From Screens to Projector, Wall, and TVs: Conceptualizing Livestreams as Design Material for Direct and Indirect Viewership Experiences

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Livestreams are now ubiquitous—moving beyond web and mobile-based platforms into products such as fitness machines and smart home assistants. As such, viewership practices have also become varied and diverse: livestreams are used for interactive entertainment, social companionship, and multi-perspective spectatorship for music festivals and sporting events. At the premier in-person gaming livestream event, Games Done Quick (GDQ), attendees engage in a variety of different viewership practices across different event spaces where the livestream is projected on large stage screens, onto walls as peripheral displays, and routed to televisions in hotel venue rooms. This study takes GDQ as an information-rich fieldsite to examine how livestream viewership shifts, changes, and interleaves across physical spaces to provide an expanded livestream experience. From 11 semi-structured interviews with GDQ attendees and participant observations at three GDQ events, we found diverse practices of both direct and indirect viewership: the livestream is viewed in collocation with an audience and stage, but is also used to establish viewership continuity across disjoint spaces, tangentially to shop for interesting moments, as a timekeeping device, and even as a means of auditory obfuscation. To unpack these forms of viewership, we conceptualize livestreams as design material and identify its two key qualities of *focality* and *metacontent*. We illustrate how examining livestreams' focality and metacontent qualities allow us to understand the relationship between different livestream configurations and different viewership behaviors, as well as chart out new under-explored design directions for livestreaming that blend physical and digital spaces.

CCS Concepts: • **Human-centered computing** → **Empirical studies in HCI**; *Displays and imagers*.

Additional Key Words and Phrases: livestreaming; materiality; technology as design material; technology configuration; viewership/spectatorship experience; video gaming

1 INTRODUCTION

From its ad-hoc grassroots beginnings, livestreaming has developed into a highly immersive form of social interactive media [20, 21, 64], steadily replacing traditional televised broadcasts [17]. Twitch, the largest online livestreaming platform, has seen unprecedented viewership growth [74], garnering an average of 2.5 million daily concurrent viewers in 2021 [65]. Livestreaming's growth

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in popularity has been attributed to its socially immersive streamer-viewer interactions via the chatroom [20, 21, 33, 64] and donations [32, 40, 72].

HCI and CSCW research have highlighted how online communities are supported through livestream technologies on web-based platforms such as Twitch, Instagram, or Facebook. These works focused on social interaction practices [14, 16, 33, 75], community building and management [5, 38, 39, 70, 71], and viewers' support behaviors for streamers [4, 26, 40, 72]. Studies on other livestreaming platforms such as Periscope and Meerkat found audiences are drawn towards the low-production, unfiltered quality of mobile livestreams as it provides more authentic streamer-viewer social interactions [20, 36, 54, 62].

Yet livestreaming is not limited to interactions on the desktop and smartphone screen. The video gaming industry has long incorporated projected livestreams into tournaments [24] and conventions [63, 64]. Livestream integration has also reached consumer products: fitness company Peloton Interactive offers livestreamed workout classes directly into their treadmills and exercise bikes [57], and livestreamed cooking classes are offered via smart home assistants like the Google Nest and Amazon Echo [51].

Moreover, research has begun to highlight how different genres of livestream content exhibit different kinds of livestream use and viewership behavior. One of the three common genres of livestreams are content-driven livestreams (i.e., gaming, art, programming) where researchers have focused on designing interaction-elevating tools to support streamer-viewer relationships and facilitate community growth [14, 33, 38, 75]. Many of these interactions were also observed and studied as donation-mediated interactions [31, 32, 40, 72, 73]. Another common form of livestreaming centers around providing viewers with relaxed, slower-paced viewing experiences instead of highly engaging viewership. This subgenre includes using livestreaming as a form of social companionship [1], group study-along sessions [30], and vicarious outdoor nature experiences [39], repurposing livestreams as a kind of ambient technology. A third type of viewership focused by HCI and CSCW researchers multi-perspective spectatorship of a public event (e.g., concert, festival, convention) where multiple broadcasts are combined to interleave different perspectives to form uniquely curated spectator experiences [12, 47, 66].

Taking stock of current literature identifying distinct viewership behavior and motivations across different livestreaming subgenres, we observe how these forms and practices of viewership are not mutually exclusive from one other. Our observational fieldwork at Games Done Quick (GDQ), the flagship video game livestream event featuring the speedrunning subculture, and interviews with attendees of GDQ shed light on how livestream viewers are dynamic users whom continually shift between multiple viewership forms across physical and social spaces. Our work is also rooted among past studies examining how livestream platform successfully motivate online stakeholders to donate to charitable causes within a short time span [45, 55, 71]. Here, we focus on the physical viewership of large in-person livestreamed events, specifically how the event livestream is woven into physical event spaces to augment attendees' social experiences. We examine three key event spaces at Games Done Quick, each with their own livestream setup and corresponding viewership behaviors: on large screens for engaged and collocated viewing, on peripheral walls of gaming spaces for tangential viewing, and on televisions in hotel rooms for private configurable viewing. This study takes GDQ as an information-rich fieldsite to examine how different forms of livestream viewership—direct, ambient, and multi-perspective—can be woven together to create an extended livestream experience more diverse than its constituent parts.

To unpack these forms of viewership, we found it useful to take the conceptual framing of materiality. Namely, we adopt Nelson and Stolterman's conception of material to encompass both the physical and abstract qualities used in the design of processes and experiences [49]. We also borrow Lambton-Howard et al.'s analytical model to consider how digital base design materials

(e.g., social media technology) are configured and augmented to improve its overall design [29]. Our work maps livestream *configurations*—assemblages [60] of livestream broadcast hardware, software, and physical spaces—to their corresponding viewership *augmentations*—diverse forms of viewership ranging from large attentive collocated viewership to momentary peripheral peeks. This mapping surfaced two key qualities when conceptualizing livestreams as material for design: *focality* and *metacontent*. Identifying focality and metacontent allows a more precise understanding of livestreams' varied configurations and augmentations. For example, we find that most livestream-supporting software promote high focality, high metacontent forms of viewership for increased engagement. At the same time, we find untapped opportunities to further explore low engagement livestreams or livestreams with interweaving focality-metacontent combinations.

2 BACKGROUND

This paper examines the video game subculture of *speedrunning* and their livestream viewership practices at a speedrunning-focused convention (Games Done Quick). As the remaining content of this paper revolves heavily around the experience of watching speedrun livestreams in different event spaces, we now provide a brief primer on the speedrunning subculture, the Games Done Quick event, the GDQ livestream overlay, and the three main GDQ event spaces with their livestream configurations—where and how the livestream is setup in the room.

2.1 Speedrunning and their Early Adoption of Livestreams

Speedrunning is the practice of completing video games in the shortest amount of time possible by optimizing gameplay execution and exploiting in-game glitches [28]. Early speedrunning between the late 1990's and early 2000's consisted of recording one's fastest game completion attempt on VHS and mailing it to the administrator of SpeedDemosArchive, a centralized website hosting speedrun records [56].

When livestreaming platforms grew in prominence in the late 2000's [64], speedrunners quickly adopted them because they provided convenient, virtual gathering grounds to discuss strategies, witness live world record attempts, and supported the shift to more accessible digital archiving formats [56]. The speedrunning community was among the earliest to fully embrace livestreaming technologies, and today demonstrates well-honed livestream broadcast and viewership practices. Thusly, the study of this subculture provides insights for livestream interaction design.

2.2 Games Done Quick and Charity Livestreams

In 2010, a group of speedrunners, inspired by the esoteric video game charity fundraiser Desert Bus for Hope [15], gathered to hold a 24-hour charity marathon wherein they would stream runs of popular games to promote their fundraiser [56]. This event, called Classic Games Done Quick and later Games Done Quick, rapidly grew in popularity and established itself as the flagship video game charity fundraiser [34, 55], reaching beyond its niche subculture and into wide popular media [9, 18, 41]. Livestreamers and charity organizers have since proven to be natural allies: livestreamers participate in social good to grow their personal brand and charity organizers offload production, marketing, and publicity labors to livestreamers [45]. Supporting nonprofit volunteer work through design is of ongoing interest in HCI and CSCW, particularly in online public outreach [19, 48], remote volunteer coordination [68, 69], and legitimacy-building [27, 42, 61]. This study continues the ongoing dialogue between livestreaming and charity fundraising events by closely examining how these events are configured to facilitate unique fundraising experiences.

Fig. 1. A screen capture of AGDQ 2019's livestream featuring the speedrunner *Bayleef* playing *Super Mario Odyssey*. Video sourced from Games Done Quick's official YouTube channel https://www.youtube.com/channel/UCI3DTtB-a3fJPjKtQ5kYHfA.

2.3 The GDQ Livestream

As the leading online charity fundraiser, Games Done Quick's livestream overlay is a widely recognized design on Twitch [8]. The livestream overlay is the interface between the livestream's virtual broadcast and its physical display medium. Our interview participants made frequent and specific references to GDQ's livestream elements as they described their viewership behaviors. Here we detail the composition of the GDQ livestream overlay followed by a description of the event spaces these livestreams occupied.

The center focus of the overlay is the *game capture feed*, a direct video relay from the game console (Figure 1–1). Secondary is the *camera feed* displaying the featured speedrunner and their commentators on the stage (Figure 1–2). To the side is an *informational panel* housing various details about the run; most notably for our study, this panel includes a *live timer* and the run's *estimated completion time* (Figure 1–3). A second panel cycles through different sponsors for the event (Figure 1–4). At the very bottom is a banner providing progress updates on donation incentives, donation goals, prizes, and upcoming scheduled games (Figure 1–5). Finally, a *live donation counter* (Figure 1–6) is located at the bottom-right corner.

2.4 The Livestream in GDQ Event Spaces

The livestream is displayed in three spaces at GDQ: the main livestream event ballroom, the open casual gaming and practice space, and the hotel rooms. We took these spaces are opportune fieldsites to explore the viewership practices of the speedrunning community.

In the main livestream room (shortened as *stream room*), the livestream is projected onto large screens between the audience and the live stage using high-powered projectors and high-fidelity speakers for viewing clarity (Figure 2 left). Three projectors are spread across the stream room to ensure convenient viewing angles regardless of position in the audience.

Outside the stream room, the *practice room* is a large space outfitted with hundreds of CRT televisions, LCD monitors, and game consoles for attendees to borrow and play video games. The

Fig. 2. Left: the stream room—the livestream projector screen is between the audience seating and the live stage. Right: the practice room—the livestream is projected directly on the peripheral wall of the gaming setups. Both pictures taken during the first-author's fieldwork at AGDQ 2019.

practice room is the go-to place for speedrunners to play games and socialize. To avoid detracting from the social atmosphere, the livestream is projected off to a side wall and kept at a low volume (Figure 2 right).

The livestream is also routed directly to the televisions in the venue's hotel rooms, allowing attendees to watch the event from the comfort and privacy of their rooms. GDQ first implemented this in 2016, and it has become a regular amenity at each of its hotel venues.

3 RELATED WORKS

Livestreaming sprung from the intersection of online chatrooms, voice over IP services, and camming culture [64]. Early livestreaming was valued for its authenticity resulting from its low-production, amateur, and often improvised formats [20]. Initial HCI studies on livestreaming culture focused on how its technology is conducive for immersive social interaction through its real-time broadcast and chatroom interactions [20] as well as its ability to act as a virtual gathering space for people of similar interests to grow and build a community [21].

3.1 Types of Livestream Viewership

The rapid growth of livestreaming spurred a diverse landscape of subcommunities and genres all with their own set of viewing and interactive practices. Three viewership forms that have been of

research interest by HCI researchers are direct attentive viewership, ambient social viewership, and multi-perspective viewership. Each of these are exhibited across GDQ spaces.

3.1.1 Facilitating Streamer-Viewer Interactions for Direct Viewership. To support more direct attentive viewership, HCI and CSCW researchers have explored designing content-specific livestream tools to facilitate streamer-viewer interactions [14, 33, 38, 75]. Two exemplar livestream tools developed by the HCI community are *Snapstream* and *Helpstone*. For digital art livestreams, Snapstream allow viewers to take screenshots of the ongoing art piece and add annotations, comments, and scribbles as a more contextually-situated form of feedback. Snapstream thereby facilitates viewers to converse with each other, share jokes, and develop their own community-driven creation pieces [75]. For gaming livestreams, Helpstone was developed specifically to assist streamer-viewer interaction for streamers of the popular strategy videogame *Hearthstone*. As the game requires complex strategies opaque to casual viewers, Helpstone provides statistic visualizations to help streamers communicate their decision making processes, aid streamer-viewer strategy discussions, and create a more welcoming space for new players [33]. In these subculture-specific contexts, livestreaming provides the digital space for these subcultures to interact, share their passions, celebrate their craft, and grow their communities, and these tools help amplify these livestream activities.

3.1.2 Personalizing Ambience. In contrast to the above studies focusing on facilitating direct streamer-viewer engagement, others studies take an interest in passive modes of engagement. One popular livestream genre is the *study along* livestream. These livestreams feature streamers reading, writing, and other forms of studying, inviting viewers to do the same. Lee et al.'s [30] study noted how the low commitment required of study along livestreams provided a malleable viewership fitted to each viewers' desired experience. Viewers can keep the livestream playing in the background as a study companion, for social motivation, or interact with the streamer and other viewers for emotional support, gaining a sense of social presence. Food and eating [1] and nature outdoor walking [39] livestream subcultures also prioritize their role as ambient technologies. While community-building remains a cross-cutting motivation, these studies also demonstrate viewers' desire for more casual and personalized viewership experiences.

3.1.3 Multi-perspective Viewing. The ubiquity of mobile phones and readily-available streaming apps has given rise to *multi-perspective livestreaming*. At physical events (e.g., concerts, sports events, festivals), attendees often livestream the event from their mobile phones. While this provided online viewers the ability to curate a personalized viewing experience with high degrees of immersion and entertainment [20, 66], it also became a challenge to manage the information density of simultaneous livestreams; researchers have explored designs to alleviate these challenges. Mostafa et al. [47] integrated replay functions in a video, audio, chat aggregating livestream platform and found users valued content-dense viewing experiences but were overwhelmed by its simultaneity. To counteract this, users deftly used the replay function to sift through the livestream to ensure they did not miss interesting happenings. Velt et al. [66] and Dezuli et al. [12] both examined the viewer experience of watching simultaneous event livestreams and explored the tension between *virtual viewership* and *physical attendance* of the event. Velt et al. [66] notably concluded that viewers of simultaneous livestreams seek not a proxy experience of "being there" but instead a more diverse form of viewership interleaving multiple threads of experience. Such experiences enrich social presence, increase social and spatial awareness, and encourage spectator interaction [12]. Similar desires for expanded, embodied experiences in livestream spectatorship were identified at by Sher and Su [55] and Lu et al. [40].

Rather than viewing multiple livestreams of the same event from different perspectives, Games Done Quick attendees view a singular livestream of the event (the speedrun) across different venue spaces. We examine this adjacent variation of multi-perspective livestream viewership, bringing to attention similar dynamic, interleaving viewership experiences.

3.2 A Material Approach to Livestreams

We conceptualize livestreams as design material to unpack how viewing experiences of livestreams change in tandem with different spaces. This focus stems from a broader discussion in HCI on technology *as material for design* instead of *a product of design* [22, 23, 37, 49]. This material conceptualization "opens up and exposes the tacit, invisible value systems and practice habits" of technology designers, pushing technology design as an interdisciplinary field [3].

The work most germane to this study's approach is by Lambton-Howard et al. [29] where they conceptualized social media technologies as material for designing online platforms for coordinated participation. Lambton-Howard et al. drew commonalities in how coordinated work is conducted across three different social media platforms, examining each case's *configuration*—manipulation of elements intrinsic to media technologies such as group size and modes of communication—along with their *augmentation*—design decisions that enhance the base material as well as the social practices in using the social media for coordination. This approach brought to surface four material qualities of social media—morphology, role, representation of activity, and permeability—and were used as analytical lenses in designing social media platforms. They also emphasized how social media can be used "as raw material [for design] with which something else is realized" [29]. We take a similar material-grounded approach to livestreams, identifying the configurations and augmentations of livestreams to demonstrate how expanded viewership experiences are realized in livestreams.

Beyond Lambton-Howard et al.'s work, literature covering livestreaming technologies and other adjacent technologies do not explicitly use a material lens. However, we do see much of this literature speaking similar tones of material configuration and augmentation. Revisiting the three types of livestream viewership (cf. Section 3.1), we can frame these works as exploring how livestreaming can be used as material for realizing specific viewership experiences. Yang et al. [75], Lessel et al. [33], and Faas et al. [14] all explored on how software tools for the livestream overlay can be designed to augment streamer-viewer social interactions. Studies on ambient livestreams examined how viewers reconfigure livestreams as periphery media to realize desired social and emotional companionship use [1, 30, 39]. For multi-perspective livestreams [12, 47, 66], multiple livestreams are configured together to augment viewer experiences beyond vicarious attendance. We use the language of materiality as lens to further unpack livestreaming's complexities.

4 METHODS

To observe and experience how the speedrunning community interacts and uses livestreams at Games Done Quick, the first author attended three separate GDQ events: AGDQ 2019 (January 6–January 13), SGDQ 2019 (June 23–June 30), and AGDQ 2020 (January 5–January 12). Structured participant observations were conducted at AGDQ 2019 with ethnographic techniques [50]: open unstructured observations, temporal mapping of attendees' activities in spaces near livestreams, and spatio-temporal mapping of how attendees moved across event spaces. Structured observations of public GDQ event spaces (the stream and practice room) were 1–2 hour sessions with fieldnotes, sketches, and photos documenting activities attendees were engaged with (e.g., watching the livestream, watching or playing video games, chatting with friends), constructing an activity blueprint with respect to different livestream configurations. The first author also conducted participant observations [11] at SDGQ 2019 and AGDQ 2020, watching the livestream in the event

room, playing video games with other attendees in the practice room, and participating in small social gatherings in hotel rooms. No observations nor notes were taken during the private gatherings attended by the first-author, however reflective notes were written afterwards summarizing these experiences. All observation procedures were approved by our university's Institutional Review Board. Overall, activities at GDQ were observed to mainly take place in the event livestream room, practice room, and hotel rooms, impelling us to develop an interview protocol focused on these spaces.

Semi-structured interviews [43] with 11 Games Done Quick attendees were conducted from June to August of 2021. Since the interview questions asked participants to describe their viewership behavior and social activities in hotel rooms, participants were recruited via contacts the first author had established at GDQ events. Interviews averaged 55 minutes and were conducted over Discord, an online voice and text messaging platform preferred by the speedrunning community. Participants were not compensated. Each participant on average attended 4.5 GDQ events (min = 1, max = 7). Our participants spanned different attendee types (6 casual attendees, 2 featured runners, 3 event volunteers) and varying involvement with speedrunning communities (2 casual and 4 dedicated followers of general speedrunning, and 5 active members of a specific speedrun game). Overall, our participants engaged in a diverse range of activities at GDQ: P1, P2, P6, and P8 were volunteers of GDQ who spent extended time in the stream room; P4, P5, P7, and P11 focused on playing videos games with other community members in the practice room; and P3, P8, and P10 spent most of their time in the venue hotel room with friends.

During interviews, participants were asked to detail their viewing behaviors and social activities in the stream room, practice room, and hotel rooms, including where they were positioned in the event space, what activity they were engaged with in the space, how frequently they were watching the livestream, what livestream content they focused on, what drew their attention to or away from the livestream, and how viewing the livestream affected their social activities. Floor plans and photographs of AGDQ 2019, SGDQ 2019, and AGDQ 2020 were provided to participants on an online whiteboard tool (Miro) where they could sketch and annotate to better recollect and articulate their experiences [44, 59].

Interview transcripts, observation notes, and personal vignettes were analyzed using a grounded theory approach [10]. Transcripts were open coded to identify emergent themes and axial coding was used to examine cross-cutting themes. Codes and themes were iteratively developed by authors in a common codebook. Codes developed included direct viewership, parallel viewership, tangential viewership, speedrunning-related social activities, background and ambience, timekeeping, always-on livestream, and shifting to livestream. Memos were used throughout the coding process to further develop thematic findings and form the genesis of our findings.

5 FINDINGS

Our participants reported varied viewership practices reflective of the different livestream configurations across event spaces. These practices include forms of direct and indirect viewership. Attendees exhibited direct, attentive viewing of both the livestream and live stage while in the stream room. Direct viewership was also practiced in hotel rooms by curating the television as a personalized miniature stream room stage. We also observed indirect viewership practices: livestreams being used as ambience in the practice room, tangentially viewed in multiple brief moments in the stream and hotel rooms, employed as a timekeeping device for the event's shifting schedule, and repurposed as an audio obfuscation tool to facilitate party games. Here we detail our participants' descriptive accounts of these viewership experiences, drawing attention to how these experiential qualities were facilitated through the livestream's configuration.

5.1 Direct Attentive Viewership Experiences

5.1.1 Sanctity of Collocated Livestream Viewership. Our participants report the sharing of the same space as the live event stage to hold a viewership quality unique in its physicality. This was made most apparent in our participants' recollection of SGDQ 2019's finale when the event reached a record $3 million in fundraising. Attendees had *"flooded through the doors"* (P8) into the stream room to witness this milestone in-person. The audience collectively watched the *"donation counter go up and up"* (P2), joining together to count down the final 100 thousand USD in unison (P6). The first author stood at the far back of the room during this moment and watched the donation counter tick over $3 million across *"an ocean of audience members"* all jumping and cheering. This collocated viewership is unique to the GDQ stream room as speedrun livestreams are primarily viewed virtually on Twitch. To share the stream room with fellow speedrun community members in celebration of their craft and philanthropy is the quintessential speedrun community experience.

This collective viewing experience is even described as *"sacred"* (P7). This is exemplified by P7's unsavory encounter with two attendees who had squeezed into a single chair next to them, *"basically sitting on [P7]'s lap"* and leaving them *"absolutely no space"* to watch the livestream comfortably. They were also *"chatting loudly, being annoying, and [creating] an unenjoyable experience"*. P7 assumed these two were first-time attendees, but still felt that they were disrupting the *"reverence"* of the room as they did not give the livestream *"the attention and respect it deserves"* (P7).

This reverential experience is explicitly upheld through GDQ's code of conduct, which specifies *"ZERO TOLERANCE for general disruption of the event"* [35]. P1 and P9, both active volunteers at AGDQ 2020, explained they had to be constantly *"looking over the crowd to look for [disruptive attendees]"* and *"reporting them to event enforcement volunteers"* (P1) to preserve the sanctity of the stream room's viewing experience.

5.1.2 Livestream and Live Stage Parallel Viewership. Our participants reported parallel viewership practices between the livestream and live stage. When our attendees described their moment-to-moment viewing behaviors beyond the projector, they called it *"peeking"* (P2) at the stage. P5 explained how they felt a *"a sense of duty [to watch] the runner [on stage]"* and not just the stream (P5). Our attendees identified the viewing of the embodied gameplay and *hype* moments on the stage to be key GDQ experiences.

Viewers highly value watching the physical virtuosic gameplay of speedrunners as they perform highly-difficult techniques such as rapid *button mashes* and millisecond-precise, *frame-perfect inputs*. P3 watched the Guitar Hero run just to admire the runner *"mash away non-stop on the controller"* for 30-minutes. P2 highlighted, with zeal, witnessing the execution of the *Zombie Hover*, a notoriously difficult technique in Zelda: Link to the Past that involves consecutive *frame-perfect inputs* with extended button mashing strewn in between. P2 described how special it was to watch the runner physically *"hold the controller against their knee to mash really fast"* instead of just seeing it on the projector. To these attendees, the essence of the stream room viewership experience is in beholding the embodied gameplay performances on the stage.

The stage also grabs attention during moments of *hype*—moments of high excitement and tension [58]. At SGDQ 2019's Luigi's Mansion run, the runner successfully executed a crucial time-saving trick *"on the last possible frame by a stroke of luck"* (P4). P4 recalled, while laughing, that in the middle of *"the whole crowd cheering [in] shock,"* they also caught the runner's look of bewilderment on stage as they were in just as much disbelief; the ability to directly witness the runner's on-stage reaction made the moment *"most memorable."* P7 shared a similar experience during AGDQ 2020 when they watched the runner defeat the final boss of Zelda: Skyward Sword blindfolded, explaining that *"[seeing] the physical aspect of [the runner] being blindfolded"* made the run an exceptional viewing experience even though *"all [they] could see on the stage was the*

back of the runner's head" (P7). P2 and P3 identified non-gameplay moments of hype to be viewing exemplars. During AGDQ 2020's Mario Maker relay race, they both found it entertaining to watch the team members exchange controllers and chairs, as if playing a *"chaotic [version of] musical chairs"* (P2). The runner's on-stage *"emotions"* and *"[bodily] animations"* were *"much more interesting than just the 2D perspective on the screen"* (P2), and the *"spectacle of all the players... being a little manic and running around in circles"* was the most entertaining for P3.

For the speedrunning community, the collocation with the live stage affords a *"surreal"* (P7) physical viewership quality. P8 used the stage to check if it *"matches up with [with the livestream]... [confirming] what [they are] seeing is real."* This behavior unveils a peculiarity among the stream room spectators: the live stage is technically the "real" event and the livestream its broadcasted "replica"; yet GDQ attendees' treat the livestream as the de facto event and the stage as its secondary. This converse relationship is not unique to the speedrunning community but a tension common among all gaming communities. Gaming conventions like Games Done Quick are physical gatherings of an otherwise online community, a contested space that blurs the boundaries between the offline and online, what is "game" and what is "not game" [63]. This blurred boundary is embraced in the stream room by symbiotically combining the livestream with the live stage to achieve the stream room's unique viewership experiences.

5.1.3   Livestream Viewership Continuity. The GDQ livestream is a week-long marathon. Attendees watch the livestream even when they are not in the stream room to remain connected to the event. P1, P2, P3, P5, P8, and P9 all noted how they often became fatigued by the stream room and would retreat back to the comfort of their hotel rooms to *"take a break from it"* (P2). Our participants indicated they would unconditionally keep the hotel television on the livestream channel. P2 explains that *"having the livestream in the room is perfect"* since they *"always want to be watching [runs]"* regardless of where they are. P4 used the livestream just as *"something nice to chill and relax to [when they] wind down from the day."* Our participants all reported the livestream was the only channel they watched in their hotel rooms.

Attendees weave together the viewing experience between stream and hotel room by keeping the hotel television playing the livestream even when they are away from the room, using it as an ever-present ambient display. In this configuration, attendees can still *"participate in the event as a whole when they are not physically [in those spaces]"* (P2). P1 reported they and their roommates would *"just leave [the television] on so it's immediately ready"* for viewing when they *"walk back in [the room]"*. P9 also *"didn't [ever] bother turning [the television] off"* when leaving the room. This persistent use of the television was even a point of conflict between P2 and the hotel's housekeeping where *"housekeeping would [keep turning] the television off"* but the latter realized this was an intentional use of the television as part of the attendees' experience and *"learned to just keep it on"* (P2).

P1, P2, P10, and the first author even kept the livestream on low volume as they slept in the evenings. P2 in particular used the television's timer function to turn the livestream off after they fell asleep; but their roommate, who would wake earlier, would turn the television back on *"first thing in the morning"* so that P2 would wake up to the livestream *"already playing."* By keeping the livestream always playing on the television, attendees interleave together the stream and hotel room viewing experiences—the livestream is autonomously paused and resumed just by virtue of moving between the two spaces.

5.1.4   Creating a Private Stream Room. Hotel rooms are used for private social gatherings. The livestream is the social centerpiece around which attendees gather and create their own miniature stream room experience. P11 frequently held gatherings of 3–4 friends to relax and chat in their hotel room, during which the *"TV [would be] kept on a lot"* but *"be muted"* to prevent detracting

from the conversations. However when there was *"an actual run that [they] wanted to watch"*, the livestream would be unmuted, cueing everyone to shift their focus onto the livestream. P11 and their friends would talk about the run, providing their *"own commentary,"* mimicking the living room social milieu displayed on the GDQ livestream [55]. These casual conversations about the livestream are only possible in the hotel rooms as doing so in the stream room would disturb the aforementioned *"sacred"* viewing experience.

These small gatherings are enhanced further when attended to by a speedrunning expert who can provide in-depth insights beyond the livestream commentary. The first author was invited to a private gathering of well-respected speedrunners at SGDQ 2019. The livestream started a run of a game specialized by speedrunners present in the room. Everyone promptly turned their attention towards the television and one of the runners in the room "became" a commentator. They provided detailed explanations of the mechanics and glitches showcased on the livestream, answered questions, and even explained the on-stage runner's personal strategies. One glitch involved a precise but mechanically-awkward *"ricochet off an enemy"* that allowed the player to fly through the air at *"21 times the normal speed."* The commentator in the room explained that the runner *"usually takes 3–4 attempts"* before succeeding; when the runner got the glitch on their first try, the room all gasped in awe as it was understood that this was an exceptional performance.

In these hotel room spaces, attendees configure the livestream television as a *"digital hearth"*—a space facilitating interaction across diverse demographics [68]. Sher and Su [55] described the GDQ livestream's camera feed as a *specialized digital hearth* for viewers to virtually participate in the on-stream conversations, banter, and jokes. Our findings of physical attendees gathering around the hotel room television to watch speedruns with a personal commentator describes an alternate *digital hearth* configuration—a privatized stream room mimicking the social milieu displayed on the livestream.

5.2 Indirect, Tangential Viewership Experiences

5.2.1 Establishing Ambience. Our participants reported varied forms of indirect livestream viewership practices. Instead of attentive spectatorship as observed in the stream and hotel rooms, attendees also pushed the livestream into the periphery, only glimpsed at in momentary snippets. In the practice rooms, our participants described the wall-projected livestream as *"background filler"* or *"interesting background noise"* (P4). Since attendees were mainly focused on playing games with friends, attendees pushed aside the livestream but retained awareness that the livestream was *"always on the wall"* (P9)—a constant background companion.

However, despite being pushed into the background, the presence of the livestream is critical to the ambient quality that defines the practice room experience. P9 explains that without the livestream, the practice room devolves into *"just another LAN [party] with a bunch of gamers."* In our interview, P4 circled the livestream on the floorplan and identified it to be *"always there;"* without it, the room *"would be a lot more eerie"* (P4). Thus, the livestream is the essential component in establishing the mise-en-scène of the practice room.

5.2.2 Tangential Viewing. Our participants described watching the livestream on the wall as means to *"peek"* (P3) into the stream room while playing games with friends. P7 recalled spending an extended period of time in the practice room with friends, during which the livestream was showcasing Doom 2016, a fast-paced action-shooter known for its stellar visuals. Even though P7 was *"primarily focused on [playing the game],"* they would find moments to *"look over occasionally"* to catch glimpses of the *"colorful explosions"* happening on the stream.

P2 and P10 were both on a constant lookout for glitch showcases and would take an extra moment to watch them on the livestream when they do occur:

> I'm not purposefully sitting down to watch [the livestream], but I'll always kind of look over and check to see *"oh what's happening on stream right now"* or *"oh this [trick] is coming on right now."* (P2)

> If I see a game I know I would be thinking *"oh I've played this [game], I know this [game]"* [or] *"oh my god WHAT ARE THEY DOING!?!"* (in response to a glitch) (P10)

These *"peeks"* (P3) provide attendees a view of the stream room without physically being there. P4 and P5 both highlight this affordance to explain why the practice room is the default social gaming grounds—one can *"hang out with everyone but still see what's happening [in the stream room]"* (P4).

In addition to interesting gameplay moments, attendees also frequently check the donation counter at the bottom-right of the livestream in anticipation for donation milestones. In interviews, P1, P2, P6, P9, and P10 all circled the donation counter as a must-check livestream component when they take glances at the livestream.

> If there's a [donation] milestone we're reaching, like passing 1 or 2 million, it doesn't matter where you are, everyone cheers. (P1)

> There is something integral to the GDQ experience to being able to look at that livestream and go *"oh holy shit we're about to hit this major milestone"* and run [to the stream room] to experience it in person. (P2)

> It's a donation total milestone, so yeah it's interesting like when they reach 1 million or 2 million. I wouldn't want to miss it. (P10)

As a peripheral display in the practice room, the livestream provides a *window shopping* experience. Games Done Quick's rotation of ~150 games, each with their own runner and commentators, intertwined with donation milestones, provides an abundance of interesting livestream moments. Attendees use the peripheral livestream in the practice room as a form of low-commitment viewership, taking brief peeks in search for opportune moments to catch exciting happenings and curate their own personal collection of GDQ experiences.

5.2.3 Livestream as a Timekeeping Device. Games Done Quick has a constantly shifting schedule that revolves around the start and finish of streamed speedruns. In practice, the completion time of speedruns can stray from the schedule upwards of 30–45 minutes. With activities revolving around speedruns at GDQ, this results in an inherently unpredictable flow of time for its attendees. To remedy this, the *live timer* and *run estimate* informational components on the livestream overlay is used as a timekeeping device to help attendees synchronize to GDQ's ever-shifting schedule.

Attendees use the informational panel (Figure 1–3) of the livestream to calculate time intervals in terms of *"time before estimates."* (e.g., a 30 minute differential between the *live timer* and *run estimate* would be referred to as *"30 minutes before estimate"*). For instance, P2 explained how they were interested in watching Zelda speedruns which were scheduled after the Dark Souls run. Instead of checking clock-face time, P2 would *"check the progress of [the Dark Souls run] on the livestream and head to the stream room 10–20 minutes before estimate."* P10 explained how it was only *"safe"* to go get food if there was enough time left before the completion of the current game. Similarly, P8 would use the timer and estimate to calculate how many games they could play in the practice room before the next run starts.

Livestream-based timekeeping is critical for runners. P4, a featured runner at AGDQ 2019, explained how their run preparations were all scheduled in terms of *"time before estimates."* P4 asked their friend to *"wake [them] up 2 hours before estimate,"* scheduled to meet with their commentators

in the practice room *"1 hour before estimate"* to go over final preparations, and *"head into the stream room 30 minutes before estimate;"* all these instances were calculated with reference to the livestream overlay. P7 echoed the same timekeeping behavior as they helped a friend who had a run at 5 A.M., staying up in the hotel room playing games while keeping an eye out for *"1 hour before estimate"* on the livestream. The timekeeping utility of the livestream elucidates a use of the livestream configuration separate from the viewership experience but instead is critical to the event-going experience.

5.3 Livestream as Audio Obfuscation

P4, P5, and P7 described another unexpected use of the livestream: as an auditory obfuscation tool to improve the experience of in-person party games—social deduction games—that are frequently played in hotel rooms. Social deduction games revolve around an "uninformed majority" and "informed minority." Each round involves the minority players making covert decisions to undermine the majority players; typically, this is accomplished by having all players close their eyes and then letting only the minority players open their eyes to communicate with each other and covertly make decisions. However, movements by the minority players are sometimes unintentionally picked up by the majority players (e.g., via slight body shifts felt through the couch or rustling that can be heard), leading to extraneous information that trivializes the identification of the hidden minority group.

The use of this extraneous information, referred to by participants as *metagaming*, is frowned upon as it *"hurts the game"* (P4). However, even among compliant players, metagaming is unavoidable and becomes a point of frustration. To resolve this, P4, P5, P7, and their friends would use the hotel television to *"control the noise level in the room"* (P4), turning the volume up to obfuscate the leaking of unintended auditory information. Players would *"actively listen [to the livestream] to prevent hearing stuff in the immediate surrounding[s]"* (P7). Furthermore, since all attendees were avid speedrunners, the livestream *"always [provides] something interesting to listen to"* (P7). In this scenario, the ability to mute and change the volume of the livestream improved the attendees' social experience.

The livestream in this use case still retains its purpose to connect the attendees back to the charity event. At AGDQ 2020, P5 decided to play music instead of using the livestream to prevent metagaming. P4 was conflicted about P5's decision, expressing that they were *"personally disappointed"* and disconnected from the event. For P4, *"it only makes sense"* to use the livestream during their party games. In this sense, the livestream carries a multitude of roles in shaping the attendee's viewership and social experiences at GDQ.

6 DISCUSSION

We find that Games Done Quick attendees exhibit different forms of viewership in response to different livestream configurations across event spaces. To analyze these behaviors, we found approaching livestreams as *material for design* and considering its material qualities useful as it provides the necessary structure and precision to unpack the spectating behaviors we observed.

We now take stock of our findings by drawing from Lambton-Howard et al.'s [29] approach to mapping material *configurations*—manipulations of the technology's base materials—to their corresponding *augmentations*—established social use behaviors. This allowed them to surface the material qualities of social media technologies to design social media for coordinated participation. Applied here, livestream *configurations* consider assemblages of broadcast hardware, software, and physical space, and *augmentations* refers to the corresponding in situ viewership practices. Taking this material approach leads us to identify two key material qualities we call *focality* and *metacontent*. We then discuss how this material framing through focality and metacontent points

us to current and future design trajectories of livestreaming (e.g., supporting interleaved, diverse livestream experiences and moving away from solely high interactive livestream experiences).

6.1 Distilling the Material Qualities of Livestreams

We first briefly summarize the main livestream viewership practices at Games Done Quick, drawing emphasis to the livestreams' configurations and their augmentations. The stream room is a high production livestream facilitating collocated and simultaneous viewing of the livestream and live stage. This is similarly seen in the GDQ venue hotel rooms where attendees gather around the television and give personalized commentary. Both configurations facilitate direct, attentive viewership supplemented by rich *digital hearths*—the sharing of discussion, commentary, and reactions around the livestream [67].

When the livestream serves a more ambient purpose in the practice and hotel rooms, it provides viewers continuity between the stream, practice, and hotel rooms. This augmentation is enabled by the configuration where the livestream is broadcasted on basic hardware (small projector, television) suited for ambient viewing: timekeeping, browsing, and audio obfuscation. These peripheral augmentations are fully realized when the livestream seamlessly dissolves into the background of the practice room or when attendees are sleeping. These configurations are distinct from the high attentive augmentations in the stream and hotel room. A summary of these mappings are organized in Table 1.

Room	Configuration	Augmentation	Material Qualities
Stream	Multiple projector screens Hifi stage speakers	Collocated viewing Parallel viewing	High focality High metacontent
Practice	On side walls Low volume speakers	Window into stream room Timekeeping device	Low focality Medium metacontent
Practice	On side walls	Background ambience	Low focality Low metacontent
Hotel	Direct TV broadcast	Space continuity	Med-high focality Low metacontent
Hotel	TV as room's *digital hearth*	Personalized stream room	High focality High metacontent
Hotel	Volume control	Audio obfuscation	Low focality Med metacontent

Table 1. Livestream configuration, augmentation, and materiality across the stream, practice, and hotel rooms.

From this mapping of configurations to augmentations, we "explored, examined, amended, and made further distinctions... [of] the everyday understanding of interactions" [22] observed from Games Done Quick livestream use, yielding an initial eight granular dimensions: viewing attentiveness, awareness of livestream's presence, physical interactions around livestream, virtual interactions through livestream, centrality of livestream content, fidelity of livestream hardware, supplemental production around the livestream to support the viewing experience, and ways viewers can interact via livestream (some dimensions expectedly overlapped with those identified by Janlert and Stolterman with interactive artifacts in general). From these initial dimensions, we distilled out two defining material qualities of livestreaming: *focality*—the degree to which the livestream is the center of attention—and *metacontent*—the degree of surrounding social activities that expand the viewership experience.

This mapping of the livestream's physical configurations to their social augmentations can be concisely conceptualized as a pairing of a livestream's focality and metacontent qualities. For instance, the stream room, made for collocated viewing of a livestream by a large audience, features a livestream of high focality and high metacontent qualities (cf. Sections 5.1.1 and 5.1.2). In contrast, the practice room, where the livestream blends into the background, features a livestream of low focality and low metacontent (cf. Sections 5.2.1 and 5.2.2). The material qualities of the livestream can also facilitate identifying similar viewing experiences in different spaces: both the stream room and hotel room have high focality and metacontent material qualities (cf. Sections 5.1.1 and 5.1.4). These *focality-metacontent* mappings of the different viewership forms are also summarized in Table 1.

We also note how the same space can exhibit different and changing livestream qualities. The livestream's focality in hotel rooms span the low and high range. The livestream may start out as an ambient backdrop to the room's social atmosphere (similar to the practice room) but can shift to embody higher focality qualities when attendees shift their attention and conversation towards the livestream, and the presence of a speedrunning expert may also elevate its metacontent; in other words, the experience of the hotel room shifts to that similar of the stream room. Without loss of generalization in the application of our material discussion, livestreaming's focality and metacontent qualities shift in accordance to the broadcasted content and how it is being viewed and integrated into social spaces. As such, our conceptualization of livestreams as design materials sees them as dynamic materials with metamorphic qualities.

6.2 Incorporating Different Livestream Qualities

Approaching livestreams with a material lens allowed us to elucidate differences between varied viewership types currently focused on by the HCI community (cf. Section 3). Direct viewership revolving around streamer-viewer interaction [14, 33, 75] comprises of high focality with varied degrees of metacontent-oriented tools and features (e.g., screenshot annotation features, game statistic visualization tools). Ambient livestreams for social companionship and emotional support [1, 30, 39] implicate low focality since the content of the livestream is intentionally simplistic (e.g., studying, eating, nature walking) and has little to no metacontent to avoid overloading the viewers' attention. Multi-perspective viewing [12, 47, 66] of a public event has high metacontent due to the high information density distributed across multiple livestreams, but exhibit flexible focality as viewers' attention continually split and shift between different livestream perspectives.

We recommend designers and researchers use this material lens as a pragmatic means to inform livestream designs aimed to diversify viewership experiences. We argue that Games Done Quick's in-person event succeeds in creating compelling experiences by assembling different focality-metacontent combinations across different spaces. GDQ's deliberate configuration of livestreams and careful consideration of their augmentations provides attendees the agency to select viewership forms best suited for their social activities, thereby achieving customizable desired event experiences.

Physical spaces provide an advantage in providing livestream focality-metacontent diversity—designers can readily provide distinct and discrete configurations of livestreams across spaces to facilitate different forms of viewership. We imagine this can be extended to other non-charity events where livestreaming can be easily integrated. For instance, research on media coverage of music festivals and sporting events can explore implementing varied focality-metacontent configurations of broadcasts across different festival spaces (e.g., live stages, food venues, entrance areas, resting areas, tailgating spaces). This approach has some parallels to research on the solely virtual spectatorship experiences of music festivals [66] and sporting events [12] that blend together different livestream configurations into the event spaces. Regardless of medium, we believe our

material approach and the common language of focality and metacontent and the calibration thereof bring utility in spectator-driven experience design.

6.3 Interleaving Livestream Qualities

Just as Games Done Quick attendees move between event spaces and consequently experience a kaleidoscope of livestream augmentations, we highlight the opportunity to intentfully design livestream experiences across spatio-temporal dimensions. Velt et al. argues that livestream viewership extends beyond the sole intent of vicarious spectatorship: livestream viewership is the continual "[interleaving of] diverse threads of experiences" to form an even more involved experience of "being there" [66]. In a similar way, attendees at GDQ interleave the livestream across the spaces of stream, practice, and hotel rooms across time to construct a seamless sense of livestream continuity (cf. Section 5.1.3). Attendees also use the wall-projected livestream in the practice room to *"peek"* into the stream room to *"shop"* for interesting moments, threading the stream and practice room together (cf. Section 5.2.2).

Outside of Games Done Quick, there have been other observed instances of this form of threaded continuity. A private Swiss movie theater includes screens in the bathroom stalls to allow a continued viewing experience as people move between the auditorium and bathroom [46]. Some sports bars provide similar television screens in the bathroom [2] or use a one-way glass in the bathroom to provide game viewership back in the bar area [52]. Although these examples are commonly brushed off as esoteric design, we chart this as a promising space for design as livestream media becomes ever more ubiquitous, viewership avenues more varied and multiplexed, and spectator experiences more layered [13, 53]. Our findings suggest that supporting this interleaved experience naturally leads to the need to support various focality-metacontent pairings.

Lastly, we also suggest that researchers examine whether Games Done Quick's success in implementing shifting viewership experiences via combinations of focality-metacontent qualities can be replicated in other livestream spaces. To what extent can a similar diversity of focality-metacontent combinations be designed for livestreams viewed solely on desktop or mobile platforms? Considering the non-static experience of livestream viewership, we should not be only designing a singular tool to be incorporated in livestreams [33, 75] or a singular livestream overlay combining together multiple perspectives [12, 47, 66], but also be designing tools to facilitate dynamic focality-metacontent shifts. For instance, study livestreamers may play video games as a break from studying, thus transition from laid-back studying content to highly-engaging video gameplay content for a brief duration before returning back to studying. There are design opportunities to explore this transitionary boundary as streamers bring different livestream overlay elements and tools in and out of their broadcast, interweaving different viewership experiences. The fluidity of such a dynamic livestream system could then mimic the shifting livestream material qualities observed at GDQ. Conversely, we also see potential in bringing virtual livestream design elements into physical spaces. GDQ only broadcasts the livestream overlay in their physical event spaces but omits other digital elements such as the chatroom, notifications, and other livestream components. There is opportunity to configure physical spaces with virtual livestream elements and explore how this augments situated livestream use and viewership experiences. For instance, the livestream chatroom could also be projected onto the walls of the practice room, allowing attendees to follow the online viewers' reaction to the livestream content. These design trajectories suggest more work is needed to explore the use of livestreams as design material in weaving together "blurred" physical and virtual boundaries [63].

6.4 Designing Away from Interactivity

Finally, we take note that HCI research on livestreams favor designs adopting qualities of high focality and high metacontent. For example, such work has importantly focused on exploring tools that promote *more* audience interaction [33, 75] and *more* community engagement [14, 38, 39, 71].

We see an alternate research direction moving away from high focality, high metacontent designs—in other words, moving away from interactivity. As demonstrated by GDQ's use of livestreams for background ambience in the practice room, livestreams do not always require attentive viewership; they can be hidden, inconspicuous, and viewed in snippets. While ongoing research do show interest in using livestreams for passive social companionship [1, 30, 39] and as a platform for low-effort, casual socialization [36], we still see further potential in leveraging low focality, low metacontent livestreams qualities. This trajectory echoes minimalist strategies in ubiquitous computing [25, 76] and IoT [6, 7] where empty space is conceptualized as a design material. If we apply the minimalist notion of "non-use or inaction [is still] active interaction" [7], interactivity in livestreams exist even when they are muted, blended into the background, or pushed into periphery spaces, as we observed. Applied here, this minimalist framing argues that passive livestream experiences are not absent of interaction; such experiences reframe livestreams as design material configured differently from typical high focality, high metacontent livestream designs.

7 CONCLUSION

As livestreams become mainstream media, designers continue to develop tools leveraging livestreaming's immersive and interactive qualities. Livestreams have expanded beyond direct viewership on web and mobile-based platforms. Some viewers enjoy the ambient features of some livestreams because they provide social companionship. Others enjoy a new kind of spectatorship provided by livestreams incorporating multiple perspectives of a singular event. To explore these expanding uses, we turn to observing, participating, and interviewing *speedrunners*—one of livestreaming's most experienced subcultures—and the ways in which livestreams are configured and viewed at their flagship event, Games Done Quick. Our findings shed light on direct and indirect forms of viewership found at GDQ. In the stream room, the livestream is viewed on large stage projectors in conjunction with the live stage, creating a *"sacred"* viewing experience. The livestream is also kept on in hotel rooms to achieve an experience of continuity between the stream and hotel room, while also being configured as a *digital hearth* for a more private stream room experience. In the practice room, the livestream dissolves into the background and is viewed in brief glances to *"shop"* for interesting moments back in the stream room. Attendees also use the livestream as a timekeeping device and appropriate its audio for social activities.

We take a material approach to draw distinctions and compare these varied livestream *configurations*—physical hardware and space—and their corresponding *augmentations*—social viewing practices. From this approach, we identified two material qualities of livestreams—*focality* and *metacontent*—introducing a more dynamic conceptualization of livestreams *as malleable design material*. Within this material conceptualization, we chart out design strategies for diversifying livestream experiences by incorporating varied *focality-metacontent* pairings and for interleaving varied livestreams to create an expanded viewership experience. These qualities also suggest less traveled design directions for livestreams that ought to be investigated; for example, taking cues from minimalist design, researchers may frame low-interactive livestreams as designs still rich in interaction. We envision future work aimed at exploring how the material that is livestreams can be weaved into, between, and across physical and virtual spaces to achieve desired, unexpected, and novel viewership experiences, such as those engendered by GDQ.

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