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Visit Your Therapist in Metaverse - Designing a Virtual Environment for Mental Health Counselling

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Abstract

The emergence of the metaverse as a virtual world platform has opened up new possibilities for the use of immersive technologies in healthcare. This paper aims to explore the potential of the metaverse for healthcare and show how metaverse should be designed. We conduct a study based on design science research and derive design principles for the designing of a virtual environment for mental health counselling. We evaluate each of these design principles and describe how they can be applied in a practical solution. The results indicate that the metaverse holds significant promise for improving healthcare delivery and enhancing patient outcomes. Our study thus contributes to the emerging field of metaverse in healthcare by providing a design approach for the development of applications that can serve as a virtual environment for therapeutic sessions between medical therapists and patients.

Keywords: Metaverse, Virtual Environment, Mental Health, Design Science Research

Introduction

Progressive digitalization has had an enormous impact on business and society in recent years. It contributed to work processes becoming more efficient and faster and to the emergence of new business models. Through increasing networking and automation, digital transformation will influence and change all areas of daily life (van Veldhoven & Vanthienen, 2020). Digital technology found its way into almost all industries and opened up new opportunities and possibilities. Companies can optimize processes and serve new business fields through digitalization (Nadkarni & Prügl, 2021). In the healthcare sector, digitalization also offers new opportunities to make medical care more efficient and patient-friendly (Stoumpos et al., 2023). One area that is being particularly boosted by advancing digitalization is the metaverse. The metaverse is a virtual world that allows users to interact and act in a virtual environment. It offers new ways to solve complex tasks and share information (Davis et al., 2009). Reviewing the relevant Information Systems (IS) literature shows that research interest in the field of the metaverse is increasing. A study on publications in the Web of Science on the topic of metaverse shows that the number of publications in 2021 tripled compared to the previous peak in 2009 (Ning et al., 2021). Parallel to the increased general research interest in the field of the metaverse, the practical and research on the topic of "Medical Extended Reality" is also increasing. For example, the University Hospital of Essen presented its "Avatar Hospital" project in August 2022. Avatar Hospital is a pilot project that simplifies the interaction between doctor and patient through a virtual hospital. The virtual hospital offers the possibility of outsourcing consultations into virtual reality and managing patient records digitally (Matusiewicz et al., 2020). Furthermore, the metaverse can be used to perform telemedicine and surgical simulations, as well as to deliver therapies in mental health (Kim & Kim, 2023). Therapists and patients can communicate with each other in real time without having to be in the same location (Sampaio et al., 2021). However, a therapeutic conversation is a complex process based on trust, openness, and empathy. It requires a certain sensitivity and adaptability to respond to the individual needs and problems of the patient (Martin & Chanda, 2016). The metaverse offers a new way to conduct these conversations, but there are no clear guidelines and standards for how a metaverse environment of a medical session regarding mental health should be designed. This is an important topic because the design of the metaverse can have a decisive influence not only on user acceptance – especially through the patient – but also on the effectiveness of the therapy. Since intrinsic motivations can affect human behavior more powerfully than extrinsic motivations (Thomas & Velthouse, 1990), we want to investigate how intrinsic motivation of patients' effect on their behavioral intention to use our artifact. Against this background, we want to answer the following research question: *What design principles (DP) for the metaverse in the context of mental health counselling are relevant for creating an engaging virtual environment for patients?* To answer this research question, we applied a design science research (DSR) approach and we have developed relevant DPs. As theoretical grounding we based our research on the Hedonic Motivation System Adoption Model (HMSAM) to examine how the DPs for the metaverse in the mental health counseling setting can influence patients' hedonic motivation and increase their acceptance of the metaverse as a therapeutic environment. The identified DPs are intended to serve as a guideline in the design of the virtual environment to help create a user-centric atmosphere and encourage patients to open up and talk about their mental problems. By presenting our key findings, we respond to a recent call of research to explore the potential of the metaverse in various industries and applications (Dwivedi et al., 2022).

Theoretical Background

Potential Application of Metaverse in Mental Health

The metaverse is described as *"a massively scaled and interoperable network of real-time rendered three-dimensional (3D) virtual worlds that can be experienced synchronously and persistently by an effectively unlimited number of users with an individual sense of presence"* (Ball, 2022; Dwivedi et al., 2023). Its significance lies in the ability to create a digital world that is not bound by physical limitations, enabling new forms of human interaction and communication (Davis et al., 2009).

There are several application areas for metaverse in healthcare (Thomason, 2021). The possible clinical uses of the metaverse and AR/VR in mental health include addressing conditions such as attention-deficit/hyperactivity disorder, autism spectrum disorder, anxiety disorders, specific phobias, and posttraumatic stress disorder, particularly depression (Ford et al., 2023). Since depression is a major contributor to the overall global burden of disease and a leading cause of disability worldwide (WHO, 2023). That's why utilizing the metaverse in the mental health domain is a novel and quickly progressing research area (Cerasa et al., 2022). Due to the rising availability and ease of access to virtual reality technology, there has been a mounting curiosity in investigating the potential benefits of virtual environments for enhancing mental health. Individuals with mental health conditions, such as social anxiety or depression, may experience difficulties engaging in social interactions in the physical world. The metaverse can provide a safe space for these individuals to connect with therapists. Previous research has demonstrated that exposure-based treatments using VR can be efficacious in decreasing symptoms of anxiety disorders and hold promise for implementation in the treatment of other illnesses such as stress-related disorders, obesity, eating disorders, pain control, addiction, and schizophrenia (Freeman et al., 2017; Jerdan et al., 2018; Novo et al., 2021; Pallavicini et al., 2022; Zeng et al., 2022). Since metaverse and mental health research predominantly deals with individuals confronting and working through their fears and anxieties in a safe, controlled environment, Baghaei et al. (2022) systematically considered the demonstration of the effectiveness of using VR to support the treatment of anxiety or depression in a range of settings. The researchers have found that VR is a valuable tool for provoking realistic reactions to feared stimuli and for pain management (Dermody et al., 2020; Jerdan et al., 2018; O'Connor et al., 2022). Additionally, it offers the ability to simulate real-life scenarios that can be difficult to replicate in traditional therapy settings (Rowland et al., 2022). Hatta et al. (2022) argue that VR has been identified as a valuable psychological tool for intervention in individuals with mental health problems due to its ability to provide immersion, engagement, and enjoyment. The authors state VR is beneficial as a psychological tool for intervention in individuals with mental health problems. They conducted a systematic review to assess the role of VR as a psychological intervention tool for mental health problems (Hatta et al., 2022). A study by Matsangidou et al. (2023) showed how multi-user virtual reality (MUVR) remote psychotherapy can improve traditional therapeutic practices. The study focused on how MUVR can enhance the effectiveness of acceptance and commitment therapy, play therapy, and exposure therapy for individuals with body shape and weight concerns. The research also explored the opportunities and challenges of using this technology in therapy sessions, highlighting its feasibility and positive user feedback for remote psychotherapy. Although some studies have explored the potential of VR in mental health interventions for specific groups, children, and young people (Harith et al., 2022), and Alzheimer's patients (Kruse et al., 2022), further research is needed to understand its benefits and limitations fully (Dwivedi et al., 2023).

Despite the exciting prospects that the metaverse presents for advancing the mental health field and offering innovative solutions to support individuals with mental health issues, significant research gaps must be addressed to comprehensively grasp the potential benefits and risks of the metaverse in this domain. The current body of evidence regarding the effectiveness of VR as a treatment for mental health problems is limited in terms of its focus on specific populations, such as children, older adults, and individuals with particular mental health conditions (Castellano-Aguilera et al., 2022; Halldorsson et al., 2021). Given that these populations may have distinct needs and respond differently to VR treatment, it is essential to understand how metaverse and AR/VR can address their mental health concerns. Previous research emphasizes the effectiveness of VR interventions for specific mental health problems (Cieślik et al., 2020; Li et al., 2022). Moreover, there need to be more reliable and valid tests to assess the effectiveness of VR interventions (Freeman et al., 2017; Rus-Calafell et al., 2018), which makes it challenging to draw firm conclusions about their efficacy. Therefore, future research should focus on developing, co-designing, and evaluating VR interventions, which must be carried out before they can be adopted as a standard form of treatment (Halldorsson et al., 2021; O'Connor et al., 2022).

Hedonic Motivation System Adoption Model

The Hedonic Motivation System Adoption Model (HMSAM) is a theoretical model that explains users' adoption of hedonic information systems, which are designed primarily for pleasure and enjoyment, rather than for utilitarian purposes. The HMSAM was designed to focus on users' intrinsic motivations in a process-oriented context, particularly in areas like online gaming, virtual worlds, social networking, and gamified learning environments. It builds on van der Heijden's (2004) model of hedonic system adoption by making cognitive absorption (CA) (Agarwal & Karahanna, 2000) a key mediator of both perceived ease of use (PEOU) and behavioral intentions to use (BIU) hedonic-motivation systems (Lowry et al., 2013) (see Figure 1).

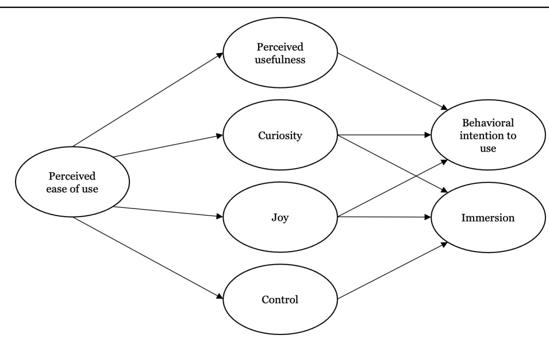


Figure 1. The HMSAM Model (Lowry et al., 2013)

Lowry et al., (2013) proposed that accepting systems can be depended on intrinsic or extrinsic motivation. Perceived enjoyment, a form of intrinsic motivation, was added to the technology acceptance model (TAM) model, and intrinsic motivation has since received continued attention in research on information system acceptance (Qiu & Benbasat, 2009; van der Heijden, 2004). Research has demonstrated that hedonic motivation, defined as the fun or pleasure of using technology, is essential in determining technology acceptance and use (Brown & Venkatesh, 2005). Many studies have validated that HMSAM plays a significant role in technology adoption (Kari & Kosa, 2023). Based on previous work (Lowry et al., 2013; van der Heijden, 2004) we assume that DPs for virtual therapy session environments must address not only utilitarian aspects for example the ability to cope with stress of the patients, but also hedonic aspects such as patients' enjoyment, control over their activities, and curiosity when using 3D virtual therapy session environments, as these significantly influence utilitarian features and actual system use (Gerow et al., 2013; van der Heijden, 2004).

Design Science Research Approach

To answer our research question regarding DPs for the mental health counseling in metaverse to create an effective and engaging virtual environment for patients, we are utilizing the well-established DSR approach (Hevner et al., 2004). DSR is an appropriate method to achieve our research goal as it has extensive applicability and a versatile approach for addressing real-world problems (Baskerville et al., 2015). Problem identification is often the first step in DSR. This process involves understanding the needs, requirements, and constraints of the problem to be solved and analyzing the current situation or status quo (Peffers et al., 2007; Vaishnavi & Kuechler, 2007). DR serve as the foundation for developing the solution. They help establish clear goals and criteria for the success of the design. Once the DRs are identified, the focus shifts to creating the solution and ensuring that it meets the needs of the stakeholders. Thus, the development of the DPs can begin. The DPs guide the actual design process. They ensure that the design takes the best possible approach and meets the stated requirements. DPs are often more abstract and general than specific requirements because they help ensure a coherent and effective design (Gregor et al., 2020). Against this background, based on the DSR approach, first three problems are defined with the help of literature review, then six DRs were derived from real user problems from literature and expert interviews, which serve as a starting point for three DPs to solve these practice-relevant problems. Specifically, we aim to create a practical 3D virtual therapy session environment that overcomes the barriers that reduce patients' preference for online therapist visits. To achieve this, we are combining theoretical understanding of patients' intrinsic motivations with their actual needs to enhance acceptance of virtual counseling. In this study, we contribute to the growing science of design for IT artifacts by deriving design DRs and DPs for mental health counseling in the metaverse and creating and evaluating the instantiated solution through two design cycles. We follow the DSR approach proposed by Vaishnavi & Kuechler (2007) and Peffers et al. (2007) which consists of six distinct phases: Awareness of the problem, suggestion, development, demonstration, evaluation, and communication (see Figure 2).

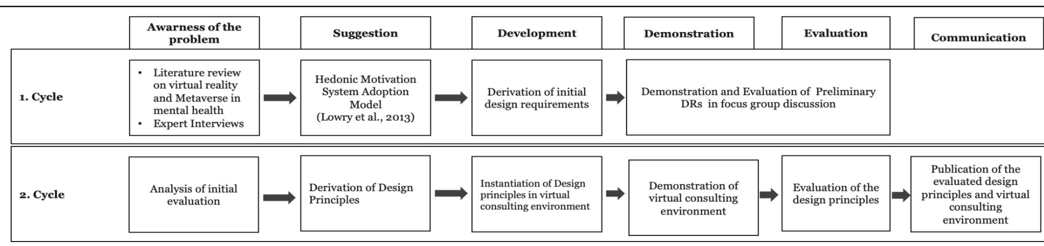


Figure 2. DSR Approach Phases

As shown in Figure 2, we performed two design cycles in order to develop a patient-centered virtual environment for a mental health session between patients and therapist. In **cycle 1**, we began our research by identifying the real-world problem in more detail to get an ***awareness of the problem***. In this vein, we reviewed related literature on the use of the metaverse and AR/VR in mental health. Afterwards, we performed twelve semi-structured expert interviews within the awareness of the problem phase. Based on the findings from literature, we ***suggested*** Lowry et al.'s (2013) HMSAM framework as the kernel theory. The HMSAM framework and the outputs of expert interviews guided the ***development*** of our DRs. We conducted two focus group discussions with ten DSR experts to ***demonstrate*** and to ensure the relevance of the identified problems (P1 – P3) (Hevner et al., 2004) and ***evaluate*** the suitability of the DRs. In **cycle 2**, we reflected on the results of cycle 1, as proposed by Vaishnavi and Kuechler (2007), thus, DRs, which we developed with the help of expert interviews, were specified to the mental health domain with the outputs of focus group discussions. Subsequently, in the ***suggestion*** phase we derived our DPs. As a next step, we analyzed existing metaverse platforms and their performance and customizing features. Based on this analysis, we decided to use Spatial and Meta Horizon Work Rooms to build our 3D virtual therapy session environment. Afterwards we ***developed*** our 3D virtual therapy session environment in line with the DPs. Here we followed the approach of Peffers et al. (2007), who proposed demonstrating the artifact before evaluating it. To ***demonstrate*** our 3D virtual therapy session environment, we invited three potential users to our metaverse lab. Subsequently, to ***evaluate*** the effectiveness of our DPs, we conducted an evaluation study with sixteen potential users among users. In the ***communication*** *phase* we communicate the results of our study following the approach of Peffers et al. (2007) by writing this paper. In the following subsections we describe our procedure of design cycles 1 and 2 in more detail.

First Design Cycle

Phase ´Awareness of the Problem´

In order to determine the level of awareness of the problem, we conducted a rigorous investigation that consisted of a structured literature review and twelve expert interviews. This approach enabled us to collect and analyze a comprehensive data set from various sources, allowing us to gain a deeper understanding of the issue. Through our analysis of both the published literature and the insights provided by the experts, we identified key themes and patterns that shed light on the extent to which the problem is recognized and understood within the relevant community. By combining these different sources of information, we obtained a more robust and nuanced view of the issue, which helped to derive our preliminary DRs.

In order to detect potential challenges, we conducted a structured **literature review** following the five steps according to the approach of vom Brocke et al. (2009). In the initial stages of our research project, we focused on investigating the impediments to the adoption of metaverse and AR/VR in mental health. Our primary goals were to establish a research agenda and set the stage for future research endeavors and to detect the problems which prevent the adoption of emerging technologies in healthcare. The literature review was conducted from Web of Science, ScienceDirect, and PubMed in a sequential manner. PubMed was consulted as a medical database as it provides access to fields of healthcare. The search term ((“mobile health” OR “digital health”) OR (“Metaverse” OR “Virtual World*” OR “Virtual Reality” OR “Augmented Reality” OR “AR” OR “VR”) AND (“Healthcare” OR “Medicine” OR “Mental Health”)) was chosen to find a broad range of potential publications. During the search of ScienceDirect and PubMed, any duplicates were removed to eliminate redundancies and ensure that the results were unique and up to date. We reviewed publications from the last ten years (2013 to 2022). This resulted in 566 publications. We established inclusion and exclusion criteria according to Webster and Watson (2002) for selecting literature: We included the publications that analyzed the readiness of patients to adopt digital health and, namely barriers and facilitators. In order to ensure representative coverage of high-quality papers, we consider papers from the basket of eight journals and A+ to C ranked publications by VHB-JOURQUAL3. In addition, we applied exclusion criteria: In this regard, while searching the online databases, several filters, including the research area (IS and healthcare), year of publication (2013 to 2023), document type (journal articles and conference papers), and language (English), were applied. We read and applied the inclusion and exclusion criteria on the papers and began analyzing and synthesizing them. Consequently, we started with 30 papers by scanning the titles and abstracts and then read these carefully. Based on the findings in the relevant literature, we developed a list of problems (P). These include ***(P1) Patients show low motivation*** to adopt new technologies because of a preference for traditional or familiar care methods (Cata & Hackbarth, 2014; Guo et al., 2013; Serrano et al., 2020). Patients may be skeptical of emerging technologies and prefer conventional approaches. Given that individuals characterized by a strong dispositional resistance to change tend to avoid experimenting with novel concepts, preferring instead to maintain the stability of their lives, the process of learning about and engaging with unfamiliar technological advances becomes a psychologically complex task (Oreg, 2003). In this sense, for example, Guo et al. (2013) investigated the enablers and inhibitors of the adoption behavior of mobile health services among the elderly. Resistance to change influences perceived usefulness, and technology anxiety is positively associated with resistance to change. ***(P2) Privacy*** is a major concern for patients during doctor's visits as they may be hesitant to disclose sensitive information or worry about the confidentiality of their medical records (Cata & Hackbarth, 2014; Ehrari et al., 2020). Cata & Hackbarth (2014) argued that it is clear from the literature that e-therapy can work, but adoption has been slow, and it is important to understand why the adoption process is slow. Privacy was defined as one of the challenges in their work, as patients have concerns about the potential monitoring, tracking, misuse, or unauthorized access of their medical information, raising privacy and security concerns. Some patients may not have the necessary technical skills to use new technologies, which could hinder their willingness to adopt them. ***(P3) Patients may experience a lack of technical proficiency*** when using new healthcare technologies, which can lead to frustration, confusion, and ultimately a reluctance to adopt or continue using the technology (Blok et al., 2017; Jacob et al., 2022). According to Jacob et al. (2020), lack of technology skills is a barrier, and numerous studies have reported a positive relationship between technology skills and willingness to use digital tools in healthcare (Jacob et al., 2022).

Moreover, we consider **expert interviews** to be suitable at the outset of a DSR study, due to the lack of pre-existing knowledge concerning the development metaverse for mental health consultation. Thus, to acquire DRs from practical sources, we conducted expert interviews. The experts work with metaverse applications and are chosen by their experiences in metaverse development and can thus envision requirements. In total, we conducted twelve interviews with various experts (see Table 1).

ID of expert (E)	Position	Metaverse Experience	ID of expert (E)	Position	Metaverse Experience
E1	Innovation & Digitalization Manager	4 years	E7	Innovation Manager	1 year
E2	Innovation Manager	2 years	E8	Strategy Manager	1 year
E3	Senior Solution Manager	3 years	E9	CEO Innovation Consulting	4 years
E4	Head of Metaverse	4 years	E10	Consultant for AR/VR/Metaverse	7 years
E5	Innovation Manager	2 years	E11	CEO Metaverse Consulting	4 years
E6	Head of Metaverse	2 years	E12	CMO & Head of Metaverse	4 years

Table 1. Overview of Experts

We created a semi-structured interview guide based on Sarker et al.'s (2013) recommendations in order to prevent typical pitfalls. The guideline covered all dependent variables of the HMSAM and enabled experts to express their experiences and ideas freely. To begin the interviews, we provided an introduction to designing a 3D virtual therapy session environment in the metaverse. We posed an overarching question to get insights from the experts' perspective and asked them what they are the general aspects that you should consider when designing a metaverse. We conducted the interviews in the beginning of 2023 online via Zoom or Teams. On average, the interviews lasted 47 minutes. All interviews were recorded and fully transcribed. As it seemed that further interviews were unlikely to provide additional information, we finished data collection after the twelfth interview because of theoretical saturation (Flick, 2004). We utilized a qualitative content analysis for extracting valuable insights of the expert interviews and in order to categorize the content. This approach facilitates the identification of DR through an in-depth analysis of the interviews (Corbin & Strauss, 2015). The software f4analyse was used to analyze the data material, which results in various aspects relevant for the DPs.

Phases ´Suggestion´ and ´Development of Design Requirements´

In the suggestion phase, we use Lowry et al.'s (2013) HMSAM framework as a Kernel Theory to derive DRs. According to the HMSAM framework, the behavioral intention to use and immersion are divided into sub-dimensions: perceived ease of use, joy, curiosity, and control. These sub-dimensions are significantly related to the behavioral intention of use and focused immersion, which indicates the acceptance of a 3D virtual therapy session environment (Lowry et al. 2013). To develop our DRs firstly we used the HMSAM and derived DR1-DR3. DR4-DR6 were derived from expert interviews. These requirements serve as general guidelines (Hevner et al., 2004) that can be applied to any virtual consultation room to enhance patient-friendliness. In the following we describe these DRs in detail:

Hedonic systems focus on the fun-aspect of using information systems and encourage prolonged rather than productive use (van der Heijden, 2004). A person's intrinsic motivation to engage in a task and their enjoyment of their interactions will lead to immersion or flow as a logical causal outcome (Guo & Poole, 2009; Webster et al., 1993). Furthermore, the greater the level of enjoyment experienced during the interaction, the more likely an individual is to allocate their attention towards the stimuli presented by the interaction (Berlyne, 1954; Cupchik et al., 2009; Nadkarni & Gupta, 2007). This allocation of attention enables a more significant portion of one's cognitive resources to be occupied by the interaction, leading to immersion (Berlyne, 1954). Recent research in cognitive science about virtual reality has substantiated the direct relationship between attention allocation and immersion (Parsons et al., 2009). In the gaming context, this means that if an individual's joy in a video game increases during an interaction, they will likely become more immersed at that time than during periods of less enjoyable gameplay (Lowry et al., 2013). Thus, we propose the ***(DR1)****: The metaverse should provide patients a pleasant experience, by individualizing their experience.*

According to Agrawal and Karahanna (2000), control refers to a user's feeling of being in charge during an interaction with a system. If a system is easy to use, the user is more likely to feel in control, and there is a positive relationship between perceived ease of use and control (Lowry et al., 2013). However, if the system is difficult to use, the user is less likely to feel in control, leading to frustration and anxiety (Compeau & Higgins, 1995). Increased control leads to a deeper level of immersion because it demands more attention. If a user perceives greater control while using a system, this will elicit a positive emotional response, and they will want to continue using it. Conversely, if the user feels a lack of control or interaction, their intention to use the system will decrease (Lowry et al., 2013). Thus, we formulate ***(DR2)****: The metaverse should give patients increased control over their activities by providing easy interaction opportunities.*

Curiosity is a surge in interest and an elevated sensory and cognitive inquisitiveness state. When curiosity increases, it tends to enhance immersion (Sweetser & Wyeth, 2005). This is because curiosity intensifies the enthusiasm towards the interaction with a system, which motivates users to continue using it thereby leading to an increase in behavioral intention to use. Hence, a heightened curiosity towards a system will likely increase behavioral intention to use, as individuals seek to gratify their curiosity through further engagement (Qin et al., 2009). Hence, inducing curiosity in patients about virtual environments will increase their willingness to visit their therapist in the metaverse. Thus, we formulate the **(*DR3)****: The metaverse should excite patients' curiosity by providing them more detailed information.*

A positive experience in the virtual world promotes a more extended immersion. According to our expert E1, a key goal of general virtual environment design is to make the user feel comfortable with making them stay longer and more productively in that environment. A pleasant atmosphere has been proven to promote immersion, while an unpleasant environment is distracting. Such an experience should give the user a sense of well-being and be enriched by appropriate elements to create a connection to the familiar (E1; E4). For this reason, the enhanced human appearance of avatars could be used for the user's well-being in virtual experiences. Additionally, feeling lonely in the metaverse can hinder the intention to use the metaverse (E1; E12). When entering virtual worlds, people may initially feel isolated and anxious because of the new environment. This is because, without interactions with others or engaging in activities, it can feel like being in an empty nightclub or bar, leading to discomfort caused by loneliness (E1; E4; E6). As a result, it is crucial to incorporate dynamic and vibrant features into the virtual environment to reduce such feelings and encourage social interaction among users. Thus, we formulate **(*DR4)****: The metaverse should prioritize patients' well-being by providing a pleasant experience and ensuring that users can engage with others in the virtual environment.*

Telehealth systems have significant privacy risks that can negatively impact the trust and adoption of patients and clinicians. Such risks include a lack of control over data collection, use, and sharing (Malhotra et al., 2004). Establishing more comprehensive standards and regulations may be necessary to guarantee robust privacy for telehealth (Hall & Mcgraw, 2014). Our experts have pointed out this problem and argued that standardized measures should be taken to ensure confidentiality (E1; E2; E3; E7). Hence, we formulate **(*DR5)****: The metaverse should safeguard patients' personal information by implementing robust security measures and privacy protocols.*

To increase acceptance, it is important to make sure that the experience is easy to access. This includes that the patient has no hurdles in understanding and no problems in navigating through a virtual world (E1; E7; E8). Supporting patient access to the system is essential because the interaction with the system can be hard to handle immediately. Providing patients tutorials (e.g., a pop-up or a small explanatory video) before their use for the introduction is helpful (E4; E5). Hence, we propose ***(DR6)****: The metaverse should offer a seamless and user-friendly accessing process by supporting patients with information about the system.*

Phases ´Demonstration and Evaluation of Design Requirements´

For the refinement of DRs, we conducted two exploratory **focus group discussions** with ten participants and approximately 68 minutes each to specify and evaluate our DRs (Tremblay et al., 2010). Since we aimed to evaluate our DR, we recruited IS researchers who regularly conduct DSR. The focus group consists of 10 IS researchers (5 females/5 males) with an average of 2.9 years of DSR experience. We identified the specific weakness and strongness of DRs by allowing direct interactions between IS researchers during the focus group discussions. One author moderated these focus group discussions. Every two sections started with an initial introduction of problems in video consulting therapy and traditional therapy. The aim of the research was then explained to the participants, after which each DR was presented, and participants were asked a series of questions. These questions included whether they understood the principle of the requirement, whether they believed it would help in designing a 3D virtual therapy session environment, and whether they had any suggestions for improvement. The questions covered all DRs and enabled participants to express their experiences and ideas freely. The questions were asked and answered in sequence for each DR. The first question aimed to test the participants' comprehension of the preliminary DR, while the remaining questions focused on the participants' perceptions of the requirement's meaning and its impact on their design of the 3D virtual therapy session environment. Finally, participants were asked for possible improvements to maximize the usefulness of the DRs. With the outputs of focus group discussions, we specified all of our DRs to the mental health domain.

The results of the focus group discussion are more than half of the participants have stated that the most significant advantage of the metaverse in the healthcare domain is its patient-centric approach. Second, information technology researchers who participated in the group discussion have indicated that the most tedious aspect of traditional therapist visits is the hours spent in the waiting room. They also mentioned that this situation is a factor that discourages patients from revisiting the same doctor. Third, the researchers who participated in the group discussion pointed out that patients need to have control and decision-making powers over their interactions to feel the benefits of the metaverse. It was stated that patients' ability to interact with their doctors or other patients easily would lead to their desire to spend more time in the metaverse. Fourth, it was noted that giving patients the power to decide whether they want to interact with their real avatars or anonymized avatars would lead patients who struggle with self-expression in certain psychological situations to visit their therapists in the metaverse. Fifth, the researchers who participated in the group discussion expressed that patients could access enriched information in the metaverse. For example, explaining a disease by enhancing it with pictures of organs, showing the healthy state of the organ, and the changes caused by the disease in that organ provide the patient with enriched information. The patient's curiosity about the information increases their interest in the system since the metaverse offers this opportunity. Sixth, according to researchers, it is possible to help people feel better in therapy by taking advantage of the opportunities offered by the metaverse according to their psychological state. For example, therapy can be provided in a forest environment with relaxing music for a patient experiencing fear. At the same time, elements can be added to the therapy environment to make a patient afraid of being alone feel better. Seventh, the researchers pointed out that patients need to be informed about using and storing critical and sensitive medical information regarding privacy. Finally, researchers have indicated that the main reason why users avoid using telehealth systems is because the system's usage is difficult for patients. Therefore, patients should be trained and supported on how to use the new technology.

Second Design Cycle

In the second design cycle, DPs were derived based on the outputs of the first design cycle concerning: (DP1) motivation and engagement, (DP2) privacy, and (DP3) technical guidance. DPs, which we derived following (Gregor et al., 2020), provide the basic resolution of all previously identified issues. A solution instantiation was subsequently developed to visualize different DP. To validate both the DPs and the resulting artifact, an evaluation study was conducted (Peffers et al., 2012). In the following the procedure of development, demonstration and evaluation of DPs is explained in more detail.

Phase ´Derivation of Design Principles´

We developed our DPs with the help of the results of the focus group discussion we conducted during our first design cycle. The final set of the derived DPs is summarized in Table 2.

Design Principle (DP)	**Description**
DP1 ´Motivation and Engagement´	For a patient-friendly 3D virtual therapy session environment to motivate and encourage, the patient should be able to … **DP1a:** … interact with the doctor/therapist in an individualized and pleasant environment. **DP1b:** … control and take responsibility for their activities. **DP1c:** … get enriched information with virtual reality technologies.
DP2 ´Privacy´	For a patient-friendly 3D virtual therapy session environment to relieve privacy concerns, the patients should be able to **DP2:** … get information about the security measures and privacy protocols before using the 3D virtual therapy session environment.
DP3 ´Technical Guidance´	For a patient-friendly 3D virtual therapy session environment to guide patients through accessing and using the system, the patients should be able to … **DP3:** … get technical support from the beginning to the end of the therapy process.

Table 2. Preliminary DPs for Patient-friendly Virtual Environment

For designers and for providers of metaverse applications to maximize the adoption of a patient-friendly virtual environment, it is essential to ensure these listed DPs. In the following, the DPs are explained in more details:

DP 1 ´Motivation and Engagement´: The sub-DPs regarding Motivation and Engagement provide a solution for Problem1 (P1) and are responsive to DR1, DR2, DR3 and DR4. More specifically, the DPs serve as a support and incentive to enable patients to visit their therapists in the metaverse. As supported by interviews, focus groups, and the HMSM framework requires principles encouraging patients to use this new technology to see their therapists virtually. DP1a indicates that patients should be able to select their individualized environment, which supports their interaction and well-being. In contrast, DP1b shows that this patient-friendly 3D virtual therapy session environment should give patients control over their activities. DP1c indicates that patients should be fed enriched information and experience with virtual reality technologies. To motivate patients in DP1a and DP1b, they should be allowed to make their own decisions. In DP1a, patients should be able to choose the environmental setting where they visit their therapist as mentioned in focus group discussions. To do this, a form should be sent to the patient before their appointment to ask how they would like to spend their daily appointment. This setting could be a usual therapist’s office, but it could also be a forest, seaside, or any environment where the patient feels comfortable. Additionally, the patient should be able to decide the level of interaction they prefer. Patients who want to wait calmly for their appointment do not need additional interaction. In contrast, a patient who dislikes being alone or becomes bored while waiting should have enriched interaction options in the waiting room. Therefore, to ensure DP1a and DP1b are effective, the metaverse should be easily adaptable. In DP1c, to attract patients’ interest, information should be presented with different experiences than traditional therapist visits. For example, a virtual experience that simulates the situation can be offered to patients with acrophobia to overcome their fear.

DP2 ´Privacy´: The DP regarding privacy provides a solution for P2 and is conforming to DR5. The second DP concerns the measures necessary to alleviate patients’ privacy concerns. As stated in the literature, interviews, and focus group discussions, an important factor in patients’ decision to visit their therapists in the metaverse is the assurance of data security and privacy. Therefore, metaverse should ensure patients’ data security and privacy according to established standards and provide them with information to address their concerns. This information may be provided before the appointment or through a briefing video or pop-up message before therapy begins during the visit.

DP 3 ´Technical Guidance´: The third DP related to technical guidance addresses problem three and is related to DR6. Literature shows that patients who do not consider themselves technically proficient tend to prefer traditional methods over alternative methods, such as Telehealth's online doctor consultations. To encourage patients to visit their therapists in the metaverse, they should be informed and supported about the system. After explaining the advantages of visiting a therapist in the metaverse, patients should be given information about how to use the system. This information could be provided as a pre-therapy video.

Phase ´Demonstration´ of 3D Virtual Therapy Session Environment

Before we began to set up the virtual environment in which we demonstrated and tested our DPs, we analyzed the features of the tools available for this purpose. There are various possibilities for implementing a virtual therapy environment in the metaverse. Platforms already exist for creating metaverse applications, such as FrameVR or Spatial (Virbela,2023a; Spatial Systems, Inc 2022). The Meta Horizon Workrooms application provides a virtual meeting environment where participants can use different rooms for different application scenarios (Meta Platforms, Inc. 2021). Unlike Spatial, the environment is fixed, and participants cannot move freely in Spatial. However, participants can connect and use their computers in virtual reality via a remote desktop connection. A whiteboard can also be operated using VR goggles' controllers. Therefore, the application scope is smaller than the Spatial environment and limited to virtual meetings. However, in these meetings, participants can interact more effectively with the provided components than in Spatial. To decide which tool to use, we conducted a pre-study and invited three potential users of the 3D virtual therapy session environment to our metaverse lab in March 2023. After allowing them to experience the test rooms we had developed in both Spatial and Horizon Workroom, we conducted a 15-minute brainstorming session with them to detect the suitability of tools for our study. While two of the participants stated that the environment created in Spatial was more exciting, the third participant pointed out that the interaction in Meta Horizon Workrooms was easier. After being confident that both virtual environments fit better with different DPs, we decided to use both tools in our evaluation experiment. We utilized both platforms to test our DPs, as each platform possessed distinct strengths. This allowed us to evaluate the applicability of our DPs across different systems, irrespective of the particular platform. We conducted interviews to evaluate the identified DPs for a patient-friendly 3D virtual therapy session environment (see Phase ´Evaluation´).

Phase ´Evaluation´ of Design Principles

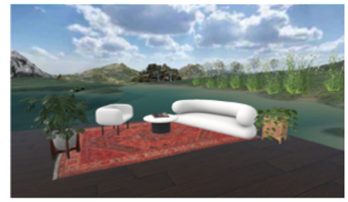
We first created two virtual environments on the Spatial and Meta Horizon Workrooms platforms, based on the derived DPs created during the second design cycle, to demonstrate our artifact to interviewees. The interviewees are sixteen potential users (44% female/56% male) between the ages of 21 and 33 who were invited to participate in the evaluation study in our metaverse lab. The participants have an affinity for digital technologies. The interviews lasted an average of 42 minutes and were then transcribed for analyzing the data material. All participants were informed about the scenario where a fictional person (the patient is facing burnout due to work-related stress and is visiting her therapist in the metaverse. The patient discusses with her therapist the possible causes of her current situation. The therapist advises her to communicate her needs and boundaries with her boss and shows her a breathing exercise. All participants in the evaluation study experiment were asked to imagine that they were patient in the described scenario, and one researcher played the role of the therapist. At baseline, eight of study participants consecutively used the metaverse to participate in the 3D virtual therapy session. The other eight successively participated in a web-based therapy session via a video conferencing tool. After that, the participants who used the metaverse used the conference tool, and those who used the conference tool used the metaverse. The division into two groups was to have a more mixed comparison of the two environments (web-based vs. 3D virtual). For the 3D environment, participants sequentially experienced the same scenario in 3D virtual therapeutic environments in Meta Horizon workrooms and Spatial, and finally, to evaluate the superiority of the proposed solution over existing solutions such as web-based video sessions. Table 3 provides a comprehensive overview of the 3D virtual therapy session environments. Furthermore, we have illustrated examples of 3D virtual therapy session environments in Figure 3 and 4. We used a semi-structured interview to collect the data. To prevent common mistakes, we followed literature guidelines when preparing and conducting the interviews, as described by Myers and Newman (2007). Using Sarker et al.'s (2013) recommendations, we developed a semi-structured interview guide that covered constructs of the HMSAM, namely: enjoyment, control, immersion, curiosity, and perceived ease of use (Lowry et al., 2013). Immersion and behavioral intention to use, which indicate the acceptance of the designed virtual environment, were measured with the mentioned construct. We measured the perceived well-being of participants with the help of The Positive and Negative Affect Schedule (PANAS) (Watson et al., 1988). Lastly, to determine if participants' privacy concerns were measured according to Dinev and Hart (2006). In this way, we created an interview questionnaire that allowed us to evaluate the **DP1 ´Motivation and Engagement´**, **DP2 ´Privacy´** and **DP3 ´Technical Guidance´.** In addition, we asked participants in the evaluation study, how they compare their experience with 3D virtual therapy sessions to their experience with video therapy sessions with the aim to identify metaverse-specific aspects in more detail. After the interviews were conducted, they were transcribed and coded and analyzed using a tool (f4analyse).

Description in Spatial	**DP**
First, one of the authors explained the use of the VR goggles to the participants and provided technical assistance about using the controller and which interaction opportunities were available. Thus, we evaluate DP3. After that, in the virtual environment in Spatial, the therapist and the patient met in the therapy environment in nature. Data security and privacy agreement measures were placed using sticky notes. That way, it is easier for the patient to follow along (Figure 3 Scene 1). Thus, we evaluate DP2. Additionally, a dog was added to the virtual environment (Figure 3 Scene 2) to provide participants with relaxation and interaction. The presence of animated animals distracts the patient from their problems, reducing feelings of anxiety and stress (E12). Incorporating comforting furniture, such as a cozy couch or rocking chair, placed in a natural setting within the 3D virtual therapy session environment could positively impact patients during a therapy session by creating a sense of relaxation and tranquility, promoting a more conducive environment for open and honest communication. This may also reduce anxiety or stress, allowing patients to feel more at ease and comfortable discussing their issues with the therapist (E7). So, we have added these elements to the natural therapy environment for the patient's well-being (Figure 3 Scene 3). With this enhanced individualization, we aim to offer a pleasant experience. Thus, we can evaluate DP1a.	• DP1a • DP2 • DP3
Description in Meta Horizon Workrooms	**DP**
Before the beginning of the therapy, the patient has watched an instruction video about using the controller and which interaction opportunities were available. Thus, we evaluate DP3. Horizon Work Room therapy session took place where the patient and the doctor met in a virtual environment designed as a therapy room. A note regarding data security and privacy was shown to the patient before the therapy session. Thus, we evaluate DP2. In this scenario, pre-existing Work Rooms developed by Meta Horizon were utilized for the therapy room. To create the therapy environment, we utilized the personalization options provided by Horizon Work Room and added posters related to our topic (Figure 4 Scene 1). Using the Whiteboard feature Meta Horizon Work Room provided, we shared a video about breathing therapy with the patient through the therapist's desktop (Figure 4 Scene 2). Thus, we evaluate DP1c. While watching the video, the therapist and the patient interactively practiced breathing therapy together (Figure 4 Scene 3). So, we can evaluate DP1b.	• DP1b • DP1c • DP2 • DP3

Table 3. Description of 3D Virtual Therapy Session Environment

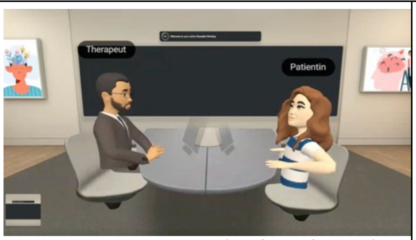
Scene 1: Data privacy information note

Scene 2: Moving animals in the surroundings

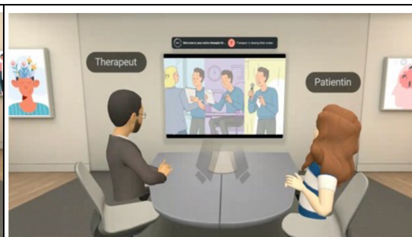


Scene 3: Consulting in nature

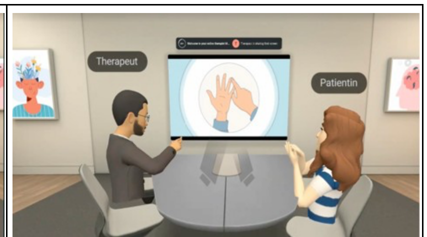
Figure 3. 3D Virtual Therapy Session Environment in Spatial



Scene 1: Customized Therapist Room in Metaverse



Scene 2: Sharing Therapists' Screen over Whiteboard



Scene 3: Interactive Breath Therapy

Figure 4. 3D Virtual Therapy Session Environment in Horizon Workrooms

In order to evaluate the first **DP ´motivation and engagement´** we asked three different questions to analyze the DP1a, b and c. To evaluate DP1a, we asked study participants (in the following abbreviated to P), how they experienced the virtual therapy session. The majority of participants responded that visiting their therapists in the metaverse was a lot of fun and a new and pleasant experience for them. Although they were excited beforehand, they were surprised at how well everything worked. Their expectations were exceeded, and the avatar reflected facial expressions and gestures well, although not all the subtleties. The environment was pleasant, with large office spaces; once they put on the VR goggles, they felt they were in a spacious office world. After that, we asked if they would have a therapy session in a natural 3D virtual therapy session environment (in our setting Spatial). Fifteen of sixteen participants have directly mentioned that they find a natural 3D virtual therapy session environment pleasant; that's why they could also visit their therapist in an individualized therapy environment like in nature. Only P3 has expressed: *"I would like to choose one of the personalized therapy environments offered based on my mood that day and the topic I would like to discuss. For example, I might do a topic that is not too complicated for me, such as the stress of daily life, in the river therapy environment offered in Spatial. But for my therapy sessions about my worries, fears, and issues that challenge me, it makes more sense for me to do it in a more serious environment designed as a therapist room"*. Therefore, DP1a, which states that the patients should be able to interact with the doctor/therapist in an individualized and pleasant environment, is supported by the participants. When we asked the participants to what extent they felt in control (DP1b) of their interactions and activities during the therapy session and what they liked most about the virtual 3D world, they all mentioned the interaction capabilities of the metaverse and their control in the metaverse: *"It's easy to use"* (P6), *"I feel like I always know what to do next"* (P4), " *The interaction was excellent; I had hands-free movement without distractions, fully immersing myself. Hand tracking worked well, occasionally slightly off but effective. Feeling my fingers accurately represented enhanced the sense of being in VR, I didn't experience any weird sensations that reminded me that I was in that virtual reality"* (P14). DP1c assume that, for a patient-friendly 3D virtual therapy session environment to motivate and encourage, the patients should be able to get enriched information with virtual reality technologies. When we asked participants about DP1c, the majority of participants said that the Metaverse environment definitely made a big contribution to better understand the solution to their mental health problem: *"When I watched the video in the metaverse, I was able to absorb the information much better. The fact that the doctor was in the same room made what was happening much more real to me* " (P8). Additionally, P16 stated: "*The metaverse environment allowed me to be more involved in the therapy session. It wasn't just a simple room with visuals. The opportunities for interaction were also useful, such as being able to watch a video and do breathing therapy with the therapist. These opportunities made me curious about the solution to my mental health problem*". Regarding second **DP ´Privacy´,** which aims to inform patients about security measures and privacy protocols before using the 3D virtual therapy session environment, participants focused primarily on the collection and storage of their personal data. Therefore, privacy is particularly important for half of the participants. Overall, DP2 was rated as *"absolutely necessary"* (P6). Some participants also argued that the metaverse should provide information about whether personal health data, such as eye tracking and gesture and mimic recording, will be collected and where this data will be stored after collection. One participant mentioned: *"I think privacy plays an important role here, as I definitely do not want what I say to be recorded or stored without my knowledge. The question of control over this is also relevant, even when privacy policies are in place or displayed, as in this example. Since my therapist has informed me where my data is stored, I would no longer be concerned about privacy. However, since we have our cell phones everywhere, I don't think this is an issue I would be concerned about"* (P15). Furthermore, the third **DP ´technical guidance´** was considered important and necessary by all participants. Participants emphasized that everyone needs technical support until they are comfortable using new technologies. For example, P9, who identified herself as experienced with VR technologies, mentioned that she didn't experience any technical difficulties while visiting her therapist in the metaverse because she was familiar with the technology. However, she noted that someone unfamiliar with the technology might choose not to visit their therapist in the metaverse because of potential technical challenges. Many participants argued that the intention to use the metaverse for visiting a therapist increased after interacting with the 3D virtual therapy session environment. The results shows that DP1 'Motivation and Engagement,' DP2 'Privacy,' and DP3 'Technical Guidance' are essential and necessary DPs in creating a patient-friendly 3D virtual therapy session environment in the metaverse. The majority of participants in our study supported this assessment. In comparing the experience in the 3D virtual therapy session environment with a web-based video therapeutical session, almost all participants mentioned that they would prefer to visit their therapist in the 3D virtual therapy session environment. P12 has expressed this with following words: *"Metaverse provides a stronger sense of proximity to the therapist due to its 3D environment, while a video conference tool creates a sense of distance. Virtual reality enhances the feeling of being in the same room during sessions."* P5 also finds *"virtual reality preferable for shared video experiences with the therapist, citing increased immersion and reduced distractions compared to Zoom."* We evaluated the effectiveness of our design principles by measuring their performance against existing solutions. Our evaluation has yielded positive results, as we have found that our design principles effectively address the problems we have identified. In addition, the results showed us that a 3D virtual therapy session environment provides patients with increased immersion and reduced distraction, making it superior to web-based video consultations that offer similar solutions.

Conclusion, Limitations and Future Research

Due to technological advances in healthcare delivery, this progressive digitalization offers new opportunities to make medical care more efficient and patient-friendly. Especially metaverse can be used to perform telemedicine and surgical simulations and deliver therapies for mental health. We apply a DSR approach to derive a solution instantiation in two consecutive design cycles to address the challenges of the literature. For this purpose, we develop DRs, DPs, and a virtual environment to encourage patients to open up and talk about their mental problems and promote their acceptance of virtual services. We are responding to the call to expand the growing research field of metaverse (Dwivedi et al., 2022) by addressing implementation in the context of a real-world use case. We develop a 3D virtual therapy session environment for patients to meet with therapists safely and pleasurably in metaverse and promote acceptance and use of the technology. In total, we conducted 16 interviews for the evaluation. The evaluation achieved theoretical saturation so that no further interviews were needed. The evaluation aimed to assess the DPs through interviews with patients. Through these interviews, it was possible to gain a deep insight into the needs and perspectives of patients. The direct involvement of patients made it possible to capture their subjective assessments and opinions of the DPs and thus gain valuable insights into how well the designed principles can work in practice. The interviews allowed patients to express their impressions of the overall effectiveness of the DPs. Our study provides several **theoretical contributions**. First, our study focuses on patients' intrinsic motivation to adopt therapy in the metaverse, while previous research has mainly focused on the effect of extrinsic motivations of the user to adopt new technology. Second, we provide several insights on designing a virtual environment in the context of healthcare in the mental health domain, which goes beyond existing research. We show that the engagement of patients in the metaverse requires an iterative design approach and many existing DRs. To provide a concrete example, during the patient's time in the metaverse, the perceived joy and the control over the interactions and curiosity triggered by the opportunities provided by the metaverse cause the patient to immerse themselves in the metaverse by increasing their intention to meet with their therapist. In addition, patients want to be technically supported before and during the use of these new therapy opportunities offered by the metaverse. They also want to be informed about how the confidentiality and security of their data are ensured. Third, we contextualize general DPs and develop a solution instantiation for patients to use metaverse for their therapist visits. Thus, we contribute by guiding researchers and IS designers on how to design easily understandable artifacts that promote patient acceptance. Thereby, the design and adoption of hedonic IS are increasingly discussed in different application areas such as education, health, or sustainability (Degirmenci, 2018; Inocencio, 2018; Kowatsch et al., 2014). Thus, we contribute to IS literature by developing DPs to encourage patients' intention to visit their therapist in a 3D world. This step toward a virtual environment for mental health consulting also holds several **practical contributions.** First, our solution instantiation vividly demonstrates how broad the application area of metaverse consultation can be if the designers and providers of metaverse applications focus on creating a patient-friendly virtual environment. Second, iteratively derived DRs and DPs also clearly show how important it is to involve metaverse experts and service providers in the development work at an early stage. Lastly, virtual environments for different medical consultation can build on the knowledge gained and use our DPs as a basis to develop optimal solutions tailored to different use cases. However, our contributions are also subject to **limitations.** The number of participants in focus group discussions is limited. In addition, we focus on a 3D virtual therapy session environment, which offers patients a high degree of well-being. We can guarantee the applicability of our DRs and DPs for all applications in healthcare domains, but our artifact could not be suitable for all applications in healthcare domains. Moreover, it is essential to note that qualitative research results were obtained in this study, and quantitative research, which provides statistically significant results, must be added through follow-up studies. The study's contributions and limitations offer ample opportunities for **future research.** While achieving statistically significant outcomes, conducting experiments in authentic settings and improving DPs moving forward will be crucial. While acceptance of using metaverse for virtual consulting can be fostered through targeted artifact design, future research and practice will need to take further approaches to ensure that this technology can continue to ensure equal health delivery for everyone. Lastly, metaverse has rapidly improved in recent years and poses many opportunities to improve, e.g., access to healthcare services. Future research should critically discuss the sustainability aspects of the technology, and research on the design of metaverse in healthcare should focus precisely on the application areas that have a major impact on acceptance.

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