Analysis of Design Considerations in Virtual Reality Social Spaces

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Virtual reality has become one of the fastest-growing new technologies in recent years, going from science fiction to a common Christmas gift in a little over a decade. Initially, VR was seen as a tool for playing and experiencing games and virtual environments. Recently, however, a new concept has been explored: using VR to facilitate social interaction. VR as a social platform has become quite a large section of the VR market, with social platforms such as Meta's Horizon Worlds and VRChat garnering large player bases (xPaw, 2023). These platforms use virtual reality as a vector for social interaction, work, and education. Some researchers have even begun to analyze VR social platforms as a way to administer experimental therapy (Hutson, 2022). However, each social platform has its own set of goals and restrictions that change how users interact with them drastically.

With the uses of virtual reality being broadened so much, I want to analyze two differing implementations of virtual reality social platforms: Meta's Horizon Worlds and VRChat, to determine how their differences may affect how users interact with each platform. Revealing why and how users interact with each platform will show why public opinion of them may differ so much, as well as how the context that each product has been developed in has shaped that evolution. Technology, monetization, user expression, user freedom, censorship, and public perception are all factors in how these technologies are shaped. The goal of this paper is to show how each of these factors has influenced the development and reception of VRChat and Horizon Worlds.

Background

The idea of virtual reality has been around for a long time as an aspect of science fiction that is particularly alluring and terrifying at the same time, with movies such as The Matrix and Total Recall evoking this feeling during VR's infancy in the 1990s. It was mostly proposed as a form of entertainment, a way to immerse oneself completely within a game or virtual environment, so its use as a social platform was largely unexpected and is a recent development within the space, with actual products reflecting this idea only releasing in the last five to ten years. This is likely a result of virtual reality technology advancing rapidly over the last decade, as VR is extremely computationally intensive, requiring very high resolutions (a common computing performance bottleneck in 3D applications) to avoid visual artificing, while also keeping track of the user's precise movement (Dwivedi, 2022). As a result of their computational intensity, VR applications must strike a balance between immersive rendering and performance to run on as many devices as possible while maintaining an acceptable level of quality. Recent developments in computing power, head-mounted displays, and motion tracking hardware and software have allowed developers to emulate the real world with more accuracy than ever before, shifting the balance towards quality.

As a result of the recent technological advancements in VR, it has become much cheaper in recent years, allowing more people to engage with it and allowing developers to increase the scope of their projects as they have more computing resources to take advantage of. These factors combined have led to VR's popularity as a social platform increasing in recent times, with more people to interact with and more advanced ways to interact being developed. VR as a social platform is the idea that people will use virtual reality to interact with other people who are in the same server and virtual space. There is no objective or goal specified for users, but the flexibility of these spaces allows them to be used for social, relaxation, or even business

purposes and is a major step in developing what many call the Metaverse. The Metaverse is a somewhat nebulous concept but is majorly associated with using virtual spaces (commonly using virtual reality but not always) to interact with and change real-world systems and create experiences through a user-defined avatar (Park, 2022).

VRChat and Meta's Horizon Worlds are both examples of applications that fall squarely under the category of social virtual reality spaces, as neither have a specific goal in mind, are driven primarily by user-made content, and generally act as a platform to interact with other people, either formally or not. Horizon Worlds is a large investment for Meta and the centerpiece of their shift towards Metaverse-oriented content (even their name has changed from Facebook to be more closely associated with it), while VRChat is independently developed with no backing from a large corporate entity. As a result, VRChat's development team has no obligations to a board of directors or shareholders, nor must they worry about making VRChat a platform for a larger project such as the Metaverse. VRChat is also the only product made by these developers and is their sole focus, as evidenced by their name, VRChat Inc.

Avatars are a central pillar of any social platform, as they offer users a way to express themselves and have that expression immediately visible to anyone they interact with. In traditional online social spaces, this avatar came in the form of a simple photo or 2D drawing to represent their profile, but in burgeoning virtual reality spaces, they become fully rendered 3D models that are, in some cases, mapped to the user's real body movements. This allows for a much deeper connection between the user and avatar and allows for forms of self-expression not possible in traditional social spaces, allowing many marginalized members of society to express their 'true' selves in a space where they feel safe. For instance, allowing a transgendered person to choose an avatar that embodies the gender they identify with while letting them explore that

experience at their own pace, with several safety caveats in place (Freeman 5). This form of self-expression is just one of the ways many marginalized people use virtual reality social spaces as a way to escape from their harsh realities, which is one of the reasons why privacy and anonymity are hotly debated topics within the social VR space. Many marginalized users, especially the LGBTQ+ community, use VR to immerse themselves in what they consider to be their truest identity, providing a safe space for them to express themselves and meet other likeminded people (Acena, 2021).

A large component of what separates virtual reality from other forms of digital social media is the factor of immersion. When in VR, many people report a sense of space around them and a sense of presence from other users in the same virtual world as them. Their brain is 'tricked' (albeit willingly on the user's part) into believing what they're seeing is real, filling in gaps left by the virtual environment. Of course, the individual knows it is not real, but it is just close enough that many even forget they're in VR when they relax, doing things such as leaning on a desk in VR and falling over or getting more scared at a VR horror experience than a traditional 2D one. The psychological impact of this immersion cannot be understated and is further amplified by a player avatar. When a person identifies with their avatar and feels as if it truly represents them, their feeling of immersion is increased even more (Krell, 2023). Because there are individuals that feel so closely connected to their avatar in VR, some amount of risk to the user is present if met with malicious activity from other users. This level of immersion is heavily facilitated by two factors: full body tracking and full avatar customization. Full body tracking is the technology to track a user's entire body, legs included, rather than just the head and hands, which is usual for older VR technology. Full avatar customization, as discussed previously, allows the user to choose any avatar they want, including one that lines up exactly

with their mental representation of themselves, allowing the user's physical body to map to their virtual one more easily on a physiological level.

Methods

Sources for this paper were collected primarily by searching the Web of Science directory provided by the University of Virginia. Within Web of Science, I kept my search narrowed down to scholarly studies of virtual reality that focused specifically on its merit as a tool for social interaction or societal change (as in using VR as an aid in social development for those with disabilities). These sources consist of secondary sources that detail research conducted some time in the last few years, as VR is so new and changing so constantly that it was essential to obtain recent studies. An important aspect of these sources is first-hand accounts from users of social VR software. Many aspects of this type of software are social, so getting first-hand accounts of social situations from scholarly articles was very important. Sources found outside of Web of Science included less formal news stories detailing public opinion or reception to new virtual reality products such as Meta's Horizon Worlds, as well as an opinion piece on its development. The only sources that do not fit within these constraints are a statistical source that recorded VRChat's player count over time, and the main websites of VRChat and Horizon Worlds. These sources are used for data acquisition, either through interviews, survey findings, or pure statistics, which will be used to inform the arguments made throughout the paper.

Results and Discussion

Design Considerations: Monetization and Moderation

Despite recent technological advancements making full-body tracking much more reasonable for the average user, of our two research cases, VRChat and Horizon Worlds, only the

former makes use of full-body tracking, with the latter using only head and hand tracking. This seems backwards, as the larger company should have access to more advanced technology and a greater pool of resources, indicating that this is a consequence of design rather than a technical or monetary limitation. The fundamental difference in the design philosophy of these platforms is that VRChat focuses on interaction and expression, while Horizon Worlds focuses on information and systems. VRChat uses its advanced customization and expression options to facilitate interesting interactions between individuals, and as a result, the primary mode of using the platform is the pursuit and execution of these interactions; it is entirely player-driven, with developer-made content being secondary to these interactions. Horizon Worlds is much more system-driven; the goal is to engage with content specifically manufactured by a developer rather than the interactions that this content may facilitate. This difference is evident on the homepage for each product. The homepage for Horizon Worlds highlights activities such as virtual basketball, laser tag, and musical events, all of which are content-driven; they may require other people, but those interactions are not the focus, rather the activity itself is (*Horizon Worlds | Virtual Reality Worlds and Communities*, n.d.). Conversely, VRChat emphasizes self-expression through full-body avatars and inter-personal interactions rather than hard-coded content (*VRChat*, n.d.), featuring videos of characters talking and even just sitting at a virtual bar.

Meta is pushing for Horizon Worlds to be more content-oriented, as shown through Meta's decision to lock content within maps (and entire maps altogether) created for Horizon Worlds behind paywalls facilitated via in-game systems made by Meta (Roettgers, 2022). This is in stark contrast to VRChat, which has no form of developer-supported monetization and instead opts for subscriptions and donations. The content-driven design of Horizon Worlds is much easier to monetize than the player-driven design of VRChat; it also allows Meta to moderate

their platform much more easily, as content can be moderated to a far greater extent and with more efficiency than moderating interactions. Social modalities of communication are lost in the systemic structure employed by Meta, creating a distinct sense of restriction for the player. In research conducted by Aalto University, researchers found that one of the largest factors pushing people to interact with VR social spaces like VRChat was the sense of freedom it gave them to express themselves through how they presented their avatars and how they could use that avatar as a vector for expressing movement like dancing (Piitulainen, 2022). Pushing this expression onto developer-made content instead of player-led actions takes away agency from players and results in an experience that feels much more manufactured and 'fake', taking away many of the benefits that virtual reality affords its users.

Another vector of monetization is that of avatar creation. When users can create a customized avatar any way they want, then there's nothing left for the developer to restrict behind a paywall, where users otherwise would have paid money for the option. Meta has opted to handle the oversight of avatar creation, creating cosmetics that the users pay for directly to Meta. Users do pay money for avatar customization on VRChat, but they pay independent 3D modelers to create custom avatars with custom effects, from customizable faces to sweat appearing on the model when a connected heart-rate sensor exceeds a user-set threshold (Kolesnichenko, 2019). The key here is that none of that money goes through the developers, and fully customizable character models mean the possibility of adult-oriented avatars, another challenge of moderation.

Horizon Worlds is supposed to be the basis of Meta's Metaverse, so they want it to be accessible to as many people as possible, including those with less powerful hardware. As a result of this stipulation, avatars and worlds can only be so geometrically complex, or else those

with slower hardware would have trouble accessing all the content the platform has to offer, and since Horizon Worlds primary vector of use is interacting with content and not people, this poses a problem. VRChat has no such obligations, however, as their primary form of income comes from a subscription to VRChat for added feature sets, allowing for much more technically complex models and worlds. This is the primary reason why people might need a professional 3D modeler if they want a custom avatar, as high-quality avatars are too complex for a standard user to create on their own. While this likely does restrict some users from using certain avatars or accessing certain worlds, it is a natural consequence of the freedom afforded by the systems implemented within VRChat and is a problem that will hopefully shrink with time as computer hardware becomes more powerful.

Moderation of Horizon Worlds will be much easier for Meta overall compared to VRChat due to the restricted nature of its body tracking, avatar creation, and world creation. Less systemic possibilities mean fewer avenues for abuse and fewer edge cases for developers and moderators to check. Because VRChat is so free in terms of avatars, worlds, and body tracking, there is much more potential for harm or indecent exposure to a user who is underage or otherwise vulnerable. This requires a much stronger presence of user moderation, which VRChat has in spades, allowing users to completely disable other players' avatars, replacing them with nebulous stick figures. As a result, Meta's Horizon Worlds, while more restricted and shallower than VRChat in areas of player expression, is much safer in terms of explicit content exposure and possible harassment, making it a reasonable choice for underage users, among other vulnerable groups that make up much of the social VR community (Maloney, 2021). This has the additive effect of making the Metaverse more amenable to advertisers or sponsors, which will

likely generate a large portion of the income needed to support the large infrastructure the Metaverse will require, as opposed to the peer-to-peer networking that VRChat employs.

Design Considerations: User Expression and Immersion

User expression and immersion are some of the largest benefits gained as a result of the transition from traditional 2D virtual spaces to 3D ones. The combination of these two factors allows users to fully embody the avatar they choose to inhabit virtual worlds and become closely entwined with the persona they choose. The primary ways that immersion and user expression are achieved in VR are through intricate avatar customization and manipulation, such as changing the expression on an avatar's face between preset options in real-time, and through advanced body tracking (including eye tracking in some cases). Avatar customization has been a staple of multiplayer virtual spaces for decades, and studies have shown that the psychology behind avatar creation is complex and carries a lot of meaning for the user (Korkeila, 2020). That meaning is enhanced by the user taking full control over this avatar and having their virtual movements perfectly mimic their real-life counterparts.

Research into VR avatars has revealed two aspects of VRChat users: the first is that users typically have a single 'main' avatar that they stick to, as opposed to traditional 2D games where users generally switch between a variety of avatars (Krell 2023). The second finding is that many users experience a feeling of intense presence in the virtual space that is so strong that some individuals even report being able to physically feel (even to an uncomfortable degree at times) when other digital avatars 'touch' them in VR (Krell 2023). Little research has been done into this "phantom sense" phenomenon, although it is likely an expectant reaction of the brain resulting in convincing visual stimulation. However, such an intense connection between a user and their avatar can lead to problems too, such as virtual harassment or, in more extreme cases,

even assault. This issue has been prevalent enough that VRChat has implemented a 'personal space' feature where other users cannot approach the affected user past a certain distance. This risk, as well as the freedom of movement that allows for more explicit actions to be taken by users, presents moderation challenges for the developers of both platforms and is a component of why Meta has not implemented full-body tracking in Horizon Worlds despite it being technically achievable.

Design Consequences

One consequence of VRChat's extensive support of player expression is the ability of marginalized groups to organize and create new fellowships in VR while expressing their sexuality freely where they otherwise may not be able to. Research into this topic has found that LGBTQ+ people feel emboldened to explore and express their identity through their avatar, body language, and voice in social VR spaces, including trans people using avatars of their corresponding gender to express themselves (Acena, 2021). Avatar customization also opens avenues of experimentation for young people trying to socialize and understand their own identities in a judgement-free space where they can present themselves in any way they like. However, since these groups are so vulnerable, they require protection within the systems they engage with to socialize, especially if users are living in cultures or areas that are hostile towards them. This is part of why privacy and anonymity are such key components of social spaces of any kind, but especially in virtual reality spaces, where so many marginalized groups tend to gather, as well as strong moderation techniques that protect these groups from harassment. Meta's privacy policies leave much to be desired and have left many people with a distrustful attitude towards its Metaverse aspirations (O'Flaherty, 2021); these concerns could be

particularly dangerous for members of marginalized groups if their privacy were to be violated and their information shared with potentially violent groups.

Currently, VRChat is enjoying consistent success, with its average player count growing by around 10% in the past year and reaching its highest concurrent player count ever in December of 2022 (xPaw, 2023). In contrast, Meta's Horizon Worlds is shrinking, achieving less than half of its monthly user goal by the end of 2022, which has caused them to start revamping aspects of Horizon Worlds to compete with other VR social platforms like VRChat (Statt, 2022). A large hurdle for Meta is scalability; the Metaverse is expensive and requires many users to interact with it financially to be profitable, but the price of entry for a VR headset is already a lot of money for many people, causing a potential barrier to new users, and budget options have begun to rise in price (Statt, 2022). This is less of an issue for VRChat, as it has the capability to be played on a traditional computer without VR. The overwhelming expectations set for Horizon Worlds by Meta and the requirements of having strict moderation and stifling monetization act as shackles to its ultimate success as a social platform, standing in stark contrast to the freedom enjoyed by VRChat, whose developers are not held down by large expectations and unmanageable infrastructure requiring millions of dollars to maintain and operate.

Conclusion

As technological advancements continue to lower the barrier of entry for virtual reality, more and more people will begin interacting with social VR spaces, especially since more people than ever spend more time at home (Gilbert, 2023). As they gain traction in our society, we need to understand the design decisions that dictate how these spaces play and feel, especially if the concept of the Metaverse is fully executed. Were the Metaverse to be realized, many people would spend a sizable chunk of their lives and money in the Metaverse, and all that information

would be collected and stored to some extent, perhaps even records of social interactions. As technology and social trends push more people into these spaces, users of VR social spaces, especially those in young and vulnerable groups, must start thinking about why they're choosing virtual socialization over in-person socialization and how they can protect themselves from potentially malicious practices that would be easy to implement in social VR and Metaverse products. The best way for users to protect themselves is to understand these products and the decisions that go into their design, whether it be monetization, moderation, or data privacy. The more the user knows, the better. Establishing research into how virtual socialization affects individuals as opposed to in-person socialization is imperative. The field is so new that researchers haven't had a chance to study this new phenomenon in depth, but a better understanding of why people choose virtual spaces and how it may affect their mental state will prove very useful in making ethical decisions regarding the design of these products.

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