Software and Cultures Case Study

Virtualization in communication: post pandemic benefits and challenges

m5271506 Kiyohiro Murai

Contents

1 Introduction

In recent years, the virtualization of communications has changed the way it communicate in business, education, and even personal life. This change was particularly accelerated by the global crisis caused by the 2020 pandemic. Lockdowns and the need for social distancing have led to digitalization in areas such as virtual meetings, distance learning, and online entertainment.

During the pandemic, many companies transitioned to remote work. This transition meant relying heavily on virtualization services for employees to work from anywhere. Platforms such as Zoom[1], Microsoft Teams[2], Slack[3], and Discord[4], which will be discussed later, have rapidly become popular as everyday communication tools[6, 4, 5, 3]. These services not only virtualized meetings, but also served as a venue for project management, document sharing, and even social interaction.

The impact of the pandemic has significantly changed the way it look at remote work and virtualized services. Many companies and organizations are rethinking the need for physical offices and exploring a combination of flexible workspaces and virtual meetings. This change has not only affected the way it work, but also corporate culture, employee well-being, and productivity.

Post-pandemic, there are many predictions about the future of remote work and virtualized services. Some researcher predict that many companies will move away from fully remote work to a hybrid model. On the other hand, advances in virtualization technology are expected to lead to more companies continuing with a completely remote work style. These changes are likely to drive further advances in virtualization technology and lead to the emergence of new business models and work practices.

This case study analyzes the impact virtualization has communication and work practices, and discusses the future of remote work and virtualized services in a post-pandemic world. It also explore how the expansion of remote work will impact individual lives and society as a whole. It aim to identify the long-term benefits and challenges of this transformation and provide direction for the future.

2 What is virtualization

In this case study, "virtualization" mainly refers to concepts in information technology and communication. Virtualization technology refers to technology that divides physical resources (e.g. servers, storage, network equipment, etc.) into multiple virtual resources and uses them efficiently [16]. Virtualization, especially in communications, is concerned with the realization of communication that is independent of physical location. It enables communication across geographic boundaries, allowing participants to attend meetings and events from anywhere in the world. This greatly increases the flexibility and accessibility of communication.

[1]https://www.zoom.com/en/products/virtual-meetings/
[2]https://www.microsoft.com/ja-jp/microsoft-teams/group-chat-software
[3]https://slack.com/intl/ja-jp
[4]https://discord.com/

3 Virtualization services

With the evolution of technology in recent years, virtualization services have become an essential part of business and daily life. Many services were already available before the pandemic. The pandemic has made these services even more important. In this section, it will focus on major remote communication service, video conferencing service, voice calling messaging service integrated communication platform, virtual office, and virtual environment using VR, AR, and MR, and provide an overview and usage examples of them. These services are used not only for work but also for a variety of purposes such as webinars, telemedicine/healthcare, and document sharing. It can also be found used in cultural facilities and entertainment fields. This has provided a way for people to enjoy culture and entertainment across countries, cultures, and races, even under restrictions during the pandemic.

3.1 Video conferencing service

Video conferencing service has become an important element of modern communication. These services have overcome geographic constraints and enabled people in remote locations to communicate face-to-face in real time. Video conferencing is used for a wide variety of purposes, including business meetings, webinars, education, healthcare, and personal interactions. This technology is also important as it saves time and money, improves accessibility, and provides a sustainable communication environment. Let's take a look at some typical service examples.

Service Name	Release (Establishment) Year
Zoom	2012
Google Meet	2017
Cisco WebEx	1995
GoToMeeting	2004
Adobe Connect	2005 (Acquisition)
BlueJeans	2009

Table 1: Video conferencing service

Zoom is a popular service that was released in 2012 and offers a variety of features such as video conferencing, webinars, live chat, and screen sharing. Known for its easy operation and stable connection quality, it is widely used not only for business but also for education and personal use.

Google Meet[5] is a video conferencing service provided by Google, originally provided as part of the G Suite web conferencing system (Hangouts Meet). The service is designed for business users and educational institutions and features a simple and easy-to-use interface.

Other services are CiscoWebEx[6] , GoToMeeting[7], Adobe Connect[8], and BlueJeans[9].

[5]https://workspace.google.com/intl/ja/products/meet/
[6]https://www.webex.com/ja/video-conferencing.html
[7]https://www.goto.com/meeting
[8]https://www.adobe.com/jp/products/adobeconnect.html
[9]https://www.bluejeans.com/

3.2 Voice calling messaging service

Voice calling messaging service is another important aspect of remote communication. These services enable instant communication between individuals and groups and serve an essential role in many aspects of business and personal life.

Service Name	Release (Establishment) Year
Skype	2004
WhatsApp	2009
Viber	2010

Table 2: Voice call messaging tool

Skype[10] provides voice calling, video calling, and instant messaging services for both personal and business users. Another feature is low-cost international calls.

WhatsApp[11] is a globally popular app that offers free messaging and voice/video calling. End-to-end encryption ensures secure communications.

Viber[12] is an app that offers free voice calls, video calls, and messaging. It features a user-friendly interface, high security, and allows the use of stickers and GIFs.

3.3 Integrated communication platform

Integrated communication platform form the basis of modern workplace and community communication. These platforms provide integrated solutions for teams and organizations to effectively collaborate, share information, and manage projects.

Service Name	Release (Establishment) Year
Microsoft Teams	2017
Slack	2013
Discord	2015

Table 3: Integrated communication platform

Microsoft Teams is an enterprise collaboration tool that integrates chat, video conferencing, file sharing, task management, and more. Seamless integration with Office 365 makes it a favorite of many companies. It plays a central role in remote work and hybrid work environments.

Slack is a tool that has revolutionized corporate communication. Streamline team communication with an intuitive chat interface, channel-based organization, and powerful integrations. Integration with various third-party applications is possible by linking with API.

Discord was originally developed for gamers, but its high-quality voice calls, video calls, and text-based chat features have made it embraced by a wide variety of communities. Characterized by low latency and high customizability, it is used by hobby groups, educational purposes, and even business meetings.

[10]https://www.skype.com/ja/

[11]https://www.whatsapp.com/?lang=ja

[12]https://viber.co.jp/

3.4 Virtual office

Virtual office is an innovative solution for remote team members to collaborate and communicate virtually. Such platforms are playing an increasingly important role as remote work becomes more widespread.

Service Name	Release (Establishment) Year
Sococo	2017
Tandem	2019

Table 4: Virtual office

Sococo[13] is a pioneering service that provides virtual office space. The platform allows users to navigate around the office through their avatars and interact with other team members in different "rooms" such as conference rooms, individual offices, and shared spaces. A combination of video, audio, and chat capabilities enables real-time communication and collaboration.

Tandem[14] is a relatively new virtual office platform for remote teams. This tool increases transparency in office environment by showing user in real time what tasks team members are currently working on and what communication tools are available. It also provides the ability to join audio and video calls with one click, facilitating rapid communication and collaboration.

3.5 Virtual environment using VR/AR

VR (virtual reality) and AR (augmented reality) provide immersive virtual environments created using digital technology. These technologies have applications in a wide variety of fields, including entertainment, education, design, and even medicine. This article[11] provides some effective usage examples using VR/AR technology, and methods are shown. Additionally, as described below, by linking with remote communication services, immersive communication becomes possible. Below, it will be introduced the major VR and AR devices.

Service Name	Release (Establishment) Year
Meta (Ocilus) Quest	2019
Google Glass	2013 (for developer)
PlayStation VR	2016
Microsoft HoloLens	2016

Table 5: Virtual environment using VR/AR

Meta Quest[15] is a standalone VR headset released under the Oculus brand. It operates independently without being connected to a PC or external sensors, allowing user to easily enjoy VR experiences. Featuring touch controllers, and high-resolution display, it is used for a wide range of applications including gaming, education, and training.

[13]https://www.telework-management.co.jp/services/tool/sococo/
[14]https://tandem.chat/
[15]https://www.meta.com/jp/quest/

Google Glass[16] is a type of wearable computer developed by Google. They are shaped like glasses and display information directly into the user's field of vision through a small prism-based display. Users can control the device using their voice or touchpad. Google Glass provides functions such as taking photos and videos, navigation, sending and receiving emails and messages, and displaying search results.

PlayStation VR[17] is a VR headset designed for Sony's PlayStation console. It focuses on a high-quality gaming experience and is compatible with PlayStation's extensive game library. Featuring superior visual immersion and a user-friendly design, it is ideal for home entertainment applications.

Microsoft HoloLens[18] is a head-mounted display that uses AR technology. It provides an interactive augmented reality experience by overlaying digital content onto the real world. The device is particularly suitable for professional applications such as education, design and manufacturing, with advanced spatial awareness and user interaction capabilities.

In addition, these articles[14, 19] introduces examples of the use of VR/AR technology in several art galleries and museums. For example, in 2018, the Smithsonian Institution held an exhibit called "No Audience: The Art of Burning Man" that incorporated VR elements. It featured a giant art installation from the annual Burning Man festival in Nevada, allowing visitors to learn about the spirit and context of the event. Although the exhibition ended in January 2019, the experience is still possible thanks to VR technology. This shows the advantage of VR in being able to permanently record temporary experiences.

This paper [2] focuses on mixed reality (MxR) applications used in the field of cultural heritage. As an example, an MxR application is presented that uses Microsoft HoloLens to enable virtual interaction with museum exhibits.

Figure 1: Mixed reality image ©Microsoft

VR and AR applications bring a new dimension to communication and collaboration, collaboration, and entertainment in various fields. Typical applications are introduced below.

VRChat[19] is a social platform centered on VR. Users interact with other users through avatars within a 3D environment. This platform is intended for interaction, communica-

[16]https://support.google.com/glass-enterprise/customer/answer/13417888
[17]https://www.playstation.com/ja-jp/ps-vr/
[18]https://www.microsoft.com/ja-jp/hololens
[19]https://hello.vrchat.com/

Service Name	Release (Establishment) Year
VR Chat	2014
vTime XR	2015

Table 6: Virtual application using VR/AR

tion and entertainment between users and is often used for social games, virtual events, virtual meetings, etc.

vTime XR[20] is one of the social VR applications. Users can create their own avatars and interact with friends, family, and new people in virtual space. This provides a real-time social experience and enhances connections with people in remote locations.

Figure 2: Screenshot of vTime XR ©vTime XR

4 Pandemic

The pandemic has changed the way it is looked at virtualized services. This crisis has a major impact on the way businesses and individuals around the world conduct their daily operations, prompting rapid changes in digitalization and virtualization. One of the most notable effects of the pandemic has been the rapid transition of many organizations to remote work. This change has increased the demand for virtualization services such as video conferencing, cloud storage, and online collaboration tools. Companies quickly adopted and began operating these tools to help employees work effectively from home.

4.1 Expanding virtualization services

The pandemic has accelerated the adoption of virtualized services. This change is not a temporary change. It has prompted many companies and individuals to adopt new ways of working and communicating. As a result, the pandemic has created new business opportunities. Demand for services and products related to digitalization and virtualization

[20]https://vtime.net/

is increasing, opening up new markets. These services have become an important way for employees to communicate and collaborate effectively, even remotely. These services have seen a dramatic increase in users during the pandemic.

This article [6] describes the increase in the number of Zoom users. Before the start of the pandemic, the number of daily meeting participants was 10 million as of December 2019. At the start of the pandemic, in June 2020, the number of daily meeting participants reached 300 million.

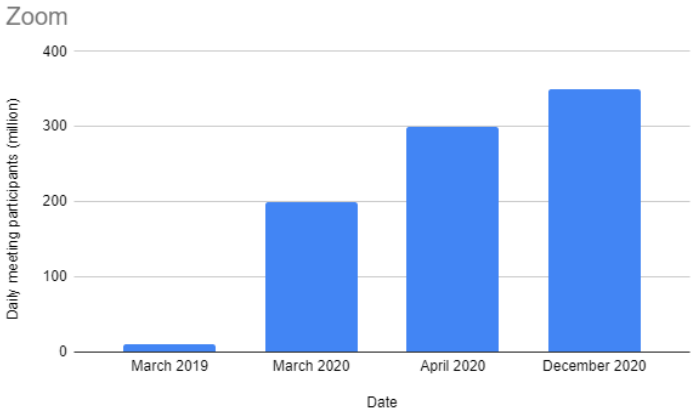

Figure 3: Number of Zoom meeting participants

In this article [4], Microsoft Teams had 20 million users in November 2019, but 44 million users in March 2020. The number of meeting minutes per day has increased to 2.7 billion. In April, the number rose to 75 million. It recorded a growth of 894% from March to June 2020. In 2022, the number of users will reach 270 million.

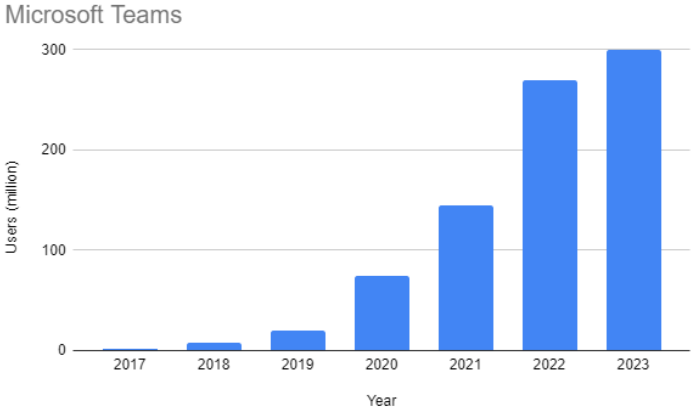

Figure 4: Number of Microsoft Teams users

This article [5] shows that the number of Slack users is increasing year by year, from 2 million in 2015 to 12 million in 2019, and in 2020. reached 18 million people. The increase in the number of users was particularly noticeable from 2019 to 2020, with an increase of 6 million people during this period. This trend shows the growing importance of digital communication tools, especially as the pandemic necessitated remote working.

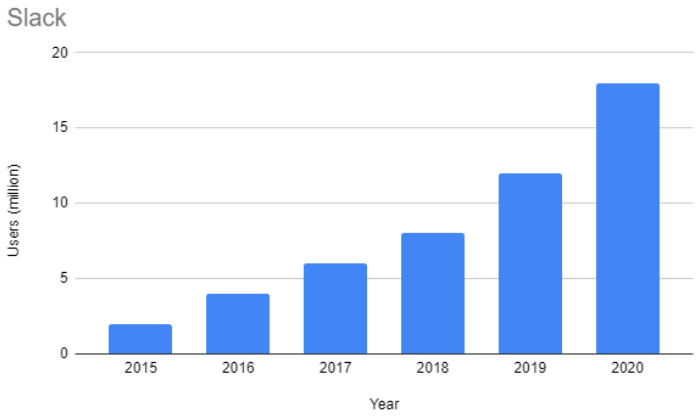

Figure 5: Number of Slack users

In this article [3], the number of Discord users will increase from 10 million in 2017 to 56 million in 2019 to 100 million in 2020. people, increasing to 175 million in 2022. This number shows the rapid adoption and growth of the communication services provided by Discord.

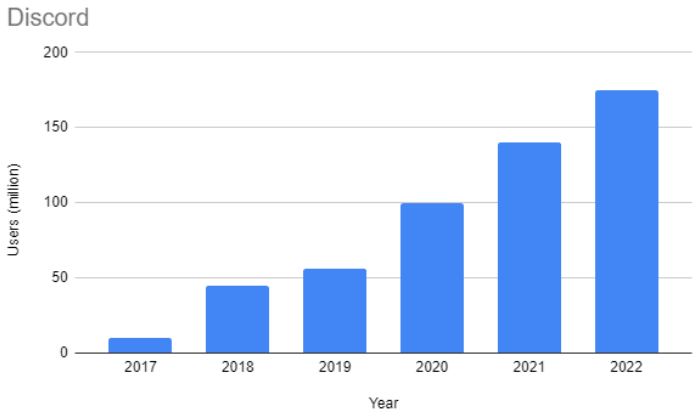

Figure 6: Number of Discord users

These data show that the pandemic has accelerated the spread of remote work and digital communication tools, prompting many companies and individuals to adopt new ways of working and communicating. Moreover, this change is not temporary. It has created new business opportunities and increased demand for services and products related to digitalization and virtualization. These services are widely used as an important way to communicate and collaborate effectively even from remote locations.

4.2 Impact of virtualization services

During the pandemic, many companies adopted (or were forced to) fully remote or hybrid work models, leading to significant changes in the way it is worked and communicate. Although this new way of working has contributed to some improvements in employee productivity, research shows that it is actually causing a decline in productivity. At the same time, much research has been conducted on the blurring of boundaries between work and private life, challenges in virtual communication, etc.

In this paper [1], a survey of 704 academic researchers revealed that during the pandemic lockdown, It talks about the loss of efficiency that comes with remote work. 94% of researchers surveyed indicated that they worked from home more during lockdown than before. Of these researchers, 47% feel that their overall research efficiency has decreased due to increased work from home. 23% said they felt more efficient and 30% said they saw no difference compared to pre-lockdown. It is also investigating the impact of lockdown on the efficiency of people living with children. Here, 58% of people answered that research efficiency has decreased overall due to increased work from home. 20% of people felt that their research efficiency had improved due to increased work from home. It was found that 22% of people felt there was no difference compared to before the lockdown. Among researchers living with children, 71% of 21 single parents and 57% of 269 partnered parents said they were less productive working from home than before the lockdown.

In this paper [12], 79% of papers published before the pandemic found that working from home increased productivity and performance. It have demonstrated that it have improved. Meanwhile, of the papers published during the pandemic, 23% showed a positive effect, 38% showed mixed results, and the remaining 38% showed a negative effect. The findings suggest that non-mandatory telecommuting can have a positive impact on productivity and performance. On the other hand, if working from home becomes compulsory and becomes full-time, or if external factors (pandemic) come into play, the overall impact will not be as positive, pointing out the possibility of a negative impact on productivity and performance.

This paper [21] analyzes the impact of remote work on collaboration in a study of Microsoft employees. Here, it use data on emails, calendars, instant messages, video/voice calls, and weekly work hours for 61,182 U.S. Microsoft employees in the first half of 2020 to show how company-wide remote work can improve collaboration and communication. It is estimating the causal relationship. It shows that company-wide remote work has made employee collaboration more static and siled, with fewer bridges between different departments. They point out that it can be difficult for employees to obtain and share new information on the network.

This paper [17] considers different forms of remote work (e.g. telework, remote work, virtual work) and their impact. In particular, the pandemic has led many companies to adopt fully remote working, which has revealed benefits such as flexibility, cost savings, and worker autonomy.

This paper [15] investigates how remote work impacts employee productivity and happiness. It compare the pre-pandemic and post-pandemic periods and analyze the impact of remote work on employee productivity. The findings suggest that remote work has had a significant impact on worker productivity and happiness both before and after pandemic. Although there are many benefits to working remotely, including improved work-life balance and job satisfaction, it also points out that it can also have negative effects, such as increased stress, anxiety, and feelings of loneliness.

These papers explore the impact of remote work and hybrid work models on the way workking. Research shows that while remote work can offer benefits such as flexibility, cost savings, and worker autonomy, it can also have negative side effects, such as reduced productivity, blurred lines between work and personal life, and collaboration issues. It is possible that user are inviting. These studies highlight that forced remote work has shown complex effects on companies and employees.

5 Predictions for virtualization services after the pandemic

Virtualized services are expected to continue to play an important role even after the pandemic. It will become common for many companies to adopt flexible working arrangements and offer employees the option of working remotely. Additionally, as technology evolves, virtualization services have the potential to provide more advanced and efficient functionality, enabling a more realistic communication experience.

5.1 Post-pandemic working environment

Enterprise use of virtualization services will continue to evolve post-pandemic. New tools and strategies will be adopted to improve employee productivity and satisfaction. Examples include approaches that focus on improving virtual office environments and more efficient resource management. In addition, through virtualization services, companies will be able to proactively recruit and collaborate with global talent beyond geographical constraints.

This study [8] is presented on the prevalence of work and its impact on US workers. According to a survey conducted in spring 2022, 58% of US workers have the opportunity to work from home at least one day a week, and 35% have the option to work from home five days a week. Remote work opportunities span a variety of occupations and geographies, and it has become clear that many workers prefer to work from home. This change reflects a fundamental shift in where, when, and how work gets done.

This study [7] shows US workers Approximately 60% can work from home, and of these, 83% were working from home before the Omicron variant spread. Many workers are now working from home by choice, due to decreased concerns about the pandemic and a preference for working from home, as well as relocation from their workplace. Although working from home has improved the balance between work and personal life, many people feel that their connections with colleagues have weakened. 60% of workers say they would like to work from home even after the spread of the pandemic subsides. However, many workers who do not have jobs that can be done from home, whose jobs involve direct interaction with others at work, remain concerned about contracting the pandemic. The frequency of telework varies by educational background and income, and is more prevalent among college graduates and higher income groups.

From 2020 to the present, the trend of US workers working from home has changed significantly. Previously, concerns about pandemic infection were the main reason, but now many workers are working from home by choice, and the main reason is their preference to work from home.

Among parents who work from home, the percentage of parents citing child care as the main reason decreased from 45% in 2020 to 32% in 2022. At the same time, the main reasons for workers not working from home are workplace work productivity and personal preference, compared to lack of effective work space or resources, opportunities for advancement, or peer pressure. This is considered to be the reason for the lack of interest.

While many new remote workers find it easier to balance work and personal life by working from home, many also feel less connected to their co-workers. Women are almost twice as likely as men to say that working from home has made it easier to advance in the workforce. Overall, new teleworkers believe that working from home will not have a

significant impact on their ability to advance in their jobs.

This study [9] found that remote work This has increased dramatically, with approximately 20-25% of the workforce in developed countries now able to work from home 3-5 days a week. This is a four to five times increase compared to pre-pandemic levels, and could result in individuals and businesses moving from large cities to suburbs and small cities. However, it has been shown that negotiations, important business decisions, and brainstorming sessions are best conducted in person.

The widespread use of video conferencing during the pandemic and the newfound acceptance of virtual meetings and other forms of remote work may also impact business travel. It is expected to have a significant impact on airlines, airports, hospitality industries, and food services.

It has also seen rapid growth in e-commerce and other online activities, with many consumers discovering the convenience of digital channels. Almost three-quarters of people who used digital channels for the first time during the pandemic say they will continue using them even when things return to "normal." This is driving growth in shipping, transportation, and warehousing jobs.

In physically proximate work areas, the adoption of automation and AI is likely to accelerate, and the proportion of work that primarily involves routine tasks is expected to be reduced. Many companies are ramping up their investments in automation and AI, with adoption expected to accelerate the most, especially in work areas with high levels of human interaction.

This study [10] It shows the changes that have brought to the working environment and the prospects for future hybrid work models. Organizations that have increased productivity during the pandemic have strengthened remote leadership by supporting and encouraging small moments of engagement among employees. Hybrid working styles will become more common in the future, with employees expected to be in the office one to four days a week. However, many organizations say they still don't have a detailed vision for hybrid work and lack coordination from top management. While most organizations saw increased individual and team productivity and increased customer satisfaction during the pandemic, not all organizations experienced the same improvements.

While many executives report increased employee productivity, customer satisfaction, and engagement, it's important to focus on small connections and training managers. In addition, implementing a hybrid model requires redesigning processes, reviewing recruitment processes, and reconsidering the allocation of human resources. Productivity leaders are likely to continually iterate and fine-tune their processes as conditions change, with leading companies completely overhauling their hiring processes and rethinking talent allocation. As such, organizations need to evolve their management styles and business processes to adapt to hybrid work models.

In this paper [1], a survey of 704 academic researchers found that When asked about how the increase would impact research efficiency, 29% of those who were not yet working from home full-time after lockdown said working from home generally improves research output. It show it was a possibility. 29% say they will be less efficient, while 41% think they are no different than before lockdown. Comparing working from home and working in an office, they find that in the office they are better at sharing ideas with colleagues, communicating with their team, and collecting data, whereas at home they are better at working on manuscripts and reviewing literature. Demonstrated that good at reading and analyzing data.

These findings make it clear that remote and hybrid work models will continue to play

an important role in corporate environments post-pandemic. This will require companies to adopt innovative approaches to increase flexibility in working environments and improve employee productivity and satisfaction. Companies can also capture new market opportunities by recruiting and collaborating globally across geographic boundaries. As such, virtualized services and flexible labor models will continue to be essential elements for the growth and evolution of society and businesses.

5.2 Adapting to virtualization

Since the coronavirus pandemic, advanced communication technologies have been developed to solve challenges in remote environments. New services are being developed to encourage more flexible remote communication. For example, the telepresence robot [13] enables more realistic communication by remotely controlling the robot terminal and conducting video chats. Many telepresence robots are installed on movable trolleys. This allows a remote operator to move from one location to another through the robot.

Additionally, with the spread of remote services, services that support online communication are gaining recognition. Shiseido's "TeleBeauty" [20] is an AR filter that can be used with online conferencing tools and video platforms. This uses a camera app called "SnapChat" that recognizes faces and allows user to enjoy various AR effects.

5.3 New virtualization services using VR and AR

Demand for new virtualization services using VR and AR applications is increasing. The pandemic in particular has created new services for businesses. Introducing services that bring smooth professional communication in virtual reality and mixed reality environments.

Service Name	Release (Announcement) Year
Spatial	2020
Microsoft Mesh	2021

Table 7: Post pandemic virtual application using VR/AR

Spatial[21] is a VR application designed to allow users to collaborate within a virtual space. The app allows users to interact through avatars and share projects and ideas within a shared virtual environment. With features such as real-time collaboration, 3D modeling, and data visualization, it is used in a variety of scenarios such as education, design, and business meetings. This article [18] is using Spatial to hold an online exhibition. is shown. A variety of content such as seminars, workshops, and live music will be held within the Spatial space, allowing user to experience virtualization technology.

[21]https://www.spatial.io/

Figure 7: Screenshot of Spatial ©Spatial

Microsoft Mesh[22] is a new platform for hybrid work and collaboration. Mesh enables shared virtual experiences and allows users to interact across geographic constraints. This platform is especially suitable for business meetings, collaboration, and educational uses.

Figure 8: Screenshot of Microsoft Mesh ©Microsoft Mesh

Existing VR/AR devices are increasingly being used in conjunction with existing communication tools such as Zoom and Microsoft Teams. This makes virtual meetings

[22]https://learn.microsoft.com/ja-jp/mesh/overview

and remote collaboration a richer, more immersive experience. As VR technology evolves, these applications continue to redefine the way people interact in virtual spaces. What differentiates it from the aforementioned VR Chat and vTime XR is that it brings smooth professional communication in virtual reality and mixed reality environments.

Advances in technology are thus playing an important role in improving the quality of communication in remote environments. New devices and applications are improving the remote work experience and promoting more natural and effective communication. These technological advances mean that people can more easily connect even from remote locations, and are an important factor in improving the quality of communication in remote environments.

6 Conclusion

6.1 Benefits from the spread of remote communication

Remote communication tools enable rapid information exchange regardless of time and location. This speeds up decisions and keeps projects moving smoothly. Correspondingly, companies can save money by reducing the need for physical meeting space and business travel. Remote communication also saves transportation costs and time. Employees can now work from home or any location of their choice, making it easier to balance their personal and work lives. Educational and job opportunities are also provided to people with physical limitations and those living in remote areas. This increases the inclusiveness of society as a whole.

6.2 Changes from pre-pandemic to post-pandemic

Before the pandemic, remote work and virtualization services already existed, but were mostly used in a few niche sectors and among tech enthusiasts. Once the pandemic began, these services quickly became a core part of daily life. Businesses and educational institutions quickly adopted new workflows that revolve around remote communication. Now, in the post-pandemic situation, these services have become essential for both business and daily life.

6.3 New virtualization service

Virtualization services that utilize new technologies such as VR and AR provide users with a sense of immersion. Remote communication using these technologies provides a higher degree of collaboration and an immersive communication experience. However, due to the high cost of these technologies, not all users or businesses can easily adopt them. Additionally, with the spread of virtualization services, services such as telepresence robots are also becoming more popular. Such services will need to continue to be developed to improve remote communication.

6.4 Spread of full remote work/hybrid work

Fully remote work gives employees the freedom to work from anywhere. This can reduce commuting time, improve work-life balance, and increase personal productivity. Hybrid work, or a combination of remote and office work, has become widespread in the wake of

the pandemic. This workstyle is attracting attention as a new way of working that meets the needs of employees while balancing flexibility and productivity.

6.5 Strengthening international communication

Virtualization services have reduced the barriers to international communication. Language barriers are gradually being overcome due to advances in technology. This fosters collaboration between different cultures and academic disciplines. It will be able to hire talented people regardless of geographic constraints. This allows us to build diverse teams and work with a global perspective. On the other hand, when users from different countries use remote services, for example, there are issues that cannot be addressed by technology, such as time differences. Virtualization services are by no means a panacea.

6.6 Future work and risk responses

The proliferation of remote work and virtualized services has brought new challenges to the fore, including weakened relationships, security issues, technological hurdles, and a blurring of the line between work and personal life. To address these issues, it is important to educate users, take appropriate security measures, and emphasize work-life balance. The pandemic has revealed the importance of virtualized services and has had a huge impact on the way it work and communicate in the future. The lessons learned from this experience will be useful for future technological development and the evolution of society.

References

[1] Balazs Aczel, Marton Kovacs, Tanja van der Lippe, and Barnabas Szaszi. Researchers working from home: Benefits and challenges. *PLOS ONE*, 16(3):1–13, 03 2021.

[2] Mafkereseb Kassahun Bekele and Erik Champion. A comparison of immersive realities and interaction methods: Cultural learning in virtual heritage. *Frontiers in Robotics and AI*, 6, 2019.

[3] BusinessofApps. Discord revenue and usage statistics (accessed on 2024/01/03).

[4] BusinessofApps. Microsoft teams revenue and usage statistics (accessed on 2024/01/03).

[5] BusinessofApps. Slack revenue and usage statistics (accessed on 2024/01/03).

[6] BusinessofApps. Zoom revenue and usage statistics (accessed on 2024/01/03).

[7] Pew Research Center. Covid-19 pandemic continues to reshape work in america (accessed on 2024/01/06).

[8] McKinsey & Company. Americans are embracing flexible work—and they want more of it (accessed on 2024/01/05).

[9] McKinsey & Company. The future of work after covid-19 (accessed on 2024/01/10).

[10] McKinsey & Company. What executives are saying about the future of hybrid work (accessed on 2024/01/10).

[11] DATAMATICS. 10 stunning use cases of ar/vr for event management (accessed on 2024/01/04).

[12] Amy Hackney, Marcus Yung, Kumara G. Somasundram, Behdin Nowrouzi-Kia, Jodi Oakman, and Amin Yazdani. Working in the digital economy: A systematic review of the impact of work from home arrangements on personal and organizational performance and productivity. *PLOS ONE*, 17(10):1–25, 10 2022.

[13] iPresence. What is a telepresence avatar robot? (accessed on 2024/01/06).

[14] MuseumNext. Virtual reality is a big trend in museums, but what are the best examples of museums using vr? (accessed on 2024/01/05).

[15] Sivaprakash J S and Venkatesh M. The impact of remote work on employee productivity and well-being: A comparative study of pre- and post-covid-19 era, May 2023. PREPRINT (Version 1) available at Research Square.

[16] Srinarayan Sharma and Young Park. Virtualization: A review and future directions executive overview. *American Journal of Information Technology*, 1:1–37, 05 2011.

[17] Danijela Sokolic. Remote work and hybrid work organizations. 02 2022.

[18] Metaverse tips. Basic knowledge of the metaverse (accessed on 2024/01/10).

[19] IEEE TRANSMITTER. Experience history and art in a whole new way with ar and vr in museums (accessed on 2024/01/04).

[20] watashi by shiseido. Telebeauty (accessed on 2024/01/10).

[21] Longqi Yang, David Holtz, Sonia Jaffe, Siddharth Suri, Shilpi Sinha, Jeffrey Weston, Connor Joyce, Neha Shah, Kevin Sherman, Brent Hecht, and Jaime Teevan. The effects of remote work on collaboration among information workers. *Nature Human Behaviour*, 6(1):43–54, 2022.