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Looking inside the VR Music Scene: Mapping Platforms, Events and People

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Figure 1: Moments from three events we attended in VRChat as part of the research. The photographs were taken using VRChat's photo feature.

Abstract

Music is increasingly performed and experienced in Social Virtual Reality (Social VR), from VRChat raves to high-production concerts on bespoke platforms. Yet Human-Computer-Interaction (HCI) research still focuses mainly on building new VR systems rather than examining the communities that already create and sustain these practices. We present a *cultural mapping of the Social VR music scene based on 84 survey responses, 27 interviews, and 17 event observations with diverse stakeholders*, including audience members, musicians, developers, platform owners, and event organisers. We found that the scene operates as a fragmented cross-platform ecosystem sustained by user-generated infrastructure and continuous community labour. The bottom-up organisation produces role fluidity with individuals dynamically shifting between roles as performers, world builders, organisers, and audience members. However, the openness that enables this creativity also creates tensions between expectations of free access and the financial and emotional labour required to keep events running. Taken together, our findings reveal the vibrant cultural practices that continue to flourish in Social VR, even as corporate narratives declare the "metaverse" dead.

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CCS Concepts

• **Human-centered computing → Empirical studies in HCI**; **Virtual reality**.

Keywords

Music, Virtual Reality, Social VR, Concerts, Audiences, Performance, Metaverse

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1 INTRODUCTION

In recent years, headlines have repeatedly declared the "death of the metaverse[1][2]" [60]. Once promoted as the next frontier of work, leisure, and culture, the concept became a buzzword weighed down by overblown promises. As investments slowed and companies shifted attention elsewhere, the metaverse was framed as a failed corporate fantasy. Yet such narratives obscure another reality [31].

[1]https://medium.com/swlh/zuckerbergs-45-billion-metaverse-just-died-the-most-embarrassing-death-321b1c39b1e9 (accessed 12/3/2025)
[2]https://em360tech.com/tech-articles/what-happened-metaverse-how-zucks-vr-dream-died (accessed 12/3/2025)

While the corporate vision may have faltered, people continue to gather, create, and sustain communities in virtual environments, specifically in Social Virtual Reality (Social VR) platforms where users meet as avatars in shared spaces[38, 63, 75]. Nowhere is this more evident than in the Social VR music scene, where concerts, raves, and jam sessions occur regularly [81]. From late-night underground parties in VRChat[3] and Somnium Space[4] to staged shows and experimental jams on PatchWorld[5], AmazeVR[6], and TribeXR[7], music in Social VR is thriving. These are distinct cultural practices, shaped by musicians, audiences, developers, and organisers who treat the medium as a legitimate space for creative expression [71, 79, 81]. For those involved, the metaverse is not dead. It is alive, improvised, and community-driven.

The Social VR music scene has evolved into a cultural ecosystem in its own right [71]. Audiences return to the same venues, dance together as avatars, form rituals that echo clubs and festivals[8], and build shared belonging that extends beyond the screen. Performers explore aesthetics unconstrained by physical limits, mixing sound, visuals, and spatial design in novel ways [32]. Developers provide infrastructures and creative affordances [9], while organisers coordinate line-ups, promotion, and moderation, as seen in VRChat's community event calendar[9]. Together, these efforts make Social VR music events sites of sociality, identity, and creative labour that reconfigure what "live music" can mean [77–79, 81].

Despite this vitality, the Social VR music scene remains largely invisible to the commercial music industry and underexplored in research. Many sub-communities are grassroots, sustained by small groups using social VR platforms and game engines to build venues, genres, and audiences on their own terms. These developments occur outside corporate strategies and rarely register in Human-Computer-Interaction (HCI). While the field has long explored virtual performance through concepts like liveness, co-presence, and interaction paradigms [40, 80, 91, 108, 109], most VR music research has focused on technical challenges such as network latency [8, 110], new instruments [93], prototype evaluations [4], or one-off shows [37]. The emphasis remains on building new systems rather than studying existing practices unfolding in Social VR [79]. Moreover, while the experience of musical Social VR worlds has also been investigated before [9], much less is known about the people who inhabit these worlds and take part in them. What is missing is empirical attention to how VR music performances are created and experienced, what motivates participation, and how these practices reshape notions of performance and community beyond the lab [77].

The argument that HCI should attend to cultural practices rather than focus narrowly on technical systems is well established. Scholars have demonstrated the value of studying how communities appropriate technologies in the wild, from virtual worlds [63, 64, 117] to creative ecosystems like Twitch [14, 41], online fan communities [86, 87], and game modding [84, 106]. We build on this tradition but argue that the Social VR music scene is a uniquely revealing case. Music is among the most pervasive human activities. It is inherently social [6], emotionally resonant [89], and a medium for identity and collective experience across cultures [22, 49, 90, 99]. In Social VR, music leverages the medium's affordances to an exceptional degree [108, 109]. Unlike applications that utilise only a subset of what VR offers, music performance draws simultaneously on immersive visuals, spatial audio, embodied movement, social co-presence, and real-time interaction [17, 51, 71, 80, 91]. The scene is also distinctly multi-platform, with practitioners moving between platforms, adapting to different affordances [79, 81]. This makes it a rich site for understanding how cultural practices transfer across technological infrastructures, with insights extending to other metaverse domains.

This presents an opportunity for HCI. The field has strong knowledge of VR's technical capabilities but far less understanding of how communities use platforms for sustained cultural practices. By focusing too narrowly on corporate or research narratives, HCI risks overlooking the cultural realities that give technologies meaning [19]. Communities are already appropriating immersive technologies in ways formal research overlooks. Studying VR music grounds HCI insights in communities already redefining what these technologies can be.

In this paper, we provide a cultural mapping of the current VR music ecosystem. Rather than focusing on a single platform or community, we examine how performances, infrastructures, and roles intersect to sustain music in VR. Our study draws on three data sources: (i) a qualitative survey with 84 participants capturing their platforms and roles; (ii) 27 in-depth interviews with musicians, audiences, developers, and organisers; and (iii) first-person observations of 12 live and 5 recorded Social VR music events across platforms. This combination moves beyond technical accounts toward an ecosystemic perspective on how music is created, experienced, and sustained in virtual environments.

Our research is guided by four questions:

- **RQ1:** What VR platforms are currently used to host music performances, and how do their affordances shape such events and the interactions that occur?
- **RQ2:** What roles do musicians, audiences, developers, and organisers play within VR music scenes, and how do these roles interact across events and platforms?
- **RQ3:** How do people work with the social and technical features of VR platforms to create and sustain meaningful musical experiences?
- **RQ4:** What values, motivations, and cultural practices shape how music is made and experienced in VR?

In answering these questions, we make three contributions:

(1) An account of the current VR music performance landscape, mapping platforms, events, and participant roles.
(2) An extension of HCI's understanding and platform-based cultural ecosystems, demonstrating how the Social VR music scene's unique characteristics – cross-platform nature, use of many VR affordances and its grounding on a universally resonant creative human practice – reveal dynamics that studies of single-platform (or interest) communities cannot capture.

[3]VRChat: https://hello.vrchat.com/ (accessed 12/3/2025)
[4]Somnium Space: https://www.somniumspace.com/ (accessed 12/3/2025)
[5]PatchWorld: https://patchxr.com/ (accessed 12/3/2025)
[6]AmazeVR: https://www.amazevr.com/ (accessed 12/3/2025)
[7]TribeXR: https://www.tribexr.com/ (accessed 12/3/2025)
[8]https://www.wired.com/story/60-hour-dance-sessions-simulated-sex-and-ketamine-inside-the-world-of-hardcore-vr-ravers/ (accessed 12/3/2025)
[9]https://vrc.tl (accessed 12/3/2025)

(3) Suggestions for how HCI might better support and collaborate with these ecosystems, rather than focusing solely on new systems that exist only within research studies.

By focusing on the people who create, sustain, and participate in VR concerts, we demonstrate that reports of the metaverse's demise and research fixations on technical problems overlook what matters most. For those inside these scenes, VR is not a failed promise of the future; it is an evolving present that redefines what live music can mean.

2 RELATED WORK

2.1 The metaverse disconnect

The metaverse has long occupied a dual position in public imagination and corporate strategy, functioning both as speculative technology and cultural metaphor. Although often described as a convergence of technologies (immersive displays, spatial audio, 3D engines, networking infrastructures, and digital economies) [74], VR became the most visible entry point to the metaverse, with Meta advancing a multibillion-dollar effort to build its metaverse vision [30, 60] and with Social VR platforms becoming a manifestation of it. When adoption lagged, and technical challenges persisted, enthusiasm collapsed, and the metaverse was reframed as a failed experiment or fad [1, 65].

Academic research followed a parallel but distinct trajectory. In HCI, work related to the metaverse has focused heavily on technical affordances of VR, novel interaction paradigms, system evaluations, and engineering challenges. This emphasis, while productive, has created a form of institutional blindness to how technologies like VR are appropriated outside laboratories. More recent Social VR studies have shifted attention to practice (as one of the ways the general public uses such technologies outside of the lab), examining activities such as socialising [67], dancing [75], drinking [17], meditation [58], and world creation [42, 43]. Yet music has received little attention, despite its ability to engage VR's full multimodal potential.

Music performances in VR showcase how different dimensions of the medium converge [109]. They combine immersive visuals and spatial audio [80, 97], embodied expression through gesture and dance [51, 98], co-presence with others [29], and real-time interactivity [17]. Few other practices align so closely with VR's affordances. Music thrives on immersion, relies on bodily engagement, and unfolds socially, making VR music communities a rich site for studying how virtual environments sustain cultural practice [43, 59, 71, 72, 81]. Despite being overlooked in corporate and academic narratives, grassroots VR music scenes continue to thrive [40, 53, 71, 76, 111]. Social VR platforms such as VRChat and Somnium Space, along with bespoke platforms like PatchWorld and TribeXR, host regular events where musicians perform, audiences return, and organisers coordinate multi-day festivals.

2.2 Technologies for music performance in VR

Within HCI, the intersection of music and Extended Reality (XR) has developed into a well-established field known as "Musical XR" [109]. More recently, scholars have proposed extending this work toward a "Musical Metaverse" [85, 108], emphasizing multi-user applications that enable multi-directional exchange of multisensory musical content. VR music performances have emerged as a primary application in this space, designed to replicate aspects of physical performances while opening new creative possibilities that transcend venue constraints [71, 73]. Research in this area, however, has been shaped primarily by a system-building orientation. Efforts often concentrate on designing novel tools, developing technical prototypes, and deriving system requirements based on evaluations of user needs [4, 8, 37, 93]. Studies have produced valuable insights into how VR can support new modes of musical interaction and performance [62, 80]. Yet, these projects are usually framed as experiments or proofs of concept, with evaluations centred on controlled user studies or one-off performances rather than on sustained community practices [56, 80]. The emphasis on technological futures and experimental systems has created a gap in understanding how VR music actually unfolds in contexts outside of the lab. While technically innovative, much of the literature gives limited attention to how musicians and audiences already appropriate VR and particularly for performance, participation, and cultural exchange. As a result, the research record often overlooks the lived realities that sustain the Social VR music scene as a grassroots cultural practice [79, 81].

2.3 From corporate and academic visions to community practices

The gap between corporate collapse, academic focus, and thriving grassroots scenes reflects a deeper tension in how technologies are valued. If HCI aligns too closely with corporate narratives [27] or research bubbles [19], it risks overlooking the everyday practices that lend meaning to technologies. VR music communities illustrate this dynamic. Academic research has concentrated on building systems, while musicians and audiences have appropriated existing platforms for sustained cultural production. As Winner argues, technologies acquire meaning through use rather than design intent [115]. Studies of appropriation in HCI [28, 70] show how communities adapt mainstream platforms to fit their needs. Theories of "communities of practice" [100, 114] further help explain how scenes like the music one in Social VR operate through shared repertoires, routines, and interaction. Community-centred design research reinforces this, stressing the importance of building on existing practices [20, 44]. Much of this work, however, remains invisible. Research on "invisible labour" in HCI has documented how moderation [55] and care work [122] sustain digital systems without recognition. Social VR music communities, such as those existing on VRChat[79], depend on similar unpaid roles, ranging from event coordination to platform moderation. Understanding these dynamics requires attention to how technologies are used "in the wild" [16], as well as understanding the realities of those who use them. Our study takes this approach by examining the infrastructures and roles that sustain music performance in Social VR today, even as they remain largely overlooked in corporate and academic accounts.

3 METHODOLOGY

The purpose of our study was to map the current VR music performance landscape by examining the platforms, event formats, and

roles that sustain the scene. We focused on people already active in the VR music performance scene (i.e., musicians, audiences, developers, and organisers) across both social VR and bespoke VR platforms. To capture the ecosystem, we used three complementary methods:

- (i) a **35-question online survey** to gather insights into platform preferences, participation patterns, motivations and challenges for audiences engaging with the Social VR music scene;
- (ii) **semi-structured interviews** to explore in more depth the experiences, practices, and values across stakeholder roles;
- (iii) **observations of 12 live and 5 recorded VR music events**, to contextualize reported practices in real-world performances and interactions.

The survey provided an overview of events and platforms as well as the different roles stakeholders play, the interviews added depth through personal narratives, while the event observations grounded these insights in situated examples. Survey results shaped the design of the interview guide, and findings from both the survey and the interviews informed the selection and focus of observations. This qualitative, multi-method approach enabled us to capture a multi-perspective view of an emerging cultural and technological space, ensuring that we did not rely solely on self-report data, but also examined practices as they occurred in VR. The study was approved by the ethics board of the institution of the last author. Below, we detail the methods associated with each data source.

3.1 Qualitative survey

Procedure. We began our research with a 35-question online survey that asked how people engage with music performances in VR. The questions combined multiple-choice and open-ended formats, asking about platforms used, frequency of attendance, memorable experiences, types of interactions during events, motivations for participation, and challenges encountered. Although we initially set out to capture audience perspectives, many respondents described wearing multiple hats within the ecosystem, such as performers, developers, and platform owners. This early insight (i.e., that roles are fluid) pushed us to broaden the focus of the study and shaped the interviews that followed.

Participants. To recruit individuals active in the Social VR music scene, we circulated the call for the survey through social VR communities, music-tech networks, event Discords, and social media (X, Facebook, Instagram, and Reddit). We also reached out directly to known organisers and artists through public VR music events. All participants were informed of the study's purpose and gave informed consent.

Our survey was completed by **84 participants (PS1-PS84)**; 54 identified as men, 25 as women, 2 as non-binary, 2 preferred not to disclose, and 1 identified as agender. They aged 18-75 (M = 39.9, SD = 13.4). Participants were primarily from Western/Northern Europe (39.7%) and North America (35.6%), with others from Eastern Europe (17.8%), Asia (5.5%), and South America (1.4%). Most lived with family (41.8%), alone (25.7%), or with a partner (25.7%). Musical training varied: 36% untrained, 19% beginners, 25% intermediate, and 20% expert. Live music attendance was mostly occasional (1-4 times yearly, 34.2%) or moderate (5-12 times yearly, 27.6%), across diverse venues from festivals to clubs. For VR experience, 73% were expert users, 22.4% intermediate, and 5.6% beginners, with varied attendance patterns (28.7% rarely, 26.3% weekly, 25% monthly, 21% seasonally). All had attended at least one VR music event in the past year.

3.2 Semi-structured interviews

Procedure. Building on survey insights, we conducted semi-structured interviews to gain a deeper understanding of the practices and perspectives of our audience members. We invited survey respondents who expressed interest in participating in further activities, and directly recruited platform owners, developers, musicians, and event organisers to ensure diverse stakeholder representation across roles and platforms. Interviews lasted 1-3 hours in participants' preferred format. Some occurred in Social VR platforms (VRChat, Engage), others via Discord or Google Meet. Interviews in VR offered unique insights as participants gave tours of favourite venues and on some occasions, events, allowing us to experience first-hand some of the things that made the VR music scene special for our participants. We used semi-structured guides tailored to each participant's role, covering event creation/curation, technical and social practices, community dynamics, and cultural values associated with VR music. All sessions were audio-recorded, with VR tours also video-recorded with consent.

Participants. We conducted interviews with **27 participants (PI1-PI27 – see Table 1)**, who were particularly active in the VR music performance scene. They identified as 9 female, 14 male, 1 non-binary, and 3 preferred not to say. Ages ranged from 18 to 71 (M = 43.2, SD = 11.9). Participants were located across Europe, North America, Central and East Asia. Interviewees represented a range of roles with some reporting multiple roles such as audiences, performers/artists, or event organisers /producers (see Table 1 for an overview of participant roles). All participants reported being expert VR users, with 66.7% of participants using VR for more than five years, 22.2% using VR for 3-5 years, and 11.1% using VR for 1-2 years. Frequency of using VR for music performance-related purposes included 37.5% 5-6 times a week, 25% daily, 25% 3-4 times a week, and 12.5% weekly. Interview participants were active across a wide range of platforms. Several were deeply embedded in VRChat, especially those involved in rave, dance, and karaoke communities. Others represented or worked closely with bespoke or company-driven platforms such as Engage, PatchWorld, Meta Horizon Worlds [10], TribeXR, Decentraland [11], and Somnium Space. A smaller group worked across multiple platforms, often blending social VR with custom-built tools and hybrid projects.

3.3 Event observations

Procedure. We conducted observations to capture real-time Social VR music practices and to contextualise survey and interview accounts in situated performance settings. Observations took place over a three-month period (April–June 2025) across multiple platforms. Two researchers attended events either through a VR headset

[10] Horizon Worlds: https://horizon.meta.com/ (accessed 12/3/2025)
[11] Decentraland: https://decentraland.org/ (accessed 12/3/2025)

Table 1: Overview of interview participants' roles and activities in the VR music ecosystem. Multiple roles are listed where participants combined positions.

Participant ID	Roles / Activities
PI01	Platform manager; involved in coordinating features and delivering large-scale concerts.
PI02	Music producer, DJ, and multi-instrumentalist; founder of a VR music company; performer in high-profile virtual events.
PI03	Platform founder; organizer of large community events; producer with focus on accessibility and storytelling.
PI04	Researcher and musician; participant offering perspectives on rehearsal, teaching, and VR's limits for music.
PI05	Platform co-founder; music producer; organizer of jams, workshops, and live shows.
PI06	Media artist; performer; creator of immersive audiovisual experiences and spatial worlds.
PI07	Creator of custom VR musical instruments and interfaces; performer; developer across multiple platforms.
PI08	Musician and sound designer; researcher in immersive audio; contributor to VR performance practices.
PI09	Educator; performer (singer, comedian, actress); organiser and supporter of concerts, open mics, and karaoke.
PI10	Researcher; designer of accessible VR instruments; drummer and performer; involved in carnival arts.
PI11	Audience member; regular attendee of VR festivals and raves since the pandemic; active in building friendships in VR.
PI12	Audience member; VRChat rave participant; community photographer capturing atmosphere of events.
PI13	Dancer; audience member; active in VR dance and music events with full-body tracking.
PI14	Audience member; dancer; occasional performer in VR events.
PI15	Organizer of karaoke and concerts; performer (singer); community collaborator in VRChat.
PI16	Audience member; regular VRChat attendee.
PI17	Audience member; bass player; music fan attending and performing in VR and offline gigs.
PI18	Platform co-founder; developer of VR music tools; performer and experienced VR creator.
PI19	Community organizer; administrator in VR music platforms; mentor for DJs; audience participant.
PI20	DJ; music teacher; organizer of events in Decentraland; collaborated with technical colleagues on VR venues.
PI21	Veteran producer of VR concerts; platform developer; audience member of various VR shows.
PI22	Platform founder; organizer of weekly concerts; producer of hybrid VR/physical shows.
PI23	Audience member; VRChat participant with years of experience.
PI24	Audience member; guitarist; VRChat participant using music events as alternative to offline clubs.
PI25	Organiser; head host of a VR club; responsible for designing events, hiring DJs, and running performances.
PI26	DJ; VRChat performer with a professional setup; staff member across multiple VR clubs.
PI27	Audience member; VRChat participant with years of experience; supports with moderation at events.

or via Twitch livestreams. Both passive (i.e., the researcher simply observing the events) and active modes (i.e., the researcher interacting with the event and its participants) of observation were employed. Passive observation focused on capturing event flow, performer–audience dynamics, and spatial design. Active participation included dancing, chatting with nearby participants, and exploring interactive elements of worlds, which helped us understand embodied engagement and social conventions. Because real-time note-taking in VR is impractical, we recorded sessions for internal reference and produced detailed written personal reflections immediately afterwards based on their experiences. These were later expanded to also include detailed descriptive accounts of the events themselves for further analysis.

Events observed. We observed **12 live events** across VRChat, Somnium Space, PatchWorld, and TribeXR, ranging from 20-minute jam sessions to 2.5-hour concerts (see Table 2). Event selection was guided through an opportunity-driven sampling approach, with interview participants recommending events, venues, and communities during the interviews. We attended several of these. Second, three observations emerged through guided tours by participants after their interviews. They took us through their preferred worlds and music spaces, as well as events that were taking place during that time, demonstrating features they considered important. In these three cases, the researcher stayed at one of the live events the participant took them to, together with them, observing the events in full and engaging with the other people attending. Third, we monitored community calendars (e.g., vrc.tl) and Discord servers

to identify recurring events across genres and scales. In addition to this, we also reviewed **5 full video recordings of influential past events** (e.g., Fat Boy Slim in Engage3, and DJ Celeste on WaveXR) that participants had mentioned, providing important context for understanding landmark events or platforms that have since been discontinued, such as AltspaceVR [12].

Ethical considerations. Observations took place only in public VR spaces or, in the case of invite-only events, with permission from organisers. Researchers used identifiable usernames and disclosed their role when interacting directly with performers, organisers, or participants, except in cases of incidental social contact. Active participation was used solely to understand event dynamics and did not involve targeted data collection. Video recordings were used only by the two researchers who attended the events to support the creation of accurate contextual accounts. During transcription, all identifiable information was removed, and observational notes focused on the general flow and atmosphere of events rather than the actions of specific individuals. Guided tours formed part of the interview protocol and were initiated by participants, who voluntarily demonstrated spaces or interactions referenced in their interviews.

3.4 Data analysis

We analysed all materials (survey open-ended responses, interview transcripts including VR interview tours, and observation records) using Reflexive Thematic Analysis (RTA) [10, 11]. RTA supported our aim of building a grounded account of a living ecosystem without a fixed codebook and helped us identify patterns in motivations, practices, roles, and values across platforms and stakeholder groups. The first author led the analysis with support from the second and third authors. The three researchers reviewed codes and cross-checked interpretations throughout to ensure that findings reflected shared judgement. Interviews were audio-recorded, transcribed using rev.com, and manually checked for accuracy. VR tours were also recorded, with spoken content transcribed and combined with contextual notes describing spatial and interactional features. Survey responses were exported as text, and observational accounts were analysed in their written form. Coding was conducted in Atlas.ti for data organisation, and Miro was used for visual clustering, theme mapping, and decision logs. These tools supported data management only. All coding was carried out manually.

Each dataset was coded inductively in line with RTA principles, which prioritise reflexive engagement [10]. The first author familiarised themselves with all the material and applied descriptive codes. Survey responses were coded for mentions of platforms, event formats, roles, motivations, and barriers. Interviews were coded for experiences, practices, and values, with multiple codes applied when roles overlapped (for example, a performer who also organised events). Observation summaries were coded for recurring behaviours, performer strategies, and platform affordances. Given the richness of the material, analysis focused on data that illuminated the broader VR music ecosystem rather than detailed accounts of specific practices such as interaction rituals.

[12]Two of the events we observed, the full event recordings were provided to us by the organizers.

After descriptive coding, codes and extracts were exported to Miro. The first three authors then synthesised the material. As an intermediate step, coded segments were grouped into descriptive collections organised by platform (for example, VRChat or Somnium Space) and then by stakeholder role (for example, performer, organiser, audience). This produced a structured overview of how practices appeared within and across contexts. The researchers then examined patterns across collections. Through synchronous and asynchronous discussions, they clustered near-duplicate codes, connected related ideas, and considered how practices and values converged or diverged across platforms and roles. This marked the shift from descriptive categorisation toward interpretative theme development. This scope supported the identification of ecosystem-level themes spanning platforms, roles, and event types. Observational data were then introduced as a secondary analytic layer. Observational excerpts were mapped onto the initial themes to contextualise, refine, or challenge patterns from surveys and interviews. For example, emote-based crowd responses noted in observations were compared with interview accounts of inconsistent rituals, revealing both alignment and divergence. This ensured that themes reflected both reported experiences and in-situ practices. Observational data were enriched and situated, and all themes remained grounded in survey and interview data.

Themes were further refined in review sessions with the broader research team, where coherence and alignment with the research questions were verified. Negative cases (i.e., data that contradicted early interpretations or challenged emerging patterns) were examined in detail during team discussions, used to reassess assumptions and identify where multiple perspectives or practices coexisted. In several instances, negative cases led us to redraw theme boundaries or split themes that were initially too broad, ensuring that the final analysis incorporated divergent accounts rather than excluding them. The iterative process yielded three higher-level themes and associated sub-themes.

3.5 Author positionality

Our backgrounds shaped both the conduct and interpretation of the study [96]. The first and second authors are active participants in the VR music scene prior to the study, attending events and engaging with communities. The first author's background in design and human-centred methods and the second author's experience in XR-based creative practice informed our decision to study this ecosystem and our sensitivity to spatial, social, and creative dynamics during data collection. Their presence at events and familiarity with the scene were essential to building rapport with participants. The third, fifth, and last authors brought expertise in HCI, XR, and multisensory systems, including immersive audio, contributing to our focus on embodiment and multimodal interaction. The fourth author's expertise in HCI, work, and ethics shaped our attention to labour, monetisation, and fairness within this creative economy.

These perspectives directly influenced the analysis. The first author conducted initial descriptive coding across the dataset in continuous discussion with the second, third, and last authors (who oversaw the project), who reviewed excerpts, questioned interpretations, and contributed alternative framings. Theme development was collaborative among the first three authors, with refinement

Table 2: Overview of live events and pre-recorded events observed and the platforms they took place in.

Platform	Type of event
Live events	
VRChat	Pre-organised karaoke session attended as part of participant-guided tour.
	DJ set in Club Orion
	DJ set by Hypothetical (major event organiser) attended as part of participant-guided tour.
	Live piano set by Naku.
	Rock Concert by Italian VRChat Community.
Somnium Space	Concert by Japanese band AZWIZ.
	Jazz music DJ set.
	Open Mic session at Somnium Tavern attended as part of participant-guided tour.
PatchWorld	Group jam session with DJ Patchy.
TribeXR	Live DJ battle streamed on Twitch.
Banter	Concert by YunjiVerse.
Wave	Show by BlackGryphOn as part of a three-event residency. It is worth noting here that although Wave in its original form has been discontinued, a new version of the platform is at the time of writing in Beta Version with access only for a limited number of users.
Pre-recorded events	
Engage	FatBoy Slim concert
WaveXR	DJ set by DJ Celeste
AltspaceVR	Concert by YunjiVerse
VRChat	DJ set as part of Slyftest festival.
Decentraland	Cross-Reality party taking place in Decentraland and in a club in Amsterdam.

involving the wider team. Our positionalities also guided event selection for observation, the analytic emphasis on the broader ecosystem, and how we interpreted cultural and organisational practices. Rather than determining findings, our perspectives informed what we were attuned to notice as researchers who engage with VR music both personally and professionally.

4 RESULTS

4.1 Platforms, performances and the wider infustructure

Participants described the Social VR music landscape as a patchwork of platforms and event formats. Rather than a single unified scene, the ecosystem spans community-driven worlds, bespoke platforms, and hybrid setups, each with distinct affordances and limitations. Discovery infrastructures play a central role in holding this fragmented landscape together.

4.1.1 Platform ecologies. Participants described the XR music landscape as fragmented across many platforms, each with distinct strengths, weaknesses, and user cultures. Broadly, these fell into community-driven platforms, such as VRChat, and commercial or hybrid platforms, including Engage, Somnium Space, and Horizon Worlds, as well as music-specific platforms like PatchWorld and AmazeVR.

Popular Social VR apps formed the backbone of activity, with VRChat dominating overwhelmingly. 52 survey participants reported using it. Many described it not just as a platform, but as an integral part of everyday life, woven into routines and social ties. PS22 explained, *"VRchat is my main form of social interaction [...] weekends are for raves"*, while PS53 captured the intensity of commitment, *"Twice a week, Friday and Saturday, 12-hour sessions each. Rave events exclusively."* Its community-driven ethos was central. P12 noted, *"[VRChat] is driven by us, by the community, not by VRChat the company. If they do something, they might bring a feature we might want."* PI27 expanded further, *"The developers of this game have nothing to do with your experience. This is 100% community-driven. The world they were in was built by someone. The avatar you're wearing, I'm wearing, he's using, it's all built by someone that's not related to the game. It's all community."* Genres in VRChat were diverse, spanning EDM and raves, karaoke, open mics, and experimental sessions. As PI22 summarised, *"Almost everything. mostly electronic music, but also rock, pop, folk, jazz."* Other platforms offered alternative or complementary experiences. Somnium Space – a social VR platform developed with sound as the priority –, mentioned by 13 participants, featured prominently as both a social venue for events and an organising tool (see Figure 2). It stood out for its monetisation features, such as tipping systems and wearables, as well as for experimenting with cross-reality events that link VR

and physical venues. Usage ranged from casual socialising, as PS74 said, *"Somnium Space I hang out with friends multiple times per week"*, to production and hosting, as PS75 noted, *"I build my own worlds and assets in Somnium Space. I attend most of the events."* For organisers such as PI22, Somnium was a space for innovation, *"We organise each month a live event with artists [...] Somnium is a great platform and should get more attention."* The small but dedicated audience Somnium attracts makes each event feel quite special. During the AZWIZ concert (a Japanese band that is a fan favourite), we observed an intimate atmosphere, despite the event taking place in a large, club-like space. The audience gathered very close to the performers, as there was no stage or large crowd, creating a supportive environment where every one of the artists could, in some ways, interact with every one of the audience members.

Decentraland, mentioned by three participants, supported recurring performances also often tied to club culture, with PS56 describing, *"I run a metaverse club in Decentraland, we perform monthly."* Horizon Worlds, noted by 15 participants, was associated with branded concerts but received mixed reviews. PS84 explained, *I've been in some of the concerts put on by Meta Horizon World by big names and was dissatisfied with them."* Both Horizon and Decentraland were often seen as less compelling. Horizon for its flat and corporate-feeling concerts, and Decentraland for its pixelated graphics and crypto-driven economy.

A long tail of other platforms surfaced in smaller ways, usually for specific concerts, jam sessions, or festivals. These included EngageXR, Resonite[13], BigscreenVR[14], Sansar[15], Banter[16], Spatial[17], RecRoom[18], Cluster[19], FrameVR[20], and UtopiaVR[21]. EngageXR, primarily a corporate and educational platform, nonetheless staged high-profile concerts such as the Fat Boy Slim show (see Figure 3), mentioned by eight participants as their most memorable event. The concert demonstrated technical polish and accessibility across devices, but was limited by less expressive avatars and a corporate framing of use. Together, this group of platforms illustrates how social connection and cultural production intertwine, offering flexible entry points for music-making, community, and spectacle through technological appropriation.

Alongside the general-use platforms, music-focused platforms carved out niches by placing music at their centre. AmazeVR – a platform that allows co-located VR concert experiences – was praised for its cinematic polish; as PS04 explained, *"AmazeVR is focused exclusively on music-related content, offering curated concert experiences featuring specific artists. It combines high-quality 3D environments with 360-degree stereoscopic video to create an immersive concert experience."* TribeXR, a virtual DJ simulator, was valued for its digital recreations of Pioneer DJ hardware (PI19, PI02) and its multiplayer features, allowing DJs to perform and collaborate as if using real equipment. It was described by PS78as a *"very social learning platform,"* offering workshops, peer support, and the ability to stream performances to platforms like Twitch. PatchWorld, mentioned by nine respondents, provided powerful tools for building instruments, worlds, and audiovisual performances. For some, it was a deeply personal space, *"As of now I live in PatchWorld"*, while others like PS54 stressed its collaborative aspect, *"PatchWorld to meet to discuss design of musical as well as visual elements."* Smaller platforms such as Soundscape VR and MYX added further variety through improvisation, DJ culture, and curated dancefloor experiences. Music-specific platforms appealed especially to musicians and creators, offering not just concerts to attend but tools and contexts for making music together.

Figure 2: Two screenshots taken during the observations of two events in Somnium Space. On the left, a concert featuring the Japanese band AZWIZ, with two musicians and a singer surrounded by the audience. On the right, a pop-up event with Jazz DJ.

Participants also recalled with affection now-defunct platforms that once played pioneering roles. AltspaceVR was significant in establishing the landscape, especially before its shutdown by Microsoft, hosting DJ sets, concerts, and community events such as Virtual Burning Man. It was often described as more structured and safer than VRChat. PI19 reflected, *"AltspaceVR is very clear. You had this avatar, you could change it a little bit, but it was more focused on the environment and the interaction."* PS56 added, *I was a regular performer on AltspaceVR and also producing events (music, talk show, panels, conferences) there with multiple groups of people."* During one of the guided tours in VRChat, the participant took the researcher

[13]Resonite: https://resonite.com/ (accessed 12/3/2025)
[14]BigscreenVR: https://www.meta.com/experiences/bigscreen-beta/ (accessed 12/3/2025)
[15]Sansar: https://www.sansar.com/ (accessed 12/3/2025)
[16]Banter: https://sidequestvr.com/app/10831/banter (accessed 12/3/2025)
[17]Spatial: https://www.spatial.io/ (accessed 12/3/2025)
[18]RecRoom: https://recroom.com/ (accessed 12/3/2025)
[19]Cluster: https://cluster.mu (accessed 12/3/2025)
[20]FrameVR: https://framevr.io/ (accessed 12/3/2025)
[21]UtopiaVR: https://www.utopiavr.world/ (accessed 12/3/2025)

Figure 3: Screenshots from *"Eat, Sleep, VR, Repeat"*, the Fatboy Slim immersive concert hosted in Engage XR. The event was a pre-recorded and pre-curated guided experience that moved audiences through a sequence of surreal music-driven environments. Each scene was designed to unfold in sync with specific tracks.

to a world where ex-music-AltspaceVR users recreated spaces from the platform within VRChat, including its signature avatar style and frequently hosted karaoke or open-mic nights. This showcases the love and dedication users still have for the platform and its afforcances. WaveXR, though closed (and at the time of writing, in a revived Beta version), was another landmark. It was particularly noted for its advanced tools and ambition in immersive audiovisual concerts, remembered as offering experiences considered unparalleled at the time. PI02 described them as "unparalleled," while PS56 recalled, *"I used to create immersive experiences using WaveXR before it folded."* The disappearance of these platforms was felt as a cultural loss, underscoring how fragile VR music spaces can be when tied to the lifespans of individual companies

4.1.2 Performance formats. Participants described the Social VR music scene as spanning a wide range of formats, from informal jam sessions to large-scale festivals and staged concerts. The variety reflected both community creativity and the technical and social affordances of the platforms.

Raves and clubs were often described as the beating heart of the Social VR music culture, especially in VRChat (see Figures 1 and 4). Events ranged from small gatherings in user-built basements to multi-instance festivals such as Slyfest[22] and Furality[23]. Participants emphasised how these recreated the atmosphere of offline raves while adding fantastical venues and global accessibility. A defining feature of VR clubs was that environments became part of the performance. Worlds were rarely static but transformed with the music. PS27 explained *"Most of them are event worlds that are just more than a venue. The music [is] interacting with more than just lights, the world itself alters to fit the event or song."* Festivals often featured elaborate multi-stage designs and long sessions that encouraged shard-hopping and late nights with friends. PS60 recalled *"Had real artists in VR with us, music was my taste, incredibly fun with friends to get to dance and drink if wanted to and be in the experience with everyone."* Curated club spaces became hubs of community life. PI23 described joining Slyfest through a friend and spending three days in VR *"It was nothing like I'd ever really experienced before [...] it's the reason I got into EDM music in the first place."* PI12 echoed the immersive pull *"I really like to be at the front, in front of the DJ, just dance with some other people that are dancing there too and just enjoy it. [...] At the end you're so immersed with your headset that you kind of forget you are not at home."* During one of the observations, the first author was guided through interconnected clubs where full-body-tracked dancers wearing audio-reactive avatars moved fluidly to the beat. The accuracy of the body tracking, together with the surrealism that the virtual space created, made the researcher feel fully present. What began as observation turned into hours of dancing, showing first-hand why people returned week after week.

At the other end of the spectrum were **staged shows and branded concerts**, often carefully curated and technologically ambitious. These ranged from electronic sets and musicals to concerts designed as immersive journeys. The appeal often lay less in live performance than in collective discovery, spectacle, and interactivity. The Fatboy Slim concert on EngageXR stood out as a recurring reference point (see Figure 3). PS67 recalled *"I got to drive a flying cockroach with a handsome man riding on the back! At one point, I was standing on the roof of a pickup truck [...] unbelievable."* Others, like PS19, praised its artistic risks, calling it *"bold, taking risks in both artistic direction and movement, with a strong identity"*. Horizon Worlds concerts by Foo Fighters and Sam Smith were remembered for cinematic qualities and intimacy, as PS09 said *"Scene design was awesome, being at the first row so close to the band."* AmazeVR was praised for quality and detail. PS15 described its concerts as *"the best quality I've seen"* and PI21 called Megan Thee Stallion's show *"mind blowing [...] the quality of the recording of her is unmatched."* Participants often noted how careful design made pre-recorded shows feel special when experienced together. PS14 observed *"Felt less like a filmed live show and more like a music video, which I enjoyed personally."* Curated shows were frequently described as *journeys* that pushed VR to its limits. PS53 remembered *"The stage was constantly changing, there was a lot of interactivity [...] it was very dynamic and used all the possibilities of VR to the maximum."* Some staged events embraced **storytelling**, integrating narrative arcs. PI08 described designing a show where each track led deeper into a fictional world *"The first track was an introductory track leading through a portal. The music itself was walking through a Stargate [...] then the audience was trapped by the artificial intelligence living there."*

More **intimate and participatory formats** also thrived, offering low-pressure entry points for performance and social bonding. Karaoke nights and open mics gave newcomers opportunities to

[22]https://www.slyfest.com (accessed 12/3/2025)
[23]https://furality.org (accessed 12/3/2025)

Figure 4: Three screenshots from VRChat Raves. On the left, the main hall of the VRChat PSY with the performer on the stage and a video wall behind; in the center, a DJ set in the VRChat world Mission Orion; on the right, a relaxation area within the Mission Orion world where people socialise during the event with two users playing on a virtual ping-pong table.

take the stage. These settings were remembered for moments of inclusion (see Figure 5). PS30 recalled *"One of the performers saw us and thought we were adorable and he brought us up on stage during his performance and he danced around us as we held each other and danced. It was a beautiful moment."* Even brief encounters mattered, such as PS77's memory of being *"dragged on stage to do a song."* For many, these events became part of weekly routines that built confidence and community. PS39 described spending *"6 to 8 hours a week I do karaoke."* Small gatherings often flipped the script on who got to be the star. PS32 noted *"A smaller event invited my friend and I on stage to be gogo dancers, felt nice to have the attention."* Karaoke in particular stood out for its positive culture. PI15 observed *"Karaoke is one of the least toxic things you can do. It's easy to find easygoing people in karaoke rooms [...] you can find many rooms where people just like singing and music."* Musicians also valued how these intimate events enabled direct interaction with audiences. PI23 described a piano player who would *"say it's nice to see you again, or someone will be a really cute avatar and sit on his piano and he'll introduce them. [...] A lot easier to do in VR than in real life."*

Collaborative jam sessions and workshops turned VR into improvisational labs where the process itself became the performance. PatchWorld and TribeXR enabled musicians, hobbyists, and learners to co-create in real time (see Figure 7). PS34 described it as *"fun random creation exploration. As of now I live in PatchWorld—free-for-all experimental jam sessions."* Sessions mixed structure and play. PI05 explained *"One is you go into a world that has a setup already of selected instruments and you just start playing. The other could be an empty world, but people bring in whatever they want. Usually, one or two people who are more proficient are running the music to make it sound good."* Workshops and DJ battles on platforms like Tribe XR (see Figure 6) complemented jams as flexible "show and tell" spaces. PI19 noted *"They'll go there and it depends on the vibe of who wants to learn and what people want to learn. Some are more into just opening a stage and having a timed slot where you get up and do a mix, then the next person does theirs, with a general conversation around it."* Regular sessions built momentum, with PS36 describing *"workshops and jams 2–3 hours a week."* Educators also valued these spaces. PS64 recalled *"A self-hosted workshop in PatchWorld with pupils [...] improvising together worked well and the group could interact musically by assigning different roles to each other."* Additionally, participants consistently emphasised the creative intensity such platforms enabled. PS38 called it *"extraordinary creative interaction possibilities"* and PS57 remembered *"improvising together on virtual instruments worked well and the group could interact musically by assigning different roles."* The new creative and collaborative possibilities enabled by XR platforms were re-affirmed also during our observations. In PatchWorld we saw musicians frequently moving around the virtual space to trigger different sonic zones, creating a choreography of motion as part of the performance. For example, a group of four users built a rhythmic loop by assembling modular blocks in mid-air while others layered melodies through gesture-controlled instruments. The collaborative process was highly visible with the users pointing, gesturing, or repositioning each other's objects to coordinate ideas, producing a shared creative flow.

Finally, **cross-reality events** blended physical and virtual presence in ways participants found uniquely powerful. Somnium Space staged concerts simultaneously in Prague and VR, giving both audiences a shared sense of occasion. PI22 recalled *"We held the event in real life, but also in VR at the same time. It was physical and virtual at the same time."* Seeing performers as both avatars and live video was a recurring source of wonder. In AltspaceVR, DJs appeared as live feeds and avatars simultaneously. PS69 said *"Celeste Lear was live on a screen from her living room while her avatar was on the decks in VR. She was both in avatar and live. First time I saw that it amazed me."* PS58 echoed *"Looking at the person in the flesh while his avatar rocked the metaverse [...] one person performing in two dimensions blew my mind."* Crowd awareness across worlds in cross-reality events added to the thrill. PS12 recalled *"We got to wave at a little*

Figure 5: Three screenshots from a community-run karaoke session in VRChat. The event was informal and participant-driven, with users gathering in a karaoke world to take turns singing, socializing, and queuing songs.

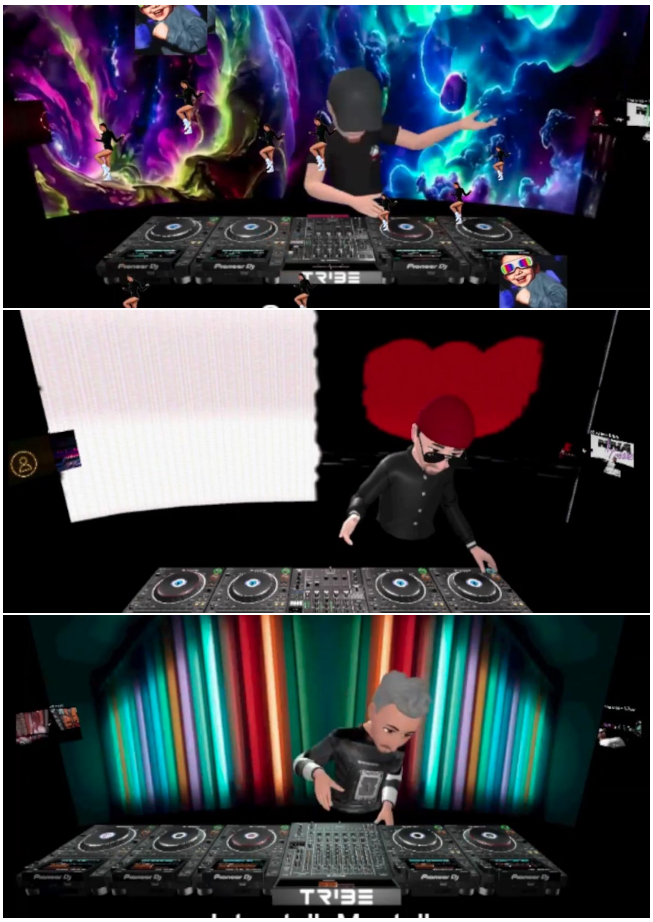

Figure 6: A DJ battle happening on TribeXR, as observed during a Twitch live event. TribeXR is a VR platform for DJs and music enthusiasts to learn, practice, and perform using virtual replicas of professional DJ equipment. During the event, musicians played their music in TribeXR, which was streamed on Twitch with a host presenting the contestants and the Twitch audience voting for their favourites.

screen to real people who were waving back. It was life-changing." PI20, who helped design such events, explained *"At the real party we put a Beamer behind the DJ, and in Decentraland there was also a giant Beamer. If you wave, they see you, they wave back. There's a delay, but it works out."* Even small gestures carried weight, as PS55 remembered *"When the artist on screen pointed out my metaverse character during a livestream."* Across accounts, hybridity was seen as a way to extend reach, connect audiences across distance, and preserve the feeling of being part of the same event.

4.1.3 Connecting the scene. Despite the wide range of platforms and performance formats, participants emphasised how the scene remains tightly knit. What tied diverse concerts, raves, and workshops together was not a single venue but a mesh of community infrastructures that gave VR music its continuity. Friend groups, club networks, and Discord servers formed the connective tissue, allowing people to move easily between different types of events while still feeling part of a shared culture. Even when concerts were hosted on different platforms, many described returning to the same Discord channels or friendship circles before and after shows, keeping their social world intact across shifting virtual stages. As PI13, *"There are Discords with calendars for a broad number of clubs, and I just see what's going on at that specific time, make sure I'm in the VRC group to join, and then put the headset on and go."* Others like PS06 emphasised word of mouth and friend groups, *"Usually something a friend would invite me to"*, or described checking event sites like vrc.tl alongside Discord, *"Checking information sources such as vrc.tl or asking friends about more hidden events."* Discord, in particular, was described as the beating heart of the ecosystem. Clubs and festivals maintained active servers where schedules were posted, technical issues solved, and social chatter flowed long after the music stopped. For many, like PS10 it was the first point of contact, *"I normally find out about events on Discord. I go to the event knowing friends will be there. We communicate on Discord to find each other."* PI20 explained, *I research on Discord and my VRChat groups I'm a part of. Make sure it's in my time zone. Sometimes I'll chat with my bff on Discord to see if he's going."* Musicians and organisers also relied on Discord for promotion, often sharing flyers, lineups, or streaming links. During our own event observations, Discord was also our main line of reference. We used it to connect with participants, locate events, and promote our study, and people frequently asked to connect with us directly through Discord. In this way, Discord blurred the line between promotion, coordination, and social life. It was simultaneously a billboard, a backstage, and a

living archive, anchoring a fragmented ecosystem into something that felt like a cohesive scene.

4.2 The Social architecture of the VR music scene

Within Social VR music spaces, participants often wore "multiple hats," shifting between roles as musicians, organisers, developers, and audiences. Their motivation to engage with the scene went beyond entertainment, driven by accessibility, identity play, creative opportunity, and the immersive pull of music. Events were part of wider cultural cycles. They were planned on Discord, shared through dancing and chat, and extended in after-parties. At the core of these cycles was social connection, where friendships, recognition, and collective "*wow*" moments forged the bonds that sustain the Social VR music scene as a community.

4.2.1 Fluid roles and interconnected labour. VR music operates as an interconnected ecosystem with fluid role boundaries and community-driven collaboration. People often hold multiple roles at once and shift as their practices evolve.

Musicians are in many ways the centre. The most popular type of musician is the DJ, who anchors club and rave culture, but their practice extends beyond performance. P125 said *"I'm a DJ. I play for probably 40 or 50 plus clubs in this game."* Many moved from Twitch into VR, where full-body tracking adds embodiment as PI14 explained *"They literally have the headset on, they have full body trackers and they just stand in their room DJing, and you one-to-one see the emotion on the avatar in the world"*. TribeXR was a common entry point, blending training and live sets *"The Tribe team were given permission to create these digital recreations of the actual professional DJ hardware [...] It's multiplayer, people can come in and hang out with you and DJ with you, and the emulations of the hardware work just the same, basically as it does in real life."* Singers and instrumentalists also found space across karaoke, open mics, and hybrids that mix pre-recorded and live elements. PI04 noted *"it's mostly electronic musicians, but there's also some people who play piano and different types of musicians[...] it's like you're going to an in-person thing but you're virtual so the spaces can be crazy again."* On Somnium Space, live vocals and instruments appeared directly in-world, as PI22 put it *"Anything from disco to live concerts with the bands. [...] they do everything they would do in real life, but they do it in VR."*

World builders, producers, and avatar/visual creators provide the stages and spectacle. Using Unity, Blender, PatchWorld, and similar tools, they construct clubs, festival grounds, and worlds impossible offline. Many are volunteers *"amateurs working in the scene on their own time"* (PI14) whose designs enable shows where *"the stage was constantly changing [...] used all the possibilities of VR to the maximum."* PIO2 recalled Club Zenith on AltspaceVR *"a floating city [...] I gave them flight privileges and included a vertical art gallery so people could fly around and look at art while listening to music."* Avatar creators, especially in VRChat, drive a thriving market with music-reactive avatars amplifying shows. As PS21 said *"I create avatars for my full-time job, so the majority of the time is spent on the weekdays testing things."* Visual artists and VJs sync light, effects, and environments with sound. PI05 noted *"It's a whole light show and visual experience that is almost as important as the music."* On WaveXR and PatchWorld, VJs animate objects and let music control colours, lighting, and environmental effects.

Event organisers and hosts handle logistics and vibe: recruiting performers and dancers, selecting worlds, balancing capacity across instances, and keeping the night flowing. PS59 said *"I have my own club in VRChat named EuroFunkVR with almost 600 people in it [...] I'm also organising events in Somnium Space and this works out great."* PI25 detailed the craft *"Hire the right DJs and dancers and set up what world we're going to use [...] figure out what the vibe for the night's going to be [...] it does take weeks in advance."* **Festival organisers** scale this up across days and stages. PI23 remembered Sly Fest *"massive with different stages."* **Cross-reality organisers** link physical and virtual spaces and keep the social backbone running. For example the Insomnia events in Somnium Space connected in-person audiences with VR via large screens. **Community managers** make sure that the events are promoted. PI22 explained *"We promote on our social media channels [...] mainly it's Twitter and Discord. We let people know that there is an event and the audience is most of the time consistent."*

Platform owners, developers, and technical specialists maintain the foundations: audio engines, spatial tools, recording, networking, and performance routing. PI18 said *"We have an audio engine that is also an audio visual engine[...] we are trying to bridge this aspect in multiplayer."* Sound engineers handle optimisation, instrument routing, and latency. Breakdowns are costly; PI42 noted *"When the software froze and the music stopped, it was devastating."* **VR photographers and videographers** like PI02 document events with in-world capture to promote communities and preserve shared memory. **Educators and mentors** sustain learning pathways. TribeXR operates as a DJ training hub. PI18 described starting a junior resident program. Meanwhile, PatchXR supports participatory workshops. PS55 recalled *"self-hosted music workshop in PatchWorld with pupils [...] improvising together worked well and the group could interact musically by assigning different roles."*

Audiences co-create the experience through dancing, exploration, and interaction. PS24 said dancing in VR changed their relationship to embodiment *"Actually losing myself to dancing was interesting because I've never had any interest in dancing before."* PI12 described the draw *"I really like to be at the front, in front of the DJ [...] at the end you're so immersed with your headset that you kind of forget you are not at home."* PS05 captured the routine *"During VR music events, I explore the environment, take in what the experience has to offer [...] interact with other users, and, of course, listen to the music."*

What stood out from the roles described above is how rarely they exist in isolation. Participants often wore several hats at once, moving between performance, organization, creation, and promotion as events unfolded. A DJ might also build the club they perform in, an organiser might double as promoter and dancer, and developers frequently join as community members, gathering feedback at shows. Much of this work was volunteer-driven, from weekly club nights to large festivals like Slyfest, where world builders, DJs, engineers, and moderators collaborated to make events possible. As PS05 put it, *"Dancing, talking, being silly, running and hosting, and organizing events."* The fluid and interconnected labour created a sense of shared ownership and resilience, but it also raised

tensions around sustainability and compensation as the ecosystem encountered commercial pressures.

4.2.2 Why VR? Motivations for participation in the Social VR music scene. VR music scenes have developed cultural practices, performance formats, and social dynamics that create distinctive value for participants, often in ways impossible in physical spaces. Motivations extended beyond entertainment to include accessibility, creativity, social connection, identity exploration, and new forms of musical interaction. These accounts show why people dedicate significant time and energy to VR music, and how these spaces generate value that feels both personal and collective.

Social connection was the strongest motivator, named by 34 participants. Concerts were described as collective experiences built through shared "wow" moments, dancing, and informal interactions. As PS07 put it, *"The social aspect of spending time with people from around the world, talking to DJs/VJs/musicians [...] able to 'teleport' to any culture's scene and experience something new."* PI11 emphasized that VR concerts provided the same reason as offline gatherings, *"You have great music and you just hang out with your friends."* Avatars lowered barriers to participation, offering the freedom to perform without fear of judgment. Even pre-recorded concerts, such as Fatboy Slim on Engage, felt live when experienced together, punctuated by moments of shared discovery. For some, these connections extended beyond VR, including relationships formed through music and dancing.

Identity exploration and accessibility were also central. Avatars allowed expression unconstrained by appearance or norms, described by PS36 as *"escapism"* and by PI24 as a "second life" with its own networks and practices. Accessibility included convenience, safety, and inclusion for those unable or unwilling to attend physical events. As PI13 noted, *"You don't have to travel to a real-life event [...] It's logistically easier to do that in VR."* Others pointed to health barriers, social anxiety, or safety concerns for women, with PS20 stressing *"The price. The safety (going out as a woman can be dangerous). The comfort of my home."* Musicians valued global reach without the cost of touring, as PI14 explained, VR allowed DJs to "play for people all over the world."

Curiosity, creativity, and experimentation were further motivators, cited by 19 participants. Artists and developers described VR as a medium that enabled impossible stages, interactive environments, and new instruments. PI05 explained, *"You can dictate the environment [...] the colour responds to the music, the lights to the volume of the drums."* Platforms like PatchWorld extended this further by allowing real-time instrument creation, turning concerts into collaborative playgrounds. PS43 summarized this as a *"social creative playground."*

Despite diverse motivations, **music itself** remained the core. Seventeen respondents emphasised the immersive and emotional qualities of VR concerts that surpassed passive listening. PS21 described the intimacy, *"If it's a band or singer, it's like they are singing to you up close."* These were seen as distinct cultural practices and not just substitutes for live shows, sometimes shaping professional trajectories. For example for PS42 VR provided a starting point for a DJ career that later moved offline.

Finally, **interactivity** amplified engagement. Participants described dancing with friends, uncovering hidden interactions, or direct exchanges with artists. PI23 recalled playful moments when audiences disrupted performances with avatars, creating laughter and connection. For PS35, playing their first VR festival was transformative, *"It was the first time I ever felt validation as an artist [...] that interaction with the audience changed my whole life."* Such accounts show that VR concerts motivate not only through access or spectacle, but by blurring the line between performer and audience, turning music into a shared act of creation and discovery.

4.3 The economics and sustainability of virtual music communities

The sustainability of VR music practices reveals a fundamental tension between the creative abundance of virtual worlds and the economic realities required to sustain them. While these communities have developed innovative approaches to generating revenue, persistent challenges around production costs, audience expectations, and platform dependencies create ongoing precarity for creators across the ecosystem.

4.3.1 Production costs and the value perception gap. Monetisation remains one of the most persistent struggles in the VR music ecosystem. High production costs and resource-intensive workflows make it difficult even for established creators to sustain activity. PI03 explained *"It's just harder because you have to build everything. It's not just building the content. You have to build the underlying code[...] it's still a lot of work. You can't just wave a magic wand and it happens."*

For individual artists and small teams, expenses such as visualisations, green rooms, and technical staff become prohibitive. PI06 reflected *"Every time you're restricted by the budgetary limitations[...] it did cost us quite a large sum so if we need to do this again, we need funding. We can't do it from our own pockets."* Developing sustainable models beyond one-off grants or project fees remains difficult. PI08 noted *"It's still been kind of hard to make money. It's harder to get people to put on a headset, see the value, and actually be willing to pay for tickets. This is not cheap to pull off."* Larger teams face even greater pressure like PI01 explained *"If it was a single developer, I think it would be enough to sustain, but we're like five and a half people, so it's impossible. Now we're aiming to transition to more freemium and marketplace models, but it's risky."* Platform founders echoed these concerns, with sales (such as PatchWorld's €30 price point) rarely covering development costs. Such difficulties reflect the broader precarity of the music industry. PI08 described it as *"one of the most tragic things[...] to live off it has become almost impossible. And if you've got great ideas, then you really need to see how to finance them."* Market saturation compounds the challenge. As PI19 observed, *"everybody is a DJ,"* with democratized access making it harder for professionals to stand out, a pattern mirrored in VR.

Economic barriers are reinforced by the gap between high production costs and audience perceptions of value. Virtual concerts were often described as more *"skippable"* or *"forgettable"* than in-person shows, undermining willingness to pay. PI01 explained *"people RSVP, but then forget or can't be bothered to put their headset on[...] something you wouldn't do if you had bought even cheap tickets to a real-life show."* Surveys and interviews indicated audiences were willing to pay around €10–15, rarely enough to cover expenses. As PI08 described, when they run a similar survey for audiences

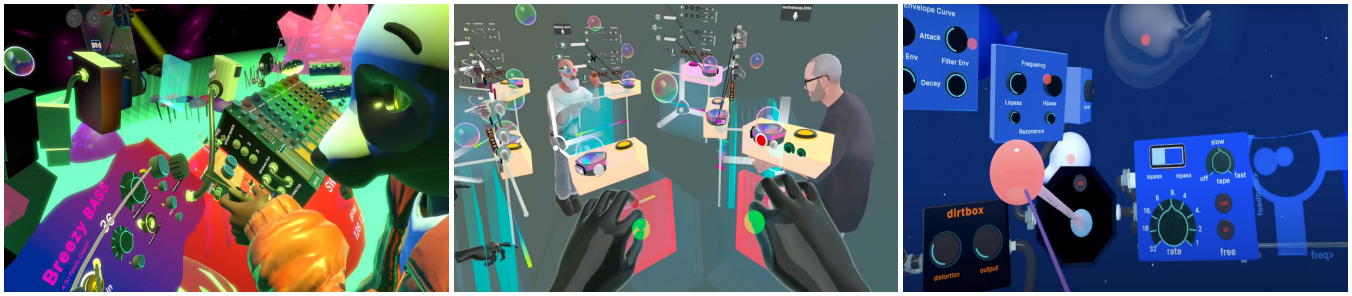

Figure 7: Screenshots taken in different user-generated worlds for music playing in PatchWorld. Each asset in the world is used to generate different types of sounds. PatchWorld is an XR platform for music and creativity that enables users to build interactive musical worlds and experiences using a visual, block-based system. It enables both novice and experienced creators to build, perform, and collaborate in virtual and mixed-reality environments.

"people were impressed and said they'd pay about 10 dollars, which is good, but it doesn't cover expenses or allow us to break even." The issue extends beyond tickets. Audiences struggle to justify buying headsets for occasional music events. PI01 noted *"even if you could argue that a €300 headset is a good investment compared to the cost of multiple concerts, that's not how people plan their leisure time."* PI10 added that even those who can afford the technology may still find it inconvenient, citing comfort, battery life, and accessibility. Although hardware is improving, high entry costs continue to limit adoption and, in turn, financial viability.

4.3.2 Platform dependencies and community values in tension. The type of platform fundamentally shapes monetisation possibilities and community norms, creating tensions between commercial viability and shared values. Revenue streams range from ticket sales and tip jars to virtual merchandise, subscriptions, and asset sales. Somnium Space, for instance, allows performers to receive direct payments, while TribeXR relies on subscriptions but faces restrictions on how mentors can be paid.

On community-driven platforms like VRChat, events are largely expected to be free, with musicians performing *"for fun"* rather than income. PI19 noted *"I know a few DJs who do earn money from it, but is it enough to live off? No."* These expectations reflect values of accessibility and inclusivity, where charging for entry is often seen as undermining the ethos of open participation. PI12 warned *"Once corporations come in, it just can't be something good. You either have to pay a lot of money to enjoy it, which denies access to people who have none[...] If you commercialise it, maybe you'll get a paid part, but it's really hard to see how that works without losing what the community built."*

Commercial platforms face a different set of barriers. Developers are often dependent on platform owners for visibility and revenue. PI05 explained *"It's really just a game of being presented on the Quest store, and we're kind of at the mercy of Meta."* Strict policies further limit financial opportunities. Attempts to introduce Patreon-style subscriptions or mentor payments have led to bans, forcing reliance on approved channels that rarely fit grassroots practices. As PI19 recalled *"They tried to help mentors earn money by doing a monetisation thing, and Meta didn't like that. Even artists who tried a Patreon setup got banned and had to do everything for free."* Such restrictions illustrate how platform control narrows options and blocks experimentation with models that might better support communities.

4.3.3 Structural risks and technical challenges. Beyond financial pressures, the VR music ecosystem faces structural risks that threaten long-term sustainability. Platform collapse is among the most significant vulnerabilities, with devastating consequences for creators and communities. The shutdown of the first version WaveXR (triggered by Google Poly's closure without viable migration options) erased years of world-building and creative work (see Figure 9). As PI02 reflected, *"The WaveXR platform, I fell in love with the tools they gave us for immersive concert experiences. To this day they are unparalleled. [...] And then the platform tragically collapsed because of Google Poly going out of business. They dragged all of our art and all our world building with it. It was very sad. The whole community was just crushed, and literally years of work for some of these creators were lost."* Similarly, Microsoft's decision to sunset AltspaceVR in 2023 without a clear explanation forced developers to rebuild from scratch (see Figure 8). As P13 described, *"Originally we were on AltspaceVR and it worked great. We were super successful. [...] And in 2023, Microsoft decided to sunset AltspaceVR, no reason given. [...] We started looking for another platform, but nobody had everything we wanted. So we decided to build our own. It is not easy, way too expensive, and I don't advise anybody to do it."* These cases underscore how platform dependencies expose creators to arbitrary decisions that can erase cultural archives overnight or push communities into financial precarity.

Technical challenges add further instability. Developers reported persistent difficulties making multiplayer functionality reliable, particularly for real-time music and interactive world effects. Hardware constraints, such as limited headset processing power, introduced microphone latency of up to a second, unreliable hand tracking, and broadband bottlenecks that restricted complex graphics and interactions. Finally, the production pipeline for VR concerts itself is demanding. It involves motion capture studios, training artists to perform effectively in virtual environments, and navigating complex approvals from artists and labels. Teams face a constant risk of *"launch day (PI05)"* failures, where technical breakdowns can compromise entire events, and the scarcity of skilled creative teams capable of translating artistic visions into compelling virtual experiences further fragilizes the ecosystem.

Figure 8: Screenshots documenting participants' world creations on WaveXR before the original version of the platform closed. WaveXR was a platform for live and interactive virtual concerts where artists could perform as avatars and audiences could participate in real-time. Assets were hosted on Google Poly.

Figure 9: Screenshots from events in AltspaceVR before the platform closed. For many participants – including audiences, performers, and developers – AltspaceVR was considered the "perfect" platform for music events, offering a balance of creative freedom and strong moderation.

4.3.4 Sustainability and value. The VR music ecosystem relies heavily on volunteer labour and user-generated content. Large projects like Virtual Burning Man on AltSpaceVR were built entirely by volunteers, with PI02 noting the *"fantastic job they did all volunteer."* This passion-driven ethos raises questions about long-term viability and fair compensation. Many creators participate for love of music rather than profit. PI12 explained *I'm not interested in making money off this. I do this purely for passion and fun and love of music."* Communities compensate for platform shortcomings through unpaid technical work (e.g., Discord queuing systems, custom streaming setups, and *little exploits" (P25)*), showing dependence on informal labour. Founders and developers monetise platforms from musical commitment, often at personal financial risk. This highlights a dilemma: volunteer-driven projects risk burnout, while small ventures lack resources to compete with larger platforms.

Fair value distribution was a recurring concern. PI01 asked *"Are we not giving our due to the 3D artists who are really what's making that? What is the fair split between the name, the music, the 3D artistry?"* Some viewed development teams' contributions as equal to or greater than performers'. Adoption challenges complicated sustainability. Meta's *heavy-handed"* commercialisation was described by PI09 as doing *more damage than good,"* fostering scepticism. Poor onboarding discouraged newcomers, while the initial *"prestige of the technology showcase"* has faded, as PI10 noted, requiring more community-oriented approaches to sustain interest.

Despite challenges, participants identified promising directions. Hybrid events could expand sponsorship and ticketing. Virtual economies around digital wearables provide modest income streams. PI03 envisioned *"The music industry model needs to change [...] labels should build VR worlds with portals to each artist [...] Monetisation could come through memberships while offering fan rewards to keep audiences engaged."* For PI03, sustainability depends less on replicating concert economics and more on cultivating fan engagement and collective value.

5 DISCUSSION

Our study mapped the current landscape of VR music performances, showing how platforms, roles, and practices intersect to sustain this ecosystem. We discovered a vibrant and diverse music culture that is largely maintained outside corporate or institutional frameworks. From raves in VRChat to curated shows and music jams on bespoke platforms like PatchWorld, performances are held together by communities who build venues, share labour, and return week after week. In discussing our findings, we reflect on what Social VR music reveals about live performance in immersive environments, how grassroots practices challenge corporate and academic visions of the metaverse, and what tensions around sustainability, accessibility, and community labour mean for future design.

5.1 Rethinking HCI's relationship with creative virtual communities

Our findings reveal a gap between how HCI has approached VR music [56, 80, 91, 94] and how communities actually operate. Research has focused on technical aims such as reducing latency, integrating physical instruments, or creating virtual instruments [8, 39, 80, 92, 93, 109]. Communities had already developed practical responses. They repurposed tools, built workarounds, and treated limitations as creative texture rather than evidence of system failure.

The most valued experiences relied on social fabric rather than technical sophistication, which turned disparate tools into working infrastructures. This connects with HCI research on appropriation [2, 26, 70], often framed as something that happens after design. Our findings show a different pattern. In Social VR music, appropriation functions as a mode of cultural production [118]. The VRChat concert scene emerged as a defining use case [79]. User innovations consistently reshaped practices and influenced platform adjustments. Workarounds for audio issues, for example, became established conventions and informed later feature development. For HCI, this suggests treating appropriation as a proactive design strategy [25], since platforms could become most generative when their future purpose cannot be fully anticipated.

This perspective reshapes how HCI understands the interplay of technical and social systems. Infrastructure in Social VR music is persistently imperfect. Latency persists, instances overflow, and audio glitches occur. Communities develop practices that treat such breakdowns as normal operating conditions. The distinction between working and broken systems becomes less useful than asking how communities adapt to the states they encounter. Work on *seamful design* [15, 35, 47] and *design frictions* [21] shows how limitations can become creative resources. Participants treated imperfections as expressive material, extending a long-standing musical relationship with constraint, evident in fixed tuning systems, breath limits, and fretted instruments [5, 46, 105]. Platform boundaries and technical imperfections now play a similar role in Social VR music, functioning as material for innovation rather than obstacles. *Can HCI use flaws and failures more deliberately as design material?* Although some areas already do, technical perfection often remains the dominant ideal. If communities turn constraints into creative possibilities at the level of infrastructure, HCI may need to focus less on eliminating friction and more on understanding which frictions become productive and for whom.

5.2 Between corporate visions and community realities

Industry's retreat from the metaverse [60] and closures such as AltspaceVR [23, 116] are often interpreted as signs of failure. Our findings offer a different view. Community formation did not falter. The misalignment lay between corporate visions and cultural practice, since communities prioritised accessibility, creative freedom, and continuity over scale or monetisation. This reflects competing social imaginaries, understood as connected ideas that shape what people consider possible. Corporate narratives focused on growth and control, while Social VR music communities operated within an imaginary grounded in shared authorship, community maintenance, and cultural longevity. Similar tensions appear in AI discourse where technical aims overshadow community values [69, 112]. HCI is well placed to surface these alternative framings and articulate community-defined models of success.

Star and Ruhleder's concept of infrastructure invisibility [101] helps explain why these cultures endure despite institutional neglect. Systems that function well often disappear from view, and grassroots Social VR music infrastructures such as Discord servers, VRChat worlds, and hybrid setups remain overlooked because they evolve outside corporate agendas. When platforms like AltspaceVR or WaveXR [57] closed, the scale of community labour became visible only during migration and reconstruction. Although platform dependencies create vulnerability, distributed and multi-platform practices support resilience by allowing social ties and cultural repertoires to move across environments. This suggests a need to rethink how success is evaluated. Designers often define metrics [83], yet such metrics privilege corporate outcomes over cultural sustainability. HCI can co-design alternative evaluation approaches with practitioners and support dialogue between developers and communities, ensuring sustainability is defined on community terms.

Tensions between expectations of free access and creators' need for compensation also shape Social VR music's cultural economy. Participants associated unpaid performance with authentic participation and viewed paid work as a sign of corporate intrusion. This dynamic reflects gift-economy logics [88, 107] in which free events signal community membership rather than consumer behaviour, and introducing payment may alter this meaning [119]. Yet volunteer labour creates sustainability challenges for world builders, moderators, performers, and founders who often invest personal resources to keep ecosystems alive. HCI's role is not to push communities toward commercial models but to explore funding mechanisms that stabilise varied contributions. HCI can also work with policymakers to recognise invisible platform labour as legitimate work. Recent EU protections for digital platform workers[24] show the need for updated regulatory frameworks. By integrating technological and human perspectives, HCI can surface tensions between platform logics and community needs and support policies that sustain creative communities while ensuring fair recognition for those who build them.

5.3 The paradox of platform dependency and community agency

Communities demonstrate considerable creativity and resilience, yet remain vulnerable to platform decisions they cannot influence. The shutdown of WaveXR, triggered by Google's termination of Poly, erased years of community-built art and memory. Such losses show how platform dependencies can eliminate cultural archives overnight, even as communities rebuild elsewhere.

This raises a question for HCI. *How can community agency be supported within platform-mediated environments?* Our findings indicate that the most successful platforms were those agnostic about use cases but rich in creation tools, with governance structures that shaped community behaviour [36, 95, 120]. Even so, community investment is not always recognised or preserved. The labour of

[24] https://www.europarl.europa.eu/topics/en/article/20190404STO35070/gig-economy-how-the-eu-improves-platform-workers-rights (accessed 12/3/2025)

world-building, the tacit knowledge involved in running events, and the social ties formed through shared experience are only partially portable when platforms close or alter policies. Communities can migrate, but often cannot take their worlds, archives, or spatial memories with them. This reveals both the emotional impact on communities and the power exercised by platform owners. Such power cannot be eliminated, but it can be counterbalanced. HCI and community representatives can co-create open-source resources that reduce reliance on centralised platforms. *What might less centralised solutions look like? What would platform-agnostic tools for world creation and event coordination require?* These questions call for collective envisioning by technologists, community organisers, and policymakers, oriented toward infrastructures that support continuity rather than corporate aims.

Even when practices persist across platforms, they remain vulnerable to decisions made by actors with no stake in the community's survival. Social VR music communities already distribute themselves across multiple platforms and use Discord as a platform-agnostic coordination layer, which helps manage technological precarity but functions as a workaround rather than a solution. For HCI, this points toward *cultural portability* [12, 54, 121] as a design concern. *What would it mean to create platforms where communities can export not only data but spatial configurations or interaction patterns that constitute their cultural infrastructure?* Existing data portability approaches focus on individual users; cultural portability requires thinking at the level of collective investment [52]. This suggests developing standardised, platform-agnostic formats for encoding experiential, spatial, and interaction data so communities can preserve and transfer the cultural infrastructures they create, independent of any single platform's future.

5.4 Toward community-sustaining design

Our findings challenge assumptions that guide user- and human-centred design in HCI. The communities we studied did not thrive because their needs were identified and addressed [13, 45, 80, 91]. Much HCI design methodology assumes stable user goals that can be captured through requirements gathering and prototyping [80], even though human-centred design emphasises context [103]. Participants instead described practices that developed over years. Rituals around avatar use, dance floor etiquette, and cross-platform festival coordination were not predictable in advance. They emerged through experimentation and cultural evolution.

This raises the question *What methodologies can support cultural development rather than attempt to predict it?* Our findings suggest successful environments function more like cities than applications [66]. They offer infrastructures that communities build upon rather than delivering fixed experiences [7, 33, 34]. Such environments prioritise extensibility over optimisation, community control over engagement metrics, and long-term sustainability over rapid growth. For HCI, this implies shifting attention from bespoke concert platforms to the foundations that communities already extend, such as cross-platform identity and social systems, robust moderation tools, and standards for migration when platforms close. It also requires recognising invisible labour [48, 55, 68, 102, 122], including scheduling, onboarding, and archiving, and supporting this labour not through automation but by strengthening the human work that sustains culture. Effective VR music infrastructure should prioritise community autonomy, creative flexibility, and cultural longevity.

Role fluidity further complicates common HCI assumptions. Participants moved between performer, audience, organiser, and world-builder roles within events and over time, challenging work that segments practices by stakeholder type. This extends theories of communities of practice [114]. We observed multi-directional role circulation where expertise in one domain, such as world-building, does not automatically confer status in another, such as performing. Central participation also varies depending on the aspect of community life one foregrounds. There is no single trajectory from periphery to centre because the Social VR music scene lacks a unified centre and operates instead as a distributed network across platforms. Participants valued platforms such as VRChat and Somnium Space because role transitions remained low-friction. Anyone could begin DJing, build a world, or host an event. Barriers were tied less to technical gatekeeping and more to the slow accumulation of tacit knowledge through participation, suggesting the need for better ways to document and translate this knowledge across community generations.

5.5 The research gap: short cycles, long cultures

Finally, our findings also raise questions on how HCI studies digital ecosystems [82, 104]. Standard research timelines – e.g., one to three-year grants producing studies of specific platforms or interventions – are mismatched with cultural ecosystems like Social VR music, which has developed over decades across multiple platforms. By the time researchers frame a problem, communities have often already developed solutions through practice. Our participants had addressed latency, coordination challenges and onboarding, all without academic or commercial input. This raises critical questions: *How do we co-create frameworks enabling sustained study of evolving socio-technical scenes? How can we evaluate technologies for sustained use when research rarely extends beyond adoption?* Without new approaches, HCI risks producing knowledge perpetually out of step with lived practice.

One response is shifting from intervention-focused to documentation-focused research. Rather than designing new systems, researchers can make visible existing tacit knowledge, improvised solutions, and emergent practices. Auto-ethnographic approaches [24, 61] offer particular promise. Researchers who are themselves community members – e.g., those studying Social VR while being active users [117], or investigating fan communities while participating as fans [86, 87] – can document evolving practices over timescales traditional studies cannot reach. This dual positioning is not a methodological compromise but a strength: sustained insider engagement surfaces tacit knowledge external observation misses, while the research lens brings analytical rigour to experiences that might otherwise remain undocumented. Beyond researcher autoethnography, encouraging community members to document their own practices advances research while serving community memory and cultural heritage.

Another response is developing long-term community partnerships [50] where researchers contribute resources (funding, technical skills, institutional legitimacy) in exchange for access and

insight [3, 18, 113, 123]. This requires shifts in funding and evaluation but offers knowledge both scientifically valuable and socially beneficial [82]. TribeXR and PatchWorld illustrate this model. Developers built long-term community relationships, iterating over years rather than months, with musicians providing expertise and developers offering technical skills. PatchWorld now extends this into formal academic collaborations[25], demonstrating that community–industry–academic partnerships are already emerging.

5.6 Provocations for future research

Based on our findings, we suggest several provocations for HCI's engagement with creative virtual communities:

What if we designed for breakdown rather than formation?
Communities routinely experience shutdowns, failures, and migrations. Designing for graceful degradation and continuity could better support resilience.

How do we study emotional labour in virtual environments?
Invisible work (e.g., moderation, coordination, teaching, archiving) sustains innovation yet remains unacknowledged. Research methods must make such labour visible and valued.

Can virtual communities inform post-platform futures?
VR music communities survived by not depending on a single platform. Designing for autonomy rather than platform control could reduce vulnerability and strengthen resilience.

How do we design creator economies that support resilience rather than competition?
Many communities relied on collective models (e.g., skill sharing, resource pooling, social capital) rather than competitive creator economies. Systems that reward collective contribution could enable more durable creative cultures.

What if innovation emerges more effectively from community experimentation than formal Research & Development?
The most ambitious practices (e.g., collaborative instruments, synchronised audiovisual spaces, cross-platform festivals) emerged from grassroots experimentation, not corporate pipelines. Supporting community-led innovation may drive progress more effectively than traditional development cycles.

5.7 Limitations

While our research provides insights into thriving virtual communities, several limitations suggest directions for future work. Our focus on music performance, while revealing important patterns about virtual community formation, represents only one domain of virtual cultural practice. Future research might examine whether similar patterns hold in other creative domains or social activities. The communities we studied primarily operate within Western contexts and on English-language platforms, despite including participants from diverse geographic locations. Research examining virtual communities that develop within different linguistic, cultural, and technological contexts could reveal alternative models of virtual community formation and different approaches to platform appropriation. Additionally, we captured these communities at a particular moment in VR's development. As hardware improves, as platforms rise and fall, as new entrants arrive, the practices we documented will evolve. Longitudinal research that follows communities through technological transitions could reveal how cultural practices adapt to changing technical conditions while maintaining continuity. Finally, while our methodology successfully captured community practices across multiple platforms, it required a significant time investment and ongoing relationship-building with community members. Future research might develop more efficient approaches to studying distributed virtual communities while maintaining the collaborative orientation that proved essential for understanding community values and practices.

[25] https://musmet.eu (accessed 12/3/2025)

6 CONCLUSION

In this study, we combined surveys, interviews, and ethnographic observation to investigate the practices, motivations, and infrastructures of Social VR music communities across multiple platforms. Our analysis showed that these communities flourish not through corporate visions or advanced technical infrastructures, but through grassroots coordination, experimentation, and mutual support. They sustain cultural practices by developing shared rituals, distributed labour, and collective creativity, offering models of resilience that stand in contrast to narratives of decline around the "metaverse." By documenting their social infrastructures, improvisational design strategies, and alternative economies, we argue that HCI can learn more from engaging with such community-driven ecosystems than from pursuing speculative corporate futures. The future of virtual environments may depend less on technical sophistication than on supporting the cultural and social infrastructures that make them meaningful to those who inhabit them.

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References

[1] [n. d.]. Meta Platforms Axes Jobs in Reality Labs to Revamp VR Vision. https://www.theglobeandmail.com/investing/markets/stocks/MSFT/pressreleases/32065132/meta-platforms-axes-jobs-in-reality-labs-to-revamp-vr-vision/

[2] Fatemeh Alizadeh, Aikaterini Mniestri, Alarith Uhde, and Gunnar Stevens. 2022. On Appropriation and Nostalgic Reminiscence of Technology. In *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems (CHI EA '22)*. Association for Computing Machinery, New York, NY, USA, 1–6. https://doi.org/10.1145/3491101.3519676

[3] Mara Balestrini, Jon Bird, Paul Marshall, Alberto Zaro, and Yvonne Rogers. 2014. Understanding sustained community engagement: a case study in heritage preservation in rural argentina. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*. Association for Computing

Machinery, New York, NY, USA, 2675–2684. https://doi.org/10.1145/2556288.2557323

[4] F. Berthaut, M. Desainte-Catherine, and M. Hachet. 2011. Interacting with 3D reactive widgets for musical performance. *Journal of New Music Research* 40, 3 (2011), 253–263.

[5] Laura Bishop. 2018. Collaborative Musical Creativity: How Ensembles Coordinate Spontaneity. *Frontiers in Psychology* 9 (July 2018), 1285. https://doi.org/10.3389/fpsyg.2018.01285

[6] Laura Bishop. 2024. Togetherness in musical interaction. *Routledge Open Research* 3, 16 (2024), 16.

[7] Eli Blevis, Chris Preist, Daniel Schien, and Priscilla Ho. 2017. Further Connecting Sustainable Interaction Design with Sustainable Digital Infrastructure Design. In *Proceedings of the 2017 Workshop on Computing Within Limits*. ACM, Santa Barbara California USA, 71–83. https://doi.org/10.1145/3080556.3080568

[8] Alberto Boem, Matteo Tomasetti, and Luca Turchet. 2025. Issues and Challenges of Audio Technologies for the Musical Metaverse. *J. Audio Eng. Soc* 73, 3 (2025), 94–114.

[9] Alberto Boem, Matteo Tomasetti, Luca Turchet, et al. 2024. Harmonizing the Musical Metaverse: unveiling needs, tools, and challenges from experts' point of view. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. 206–214.

[10] Virginia Braun and Victoria Clarke. 2019. Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health* 11, 4 (Aug. 2019), 589–597. https://doi.org/10.1080/2159676x.2019.1628806

[11] Virginia Braun and Victoria Clarke. 2021. One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology* 18, 3 (2021), 328–352. https://doi.org/10.1080/14780887.2020.1769238

[12] Elisa Brini, Anna Zamberlan, and Paolo Barbieri. 2022. Culture portability from origin to destination country: The gender division of domestic work among migrants in Italy. *Demographic Research* 47 (Oct. 2022), 577–614. https://doi.org/10.4054/DemRes.2022.47.20

[13] Carrie J Cai, Michelle Carney, Nida Zada, and Michael Terry. 2021. Breakdowns and Breakthroughs: Observing Musicians' Responses to the COVID-19 Pandemic. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. ACM, 1–13. https://doi.org/10.1145/3411764.3445192

[14] Jie Cai, Cameron Guanlao, and Donghee Yvette Wohn. 2021. Understanding Rules in Live Streaming Micro Communities on Twitch. In *Proceedings of the 2021 ACM International Conference on Interactive Media Experiences (IMX '21)*. Association for Computing Machinery, New York, NY, USA, 290–295. https://doi.org/10.1145/3452918.3465491

[15] M. Chalmers, I. MacColl, and M. Bell. 2003. Seamful design: showing the seams in wearable computing. In *2003 IEE Eurowearable*. 11–16. https://doi.org/10.1049/ic:20030140 ISSN: 0537-9989.

[16] Alan Chamberlain, Andy Crabtree, Tom Rodden, Matt Jones, and Yvonne Rogers. 2012. Research in the wild: understanding 'in the wild' approaches to design and development. In *Proceedings of the Designing Interactive Systems Conference*. ACM, Newcastle Upon Tyne United Kingdom, 795–796. https://doi.org/10.1145/2317956.2318078

[17] Qijia Chen, Andrea Bellucci, and Giulio Jacucci. 2024. "I'd rather drink in VRChat": Understanding Drinking in Social Virtual Reality. In *Proceedings of the CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI '24)*. Association for Computing Machinery, New York, NY, USA, Article 797, 16 pages. https://doi.org/10.1145/3613904.3642405

[18] Simran Chopra. 2019. HCI for Participatory Futuring in Sustainable Communities: Reconciling Visions with Everyday Practice. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems (CHI EA '19)*. Association for Computing Machinery, New York, NY, USA, 1–6. https://doi.org/10.1145/3290607.3299085

[19] Lucas Colusso, Cynthia L. Bennett, Gary Hsieh, and Sean A. Munson. 2017. Translational Resources: Reducing the Gap Between Academic Research and HCI Practice. In *Proceedings of the 2017 Conference on Designing Interactive Systems* (Edinburgh, United Kingdom) *(DIS '17)*. Association for Computing Machinery, New York, NY, USA, 957–968. https://doi.org/10.1145/3064663.3064667

[20] Ned Cooper, Tiffanie Horne, Gillian R Hayes, Courtney Heldreth, Michal Lahav, Jess Holbrook, and Lauren Wilcox. 2022. A Systematic Review and Thematic Analysis of Community-Collaborative Approaches to Computing Research. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems (CHI '22)*. Association for Computing Machinery, New York, NY, USA, 1–18. https://doi.org/10.1145/3491102.3517716

[21] Anna L. Cox, Sandy J.J. Gould, Marta E. Cecchinato, Ioanna Iacovides, and Ian Renfree. 2016. Design Frictions for Mindful Interactions: The Case for Microboundaries. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA '16)*. Association for Computing Machinery, New York, NY, USA, 1389–1397. https://doi.org/10.1145/2851581.2892410

[22] I. Cross. 2001. Music, cognition, culture, and evolution. *Annals of the New York Academy of Sciences* 930 (2001), 28–42. https://doi.org/10.1111/j.1749-6632.2001.tb05723.x

[23] Allen D. 2023. Why Microsoft Killed AltspaceVR (and where are users going next?). https://medium.com/@justafiend/why-microsoft-killed-altspacevr-and-where-are-users-going-next-d5545587b38

[24] Audrey Desjardins and Ron Wakkary. 2016. Living In A Prototype: A Reconfigured Space. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*. Association for Computing Machinery, New York, NY, USA, 5274–5285. https://doi.org/10.1145/2858036.2858261

[25] Alan Dix. 2007. Designing for appropriation. In *Proceedings of the 21st British HCI Group Annual Conference on People and Computers: HCI...but not as we know it - Volume 2 (BCS-HCI '07)*. BCS Learning & Development Ltd., Swindon, GBR, 27–30.

[26] Paul Dourish. 2003. The Appropriation of Interactive Technologies: Some Lessons from Placeless Documents. *Computer Supported Cooperative Work (CSCW)* 12, 4 (Dec. 2003), 465–490. https://doi.org/10.1023/A:1026149119426

[27] Paul Dourish and Genevieve Bell. 2011. *Divining a digital future: mess and mythology in ubiquitous computing*. MIT Press, Cambridge, Mass.

[28] Sebastian Draxler, Gunnar Stevens, Martin Stein, Alexander Boden, and David Randall. 2012. Supporting the social context of technology appropriation: on a synthesis of sharing tools and tool knowledge. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. Association for Computing Machinery, New York, NY, USA, 2835–2844. https://doi.org/10.1145/2207676.2208687

[29] Nathaniel I. Durlach and Mel Slater. 2000. Presence in Shared Virtual Environments and Virtual Togetherness. *Presence: Teleoperators & Virtual Environments* 9 (2000), 214–217.

[30] Yogesh Kumar Dwivedi, Laurie Hughes, A. Baabdullah, Samuel Ribeiro-Navarrete, M. Giannakis, Mutaz M. Al-Debei, Denis Dennehy, Bhimaraya Metri, Dimitrios Buhalis, Christy M. K. Cheung, Kieran Conboy, R. Doyle, Rameshwar Dubey, V. Dutot, Reto Felix, D. Goyal, A. Gustafsson, Christian Hinsch, Ikram Jebabli, M. Janssen, Young-Gab Kim, Jooyoung Kim, Stefan Koos, David Kreps, N. Kshetri, Vikram Kumar, K. Ooi, S. Papagiannidis, I. Pappas, Ariana Polyviou, Sang-Min Park, N. Pandey, M. Queiroz, R. Raman, P. Rauschnabel, Anuragini Shirish, M. Sigala, K. Spanaki, Garry Wei-Han Tan, Manoj Kumar Tiwari, G. Viglia, and S. Wamba. 2022. Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *Int. J. Inf. Manag.* 66 (2022), 102542. https://doi.org/10.1016/j.ijinfomgt.2022.102542

[31] Yogesh K. Dwivedi, Laurie Hughes, Abdullah M. Baabdullah, Samuel Ribeiro-Navarrete, Mihalis Giannakis, Mutaz M. Al-Debei, Denis Dennehy, Bhimaraya Metri, Dimitrios Buhalis, Christy M. K. Cheung, Kieran Conboy, Ronan Doyle, Rameshwar Dubey, Vincent Dutot, Reto Felix, D. P. Goyal, Anders Gustafsson, Chris Hinsch, Ikram Jebabli, Marijn Janssen, Young-Gab Kim, Jooyoung Kim, Stefan Koos, David Kreps, Nir Kshetri, Vikram Kumar, Keng-Boon Ooi, Savvas Papagiannidis, Ilias O. Pappas, Ariana Polyviou, Sang-Min Park, Neeraj Pandey, Maciel M. Queiroz, Ramakrishnan Raman, Philipp A. Rauschnabel, Anuragini Shirish, Marianna Sigala, Konstantina Spanaki, Garry Wei-Han Tan, Manoj Kumar Tiwari, Giampaolo Viglia, and Samuel Fosso Wamba. 2022. Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management* 66 (Oct. 2022), 102542. https://doi.org/10.1016/j.ijinfomgt.2022.102542

[32] Damian Dziwis, Henrik Von Coler, and Christoph Pörschmann. 2023. Orchestra: a toolbox for live music performances in a web-based metaverse. *Journal of the Audio Engineering Society* 71, 11 (2023), 802–812.

[33] W Keith Edwards, Victoria Bellotti, Anind K Dey, and Mark W Newman. 2003. Stuck in the Middle: The Challenges of User-Centered Design and Evaluation for Infrastructure. *NEW HORIZONS* 5 (2003).

[34] W. Keith Edwards, Mark W. Newman, and Erika Shehan Poole. 2010. The infrastructure problem in HCI. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '10)*. Association for Computing Machinery, New York, NY, USA, 423–432. https://doi.org/10.1145/1753326.1753390

[35] Upol Ehsan, Q. Vera Liao, Samir Passi, Mark O. Riedl, and Hal Daumé. 2024. Seamful XAI: Operationalizing Seamful Design in Explainable AI. *Proc. ACM Hum.-Comput. Interact.* 8, CSCW1 (April 2024), 119:1–119:29. https://doi.org/10.1145/3637396

[36] K. J. Kevin Feng, Rock Yuren Pang, Tzu-Sheng Kuo, Amy Winecoff, Emily Tseng, David Gray Widder, Harini Suresh, Katharina Reinecke, and Amy X. Zhang. 2025. Sociotechnical AI Governance: Challenges and Opportunities for HCI. In *Proceedings of the Extended Abstracts of the CHI Conference on Human Factors in Computing Systems*. ACM, Yokohama Japan, 1–6. https://doi.org/10.1145/3706599.3706747

[37] Ciaran Frame. 2024. Concerts of the Future: Designing an interactive musical experience in VR. In *International Conference on New Interfaces for Musical Expression*. NIME, 359–366.

[38] Guo Freeman, Samaneh Zamanifard, Divine Maloney, and Alexandra Adkins. 2020. My Body, My Avatar: How People Perceive Their Avatars in Social Virtual Reality. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems*. ACM, 1–8. https://doi.org/10.1145/3334480.3382923

[39] José L Gómez-Sirvent, Francisco Lopez de la Rosa, Roberto Sánchez-Reolid, Rafael Morales Herrera, and Antonio Fernández-Caballero. 2025. Musical instruments in extended reality: A systematic review. *International Journal of Human–Computer Interaction* 41, 16 (2025), 10143–10162.

[40] Ben Green. 2023. Splendour XR: Place, Experience and Liveness at a Virtual Music Festival. *Leisure Sciences* (2023), 1–18.

[41] William A. Hamilton, Oliver Garretson, and Andruid Kerne. 2014. Streaming on twitch: fostering participatory communities of play within live mixed media. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*. Association for Computing Machinery, New York, NY, USA, 1315–1324. https://doi.org/10.1145/2556288.2557048

[42] Jihae Han, Adalberto L. Simeone, and Andrew Vande Moere. 2024. Superarchitectural: Challenging the Architectural Design of the Metaverse. In *Designing Interactive Systems Conference*. ACM, IT University of Copenhagen Denmark, 1895–1913. https://doi.org/10.1145/3643834.3661637

[43] Jihae Han, Yu Sun, Sophia Ppali, Alexandra Covaci, and Andrew Vande Moere. 2025. To Cuddle, Mingle, Venture, or Guide: How Architectural Affordances Influence the Experience of Social VR Places. In *Proceedings of the 2025 ACM Designing Interactive Systems Conference*. ACM. https://doi.org/10.1145/3715336.3735772

[44] Christina N. Harrington, Paola Favela, Cella M. Sum, Sarah Fox, and Lynn Dombrowski. 2024. The Denizen Designer Project: Practices, Relationships, and Principles of Activist-Led Design. *Proc. ACM Hum.-Comput. Interact.* 8, CSCW2 (Nov. 2024), 358:1–358:32. https://doi.org/10.1145/3686897

[45] Oliver Hödl. 2016. *The design of technology-mediated audience participation in live music*. https://doi.org/10.34726/hss.2016.37385

[46] Simon Holland, Tom Mudd, Katie Wilkie-McKenna, Andrew McPherson, and Marcelo M. Wanderley (Eds.). 2019. *New Directions in Music and Human-Computer Interaction*. Springer International Publishing, Cham. https://doi.org/10.1007/978-3-319-92069-6

[47] Sarah Inman and David Ribes. 2019. "Beautiful Seams": Strategic Revelations and Concealments. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI '19)*. Association for Computing Machinery, New York, NY, USA, 1–14. https://doi.org/10.1145/3290605.3300508

[48] Jialun'Aaron' Jiang, Skyler Middler, Jed R Brubaker, and Casey Fiesler. 2020. Characterizing community guidelines on social media platforms. In *Companion Publication of the 2020 Conference on Computer Supported Cooperative Work and Social Computing*. 287–291.

[49] Patrik N. Juslin and Daniel Västfjäll. 2008. Emotional responses to music: the need to consider underlying mechanisms. *The Behavioral and Brain Sciences* 31, 5 (2008), 559–575; discussion 575–621. https://doi.org/10.1017/s0140525x08005293

[50] Hooman Khanpoor, Mohammad Amerzadeh, Ahad Alizadeh, Omid Khosravizadeh, and S. Rafiei. 2024. Developing a community-responsive research model in the healthcare system: a mixed-method study. *BMC Medical Research Methodology* 24 (2024). https://doi.org/10.1186/s12874-024-02250-1

[51] Konstantina Kilteni, Raphaela Groten, and Mel Slater. 2012. The sense of Embodiment in virtual reality. *Presence (Camb.)* 21, 4 (Nov. 2012), 373–387.

[52] Jeong-Yoo Kim. [n. d.]. Data Portability and Interoperability Between Digital Platforms. *Journal of Economics & Management Strategy* n/a, n/a ([n. d.]). https://doi.org/10.1111/jems.12643 _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/jems.12643.

[53] Eugene Kukshinov, Daniel Harley, Kata Szita, Reza Hadi Mogavi, Cayley Macarthur, and Lennart E. Nacke. 2024. Disembodied, Asocial, and Unreal: How Users Reinterpret Designed Affordances of Social VR. In *Designing Interactive Systems Conference*. ACM, IT University of Copenhagen Denmark, 1914–1925. https://doi.org/10.1145/3643834.3661548

[54] Jonas R. Kunst, Katharina Lefringhausen, and Hanna Zagefka. 2024. Delineating the boundaries between genuine cultural change and cultural appropriation in majority-group acculturation. *International Journal of Intercultural Relations* 98 (Jan. 2024), 101911. https://doi.org/10.1016/j.ijintrel.2023.101911

[55] Tina Kuo, Alicia Hernani, and Jens Grossklags. 2023. The Unsung Heroes of Facebook Groups Moderation: A Case Study of Moderation Practices and Tools. *Proc. ACM Hum.-Comput. Interact.* 7, CSCW1 (April 2023), 97:1–97:38. https://doi.org/10.1145/3579530

[56] Vali Lalioti, Sophia Ppali, Andrew J. Thomas, Ragnar Hrafnkelsson, Mick Grierson, Chee Siang Ang, B. S. Wohl, and Alexandra Covaci. 2021. VR Rehearse & Perform - A platform for rehearsing in Virtual Reality. In *Proceedings of the 27th ACM Symposium on Virtual Reality Software and Technology*. ACM, 1–3. https://doi.org/10.1145/3489849.3489896

[57] Ben Lang. 2021. Wave Deprecates VR App to Focus on Broader Distribution of Its Virtual Performances. https://www.roadtovr.com/wave-shutters-vr-app-focus-broader-distribution/ Section: News.

[58] Lika Haizhou Liu, Xi Lu, Pei-Chun Chiang, Daniel A. Epstein, and Kurt Squire. 2025. Meditating Together: Practices, Benefits and Challenges of Meditation on Social Virtual Reality. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (CHI '25)*. Association for Computing Machinery, New York, NY, USA, Article 984, 20 pages. https://doi.org/10.1145/3706598.3713172

[59] Ben Loveridge. 2023. An Overview of Immersive Virtual Reality Music Experiences in Online Platforms. *Journal of Network Music and Arts* 5, 1 (May 2023). https://commons.library.stonybrook.edu/jonma/vol5/iss1/5

[60] Paul Benjamin Lowry, Wai Fong Boh, Stacie Petter, and Jan Marco Leimeister. 2025. Long Live the Metaverse: Identifying the Potential for Market Disruption and Future Research. *Journal of Management Information Systems* 42, 1 (Jan. 2025), 3–38. https://doi.org/10.1080/07421222.2025.2455770 Publisher: Routledge _eprint: https://doi.org/10.1080/07421222.2025.2455770.

[61] Andrés Lucero. 2018. Living Without a Mobile Phone: An Autoethnography. In *Proceedings of the 2018 Designing Interactive Systems Conference*. 765–776. https://doi.org/10.1145/3196709.3196731 arXiv:1804.04833 [cs].

[62] Pieter-Jan Maes, Bavo Van Kerrebroeck, Mattia Rosso, Ioulia Marouda, and Marc Leman. 2024. Extended reality (XR) in embodied musical art and science. In *The Routledge Handbook of Embodied Cognition*. Routledge, 143–155.

[63] Divine Maloney and Guo Freeman. 2020. Falling Asleep Together: What Makes Activities in Social Virtual Reality Meaningful to Users. In *Proceedings of the Annual Symposium on Computer-Human Interaction in Play*. ACM, Virtual Event Canada, 510–521. https://doi.org/10.1145/3410404.3414266

[64] Divine Maloney, Guo Freeman, and Donghee Yvette Wohn. 2020. "Talking without a Voice": Understanding Non-verbal Communication in Social Virtual Reality. *Proc. ACM Hum.-Comput. Interact.* 4, CSCW2 (Oct. 2020), 175:1–175:25. https://doi.org/10.1145/3415246

[65] Pranav Dixit Mann, Jyoti. [n. d.]. Meta lays off Reality Labs employees while continuing to hire hundreds more. https://www.businessinsider.com/meta-layoffs-recruits-reality-labs-restructuring-2025-4

[66] John McCarthy and Peter Wright. 2004. Technology as experience. *interactions* 11, 5 (Sept. 2004), 42–43. https://doi.org/10.1145/1015530.1015549

[67] Joshua McVeigh-Schultz, Elena Márquez Segura, Nick Merrill, and Katherine Isbister. 2018. What's It Mean to "Be Social" in VR?: Mapping the Social VR Design Ecology. In *Proceedings of the 2018 ACM Conference Companion Publication on Designing Interactive Systems*. ACM, 289–294. https://doi.org/10.1145/3197391.3205451

[68] Jonathan Mella, Sarah Frampton, and Anna Cox. 2024. Unseen Work: Leveraging Generative AI for Invisible Academic Labour. In *Mensch und Computer 2024-Workshopband*. Gesellschaft für Informatik eV, 10–18420.

[69] Jakub Mlynar, Farzaneh Bahrami, André Ourednik, Nico Mutzner, Himanshu Verma, and Hamed Alavi. 2022. AI beyond Deus ex Machina – Reimagining Intelligence in Future Cities with Urban Experts. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems (CHI '22)*. Association for Computing Machinery, New York, NY, USA, 1–13. https://doi.org/10.1145/3491102.3517502

[70] Daniel Mwesigwa and Christopher Csíkszentmihályi. 2024. Air/time Travel: Rethinking Appropriation in Global HCI and Futures of Electronic Exchange. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems (CHI '24)*. Association for Computing Machinery, New York, NY, USA, 1–21. https://doi.org/10.1145/3613904.3642590

[71] Kelsey Onderdijk, Lies Bouckaert, Edith Dyck, and Pieter-Jan Maes. 2023. Concert experiences in virtual reality environments. *Virtual Reality* 27 (jun 2023). https://doi.org/10.1007/s10055-023-00814-y

[72] Jieun Park, Youjin Choi, and Kyung Myun Lee. 2024. Research Trends in Virtual Reality Music Concert Technology: A Systematic Literature Review. *IEEE Transactions on Visualization and Computer Graphics* 30, 5 (2024), 2195–2205. https://doi.org/10.1109/TVCG.2024.3372069

[73] Jieun Park, Youjin Choi, and Kyung Myun Lee. 2024. Research trends in virtual reality music concert technology: A systematic literature review. *IEEE Transactions on Visualization and Computer Graphics* 30, 5 (2024), 2195–2205.

[74] Sang-Min Park and Young-Gab Kim. 2022. A Metaverse: Taxonomy, Components, Applications, and Open Challenges. *IEEE Access* 10 (2022), 4209–4251. https://doi.org/10.1109/ACCESS.2021.3140175

[75] Roosa Piitulainen, Perttu Hämäläinen, and Elisa D Mekler. 2022. Vibing Together: Dance Experiences in Social Virtual Reality. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 188, 18 pages. https://doi.org/10.1145/3491102.3501828

[76] Roosa Piitulainen, Perttu Hämäläinen, and Elisa D Mekler. 2022. Vibing Together: Dance Experiences in Social Virtual Reality. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA). ACM, Article 188, 18 pages. https://doi.org/10.1145/3491102.3501828

[77] Sophia Ppali. 2023. Music from Anywhere & Everywhere: Exploring the design space of remote music performance. In *Companion Publication of the 2023 ACM Designing Interactive Systems Conference*. ACM, 45–49. https://doi.org/10.1145/3563703.3593067

[78] Sophia Ppali. 2025. *Music from anywhere & everywhere: exploring the design space of remote music performances*. phd. University of Kent,. https://doi.org/10.22024/UniKent/01.02.111215

[79] Sophia Ppali, Boyd Branch, Alberto Boem, Elena Ppali, Max Scorer, Chee Siang Ang, Luca Turchet, and Alexandra Covaci. 2025. The Virtual Concert-goer: Audience Perspectives on Remote Music Performances. *Proc. ACM Hum.-Comput.*

Interact. 9, 7 (Oct. 2025), CSCW250:1–CSCW250:30. https://doi.org/10.1145/3757431

[80] Sophia Ppali, Vali Lalioti, Boyd Branch, Chee Siang Ang, Andrew J. Thomas, Bea S. Wohl, and Alexandra Covaci. 2022. Keep the VRhythm going: A musician-centred study investigating how Virtual Reality can support creative musical practice. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems (CHI '22)*. Association for Computing Machinery, New York, NY, USA, 1–19. https://doi.org/10.1145/3491102.3501922

[81] Sophia Ppali, Max Scorer, Elena Ppali, Boyd Branch, and Alexandra Covaci. 2024. Remote Rhythms: Audience-informed insights for designing remote music performances. In *Proceedings of the 2024 ACM Designing Interactive Systems Conference (DIS '24)*. Association for Computing Machinery, New York, NY, USA, 2675–2690. https://doi.org/10.1145/3643834.3660719

[82] Lucero Radonic, Cara Jacob, Rowenn Kalman, and E. Lewis. 2021. It's a sprint, not a marathon: a case for building short-term partnerships for community-based participatory research. *Qualitative Research* 23 (2021), 380–398. https://doi.org/10.1177/14687941211029477

[83] Iyad Rahwan, Manuel Cebrian, Nick Obradovich, Josh Bongard, Jean-François Bonnefon, Cynthia Breazeal, Jacob W. Crandall, Nicholas A. Christakis, Iain D. Couzin, Matthew O. Jackson, Nicholas R. Jennings, Ece Kamar, Isabel M. Kloumann, Hugo Larochelle, David Lazer, Richard McElreath, Alan Mislove, David C. Parkes, Alex 'Sandy' Pentland, Margaret E. Roberts, Azim Shariff, Joshua B. Tenenbaum, and Michael Wellman. 2019. Machine behaviour. *Nature* 568, 7753 (April 2019), 477–486. https://doi.org/10.1038/s41586-019-1138-y Publisher: Nature Publishing Group.

[84] Elizabeth Reid, Laura Paul, Rafael Alves Heinze, and Regan L. Mandryk. 2025. If You Build It, They Will Comment: Distributed Mentoring in an Online Game Modding Community. *Proc. ACM Hum.-Comput. Interact.* 9, 6 (Oct. 2025), GAMES016:447–GAMES016:474. https://doi.org/10.1145/3748611

[85] Claudia Rinaldi and Carlo Centofanti. 2024. The Musical Metaverse: Advancements and Applications in Networked Immersive Audio. In *2024 IEEE 5th International Symposium on the Internet of Sounds (IS2)*. IEEE, 1–7.

[86] Kathryn E. Ringland, Arpita Bhattacharya, Kevin Weatherwax, Tessa Eagle, and Christine T. Wolf. 2022. ARMY's Magic Shop: Understanding the Collaborative Construction of Playful Places in Online Communities. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems (CHI '22)*. Association for Computing Machinery, New York, NY, USA, 1–19. https://doi.org/10.1145/3491102.3517442

[87] Kathryn E. Ringland, Elin Carstensdottir, Matthew Tung, Bhavani Seetharaman, Tessa Eagle, Leya Breanna Baltaxe-Admony, and Kevin Weatherwax. 2024. Together in the Mikrokosmos: Exploring Disabled Embodied Experiences in Designed Sociotechnical Worlds. *Proc. ACM Hum.-Comput. Interact.* 8, CSCW2 (Nov. 2024), 435:1–435:39. https://doi.org/10.1145/3686974

[88] Sanika Rohanekar. 2025. Gift economy as an alternative to achieve sustainable development: The case of Earthen Routes. *Cities* 160 (May 2025), 105796. https://doi.org/10.1016/j.cities.2025.105796

[89] Valorie N Salimpoor, Mitchel Benovoy, Gregory Longo, Jeremy R Cooperstock, and Robert J Zatorre. 2009. The rewarding aspects of music listening are related to degree of emotional arousal. *PloS one* 4, 10 (2009), e7487.

[90] Thomas Schäfer, Mario Smukalla, and Sarah-Ann Oelker. 2014. How music changes our lives: A qualitative study of the long-term effects of intense musical experiences. *Psychology of Music* 42, 4 (2014), 525–544. https://doi.org/10.1177/0305735613482024

[91] Ruben Schlagowski, Fabian Wildgrube, Silvan Mertes, Ceenu George, and Elisabeth André. 2022. Flow with the Beat! Human-Centered Design of Virtual Environments for Musical Creativity Support in VR. In *Proceedings of the 14th Conference on Creativity and Cognition*. ACM, 428–442. https://doi.org/10.1145/3527927.3532799

[92] S. Serafin, A. Adjorlu, N. Nilsson, L. Thomsen, and R. Nordahl. 2017. Considerations on the use of virtual and augmented reality technologies in music education. In *IEEE Virtual Reality Workshop on K-12 Embodied Learning through Virtual & Augmented Reality*. IEEE, 1–4. https://doi.org/10.1109/kelvar.2017.7961562

[93] S. Serafin, C. Erkut, J. Kojs, N.C. Nilsson, and R. Nordahl. 2016. Virtual Reality Musical Instruments: State of the Art, Design Principles, and Future Directions. *Computer Music Journal* 40, 3 (2016), 22–40.

[94] Stefania Serafin, Michele Geronazzo, Cumhur Erkut, Niels C Nilsson, and Rolf Nordahl. 2018. Sonic interactions in virtual reality: state of the art, current challenges, and future directions. *IEEE computer graphics and applications* 38, 2 (2018), 31–43.

[95] Yuya Shibuya, Andrea Hamm, and Teresa Cerratto Pargman. 2022. Mapping HCI research methods for studying social media interaction: A systematic literature review. *Computers in Human Behavior* 129 (April 2022), 107131. https://doi.org/10.1016/j.chb.2021.107131

[96] Aneesha Singh, Martin Johannes Dechant, Dilisha Patel, Ewan Soubutts, Giulia Barbareschi, Amid Ayobi, and Nikki Newhouse. 2025. Exploring Positionality in HCI: Perspectives, Trends, and Challenges. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (CHI '25)*. Association for Computing Machinery, New York, NY, USA, 1–18. https://doi.org/10.1145/3706598.3713280

[97] M. Slater. 2009. Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364, 1535 (2009), 3549–3557. https://doi.org/10.1098/rstb.2009.0138

[98] Mel Slater, Bernhard Spanlang, and David Corominas. 2010. Simulating Virtual Environments within Virtual Environments as the Basis for a Psychophysics of Presence. *ACM Trans. Graph.* 29, 4, Article 92 (July 2010), 9 pages. https://doi.org/10.1145/1778765.1778829

[99] Christopher Small. 1998. *Musicking: the meanings of performing and listening*. Wesleyan Univ. Press [u.a.].

[100] Olivier St-Cyr, Craig M. MacDonald, Elizabeth F. Churchill, Jenny J. Preece, and Anna Bowser. 2018. Developing a Community of Practice to Support Global HCI Education. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems (CHI EA '18)*. Association for Computing Machinery, New York, NY, USA, 1–7. https://doi.org/10.1145/3170427.3170616

[101] Susan Leigh Star and Karen Ruhleder. 1996. Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces. *Information Systems Research* 7, 1 (March 1996), 111–134. https://doi.org/10.1287/isre.7.1.111 Publisher: INFORMS.

[102] Susan Leigh Star and Anselm Strauss. 1999. Layers of silence, arenas of voice: The ecology of visible and invisible work. *Computer supported cooperative work (CSCW)* 8, 1 (1999), 9–30.

[103] Marc Steen. 2011. Tensions in human-centred design. *CoDesign* 7, 1 (2011), 45–60. https://doi.org/10.1080/15710882.2011.563314

[104] R. Stoecker. 2008. Challenging institutional barriers to community-based research. *Action Research* 6 (2008), 49–67. https://doi.org/10.1177/1476750307083721

[105] Tobias Theel and Jörg Sydow. 2024. Organizing Creativity With Constraints—Insights From Popular Music Songwriting Teams. *Journal of Management Inquiry* 33, 3 (July 2024), 265–283. https://doi.org/10.1177/10564926231191087 Publisher: SAGE Publications Inc.

[106] Sarah-Kristin Thiel and Peter Lyle. 2019. Malleable Games - A Literature Review on Communities of Game Modders. In *Proceedings of the 9th International Conference on Communities & Technologies - Transforming Communities (C&T '19)*. Association for Computing Machinery, New York, NY, USA, 198–209. https://doi.org/10.1145/3328320.3328393

[107] Niels Thygesen. 2019. The gift economy and the development of sustainability. *Local Economy* 34, 6 (Sept. 2019), 493–509. https://doi.org/10.1177/0269094219882261 Publisher: SAGE Publications Ltd.

[108] Luca Turchet. 2023. Musical Metaverse: vision, opportunities, and challenges. *Personal and Ubiquitous Computing* (2023), 1–17.

[109] L. Turchet, R. Hamilton, and A. Çamci. 2021. Music in Extended Realities. *IEEE Access* 9 (2021), 15810–15832. https://doi.org/10.1109/access.2021.3052931

[110] Luca Turchet, Claudia Rinaldi, Carlo Centofanti, Luca Vignati, and Cristina Rottondi. 2024. 5G-enabled Internet of Musical Things architectures for remote immersive musical practices. *IEEE Open Journal of the Communications Society* 5 (2024), 4691–4709.

[111] Tara Venkatesan and Qian Janice Wang. 2023. Feeling Connected: The Role of Haptic Feedback in VR Concerts and the Impact of Haptic Music Players on the Music Listening Experience. In *Arts*, Vol. 12. Mdpi, 148.

[112] Himanshu Verma, Jakub Mlynar, Roger Schaer, Julien Reichenbach, Mario Jreige, John Prior, Florian Evéquoz, and Adrien Depeursinge. 2023. Rethinking the Role of AI with Physicians in Oncology: Revealing Perspectives from Clinical and Research Workflows. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (CHI '23)*. Association for Computing Machinery, New York, NY, USA, 1–19. https://doi.org/10.1145/3544548.3581506

[113] N. Wallerstein, J. Oetzel, Shannon Sanchez-Youngman, Blake Boursaw, E. Dickson, S. Kastelic, P. Koegel, J. Lucero, M. Magarati, Kasim Ortiz, Myra Parker, J. Peña, Alan N. Richmond, and B. Duran. 2020. Engage for Equity: A Long-Term Study of Community-Based Participatory Research and Community-Engaged Research Practices and Outcomes. *Health Education & Behavior* 47 (2020), 380–390. https://doi.org/10.1177/1090198119897075

[114] Etienne Wenger. 1998. *Communities of practice: Learning, meaning, and identity*. Cambridge University Press, New York, NY, US. https://doi.org/10.1017/CBO9780511803932 Pages: xv, 318.

[115] Langdon Winner. [n. d.]. Do Artifacts Have Politics? ([n. d.]).

[116] Chloe Xiang. 2023. Microsoft Shuts Down Legendary VR Metaverse. https://www.vice.com/en/article/microsoft-shuts-down-metaverse-altspacevr/

[117] Michael Yin and Robert Xiao. 2023. Drifting Off in Paradise: Why People Sleep in Virtual Reality. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI '23)*. Article 498, 13 pages. https://doi.org/10.1145/3544548.3580947

[118] Victor Zappi and Andrew McPherson. 2014. Dimensionality and appropriation in digital musical instrument design. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. 455–460.

[119] Viviana A. Zelizer. 1996. Payments and Social Ties. *Sociological Forum* 11, 3 (1996), 481–495. https://www.jstor.org/stable/684897 Publisher: [Wiley,

Springer].

[120] Amy X. Zhang, Michael S. Bernstein, David R. Karger, and Mark S. Ackerman. 2024. Form-From: A Design Space of Social Media Systems. *Proc. ACM Hum.-Comput. Interact.* 8, CSCW1 (April 2024), 167:1–167:47. https://doi.org/10.1145/3641006

[121] Yurou Zhang, Shichao Zhao, Kamarin Merritt, Yurou Zhang, Shichao Zhao, and Kamarin Merritt. 2025. "Meme-ing" Across Cultures: Understanding How Non-EU International Students in the UK Use Internet Memes for Cultural Adaptation and Identity. *Behavioral Sciences* 15, 5 (May 2025). https://doi.org/10.3390/bs15050693 Company: Multidisciplinary Digital Publishing Institute Distributor: Multidisciplinary Digital Publishing Institute Institution: Multidisciplinary Digital Publishing Institute Label: Multidisciplinary Digital Publishing Institute Publisher: publisher.

[122] Pengyu Zhu, Yiming Yao, Haiyue Lu, Tse Pei Ng, Celeste Seah, Janghee Cho, Yiying Wu, and Jung-Joo Lee. 2025. Unveiling the Invisible Work of Migrant Care Workers in Aged Care Homes: Implications for Future Care Technologies. In *Companion Publication of the 2025 ACM Designing Interactive Systems Conference*. Association for Computing Machinery, New York, NY, USA, 329–334. https://doi.org/10.1145/3715668.3736372

[123] Linnea Öhlund and Mikael Wiberg. 2025. Social Justice in HCI: Current Streams, Considerations, and Ways Forward. *Interacting with Computers* (March 2025), iwaf009. https://doi.org/10.1093/iwc/iwaf009