"Good and Scary at the Same Time"—Exploring Citizens' Perceptions of a Prospective Metaverse

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If a metaverse as a seamless convergence of our digital and physical world is realized, whose values and philosophies are going to be reflected? Currently, metaverse development is placed in the hands of industry, narrowing perspectives of the essential human conditions for healthy, pluralistic societies. With our work, we broaden this view by exploring citizens' imaginations and perceptions of a prospective metaverse through cross-cultural discourse. In our group-based study performed in mid-2023 in Germany, we confronted 276 multinational participants with selected narratives about fictitious metaverse use cases created by laypeople in Japan to elicit value discussions. Our survey approach encourages joint reflections about future technological development. The analysis reveals how participants discuss relations between technology and values such as health, knowledge, equality, autonomy, security, and privacy from negative as well as positive perspectives. We highlight participants' perceptions of potential harms and benefits of the metaverse, and present themes that are at the forefront of citizens' minds when reflecting on the metaverse as a socio-technical construct. Finally, we discuss implications for ethical technology development.

The term *metaverse* was first coined in the early 1990s, and it gained widespread recognition as a household term following Meta's (formerly Facebook) announcement in 2021, outlining the company's strategic commitment to develop a prospective metaverse.[1] While many companies announced investments in its development, a future viable deployment does not solely depend on technological advancements, but also on societal and ethical factors. An industry led, homogenized metaverse may pose significant risks if diverse societal needs are poorly addressed and existing digital disparities are furthered. Responding to these dynamics, intergovernmental organizations are taking action. For example, the International Telecommunication Union formed a working group on the metaverse in late 2022, and the European Commission hosted a citizens' panel on virtual worlds in early 2023.

While academic discourse still lacks a unified definition,[1] the concept of a *metaverse* can be described as "a virtual environment blending physical and digital, facilitated by the convergence between the Internet and Web technologies, and Extended Reality",[2] allowing people to interact with each other or with virtual objects.[3] Thereby, *extended reality* can refer to any form of new reality including an augmentation or replacement of the physical reality with a virtual reality.[4] With their avatars, users can represent their virtual selves, enabling them to experience alternate lives in a digital realm.[2] While the metaverse describes a holistic space where all virtual actions come together, the

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multiverse consists of multiple virtual worlds, each of which is oriented toward a specific purpose.[3] The two concepts share central issues and challenges relating to the possibility of seamlessly interacting with the physical and virtual worlds. Therefore, in this article, we consider key results related to the notion of a metaverse as also applicable to a pervasive multiverse.

Previous research has explored challenges and undesirable impacts related to the metaverse,[1] but has rarely investigated viewpoints of lay citizens who will inevitably be impacted by an emerging cyberspace.[2] Our study addresses calls from previous research to investigate the *social acceptability* of the metaverse (i.e., the reflection of metaverse users' collective opinions and judgments on actions and policies).[2] Analyzing factors of acceptability is vital, as these aspects underpin the metaverse's sustainability.[2,5] We address this gap by highlighting citizens' perspectives on visions of a prospective metaverse that can inform research on its social acceptability. Specifically, we ask: How do citizens perceive and discuss the social impact, human factors, and interconnected value debates of a prospective metaverse? We study this question by initiating and analyzing a citizen discourse, where laypeople are confronted with fictitious metaverse scenarios as easy entry points for discussions. With this study, we contribute themes that are at the forefront of citizens' minds when reflecting about fictitious metaverse scenarios. Participants' reflections illustrate perceived fears and opportunities, and articulate societal, ethical, and technical challenges. These reflections can be interpreted as either hindering or fostering social acceptance.

RELATED LITERATURE

We map the current discourse on challenges and potentials of the metaverse, and outline design research methods to foster discourse.

Metaverse: Areas, Challenges, Potentials, Ethics

Application areas for the metaverse are manifold, such as smart cities, remote work and education, virtual economy and marketing, culture/tourism and entertainment, and social activities.[1,6] Prior work lists various challenges,[6,7] in particular regarding privacy and security (data collected from sensors and data based on communications and behaviors); user's and bystanders' physical safety; governance of the metaverse (laws, code, organizations);[8] usability and affordability of physical interaction devices and computing resources; and cyber-syndrome due to excessive use.

Ethical aspects, discussed recently under the label of *metavethics*,[9] explore the need for metaverse applications to positively impact the real world (e.g., regarding accessibility, diversity, equality, humanity,[10] and trust).[7] To explore such ethical implications and to solve practical challenges, disciplinary and cross-disciplinary contributions are needed.[6,9] In this context, a key matter is the involvement of different stakeholder groups in the various research undertakings. For example, based on industry expert interviews, characteristics for a positive metaverse development have been identified including being open and accessible; honest and understandable; safe and secure; sustainable; driven by inclusion and social equity; valuing integrity, ethics, and privacy; guaranteeing ownership and data protection; fostering diversity through self-expression; innovating responsibility; and complementing the physical world.[11]

However, some research teams advocate for the involvement of a broader set of relevant stakeholders, including users.[7] Unfortunately, previous research has identified a lack of studies investigating factors of influence for user acceptance of a metaverse, while partly addressing this gap by developing an extended technology acceptance model.[5,12] The generic model is widely used to explore factors influencing acceptance of a new technology. In the metaverse context, perceived ease of use, perceived usefulness,[12] or additionally social interaction and emotional attachment[5] were identified as positive influences on attitudes toward its usage.

The integration of even more diverse perspectives is still lacking, as nonusers and potential future users will also be affected by a prospective metaverse. Hence, we identify a research gap in the investigation of lay citizens' perceptions of the idea of an established metaverse as a socio-technical construct—where technology is embedded in a larger social system, which is always evaluated in relation to societal values—and their associated perceived threats and opportunities.

Research Through Design (RtD) in Human–Computer Interaction (HCI)

In recent years, RtD, especially utilizing critical design approaches like *speculative design* (SD), has increasingly been applied in HCI research[13] to elicit discourse through the creation of and confrontation with so-called *props*,[14] which are digital or physical representations of speculated futures. They can take different formats and be provocative, potentially also leading to an intended discomfort, in order to trigger questions about prospective social and societal living environments.

Reacting to criticism about being an expert practice that narrows the scope of critique and perspectives, a turn toward *participatory speculative design* (PSD) has been taken.[15] PSD as a practice[15] involves nondesigners and can concern both the creation of and the deliberate confrontation with props. PSD as confrontation can be positioned as a form of RtD when nondesigners reflect upon previously created props to inform future research, including other design processes or public policy. In previous research projects, these reflection modes acted as means of capturing public opinions, as well as a form of public engagement, and were realized through workshops and focus groups, for example.

METHODOLOGY

Creation of SD Props for the Survey

Our process of eliciting group-based discussions is driven by confronting laypeople with SD props. These present ethical questions related to metaverse use cases. To facilitate this reflection according to PSD principles,[15] we created props in the form of fictional chat conversations (see Figure 1). The chat conversations start with the presentation of short image-text pairs, describing and depicting metaverse use cases of fictional future scenarios. The methodical design of the prop confrontation was inspired by previous research.[16] The content of the props was also informed by the results of previous research,[17] which took the form of metaverse-related narratives (magazine articles) created by PSD workshop participants.

To create the image-text pairs as part of the props, two authors transformed four selected metaverse-related narratives into easily accessible summaries in a news article style. This was inspired by narrative ethics, where stories are the means to convey and sensitize to ethical issues in a tangible way.[18] Each narrative summary was supplemented by an AI-generated visualization. Figure 1 depicts the text-image pairs for the narratives; Figure 1(a) illustrates one prop.

The narratives informing the creation of our props were selected based on a twofold rationale: We aimed at taking inspiration from props that were 1) created by laypeople instead of experts such that survey participants reflect upon issues that are at the forefront of other laypeople's minds; 2) created in a non-Western context to emphasize reflection on ideas influenced by other local cultural settings. The selected narratives were created by Japanese citizens in 2022 during a PSD workshop.[17] These narratives do not holistically represent metaverse capacities. Rather, they are depictions of how participant groups make sense of a metaverse as a socio-technical construct through fictional use cases. Summarizing, the props we created for our study represent snapshots of fictional use cases. We utilize them as an easy entry point for reflective processes, similar to narratives describing ethical dilemmas in narrative ethics.[18]

Survey Conceptualization and Process

Our survey approach was conceptualized as cross-cultural in a twofold manner: 1) we elicited joint reflections from multinational audiences in Germany, while 2) making use of props informed by narratives from Japanese citizens that integrated non-Western viewpoints into the discussions. Thereby, we strive to connect to the aims of intercultural digital ethics (IDE). Here, scholars argue for ethical pluralism, fostering engagement in ethical debates around digital technologies across cultural differences striving for ethical cosmopolitanism.[19]

Before the survey, we gave a short introduction to the concept of the metaverse. At the start of the survey, groups were randomly confronted with one of the four props. Then, participants were asked about their perceptions (Q1), and to indicate their level of comfort with the depicted scenario on a 7-point Likert scale (1: "not at all" to 7: "very much"). After submitting their rating, Q2 was presented, which asked about alternative use cases of the technologies described in the scenario. The respective technology was either *AI-driven collective personalities*, *AI-driven autonomous avatars*, *metaverse as simulated immersive physical experience*, or *taste simulation*. Subsequently, information addressing narrative-specific value debates was provided: granting autonomous AI entities rights and their influence on human social interactions (U12-Topia, MOTHER); people suffering from VR traumas or losing their sense of reality (DisasterPrevention); metaverse-driven globalization and international exchange devaluing local cultures and practices (XR-Food). Q3 asked about response strategies to the described issues. The survey concluded with collecting data on groups' usage of ChatGPT, their confidence level in explaining the concept of the metaverse, and their demographics. The survey was pretested with six participants.

Recruitment of Participants and Sample

We performed four rounds of data collection between April and June 2023. Subjects formed groups of two to four people or participated alone. On three occasions, an online version of the survey was utilized (duration approximately 25 min). They took place in lectures and seminars at two large universities in Germany

a) MOTHER

A friend sent the following text message and an excerpt from a news article to your group chat.

Hello, I hope you are well.
Have a look at this excerpt from a news article:

In 2032, the metaverse has become an established part of societies worldwide. It can be experienced in form of interconnected virtual worlds but is also visually added as a digital layer to our physical reality with the help of various technologies.

Many people chose to be represented in the metaverse by an individual virtual figure, a so-called avatar. Since large parts of social and working life now take place in both virtual and real space, the possibilities of interactions and corresponding requests are constantly increasing. Answering these is thus becoming a growing challenge for people in metaverse societies.

A new generation of AI-supported avatars is therefore able to interact autonomously on behalf of their human users, to perform tasks for them and to network or socialize. One person can utilize several virtual representatives, which are individually adjusted to the user during the creation process. The experiences of the avatars can later be revisited by the users as a form of virtual memory. Thus, these autonomous avatars are already being used in interpersonal contexts in a variety of ways as well, for example in virtual childcare but also in dating.

Q1

Imagine this scenario was real, how would you feel about it?
What do you think would be the consequences?

group response

How comfortable are you with the scenario described? (please select)
not at all ○ ○ ◉ ○ ○ ○ ○ very much

Q2

How else could one apply the fictional technology (AI-driven autonomous avatars) described in the article?

group response

The article further states:

As the usage of new AI-supported entities such as autonomous avatars increases, new social debates are emerging. These debates focus primarily on the questions of whether autonomous avatars should be granted personal rights, but also how their permanent use might affect interpersonal relationships.

Q3

How could a future metaverse society deal with these issues?

group response

Send Message

b) DisasterPrevention

Intro sentences

Using different technical tools (for example, built into a full-body suit), it is possible to integrate haptic and audiovisual stimuli into the experience of the Metaverse in such a way that a comprehensive immersive user experience is created. Users can now experience the virtual space with their entire body and navigate it in a similar way to the physical sphere.

The possible applications extend far beyond the spectrum of VR games. For example, the Japan Meteorological Agency is developing a training program for disaster situations. Various natural disasters such as earthquakes or floods, which occur more frequently in Japan due to its geographic location, can be simulated virtually in environments familiar to citizens, and response strategies can be trained.

c) XR Food

Intro sentences

There has also been great progress in the field of technical sensory stimulation in recent years. It is now possible to simulate various sensory impressions for users in virtual space such as smell and taste. This has a major impact on the food industry and food consumption worldwide. Since it is now possible to simulate elaborate dishes using only basic ingredients, a global sharing of food reserves has been established and food shortages are a thing of the past.

With the help of technology, people can now eat healthier and anti-allergenic foods without compromising on enjoyment. So-called XR restaurants are an integral part of the Metaverse and are used collectively by people around the world to experience international, as well as experimental VR cuisine. This seems to lead to the emergence of a global food culture.

d) U12Topia

Intro sentences

In Japan alone, more than 10,000 virtual communities already exist. Members of these communities spend time together in virtual environments that can be individually designed and discuss common issues. With the help of artificial intelligence (AI), it is possible to aggregate the opinions and discourse formed in these communities and create a form of collective personality from them. One of the most famous collective personalities in Japan is the AI Topikin, which is formed from the largest virtual community of school children, U12-Topia.

Since Japan is a so-called Silver Democracy, i.e., a society where politics is primarily made by elderly people for elderly people due to the age structure of the society, there is now a discussion about whether AIs like Topikin could be part of the parliament. In this way, the voices of the younger generations could be given greater political weight.

FIGURE 1. (a) Chat-conversation-prop as displayed for narrative MOTHER. (b)–(d) text-image pairs for other props.

including students in the fields of business, information systems, and design. Participants were informed about the study's purpose and gave consent before starting the survey via the survey form. Groups could also refuse to submit the survey, with the effect of us not obtaining their data. Groups were informed when to proceed to the next question. In total, 222 students participated in 99 groups (mean group size = 2.24; female = 73, male = 118, other = 6, gender not indicated = 25; German = 106, non-German = 101, nationality not indicated = 15; 39 different indicated countries; 53.5% of groups had mixed nationalities). Participants were aged between 18 and 65 (mean = 21.85, 18-24 = 179, 25-34 = 29, 35-44 = 1, 45-54 = 1, >55 = 3, not indicated = 9).

Aiming for a greater age variation, we repeated the survey at a panel event in Germany on future technologies. Because of a reduced time scope of 15 min, we used a paper-based version of the survey and left out Q3. In total, 54 individuals of German nationality participated in 41 groups (mean group size = 1.32, female = 27, male = 22, other = 4, not indicated = 1). Participants were aged between <18 and >75 (<18 = 1, 18-24 = 27, 25-34 = 14, 35-44 = 4, 45-54 = 5, >55 = 3).

Analysis of Perception Survey Responses

We excluded five groups from the analysis because participants indicated that their responses were fully generated using ChatGPT, and one group because a team member was under 18 years of age. The final dataset consists of 134 groups. Thirty-three groups received the narrative *DisasterPrevention*, 33 groups *MOTHER*, 37 groups *U12Topia*, and 31 groups *XRFood*. As (intercultural) groups' responses represent the outcome of a shared discourse, we deliberately chose not to analyze responses according to different nationalities of group members. In fostering these spaces for intercultural discourse with our group-based study, we sought to encourage participants to engage with perspectives of ethical pluralism.

We applied values coding and content analysis.[20] We inductively developed different category schemes for each survey question and analysis focus. First, three researchers individually categorized 10% of the data, whereby one survey question was always covered by two researchers. Then, identified themes were compared and an initial coding scheme was developed. This scheme was applied to a random sample and the applicability of the scheme, as well as the addition or removal of categories, was discussed. After two iterations, the entire dataset was coded. Multiple categories could be assigned to different elements of one text response (unit of coding). After categorization, we performed frequency analysis of the developed codes.[20]

Values coding of responses on Q1 allowed us to identify participants' central values related to the presented scenario (section "Negotiated Values Related to the Narratives"). Content analysis of responses to Q1 allowed us to identify perceived threats, challenges, and opportunities (section "Negotiated Themes Related to the Narratives"). Both analysis methods applied to responses to Q2 allowed us to identify the perceived benefits of alternative use cases (section "Alternative Use Cases and Assumed Benefits"). Through content analysis of responses to Q3, we identified participants' strategies to react to raised societal issues (section "Strategies to Cope With Societal Issues").

RESULTS

Before engaging with the props, 56.3% of students indicated having *a little understanding* of the term "metaverse" (other options: *never heard of it:* 6.3%; *heard of it:* 14.4%; *good understanding:* 21.3%; *detailed understanding:* 1.7%). At the end of the study, 49.3% of all participants indicated being *fairly confident* in describing what the metaverse is (other options: *not confident:* 3.0%; *not particularly confident:* 31.6%; *very confident:* 16.2%). The results are to be interpreted in the context of these levels of understanding.

Level of Comfort and Modes of Discussion

We analyzed how comfortable groups felt about the presented narratives (overall mean = 3.9). A Kruskal–Wallis test found that the experimental variable *narrative* (i.e., which prop was randomly presented to a participant group), significantly influenced the comfort levels ($\chi^2 = 9.78$, $p = .02$, $df = 3$). Post-hoc pairwise comparisons using Dunn's test with Bonferroni correction for multiple comparisons identified one significant difference: Groups confronted with the MOTHER narrative felt significantly less comfortable (mean = 3.3) than groups confronted with the DisasterPrevention narrative (mean = 4.4; $z = 2.87$, $p_{\text{adj}} = .01$). The mean comfort level with both narratives *U12Topia* and *XR Food* was 4.1.

Deriving participants' modes of discussion from Q1 shows that the majority of participant groups negotiate both advantages and disadvantages of the presented technology (61.9%), while 27.6% of participant groups share exclusively critical attitudes, and 10.4% of participant groups express exclusively positive attitudes. Overall, these results indicate that the

narratives enabled participants to weigh positive and negative aspects and to reflect on the presented applications also from a critical point of view, even when indicating being comfortable with the presented narrative. This is reflected quite well in a quote from one group, which indicated perceiving the shown content as "good and scary at the same time."

Negotiated Values Related to the Narratives

We identified eight value clusters (times of occurrence in brackets). Most values have components that are fostered and threatened by the metaverse. The values of *conviviality and sociability* are the most frequently touched upon (85 times). On the one side, groups see them threatened regarding a decrease in physical interactions and the negative effects of hyper-connectivity. On the other side, they see the value fostered through the possibility of connecting interculturally and having virtual social interactions, increasing social and cultural diversity, and enabling interpersonal care.

The second largest value cluster focuses on *equality and equity* (71 times). Equality and equity can be fostered by a metaverse if accessibility (e.g., for different age groups and regarding affordability) is ensured and inclusive. Some argue that metaverse use cases could enhance wider political representation and, hence, enhance equality, while others question the reasonableness of such a process. In the cluster *knowledge and experience* (33 times), participant groups argue that the metaverse can facilitate virtual learning. On the contrary, some indicate that real life and personal experiences are crucial for learning, for having authentic experiences, and for not forgetting about traditional crafts. The value *health* (24 times) refers to participants negotiating positive effects, such as through simulated food, and negative effects, such as through a lack of physical activity and mental health issues.

In the value cluster *autonomy and self-determination* (14 times), groups argue that autonomy could be threatened by automated or AI-driven processes. Closely related is the cluster *privacy and security* (37 times), which captures values that many groups perceive as endangered: Several groups highlight a threat through various arising possibilities of manipulation. In contrast, some put forward that metaverse technology could also help save natural resources and, hence, contribute to global resource security. The cluster *power and control* raises questions of regulation, responsibility, accountability, and control over technology (22 times). Finally, groups also mention issues related to *accuracy and quality*, particularly the need to ensure technical accuracy and fair AI (37 times).

Negotiated Themes Related to the Narratives

Two clusters of threats and challenges can be mapped. First, participant groups debate potential negative influences of immersive technology on human social interactions and the necessity to balance real-world and virtual experiences. This cluster includes arguments in the following areas:

- *Immersive technology preventing/eliminating (physical) interpersonal exchange* (26 times), e.g., "People will spend more time at home without really interacting with people in the real world";
- *Threat of escapism through immersive technology* (22 times), e.g., "[S]omeone can get addicted to Metaverse and doesn't want to come back to the physical world";
- *Immersive technology affecting people's sense of reality* (15 times), e.g., "[P]eople who overused virtual worlds often started to lose some sense of reality";
- *Technology preventing people from learning or making use of individual skills* (9 times), e.g., "People would focus more on living their metaverse' life rather than the real one, forgetting about what it means to sociali[z]e or developing their social skills";
- *Superiority of real-world experiences over virtual experiences* (7 times), e.g., "Real interactions are of higher value but are lost more and more."

Second, focusing more on technical conditions and challenges of immersive technology (often in combination with the use of AI), groups discussed the following aspects:

- *Security/privacy/accountability challenges* (22 times), e.g., "[P]eople's personal information and activities in the metaverse could be vulnerable to cyberattacks or other forms of digital exploitation";
- *Necessity to ensure technical accuracy* (13 times), e.g., "AI should be perfected to a point where the security of the communities is guaranteed";
- *AI does not fit the task* (13 times), e.g., "AI is not the right way";
- *Risking misuse of power* (10 times), e.g., "[P]eople that are in [c]ontrol of the Metaverse [could abuse] [...] their power";

- *Ensuring accessibility of technology* (10 times), e.g., "The access to the technology won[']t be easy due to the price and [I] am not sure w[h]ether it is available for the whole society or only the richer part."

Central perceived opportunities and benefits are:

- *Immersive technology enabling new personal learning experiences* (15 times), such as in education;
- *Immersive technology enabling new opportunities for virtual communication/ collaboration/ socialization* (12 times);
- *Technology enhancing (individual) efficiency* (12 times).

Overall, for Q1, perceived threats or challenges outnumbered perceived opportunities.

Alternative Use Cases and Assumed Benefits

Central perceived benefits of alternative use cases can be split into two central thematic clusters. First, we observe the following benefits of the combination of AI and metaverse technology:

- *The combination of AI and metaverse technology allowing data to be mapped or be utilized for research tasks* (22 times), e.g., "Any field interested in the opinion of people. For example, public administration to better understand feelings and needs of people";
- *AI agents acting as advisor/assistant* (14 times), e.g., "One could use the AI for[,] e.g.[,] problem finding to create a person who passes on the most important problems of society to the government or companies";
- *Delegate undesired or underresourced tasks, e.g., elderly care, to artificial agents* (12 times), e.g., "Virtual avatars can also be used to replace individuals doing repetitive tasks" or "Maybe in treating people with dementia or other even depressions."

Second, we find the following benefits emerging from the metaverse as immersive virtual interaction space:

- *Metaverse technology making virtual interactions and communication more immersive* (17 times), e.g., "It could be used for all kinds of physical immersion, as well as to facilitate meetings in person over large distances";
- *Overcoming previous barriers of interaction and communication, e.g., location or language* (12 times), e.g., "Social life is possible without language barriers and location";
- *Enabling learning processes through virtual training* (10 times), e.g., "Simulation of car driving lessons on a fictional road. Virtual museum visit.".

Strategies to Cope With Societal Issues

Participants' main strategies to react to specific proposed societal issues are:

- *Regulation (e.g., laws or guidelines) or restriction of use (e.g., time or age limit)* (33 times);
- *Education about technology to create virtual literacy* (15 times);
- *Implementation of mechanisms for clear distinction between virtual and real spaces* (10 times);
- *(Not) granting rights to AI systems* (20 times).

DISCUSSION

To discuss results and implications for metaverse development, we identify overarching themes and observations and discuss their ethical and technical dimensions.

Overarching Themes and Observations

A first overarching theme can be identified as *balancing virtual and physical realms*. This evolves around questions on the impact of immersive technology on human social interaction and, even more fundamentally, on conviviality and sociability. Immersive technology is here, on the one side, seen as opposing conviviality and sociability by shifting meaningful human interactions to virtual spaces, where they are perceived as less meaningful or even replaced by interactions with nonhuman agents or environments. This is perceived to possibly lead to people forgetting about their social skills or even preventing them from acquiring those. In addition, possible addictive or escapist effects of virtual spaces are perceived to shift spaces of human action primarily to the virtual sphere. A reason for the frequent mentioning of escapism might be the comparatively high media coverage of this problem and the depiction of addiction in popular movies such as *Ready Player One*, which was explicitly mentioned in participants' responses several times. On the other side, a prospective metaverse is also perceived to create new accessible and inclusive ways of

communication and interaction to overcome barriers like location and language.

A second overarching theme covers the *meaningfulness and technical requirements of metaverse technology*. Here, the question arises as to what metaverse use cases can be perceived as meaningful (i.e., adding value to society). Some use cases are perceived to be an attempt at a technical solution that does not actually solve any societal issue. Some notions of meaningfulness can be found in the perceived benefits in section "Negotiated Themes Related to the Narratives." There are strong opinions about the need to ensure the technology's accuracy and fairness, the user's privacy and security, as well as accessibility. Eventually, this could contribute to an equitable metaverse.

Ethical Implications

To derive ethical implications, we react to a core question of metavethics, namely, "to what extent [will] the Metaverse [...] provide opportunities for diminishing accessibility barriers and increasing inclusion, by guaranteeing a safe environment in which diversity and equity prevail?",[9] Notably, participants touched upon this question automatically.

According to participants, accessibility barriers can be diminished and inclusion increased on several levels: This includes addressing issues of economic affordability, haptic and sensory-enhanced usability for all levels of human ability, and literacy on how to use and participate in metaverse technology. A safe environment concerning diversity and equity can be fostered by ensuring fair and accurate technology, preserving users' privacy and security, and preventing the emergence of manipulative systems and power structures or monopolies, which also resonates with suggestions from prior research.[7] While some of these tasks are to be tackled by the developing community, governmental regulation or, in theory, the commitment to ethical guidelines and principles are also sensible strategies to ensure that the above-listed measures are taken seriously. Not to be neglected is the education of citizens about technology to build a virtuality-literate society that can consciously use, as well as reflect upon the use of, a prospective metaverse. This also includes asking *What could possibly go wrong?* and allowing for discussions on the negative impact on current industries or specific groups of society in order to introduce relevant measures.

Implications for Technical Development

According to the participants, steps should be taken to ensure that digital spaces of interaction do not displace physical ones and do not foster addiction or extreme forms of escapism in virtual spaces. Attention-based business models in the context of the metaverse (i.e., models that strive to keep users in virtual spaces as long as possible to monetize their data) would further increase participants' concerns. This is also related to participants' fear of people losing their sense of reality due to excessive use of immersive technologies. In response, many participant groups propose countermeasures to encourage real-world interactions and demand clear indicators for virtual spaces. The latter aspect is of particular importance, as hardware solutions increasingly emphasize immersiveness by reducing the weight or even the materiality of the devices themselves. Similar reasoning can be applied to software and content parts. Overall, fostering a broad and pluralistic discourse on immersiveness and individual agency to adjust virtual experiences seems beneficial to inform technology development.

LIMITATIONS AND FUTURE RESEARCH

Reflecting on our method, we first observe that while some nuances might be lost in the translation from oral discussion to written survey responses, the results cover a breadth of topics. Future research should experiment with alternative modes of collecting data, such as recording oral discussions. Second, we notice that the speculative and partially provocative nature of the props can evoke an extreme appreciation or rejection of the ideas they transport. While these reactions can be perceived as the result of successful speculative props irritating observers and initiating reflections, the participants' responses (including discussed values, themes, alternatives, and strategies) must be interpreted in light of the presented narratives. While props guide preliminary dialog, the survey design prompts participants to expand on provided stories by reflecting on consequences and alternatives, resulting in a wide array of topics. Nevertheless, to further broaden the discourse, new props should be created and utilized as part of future research. This is especially relevant as in the creation of props, cultural-specific issues may be foregrounded (e.g., U12Topia foregrounding Japan's aging population). While this cultural specificity can enrich discourses by adding new viewpoints, it also demands a variety of perspectives to prevent one-sidedness when striving for ethical cosmopolitanism. Third, while we attempted to obtain age-diverse participants, the sample is quite young. This may have introduced a bias. Future work could utilize the alternative use cases identified by participants as a starting point for follow-up creation workshops to let the discourse grow further.

CONCLUDING REMARKS

In conclusion, we emphasize the crucial aspect of fostering literacy in virtuality for enabling a reflective and conscious usage of immersive technologies. This was repeatedly mentioned by participants in response to perceived threats and challenges. In this regard, our research approach is also meant to contribute to fostering literacy in virtuality by providing an easy entry point for nonexperts to socio-technical debates through tools and impulses to encourage reflection. Several concluding comments by participants explicitly show that this aim was achieved (e.g., "This survey was very engaging and thought-provoking. It challenged me to reflect on the possible impacts of the metaverse on society and culture)". Given that citizens are key stakeholders of a prospective metaverse, engaging them in relevant discussions can only be beneficial for a future viable metaverse. For this endeavor, an informed and engaged public is a fundamental necessity.

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