Matrix” but with a twist, take the red pill and stay in the world of videoconferencing, giving in to the fatigue that comes with it. Or should they take the blue pill – and enter the virtual enterprise metaverse when meeting with colleagues?

We use a real-world application, comparing the practical use of VR headsets for meetings in the enterprise metaverse with

the use of videoconferencing for the same meetings. Our research here is situated in the context of agile planning, an area which seems to be well suited as extent findings point at the potential of virtual meetings to facilitate creative solutions, which constitute an essential aspect of agility-focused initiatives. More specifically, we report the results from two separate, but related experimental studies in which managers of a public organization, namely the Ministry of the Interior and Sport of the German State of Lower Saxony, together with managers of partner organizations (e.g., consulting firms) use either the videoconferencing software Skype or the VR headsets Pico 3 for program-increment planning (in short: PI-planning) meetings, developing agile business strategies.

Their particular effort reflects the organization’s *scaled business agility*, defined as the ability to adapt and respond quickly to developments beyond the actions of single organizational teams, and we investigate how the use of VR headsets for meetings in the enterprise metaverse helps or hurts such scaled business agility. The research reported involves the participation of about 169 managers in the first study and 105 managers in the second study; data collection took place over the course of six months between June and December 2022.

<sup>4</sup> Hennig-Thurau, Thorsten, Dorothea N. Aliman, Alina M. Herting, Gerrit P. Cziehso, Marc Linder, and Raoul V. Kübler (2023), “Social Interactions in the Metaverse: Framework, Initial Evidence, and Research Roadmap,” *Journal of the Academy of Marketing Science*, 51 (4), 889–913.

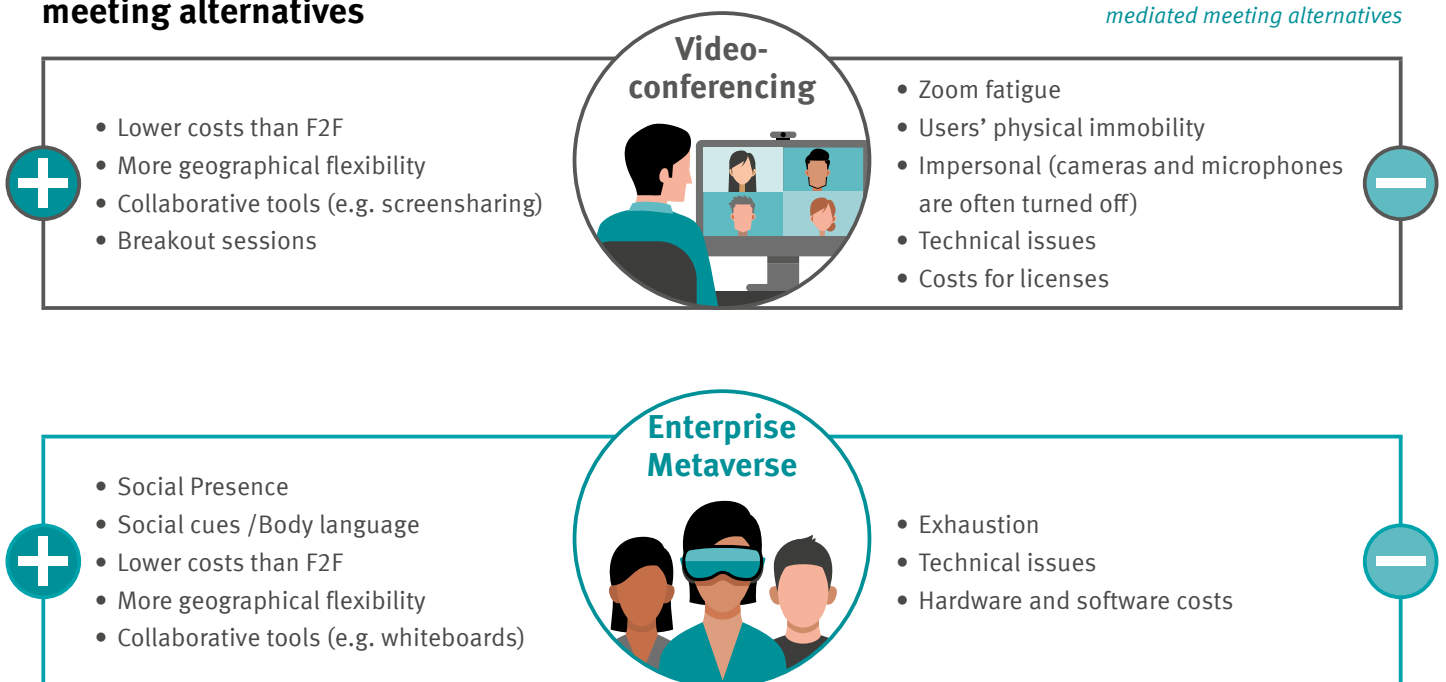
# Meet the Candidates!

The long-held dominance of F2F meetings reflected their higher effectiveness than technology-mediated meeting formats (first audio-only teleconferencing,<sup>5</sup> then videoconferencing<sup>6</sup>). The reason is that F2F communication is known to be the “richest” form of communication,<sup>7</sup> as it allows interactants to directly exchange social cues through their body language and other non-verbal signals. The main reason for the use

of technology-mediated meeting alternatives has been their comparably lower costs, which has become the more prominent the more spread-out teams have been (a function of globalization). The rise of technological alternatives and particularly videoconferencing also mirrors the cost advantages which have resulted from the increasingly ubiquitous character of digital infrastructure.

## Technology-mediated meeting alternatives

Figure 1: Pros and cons of technology-mediated meeting alternatives



<sup>5</sup> Tang, John C. and Ellen Isaacs (1992), “Why Do Users Like Video?: Studies of Multimedia-supported Collaboration,” *Computer Supported Cooperative Work*, 1 (3), 163–196.

<sup>6</sup> Denstadli, Jon Martin, Tom Erik Julsrud, and Randi Johanne Hjorthol (2012), “Videoconferencing as a Mode of Communication: A Comparative Study of the Use of Videoconferencing and Face-to-Face Meetings,” *Journal of Business and Technical Communication*, 26 (1), 65–91.

<sup>7</sup> Daft, Richard L. and Robert H. Lengel (1986), “Organizational Information Requirements, Media Richness and Structural Design,” *Management Science*, 32 (5), 554–571.

## Videoconferencing

With the onset of the COVID-19 pandemic in 2020, videoconferencing has become the new go-to option for team meetings, which is reflected in the exorbitant revenue growth of collaboration platforms. Revenues for Zoom also increased from \$330 million in 2019 to \$4 billion only three years later.<sup>8</sup> In addition to reducing travel costs and emissions compared to F2F meetings, it provides greater flexibility for employees. The value of video meetings benefits from the addition of collaborative tools such as screen sharing or breakout-sessions, which contribute to meeting effectiveness.

However, as the use of videoconferencing platforms has grown, so have the critical voices. Negative headlines such as “Why Zoom is terrible” or “The reason zoom calls drain your energy” can be traced back to the concept of “Zoom fatigue”.<sup>9</sup> It refers to the negative impact that some features of videoconferencing, such as the users’ physical immobility and constant exposure to their own image on the screen, have on users. Research shows that increased participation in videoconferencing leads to a sense of exhaustion and thus decreased concentration.<sup>10</sup> Compared to traditional F2F meetings, studies show F2F communication to be clearly superior with regard to interpersonal mechanisms,<sup>11</sup> higher levels of social presence, and also productivity.<sup>12</sup>

## Enterprise metaverse

Those insights have pathed the way for alternative technologies that suffer less from these disadvantages, specifically those that provide the foundation for the “enterprise metaverse”. As Facebook (the company) was renamed Meta, the term “metaverse”, coined originally by fiction writer Neal Stephenson in 1992,<sup>13</sup> became more prominent to people around the world. With this prominence came a new interest in high-fidelity VR devices in their role as a “gateway to the metaverse”, and also new virtual-reality applications covering a wide range of use cases such as gaming, entertainment, shopping, as well as virtual collaboration. Those apps make

use of state-of-the-art standalone VR devices ability to let users, via their virtual representations named avatars, act and interact within vivid representations of physical and virtual realities, including work and collaboration environments.

What is different in this enterprise metaverse than in when meeting via videoconferences and what’s the pitch for the new technology? Initial studies<sup>14</sup> show that meetings in this metaverse can provide higher levels of “social presence” when compared to other computer-mediated meeting alternatives such as Zoom or Skype – team members feel closer together in a spatial way, similar to physical meetings. This means that the use of the enterprise metaverse through VR devices could combine the advantages of videoconferences with the social presence element of physical meetings, while limiting the disadvantages of traditional of videoconference tools such as Zoom or Skype.<sup>15</sup> However, research has also mentioned a number of potential limitations of the technology that might reduce the attractiveness and value of meetings in the enterprise metaverse. Those include potential physical exhaustion as a result of the wearing of VR headsets, the fact that participants are represented not by a live video showing themselves, but a virtual avatar, and also potential reactance against the new technology by employees, particularly those with a high level of anxiety against all kinds of technological innovations.<sup>12 16</sup>

Existing empirical findings on the value of such enterprise metaverse meetings are rare. A number of companies have reported anecdotal evidence for the usefulness of virtual meetings for a variety of tasks and activities, including workshops (e.g., Axel Springer), employee onboarding (e.g., Accenture), or training (e.g., Walmart). But those reports lack the empirical and analytical rigor that would be essential for any kind of generalization. The only evidence that we know of so far comes from a series of scholarly studies conducted in the university environment, where students served as participants and classroom assignments stood in for company

<sup>8</sup> Statista (2023), “Zoom’s Revenue Worldwide in 2019-2023”, Statista, (accessed August 17, 2023), [available at <https://www.statista.com/statistics/1252725/>].

<sup>9</sup> Bailenson, Jeremy N. (2021), “Nonverbal Overload: A Theoretical Argument for the Causes of Zoom Fatigue”, *Technology, Mind, and Behavior*, 2 (1), 1–16.

<sup>10</sup> Bennett, Andrew A., Emily D. Champion, Kathleen R. Keeler, and Sheila K. Keener (2021), “Videoconference Fatigue? Exploring Changes in Fatigue After Videoconference Meetings During COVID-19”, *Journal of Applied Psychology*, 106 (3), 330–344.

<sup>11</sup> Basch, Johannes M., Klaus G. Melchers, Anja Kurz, Maya Krieger, and Linda Miller (2021), “It Takes More Than a Good Camera: Which Factors Contribute to Differences Between Face-to-Face Interviews and Videoconference Interviews Regarding Performance Ratings and Interviewee Perceptions?”, *Journal of Business and Psychology*, 36 (5), 921–940.

<sup>12</sup> Andres, H. P. (2002). “A Comparison of face-to-face and virtual software development teams”. *Team Performance Management: An International Journal*, 8 (1), 39–48.

<sup>13</sup> Stephenson, N. (1992), “Snow crash”. Bantam Books.

<sup>14</sup> Hennig-Thurau, Thorsten, Dorothea N. Aliman, Alina M. Herting, Gerrit P. Cziehso, Marc Linder, and Raoul V. Kübler (2023), “Social Interactions in the Metaverse: Framework, Initial Evidence, and Research Roadmap”, *Journal of the Academy of Marketing Science*, 51 (4), 889–913.

<sup>15</sup> Wiederhold, Brenda K. (2020), “Connecting Through Technology During the Coronavirus Disease 2019 Pandemic: Avoiding ‘Zoom Fatigue’”, *Cyberpsychology, Behavior, and Social Networking*, 23 (7), 437–438.

<sup>16</sup> Meuter, Matthew L, Amy L Ostrom, Mary Jo Bitner, and Robert Roundtree (2003), “The Influence of Technology Anxiety on Consumer Use and Experiences With Self-service Technologies”, *Journal of Business Research*, 56 (11), 899–906.



tasks, points at the value-enhancing potential of such meetings through higher social presence, but also demonstrates the existence of limiting forces such as higher participant exhaustion. Overall, value creation in these study settings was similar for those who met via videoconferencing and those who met in the enterprise metaverse, with hardly any systematic (dis)advantage of virtual meetings compared to videoconferences. The authors end their investigation by highlighting the various factors that need to be accounted for when it comes to make the best out of the enterprise metaverse, such as group sizes and meeting length.<sup>17</sup>

**“Empirical findings on the value of enterprise metaverse meetings are rare“.**

In the following, we shed more light on the issue and offer robust empirical insights on the usefulness of virtual meetings in practice. We do so with two related experimental studies that were conducted at the Ministry of the Interior and Sport in Lower Saxony (Germany) in cooperation with the eXperimental Reality Lab of the University of Münster’s Marketing Center. Being integrated in the ministry’s regular work routine and employing actual employees of the ministry, our results offer the first scholarly comparison of the use of virtual meetings in the practical context of a large professional organization.



Figure 2: Avatars of managers meeting in a virtual metaverse environment

<sup>17</sup>Hennig-Thurau, Thorsten, Dorothea N. Aliman, Alina M. Herting, Gerrit P. Cziehso, Marc Linder, and Raoul V. Kübler (2023), “Social Interactions in the Metaverse: Framework Initial Evidence, and Research Roadmap”, *Journal of the Academy of Marketing Science*, 51 (4), 889–913.

# The Empirical Setting

## Background and Setting

The digitization program “Digitale Verwaltung Niedersachsen” (“Digital Administration Lower Saxony”) run by the Ministry of the Interior and Sport in Lower Saxony has been operating according to the Scaled Agile Framework (“SAFe”),<sup>18</sup> a prominent framework for scaled business agility. While agility exists at multiple layers of organizations, scaled business agility refers to an organization’s ability to adapt and respond quickly to developments as part of a certain program or initiative – beyond the actions of single organizational teams, while not covering all parts of the organization’s value creation.<sup>19</sup>

In this research, we focus on different dimensions of scaled business agility that originate from the SAFe framework and mirror the nature of agility being a latent and formative construct (see Figure 3). Specifically, we investigate to which degree the setting of a meeting (and the corresponding technology used) supports (1) flexible planning, (2) the proactive addressing of potential problems, (3) changing plans and visualize them, (4) quick and effective reactions to unforeseen developments, and (5) intense participation of all members in discussions.<sup>18</sup>

When investigating technology-mediated meetings in an agile organization, it is critical to determine whether and to what extent the technology-mediated meeting alternative enables agile processes within and across teams.

The overall goal of the ministry’s digitization program is to enable the digital transformation of the government of the German state of Lower Saxony, which offers a large number of services for the states about eight million citizens. Meetings began during the COVID-19 pandemic in January 2021, when roughly 125 managers who participated in the

program got together via videoconferencing, namely by using the software Skype. The limitations the program hosts experienced with this format (such as a lack of “togetherness”) raised the question whether conducting meetings in the enterprise metaverse via virtual-reality devices as part of that digitization program would increase the scaled business agility (and overall performance) of its program while keeping costs lower than in the case of personal meetings. For that reason, the ministry cooperated with external partners that provided additional knowledge and gained access to about 50 state-of-the-art VR headsets.

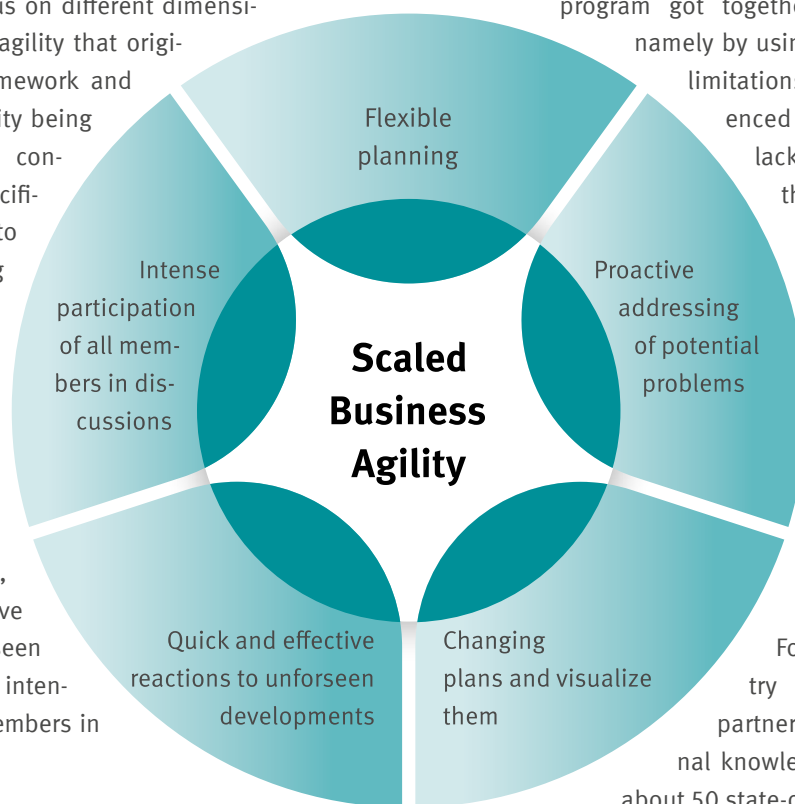


Figure 3: The dimensions of scaled business agility investigated in this research

<sup>18</sup> Scaled Agile, Inc. (2023), “SAFe 6.0 Framework”, Scaled Agile Framework, (accessed August 17, 2023), [available at <https://scaledagileframework.com/>].

<sup>19</sup> Pinho, Celso R.A., Maria Luiza C.A. Pinho, Seyda Z. Deligonul, and S. Tamer Cavusgil (2022), “The Agility Construct in the Literature: Conceptualization and Bibliometric Assessment”, *Journal of Business Research*, 153, 517–532.



### The Two Studies

As a central element of the ministry’s digitization program and the SAFe framework in general, “PI-Plannings” represent multi-day events when participating managers and stakeholders come together once a quarter to plan, negotiate, and align on a plan on both the program and team level for the next months. To align responsibilities with each other, PI-planning events usually take place over a period of three subsequent days. As part of the digitization program they have been scheduled regularly over the year in a three-month cycle. During a PI-planning event, participants meet in teams for project breakouts to discuss the status of projects and set up goals for the next PI-planning. They also meet in plenary sessions to give overall “confidence votes” (e.g., how confident is the team that it can meet the goals for the next PI-planning?) and also to evaluate the PI-planning in a retrospective meeting.

Each PI-planning event is structured similarly and encompasses the same program points with potentially varying topic areas depending on the projects that are discussed. This report includes two distinct, but related studies, conducted during three PI-Planning events between June 2022 and December 2022 organized by the Ministry of the Interior and Sport in Lower Saxony. As shown in Figure 4, subject of the first study was the integration of VR meetings as part of a three-day PI-planning event in September 2022 (“Data collection B”) that was otherwise carried out via videoconferencing and its comparison with the preceding, similarly structured PI-planning in June 2022 (“Data collection A”), where all activities were carried out via videoconferencing (no integration of VR). Study 2 focused on a single 45-minutes session on the final

day of the subsequent PI-planning event in December 2022 (“Data collection C”) which was carried out by some participants in VR, while others met via videoconferencing.

*Study 1: Evaluating the use of virtual meetings as part of multi-day PI-planning events.* The first study was a longitudinal comparison of two follow-up PI-planning events as part of the quarterly PI-planning series. The goal here was to assess managers’ responses to the *combined use* of videoconferencing and meetings in the metaverse as part of a multiday PI planning event. The nature of the study resembled a within-subjects design, as the same managers participated in both events (though not all of the managers took part in the second event).

In Data collection A, 125 managers participated via desktop PCs during the whole PI-planning event using the Skype for Business software by Microsoft (hereinafter referred to as “Skype”). After completing the PI-planning, participants were asked to rate their experience of the event. Data collection B took place after the following PI-planning event, whose structure differed from the previous one only insofar as a group of 44 managers participated in meetings via state-of-the-art VR glasses (namely Pico 3) on the next day. Using a customized virtual space in the Arthur collaboration app, participants met for a retrospective, a presentation of results, and a confidence vote which lasted a total of 90 minutes, with two breaks (see Figure 5 for an exemplary screenshot of those meetings). The meetings on that last day were preceded by an optional 30 minute “onboarding” session in which participants were

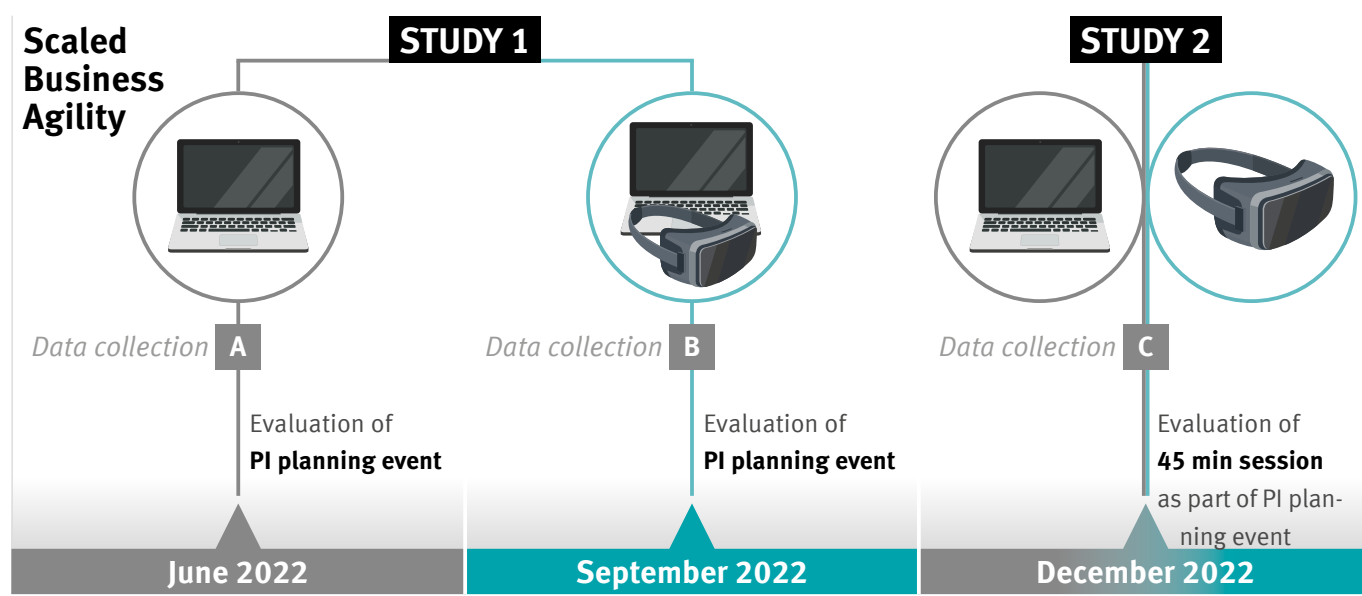


Figure 4: Study design and data collections



Figure 5: Welcome speech by organizer on final PI-planning day in September

familiarized with the technology and software. Data collection B was carried again out at the end of the final day of the PI-planning event. Figure 6 shows the detailed structure of the PI-planning event in September (i.e., Data collection B). The sample of Study 1 thus consists of the responses of those managers who participated in the PI-planning event in June 2022 via Skype for Business ( $n = 125$ ; Data collection A), which we compared with the aggregated results of the managers who used Skype during the first part of the PI-planning event in September and the VR collaboration app during the final day of that PI-planning event ( $n = 44$ ; Data collection B).<sup>20</sup> For both PI-planning sessions (i.e., June and September), the questionnaire consisted of two parts: While the first part dealt with the degree to which the used technology (Skype versus a combination of Skype and VR) supported managerial agility, the second part focused on participants' general evaluation of the event.<sup>21</sup> We used seven-point Likert scaled questions throughout and measured most constructs with multiple items, which were identical in both data collections. When analyzing the responses, we used equal-weighted averages of any construct's items when appropriate. The team size during the events varied between meetings with about 10 participants (e.g., for the "retrospective" session) and plenary meetings with all PI-planning participants (e.g., for the "confidence vote" session).

While using equivalent meeting formats and daily schedules on both PI-planning events should have limited potential biases caused by other factors than the used technology, we draw on a number of measures that we argue should *not* differ between the two events to investigate the general comparability of the two PI-planning events in June and September. Specifically, we draw on the participants' team-related evaluations for the overall event, as each participant was part of several different teams, so that his or her post-event average team assessment for the overall event should reflect how he or she experienced the PI-planning event, and its participants, in general, something that should have been relatively stable given the similar tasks and event structure. We find no significant differences for team communication (the perceived quality of interacting with a participant's "team members";  $\bar{x}_{\text{June}} = 5.63$ ,  $\bar{x}_{\text{September}} = 5.41$ ,  $\Delta\bar{x} = \text{n.s.}$ ), team atmosphere (the perceived quality of the atmosphere of meetings with other team members;  $\bar{x}_{\text{June}} = 5.63$ ,  $\bar{x}_{\text{September}} = 5.64$ ,  $\Delta\bar{x} = \text{n.s.}$ ), and team productivity (the productivity of the teams a participant has been working in, as perceived by him or her;  $\bar{x}_{\text{June}} = 5.52$ ,  $\bar{x}_{\text{September}} = 5.19$ ,  $\Delta\bar{x} = \text{n.s.}$ ), which we treat as support that the PI-planning events in June and September were not perceived by our study participants as systematically different.

**Study 2: Evaluating the use of virtual meetings for a single PI-planning session.** The second study was conducted during the three-day PI-planning event in December 2022 and referred to a single 45-minute session, namely the "retrospective" meeting of the event which provided an opportunity for teams to reflect on their recent work, identify areas for improvement, and make changes for the upcoming iteration. The goal here was to assess managers' responses to the (exclusive) use of

<sup>20</sup> Due to the fact that the survey took place at the end of the last PI-planning day which only those participants who used VR devices attended, only these participants were surveyed (but not those who did not use a VR headset). Due to data privacy regulations, no data could be collected at the level of the individual participant.

<sup>21</sup> See Appendix A for exemplary questions.

meetings in the metaverse via VR technology for such a session and to compared it with the same meeting conducted via videoconferencing. The nature of this study was a between-subjects design, as different managers participated in two versions of one and the same session.

Teams consisting of ten managers each participated in the session either via desktops using Skype or via VR headsets (again, Pico 3), where they again met in a customized space in the Arthur collaboration app. The sample of this study con-

sists of a total of 105 managers, 59 of which used Skype for Business for the session, while 46 managers used the VR collaboration app. The two-part structure of the questionnaire and the scales used was the same as in Study 1. In contrast to Study 1 where we could not find differences between team evaluations as they referred to the various different teams a respondent participated in over the course of the multi-day PI-planning event, we this time find significant differences for the team evaluation measures, which were more positive for the VR condition.<sup>22</sup>

### Procedure PI-Planning September

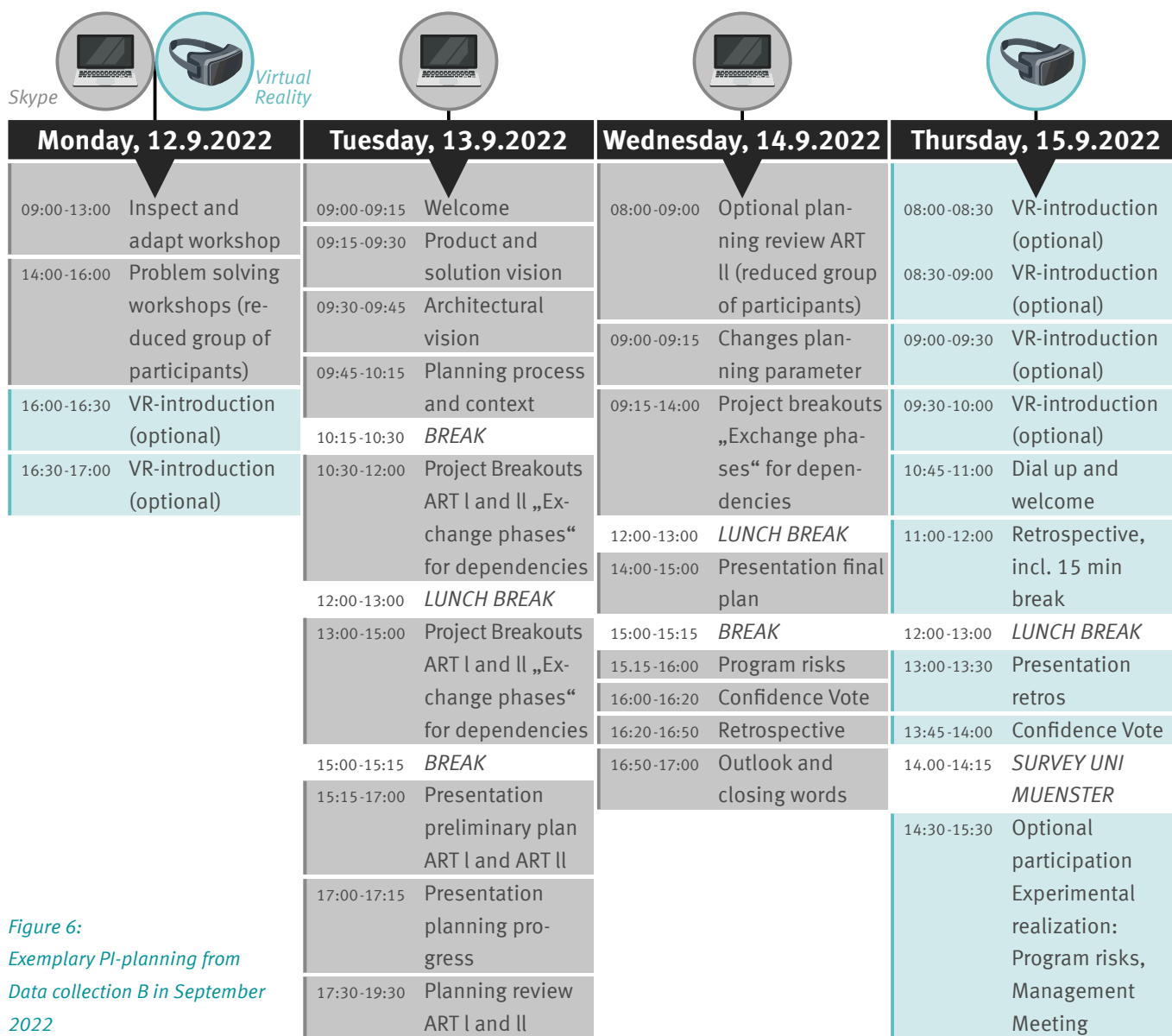


Figure 6: Exemplary PI-planning from Data collection B in September 2022

<sup>22</sup> “Perceived quality of interacting with team members”:  $\bar{x}_{VR} = 5.94, \bar{x}_{Videoconferencing} = 5.12, \Delta\bar{x} = 0.82$ . “Perceived team atmosphere”:  $\bar{x}_{VR} = 6.19, \bar{x}_{Videoconferencing} = 5.36, \Delta\bar{x} = 0.83$ . “Perceived team productivity”:  $\bar{x}_{VR} = 5.80, \bar{x}_{Videoconferencing} = 5.20, \Delta\bar{x} = 0.6$ . All differences are significant at  $p < .05$ .

# How the Enterprise Metaverse Affects Scaled Business Agility and Other KPIs

## Findings for Scaled Business Agility

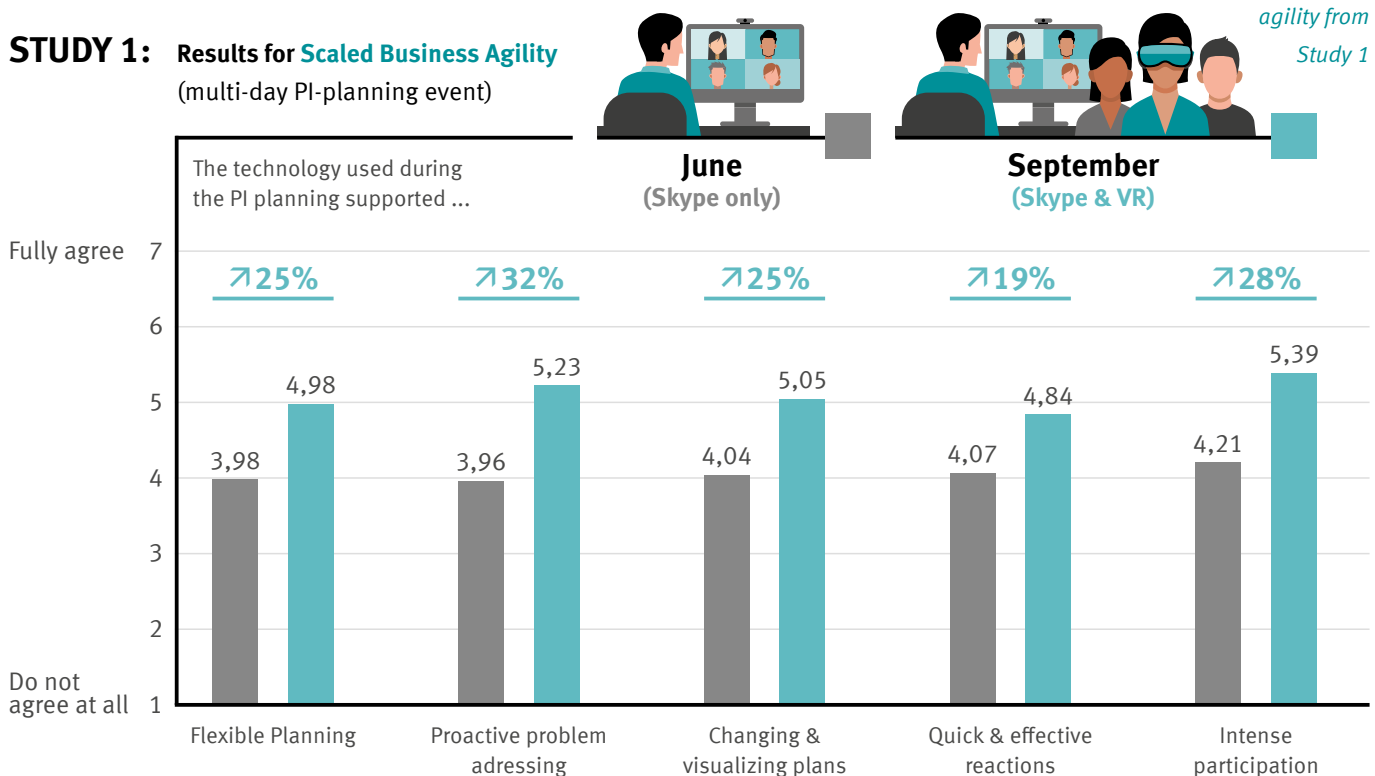
Regarding the key concept of scaled business agility, the results show that, in the settings of this research, meetings in the enterprise metaverse via state-of-the-art VR headsets support agile work in and with teams significantly more than meetings via videoconferencing conducted via Skype. We find this for both of our studies: For Study 1, where managers assessed a combination of videoconferencing and metaverse activity during a multi-day PI-planning event (see Figure 7), as well as for Study 2, where managers rated a 45-minute session in which metaverse technology was used exclusively (see Figure 8).

Specifically, we find for both studies and for *all five* agility dimensions that the enterprise metaverse was perceived as more suitable for the organization's scaled business agility

when compared with the exclusive use of videoconferencing. The average increase in perceived agility attributed to the metaverse setting in Study 1, when the immersive technology was used for the first time, is 26 percent. In Study 2, the average increase in perceived agility over the five agility dimensions is still substantial, but somewhat lower, with 16 percent. The agility dimensions that exhibit the greatest differences between videoconferencing/Skype-only users and (partially) VR users in *both* studies are the support of flexible planning (Study 1:  $\Delta\bar{x} = 1.00$ ; Study 2:  $\Delta\bar{x} = 0.80$ ) and the change and visualization of plans (Study 1:  $\Delta\bar{x} = 1.01$ ; Study 2:  $\Delta\bar{x} = 0.94$ ). The differences are significant at  $p < .05$  for all five agility dimensions, indicating that they are generalizable instead of due to artifacts of this research.

Figure 7: Results for scaled business agility from Study 1

### STUDY 1: Results for Scaled Business Agility (multi-day PI-planning event)



At the same time, we note that the relative advantage-ness see for the agility dimensions as a result of metaverse technology differs between the two studies. The strongest percentual differences for Study 1 exist for the dimension of proactive problem addressing with 32 percent, followed by the level of participating of team members (28 percent), and comparably lowest for quick and effective reactions. In the

context of this second study, we find the strongest positive impact of the metaverse environment for the changing and visualizing of plans (19 percent), followed by the flexibility of planning and intense participation (16 percent). This time, proactive addressing of problems gains the least of the five dimensions, namely 12 percent.

**STUDY 2: Results for Scaled Business Agility**  
(45-minute session during PI-planning event)

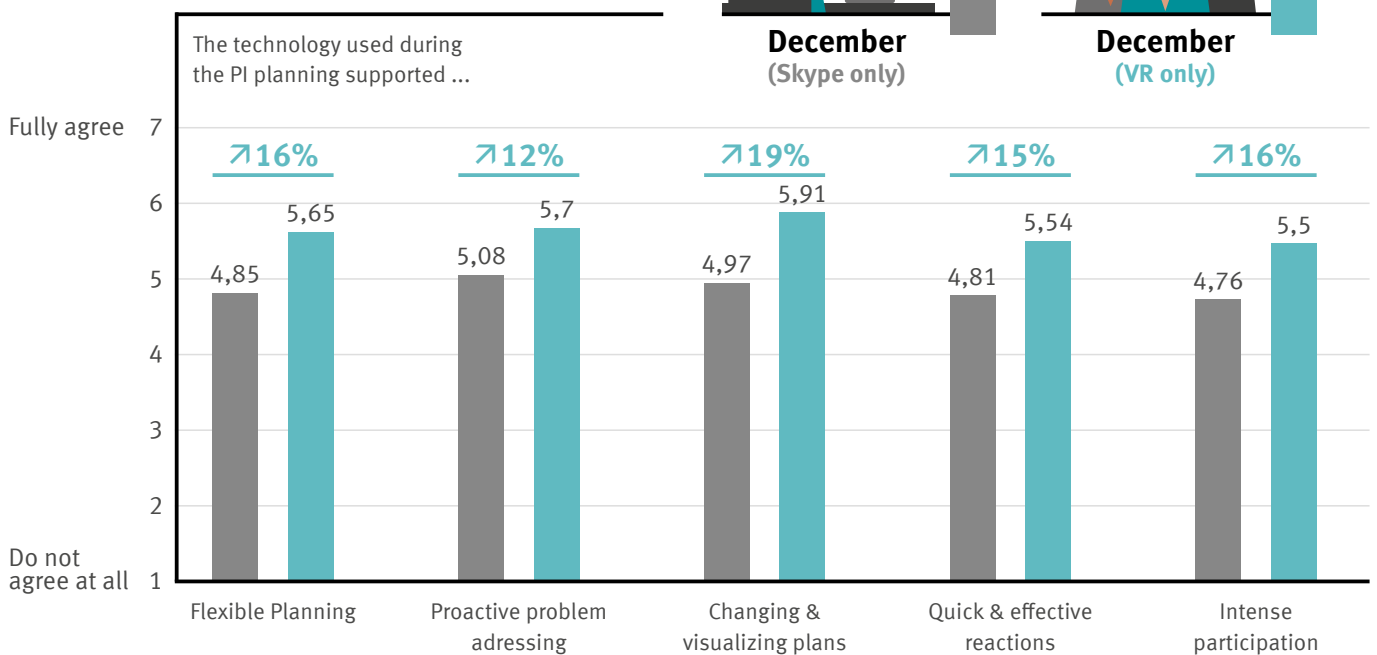


Figure 8: Results for scaled business agility from Study 2

While the results are, in general, highly supportive for the use of metaverse technology in the contexts of our studies, the differences between the two studies might be of value on their own. We believe they point at two aspects of metaverse cooperations in an agility context: First, they could be interpreted as an indication of the “newness effect” of the use of VR technology. As the participants of Study 2 are the same as those of the preceding Study 1, the VR technology and their application to PI-planning is no longer new to them. This interpretation would suggest that about 40 percent of the agility increase we find in Study 1 might be attributed to the initial use of the technology and “wears off” when the use of the technology becomes part of a work routine.

Moreover, the differences in advantages we note among the five agility dimensions can be attributed to the role of the study

context and the relevance of the specific tasks that the participants are required to perform when meeting in the metaverse. While in Study 2 the setting was specific in that VR technology was only used for the “retrospective” meeting element of the overall PI-planning event, Study 1 required a much broader set of activities from the participants, as the VR setting not only included the “retrospective” meeting, but also the presentation and confidence voting elements. For example, it appears plausible that the agility-dimension of changing and visualizing plans, which received the highest appraisal from participants of Study 2 but was ranked only fourth among the five dimensions in terms of metaverse benefits, is particularly useful when it comes to reflect on extant work, identify weaknesses, and suggest future changes. Thus, the context and tasks of a meeting must be considered essential when it comes to judge the agility-enhancing potential of metaverse technology.

But *why* is it that the participants consider an advantage by using virtual-reality technology? Compared to traditional videoconferencing, meetings in the enterprise metaverse benefit from spatial audio and the ability to quickly exchange information in sub-teams by simply moving together to a “quiet” corner of the virtual room and talking without being overheard by others. Another advantage over the chat room option in Skype is the organic and F2F nature of the communication. When team members want to coordinate responsibilities and create plans by sharing information in real time, assess and flexibly allocate resources, and communicate

what is needed to successfully implement the plans they have developed, they can do so without actually leaving the virtual room as they would in chat rooms. This more direct way of communicating and collaborating explains why the users of the enterprise metaverse consider it a more agile meeting environment than videoconferencing. Further, enterprise metaverse collaboration applications such as the one used here enable the use of additional tools that facilitate agile working, such as whiteboards, notes, or other interactive tools, in a three-dimensional setting – something that can particularly increase visualizing plans (see Figure 9).



Figure 9: Visualizing plans in the enterprise metaverse

**“The more direct communication and collaboration might explain why the enterprise metaverse is considered a more agile meeting environment.”**

### *Beyond Agility: Toward an Overall Evaluation of the Enterprise Metaverse*

Finally, we also extended the scope of our probing into the enterprise metaverse and looked at how participants evaluated the experience in general. We study two main categories of concepts that help us to understand the meetings as a whole and also their long-term use: managers’ so-called perceptions of “intermediate states”,<sup>23</sup> as important mediators of the managers’ immediate responses to spending time in the metaverse, and also their cognitive-emotional overall evaluation.

*Perceptions/intermediate states.* A first insight shows that managers experienced a stronger feeling of “togetherness” with their colleagues when acting in the enterprise metaverse, a state also referred to as *social presence*. Figures 10a and b show that in both studies, those in the enterprise metaverse felt a higher level of such social presence, which is consistent with other studies of other kinds of gatherings in virtual worlds and also the focal role that researchers have been assigned to the concept of social presence for the metaverse in general.<sup>23</sup>

<sup>23</sup> Hennig-Thurau, Thorsten, Dorothea N. Aliman, Alina M. Herting, Gerrit P. Cziehso, Marc Linder, and Raoul V. Kübler (2023), “Social Interactions in the Metaverse: Framework, Initial Evidence, and Research Roadmap”, *Journal of the Academy of Marketing Science*, 51 (4), 889–913.

**STUDY 1:**  
Perceptions and intermediate states during multi-day PI-planning event



Figure 10 a: Results for perceptions and intermediate states from Study 1

	June (Skype only)	September (Skype & VR)	Difference
Social presence	4.42	5.01	0.59*
Scope of action	5.14	4.68	-0.46 n.s.
Exhaustion	4.49	4.41	-0.08 n.s.

\* Difference is significant at  $p < .05$ ; n.s. means difference is non-significant

**STUDY 2:**  
Perceptions and intermediate states during 45-minute session



Figure 10 b: Results for perceptions and intermediate states from Study 2

	December (Skype only)	December (VR only)	Difference
Social presence	3.84	5.71	1.87*
Scope of action	5.02	5.24	0.22 n.s.
Exhaustion	3.02	3.62	0.6*

\* Difference is significant at  $p < .05$ ; n.s. means difference is non-significant

Moreover, we checked whether participants who met in the enterprise metaverse experienced a lower, or higher, *scope of action* than those who met via videoconferencing. Scope of action refers to the ability to act and participate in a technology-mediated meeting to the same extent as in a F2F meeting. While the enterprise metaverse offers specific features, its apps, including the one used in this research, restricts other abilities, such as access to the physical world, which makes typing on virtual keyboards often cumbersome. In our context, pros and advantages seem to neutralize each other – we do not find significant differences between those who have used the enterprise metaverse and those who have not.

As the last mediator of value creation in the metaverse, we look at the participating managers’ *exhaustion*, which has been argued to result from the weight of current VR devices and the strain associated with their usage. In this research, we find no extraordinary exhaustion for metaverse users beyond the level reported by PC users in Study 1, in which VR usage was *one* part of a multiday event. For Study 2 however, we find that users of the enterprise metaverse are more exhausted from the “retrospective” session than those who participated in a similar session via Skype. Thus, those who are planning meetings in the enterprise metaverse should pay attention to this findings and potential threat; sufficient breaks between VR sessions can help to attenuate users’ exhaustion.

*Emotions and other reactions to working in the enterprise metaverse.* In both studies, meetings in the enterprise metaverse were perceived as more fun and interesting than Skype meetings (see Figure 11 a and b). Having fun during meetings is not something “unprofessional” – instead, fun contributes to a team’s creativity<sup>24</sup> or performance.<sup>25</sup>

Moreover, we find that the metaverse environment was perceived as offering more *comfort*, as a state of physical ease and freedom to act, to those who participated in the meetings using a VR device. This finding, however, was exclusive to Study 2, when we analyzed a specific 45-minute “retrospective” session, while the perceived comfort of the enterprise metaverse did not differ when the whole multi-day PI-planning event was the subject – for the latter we find an

increase in comfort, but that was not pronounced enough to reach statistical significance.

Finally, those who participated in the enterprise metaverse was looking forward to the next PI-planning more positively than those who did not. We find this result in both studies – while the difference in *positive anticipation* is already quite strong in Study 1 ( $\Delta\bar{x} = .74$  on the 7-point scale), it is almost twice as strong in Study 2 ( $\Delta\bar{x} = 1.41$ ). We consider this as a major insight, as it shows that meetings in the metaverse can lead to a higher motivation to attend future work events compared to using Skype for meetings, and that they can do so well beyond the initial “woweffect” of using the technology for the first time.

**STUDY 1:**  
Emotions and other reactions during multi-day PI-planning event



Figure 11 a: Results for emotions and other reactions from Study 1

	June (Skype only)	September (Skype & VR)	Difference
Fun during team meetings	5.46	5.93	0.47*
Comfort	5.08	5.26	0.18 n.s.
Anticipated positive emotions	4.85	5.59	0.74*

\* Difference is significant at  $p < .05$ ; n.s. means difference is non-significant

**STUDY 2:**  
Emotions and other reactions during 45-minute session



Figure 11 b: Results for emotions and other reactions from Study 2

	December (Skype only)	December (VR only)	Difference
Fun during team meetings	4.87	6.11	1.24*
Comfort	4.99	5.76	0.77*
Anticipated positive emotions	4.10	5.51	1.41*

\* Difference is significant at  $p < .05$ ; n.s. means difference is non-significant

<sup>24</sup> Isen, Alice M., Kimberly A. Daubman, and Gary P. Nowicki (1987), “Positive Affect Facilitates Creative Problem Solving”, *Journal of Personality and Social Psychology*, 52 (6), 1122–1131.

<sup>25</sup> Lehmann-Willenbrock, Nale and Joseph A. Allen (2014), “How Fun Are Your Meetings? Investigating the Relationship Between Humor Patterns in Team Interactions and Team Performance”, *Journal of Applied Psychology*, 99 (6), 1278–1287.



# And What about the Cost Side?

## A Tentative Comparison of Meetings in the Metaverse with F2F Meetings

Our analysis so far focuses on the productivity side of work – it shows that meetings in the enterprise metaverse can increase this productivity in terms of agility and other performances outcomes, compared to meetings that are exclusively conducted via videoconferencing software. But what about the cost side of such meetings? While the costs of the enterprise metaverse and videoconferencing should be somewhat similar, with the exception of the price of headsets which need to be acquired for that purpose, the software platform used and also related service costs, we wanted to compare the costs of meetings in the enterprise metaverse with those of meetings in person, or “F2F”. The idea: if the enterprise metaverse presents a valid alternative to F2F meetings in terms of immersiveness, how does it compete with F2F in terms of costs?

We collected data from the 105 participants of the PI-planning event in December and calculated both environmental and financial costs of traveling to the ministry headquarters in Hannover (Germany), as well as the necessary accommodation costs. We made the assumption that travel options “On foot/By Bike”, “Public transportation”, “By car (electric)”, and “By car (hybrid)” are associated with relatively low carbon footprints and thus focused on the environmental and financial costs of using traditional (combustion) cars and airplanes. Those travel options would have been used by about 30 % of the PI-planning participants. Specifically, each of the 32 participants who would have used a combustible car would have, on average, traveled a total of approximately 396 km to and from the headquarters, resulting in approximately 2,686 kg of CO2 emissions, assuming they stayed in a hotel during

the three days of the PI-planning event. In addition, six participants would have flown in for the PI-planning. When doing so, they would have traveled an average total distance of 1,134 kilometers and consumed at least 871 kg of CO2 emissions. In sum, hosting the PI-planning in person would have resulted in a total of at least 3,557 kg of CO2 emissions.<sup>26 27</sup>

With regard to financial costs, travel costs would have been 42 car drivers x 396 km x 0.3 Euro/km (as fixed compensation) = 4,989.60 Euro plus 6 flights for 200 Euro each = 12,000 Euro. In addition, an in-person PI-planning would have caused accommodation costs of about 22,218 Euros for hotel rooms for the participants not living in or near Hannover (i.e., 59 participants x 138 Euro x 2.7 nights p.p.) would have needed hotel rooms to stay for the three-day event. Thus, total financial costs would have been 39,207.60 Euro for hosting the three-day PI planning as an in-person event.

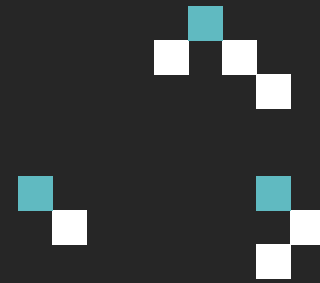
These costs need to be compared with the environmental costs caused by the usage of VR headsets, including internet technology, cloud storage, and server usage by the metaverse apps as well as the acquisition and maintenance costs of VR headset usage. **It seems plausible that environmental costs are substantially lower for the remote meeting via the enterprise metaverse.** When it comes to financial costs, it seems noteworthy that the almost 40k costs for the single in-person variant of the event is roughly the equivalent of the one-time purchase of a VR headset for each of the 105 participants (e.g., 350 Euro x 105 = 36,750 Euro) which can be used for multiple PI-planning events.

<sup>26</sup> Statista (2021a), “CO<sub>2</sub>-Emissionen von Pkw nach Antriebsform 2020,” Statista, (accessed August 16, 2023), [available at <https://de.statista.com/statistik/daten/studie/1180098>].

<sup>27</sup> Statista (2021b), “CO<sub>2</sub>-Emissionen ausgewählter Flugzeugmodelle 2021,” Statista, (accessed August 16, 2023), [available at <https://de.statista.com/statistik/daten/studie/1330533>].



## What We Have Learned



This research covers findings from two real-world studies in which managers of the Ministry of the Interior and Sport of the German State of Lower Saxony together with managers of partner organizations (e.g., consulting firms) participated in parts of PI-planning events via VR headsets. It is among the first that studies the effectiveness the use of VR technology in a real-world enterprise metaverse context on a large scale. Overall, findings from our two studies show that meetings in the enterprise metaverse can benefit from the unique characteristics of VR technology, resulting in higher levels of scaled business agility as perceived by the participating managers. Returning to our initial metaphor from the “Matrix” movie, taking the “blue pill” and entering the enterprise metaverse can offer a lot of benefits, with which the reality of videoconferences has difficulties competing with.

The findings reported here clearly show that meetings in the enterprise metaverse support agile work in and with teams significantly better than meetings via videoconferencing software Skype, making it a candidate for future usage. We also learn that the positive impact of such meetings in the enterprise metaverse is not limited to agility but extends to the positive emotions the meeting participants experience during the events (more fun! More looking forward to the follow-up meeting!).

Let note that our focus was on agility and that the studies were carried out with a particular goal, in a specific context and also against a distinct videoconferencing tool (Skype), so that generalization of our findings to other contexts must be carefully considered. Also, setting up meetings with VR-technology within the scope of a PI-planning event brought up challenges in terms of organizational culture as well as questions regarding operational, security-related, and technological issues, which managers should consider when planning meetings in the enterprise metaverse.

Nonetheless, this Study shows that, unlike in the movies, taking the “blue pill” is no dystopia, but can be worthwhile. We provide empirical real-world evidence that the enterprise metaverse can enable higher levels of scaled business agility via higher social presence of those who meet if used wisely. Will you dare?

**“Unlike in the movies, taking the  
“blue pill” by entering the enter-  
prise metaverse is no dystopia,  
but can be worthwhile”.**

### *Recommended Reading:*

*Hennig-Thurau, Thorsten, Dorothea N. Aliman, Alina M. Herting, Gerrit P. Cziehso, Marc Linder, and Raoul V. Kübler (2023), “Social Interactions in the Metaverse: Framework, Initial Evidence, and Research Roadmap,” Journal of the Academy of Marketing Science, 51 (4), 889–913.*

*Hennig-Thurau and Björn Ognibeni (2022), “Metaverse Marketing”, NIM Marketing Intelligence Review, 14 (2), 43-47.*

# Appendix A – Exemplary questions from Data collection B (i.e., September)

Outcome Category	Construct	Source	Exemplary Question	Scale
<b>Scaled Business Agility</b>	Flexible planning	<i>One question adapted from SAFe<sup>28</sup></i>	“The combination of the software Skype and the virtual reality headset supports flexible planning in an ideal way.”	1–7 agreement
	Proactive addressing of potential problems	<i>One question adapted from SAFe<sup>28</sup></i>	“The combination of the software Skype and the virtual reality headset supports proactive addressing of potential problems to a high degree.”	1–7 agreement
	Changing plans and visualize them	<i>One question adapted from SAFe<sup>28</sup></i>	“The combination of the software Skype and the virtual reality headset makes it very easy to change plans and visualize them.”	1–7 agreement
	Quick and effective reactions to unforeseen developments	<i>One question adapted from SAFe<sup>28</sup></i>	“The combination of the software Skype and the virtual reality headset supports the quick reaction to unforeseen developments to a high degree.”	1–7 agreement
	Intense participation of all members in discussions	<i>One question adapted from SAFe<sup>28</sup></i>	“The combination of the software Skype and the virtual reality headset encourages that all team members participate intensively in the discussion in the team breakouts.”	1–7 agreement
<b>Perceptions and intermediate states</b>	Social presence	<i>Three questions adapted from Nowak and Biocca (2003)<sup>29</sup></i>	“During the PI-Planning with the combination of the Skype software and the virtual reality headset, I had the impression of being ‘together’ with the other team members.”	1–7 agreement
	Scope of action	<i>Two own questions</i>	“I was able to do everything that was necessary for the topic processing overall just as if it had been a physical PI planning meeting.”	1–7 agreement
	Exhaustion	<i>Three questions adapted from McNair et al. (1971)<sup>30</sup></i>	“After this PI-planning, I feel exhausted.”	1–7 agreement
<b>Emotions and other reactions</b>	Fun during team meetings	<i>Three questions adapted from Dabholkar (1994)<sup>31</sup></i>	“Working with the other team members was fun overall.”	1–7 agreement
	Comfort	<i>Two questions adapted from Holbrook and Batra (1988)<sup>32</sup></i>	“During the PI planning, I felt comfortable throughout.”	1–7 agreement
	Anticipated positive emotions	<i>Two questions adapted from Hennig-Thurau and Houston (2019)<sup>33</sup></i>	“I am looking forward to the next PI Planning.”	1–7 agreement

Note: All questions were translated from German into English.

<sup>28</sup> Scaled Agile, Inc. (2023), “SAFe 6.0 Framework,” Scaled Agile Framework, (accessed August 17, 2023), [available at <https://scaledagileframework.com/>].

<sup>29</sup> Nowak, K. L., & Biocca, F. (2003). The effect of the agency and anthropomorphism on users’ sense of telepresence, copresence, and social presence in virtual environments. *Presence: Teleoperators and Virtual Environments*, 12(5), 481–494.

<sup>30</sup> McNair, D. M., Lorr, M., & Droppleman, L. F. (1971). *Manual: Profile of mood states*. San Diego: Educational & Industrial Testing Service.

<sup>31</sup> Dabholkar, P. A. (1994). Incorporating choice into an attitudinal framework: Analyzing models of mental comparison processes. *Journal of Consumer Research*, 21(1), 100–118.

<sup>32</sup> Holbrook, M. B., & Batra, R. (1988). Toward a standardized emotional profile (SEP) useful in measuring responses to the nonverbal components of advertising. In S. Hecker & D. W. Stewart (Eds.), *Nonverbal communication in advertising* (pp. 95–109). Lexington, MA: D.C. Heath.

<sup>33</sup> Hennig-Thurau, T., & Houston, M. (2019). *Entertainment Science*. Cham: Springer.



**UNIVERSITY OF MÜNSTER**  
Marketing Center Münster  
XRLAB@MCM  
Am Stadtgraben 13-15  
48143 Münster

**<https://xrlab-mcm.space/>**