Engaged or Not Engaged, That Is the Question: The Impact of Duality on the Participatory Experience of Augmented-Reality Interventions in Cultural Spaces

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1. Introduction

Augmented-reality (AR) applications in our cultural spaces intended to both educate and amuse have become increasingly familiar as curatorial intervention over the last decade. During this time, museums, art galleries, and other cultural spaces have displayed an appetite for these interventions, which are often positioned as a panacea for audience engagement and demographic expansion. In this period, innumerable academic papers have extolled the potential or actual virtues of this technology to inform, stimulate, or entertain.

My own experiences creating AR applications and engaging with others have painted a starker picture of the realities of deploying such. First, barriers exist, such as accessibility, not having the right kit; functionality, the kit not working; visibility, participants not knowing anything is there to be engaged with; and intentionality, the participant wanting to engage with AR as part of the visiting journey. I have written about these previously (Jefferies 2021, 2023). In this article, we will assume these barriers have been overcome, even if in these idealized circumstances experiential barriers persist. This relates to the fundamental premise of augmented reality, its ability to combine two contexts, the physical and the digital.

Here I will seek to develop a framework for critically evaluating the interconnected relationship of these contexts, or the duality between them, on the participatory experience of augmented-reality interventions in cultural spaces. To achieve this, a brief definition of what is meant by the participatory experience in this context will be offered, followed by both a practical and philosophical examination of the notion of duality. I then use duality as an evaluative tool to assess the participatory experience of two

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case studies, with the findings leading to broader conclusions about AR as a creative medium.

2. Augmented Reality, Cultural Spaces, and the Participatory Experience

Augmented reality within cultural spaces is an area of high research interest. Indeed, the museum is seen by many as the ideal environment to test this technology in real-world conditions, being a controlled environment with a ready supply of participants (Tillon, Marchal, and Houlier 2011). Much of this research is concerned with the technology itself, be that tracking or method of augmentation (Papagiannakis et al. 2005; Adhani and Rambli 2012; Kim 2013). This was particularly true during the 2000s, where usability, software, and hardware dominated the discourse (Billinghurst, Kato, and Poupyrev 2001; Zhou, Dun, and Billinghurst 2008; Choi 2014). This research has to an extent formalized AR as a technology within museums and galleries, with methodologies and processes becoming recognized and supported by a hardware and software infrastructure (Bekele et al. 2018).

These developments facilitated a growing shift in the literature away from the technological to a closer examination of the participant and their interactions with the AR interventions (Scholz and Smith 2016; Tsai and Huang 2017; Chung et al. 2018). In the main, this research employs a quantitative approach, modeled on human-computer interaction (HCI) methodologies. These papers generally do not seek to understand or assess the participatory experience as we will later define it, nor, to a large extent, the learning or meaning-making achieved, but rather they seek to provide insight into interaction with interface, dwell time, and level or depth of completion (Paliokas et al. 2020; Roberts et al. 2018). With this being attributed largely to the fact that the majority of case studies reviewed in this literature "take the shape of technological proof-of-concepts aimed at illustrating the potential of AR" (Keil et al. 2013, 685) rather than considering the wider visiting experience.

By approaching analysis of participatory experience from a curatorial, rather than HCI perspective, alternative methods emerge. First, a pragmatic position can be taken "based on determining the extent to which an exhibit communicates its intended messages… to its intended audiences" (Shettel, 2001, 327). When considering individual experience, the approach set out by Shettel becomes problematic, and an experiential learning perspective would challenge the notion that only the curatorially intended learning has epistemological value, particularly as Kolb (1984, 38) states, "learning is the process whereby knowledge is created through

the transformation of experience." This indicates that learning and knowledge, when applied to AR in museums, is more amorphous than those creating projects often seek to assess and that rigid definitions of exhibit efficacy, based on acquisition of intended knowledge alone, fall short of capturing the range of meaning being created.

Costello and Edmonds (2007) offer a framework that acknowledges a wider range of epistemological modes of engagement. Their framework and categories within it, including exploration, competition, and creation, recognize a fuller spectrum of engaged experiences from which both pleasure and meaning can be derived and subsequently assessed. This infers the need, when analyzing AR projects, to consider meaning, learning, and value that fall outside the intended content or concept of the work, attempting to gain perspective on the broader experience audiences derive from interacting and, with this, a broader idea of what the participant does. The participatory experience is defined here as the overarching ability to engage the participant and elicit a pleasurable response, considering not what was learned, or what was achieved, but the extent to which the participant was activated, engrossed, or enticed.

This position is rooted in Lev Manovich's seminal work *The Poetics of Augmented Space* (Manovich 2006). Manovich explores the notion of spatial augmentation as being distinct from the technology used to deliver it, seeking "to focus on the experience of the human subject in augmented space as opposed to particular electronic, computer, and network technologies" (Manovich 2006, 220).

3. Duality: The Physical and the Digital

In this section, we will focus on the relationship between the physical and digital contexts of an AR experience. The balance, value, and influence of these contexts upon the participatory experience of those engaging with AR applications is central. As such, a consideration of the practical and philosophical models pertaining to this and their implications for AR as a creative medium will be attempted.

Azuma (2015) defines three modes of AR experiences, with each of these deriving experiential value, in varying degrees, from either the physical context or the digital context. This points to what is posited here as a core characteristic of AR, that the participant is at the confluence of two streams of experiential information, these being the physical context of space and the digital context of augmented media, with how these relate and influence each other being pivotal to the experience.

This notion resonates with Castells, who offers a model of production and consumption that is governed by two separate, yet overlapping spaces; the space of flows and the space of places (Castells 2010), Here, the space of places is positioned as the inhabited, localized physical context in which we live, with the space of flows being a globalized, amorphous network of communications and data. Within Castell's writing, these persist as a perceived tension between the two spaces, hypothesizing a "dominant tendency toward a horizon of networked, ahistorical space of flows" (Ibid., 459).

This perspective of an inevitable conflict between the physical and digital is often refuted by new media theorists and practitioners (Lillemose 2006; Valenzuela-Turner 2011), who envision a balance being struck, utilizing the contextuality of these combined spaces to erode the barriers between them and create new meaning and value (Peel 2013).This erosion of barriers is reliant on the space of flows having the capacity to impact positively and meaningfully upon the lived experience of the physical, a capacity that is refuted by some. Siegal (2008) and Lanier (2010) both position digital, in a way that resonates with Castells, as the Genghis Khan of contemporary culture, replacing interpersonal interactions with networked ones at significant loss, a notion supported and extended by Turkle who predicts a technologically mediated separation where "we come to see our online life as life itself" (Turkle 2011, 17).

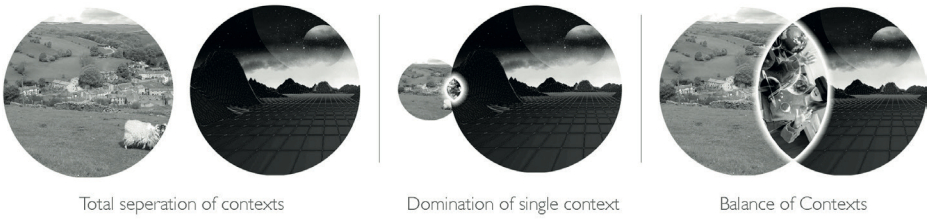
> … it should be clear that the differences between the physical and digital always remain important even when acknowledging that our reality is always some combination of the two. (Jurgenson 2012a, 86.)

Jurgenson offers an alternative view, re-appropriating the term *augmented reality* to signify "a conceptual perspective that views our reality as the byproduct of the enmeshing of the on and offline" (Jurgenson 2012, 88). Positioning the digital and physical as co-created parts of a single lived experience as opposed to the "digital dualist" view of the physical and digital as separate, hierarchical and conflicting entities (Spafford 2013), Jurgenson proposes a spectrum where at one end interactions are seen as mainly augmented, the context co-creating the experience, and at the other largely dualist, with only limited overlap. This spectrum aligns pleasingly with the reality-virtuality continuum proposed by Milgram et al. (1994) in which AR and MR are placed in a continuum between full reality and full virtuality. These in combination make up our conceptualization

of duality, with Jurgenson considering the philosophical and experiential and Milgram the technical and processed orientated.

It is hoped that the relevance inherent within the above is clear. For an AR experience to fully use both spaces, both contexts, a promise the medium makes, it has to be at once object-oriented, drawing value from the physical, and system-oriented, drawing value from the immaterial. To achieve this, Jurgenson's position of co-creation must be accepted and, alongside that, an acceptance that there is a varying degree to which the physical and digital achieve this co-creation. This creates a spectrum of duality (Figure 1) which considers the degree to which the physical and digital collaborate in the co-creation of experience, with the real and the virtual being viewed as distinct actors, with specific attributes, cooperating to create meaning. It is this conceptualization of the spectrum of duality that will be applied to two case studies in the next section, with the intention of using this as a means to consider and evaluate its impact upon the participatory experience of those who engaged with them.

Figure 1: Spectrum of duality



4. Case Studies

4.1. Introduction

In this section, we will examine two of my previous projects through the lens of duality, in an attempt to understand the efficacy of this perspective in enabling an evaluation of the participatory experience. I will seek to provide an account of how the duality of these experiences related to the participatory experience of those who engaged with them. In both projects, a narrative observational methodology was employed, in which participants were observed interacting, and a written account of this was created, supported by a post-engagement unstructured interview. The author completed a database of observations (Jefferies n.d.).

4.2. Can't Stop Looking

Project Description:

This project responded directly to the real and the unreal, the overarching theme of the *British Art Show 8*. The aim was to use augmented reality to question these boundaries by exploring the interaction between the physical and the digital to create conceptual meaning. The augmented digital space (Figure 2 (A)) was activated by the embedded physical image targets, which were intended to mimic the space in which the piece was situated, meaning that this instantiation included the floor, walls, and plinths, mapped to intersect with the physical objects.

The artwork itself took the form of three plinths and vitrines (Figure 2 (B)), each containing an object whose core function and social impact is linked to networked culture and the way digital information intersects with physical perceptions. To accompany this physical installation a proprietary application titled "cant stop looking" was produced.

Figure 2. Project images, *British Art Show 8*

Technical Details:

The application developed with the game engine Unity and hosted on both Android and Apple app stores used Vuforia Image Tracking to

superimpose a reimagined digital version of the physical gallery space. The participant could then move around this digital space, exploring the sounds, images, and videos related to the physical objects displayed on the plinths. This intended to create a juxtaposition between the physical and digital spaces, which developed in complexity and level of immersion the longer the piece was interacted with, generating a tension between the real and digital contexts that grew as they diverged, symbolizing the impact our online interactions have on our perceptions. The application was offered for free via mobile app stores, using a BYOD (bring your own device) model of distribution. Full project documentation can be found at Jefferies 2016.

Evaluation of Duality:

When considering this project through the lens of duality, a number of new conclusions can be made, not immediately apparent from the observations. In the main, there is no tangible conversation between the physical objects on the plinths and the digital gallery superimposed, with the digital being overemphasised and drawing all attention. This separation was heightened by the opacity of the digital, which obscured the physical objects and the context they offered. As such, it is perhaps of little surprise that so few who used it grasped the significance of the physical objects and, by extension, the broader concept. Those who participated thought it looked nice and were engaged by the novelty of the technology. Yet they drew limited significance from the intersection of the physical and digital contexts, there being not only no compulsion to consider the physical but also visual barriers, when viewing via their device, to prevent it.

When this is considered against the broader participatory experience of those who chose to engage, the impact of duality begins to emerge. Those who did decide to engage in the main reported a positive experience but this generally related to their esthetic experience of AR rather than the conceptual meaning the work sought to offer. Indeed, the novelty of engaging with AR is perceived in this case to be the main source of positive experience. When asked, participants demonstrated a limited comprehension of wider meaning either intended or unintended. This response can be largely attributed to the duality between the physical and digital contexts of the artwork, with the digital component dominating and, beyond this, actively obscuring the contextual relevance of the physical.

This lack of connection between the real and digital had a clear impact on the ability of applications to generate positive participatory engagement. This lack of conversation between the physical and digital seems to have

curtailed the participants' capacity to create lasting meaning from what was intended to be a conceptual piece, warning of the pervasive impact of networked devices. It is rather ironic that an artwork whose purpose was to warn of the influence and attraction of the digital occluded and separated its audience from the significance of their physical surroundings. Rather than creating an integrated artwork that leveraged both contexts, a virtual space was created that occluded the wider gallery, the physical artworks, and the context the objects offered. This caused the participants to become isolated from their physical context, creating a duality between the contexts and reducing the opportunity for meaning making.

4.3. Temple Newsam AR

Project Description:

Temple Newsam AR (TNAR) was an educational application developed for Temple Newsam House near Leeds. This application, positioned in the picture gallery of the main house, set out to tell the hidden narrative behind the construction and redevelopment of this space through the medium of augmented reality. Two characters were identified, and a series of narratives developed, based upon their actions in the past and the effect these had upon the picture gallery. A gamified process was used, modelled on text-based computer games such Planet Fall (1983) (Figure 2 (C)).

In this project, the participant played as either Sir Arthur Ingram, a sixteenth-century businessman – some say nefarious entrepreneur – or Sir Henry Ingram, a relatively impoverished viscount. The player was required to make choices based upon real historical events and navigate conflicting pressures to obtain enough money to either build the picture gallery in the first place or refurbish it. Once each text-based narrative was complete, the participant was rewarded with the opportunity to redecorate, in a related historical style, a digital replica of the picture gallery (Figure 2 (D)), which was superimposed over the physical space. This progressed through three specific narratives within the text-based game intending to bring to life two former owners of Temple Newsam, through the choices they made.

Upon completion, participants were able to freely redecorate the whole digital representation of the picture gallery including portraits and furniture, based upon images from the Temple Newsam archive or from existing historical details found in other areas of the house. The intention was to offer an informed and layered perspective of the space, juxtaposing the curated and re-created space presented in the physical. The completed digital room would then act as a souvenir, which could be viewed and interacted with after the visit.

Technical Details:
The application was again developed using the game engine Unity and hosted on both Android and Apple app stores, using Vuforia Image Tracking and ARKit/ARCore plane detection to situate the digital recreation within the physical picture gallery. Participants began the experience by completing an instructional scene, teaching them how to use both image tracking and plane detection. This step was followed by a series of text game narrative, with the redecoration of the picture gallery being used as a reward. Each stage displayed the existing space in different historical states, and the participant unlocked each state through the completion of the text-based games. The application used a BYOD (bring your own device) model of dissemination and was intended for general release on the major app stores. Full project documentation can be found at Jefferies 2018.

Evaluation of Duality:
As with this previous project, new insights into the participatory experience can be gleaned when evaluating this project specifically through the lens of duality. In this case, the level of interconnectivity between the digital and physical content again proved to be pivotal to the perceived quality of the engaged experience. The two parts of this application displayed very different levels of duality, that is, the text-based game having near total duality and the redecoration scenes the opposite, with the digital and physical contexts being intertwined. The observations made and feedback received indicate that the scenes where duality was lowest, in particular, the final decoration scenes where the participants recreated a digital version of the physical space and could see a transformation from the Tudor to the Georgian interiors, were the most engaging and impactful. It was at this point that the connection between the two contexts was at its most tangible, with the hidden layers of history overlaying the physical reality and offering a view into the past. The opposite was the case during the text-based game, with some of the participants commenting that there was not a connection between the onscreen content and the heritage context, while some stated that it would have been better if the answers could have been found in the physical space.

When considering the parts of the application separately, the text-based game should not be considered augmented reality, because it had not fulfilled two of the three criteria for AR as set out by Azuma (2015). The redecoration scenes, on the other hand, do fulfil these criteria, and it is here that the positive engagement was observed. Although it could certain-

ly be argued that the participants simply did not find the text-based game engaging, it was the passages in which AR was employed that saw a reduction in their comparative isolation, increased comprehension, and observable and reported positive participatory experience.

This application was successful, in terms of positive participatory experiences, when the physical and the digital were leveraged together, but it failed as the connection between them diminished. The consequence of using a game modelled on single-participant participation that required significant focus on the screen was to isolate those using it from the historical context around them. Indeed, the text-based game reduced the tangible connection between the participant and physical surroundings, increasing duality. This resulted in a disjointed and isolating experience that removed the visitor from the wider context offered by the physical. However, the positive experience observed in the later portion of this project shows a possible way forward. In this case, the interaction was intrinsically linked to the space, requiring and encouraging those participating to consider this context, thus facilitating a flow between the digital and the physical, which came together to enhance rather than undermine the other.

5. Duality and the Participatory Experience

The fundamental function of augmented reality is its ability to convincingly align digital content to physical spaces or objects as an illusion, achieved by using physical anchors on which to hang your dinosaur or sofa. Yet for this alignment of the physical and digital to provide opportunity for positive participatory engagement, there has to be a conversation between these contexts, with meaning most successfully being made at the confluence of two complimentary streams of experiential stimuli. The following two projects offered here as examples sought to demonstrate this more fully and provide even more insight into creative methods by which this confluence can be facilitated.

The first example, *We AR in MoMA* 2010, by Mark Shwarek and Sander Veenhof, took the form of a covert exhibition of AR artwork inside MoMA (Museum of Modern Art), New York, placing dozens of virtual sculptures and other digital artworks by a range of artists around this famous gallery. The artists then invited a number of guests who were notionally predisposed to this form of intervention, being attendees of the Conflux arts festival, all without prior consent or knowledge of MoMA. This project intended to challenge the notion of the gallery as a closed space, creating

a model that "provides a different way of negotiating with the gallery" (Veenhof 2018).

What is of interest here is the way in which the participants themselves and their interactions have a fundamental impact on the duality between the physical and digital contexts of this exhibition. *We AR in MoMa*, is still available for those who have access to the LayAR Application, although there is total duality in its current state, there being no indication that the digital is available. It was during the initial event, when hundreds of people, expectations primed, turned up en masse, that their actions and interactions with the virtual world created a tangible and meaningful spectacle in the physical. At this point, the duality between the physical context of the gallery and the augmented content was at its lowest. It was also at this point that the challenge to the institution was felt, as though a critical mass had been reached. Only then were the intentions of the project realized, the space opened, the hierarchy of the institution undermined, and the artwork itself given the same platform as the "real art" even if only for a fleeting moment in time.

The second example is *If You Go Away* (2015), by Invisible Flock, who describe the project as "a GPS powered art game, an app designed to be played on the streets" (Invisible Flock 2016). The application is location-specific and modeled on classic point-and-click video games popular in the 1990s. The participants progress through the narrative by solving puzzles and interacting with objects. The difference is that the participant moves in the real world to achieve this, walking across a square to retrieve the virtual beer can out of the real bin, for example. The experience was both location-specific and time-specific, with the main story only becoming available if played at dusk. It was the Leeds incarnation that I used, which began outside the town hall and culminated on a bridge over the River Aire at sunset.

It is this project of all those I have created and used that demonstrates what can be termed here as the lowest level of duality, in that the interrelation between the physical and digital contexts is highly synthesised, with narrative cues taken from real-world locations and times to coincide with real world occurrences, resulting in the participants dancing on a bridge at sunset. This multimodal form of interaction, whereby the participant is not only viewing content but embodying it, in this case using accelerometers in the phone to sense when the participant was indeed dancing, dissolves the division between the physical and digital. A single unified experience emerges, enabling a more fundamentally participatory involvement with the narrative, whereby actions create the experience both for the partici-

pant and as a performance for others. There is a physical manifestation and physical reaction to the digital experience. This physical manifestation is the artwork becoming activated. This activation and the all-encompassing immersion within the experience deliver a sense of presence that fulfils the promise of AR, in that it can transcend the technology being used to deliver it as imagined by Manovich. (Marto and Gonçalves 2022; Papagiannakis et al. 2017; Tham et al. 2018.)

This sense of presence, a phenomenon most often associated with and considered in relation to virtual reality, is generally accepted as being made up of two key components. The first, as above, is a transcendence of the technology used to deliver an experience, and the second is a transportative sensation of "being there" (Bokyung 2009). Both of these conditions have proven difficult for AR, mobile in particular, to evoke. First, this is due to the explicitness of the viewing media and the aforementioned pervasive attraction of the screen. Second, this relates specifically to our central concern here, duality. I posit that with regard to mobile AR specifically, duality and presence are two connected parts of the same phenomena, in that for presence to be achieved, duality has to recede, with the confluence of contexts aligning.

This confluence of context and retreat of duality is made possible by the way in which the audience interacts, meaning there has to be a reason and motivation to undertake action in the real. The digital must promote behaviors within or draw attention to where participants are, so as to reveal the value of that space or its content. Otherwise, the screen will dominate and duality return. When starting out, and for probably too long in my practice-based research, my creative focus was always on the apps, the digital content, whether the tracking worked, whether it looked cool, and not on what the fundamental characteristic of AR is – augmentation. The balance between the digital and physical was always skewed too far toward the digital, with the physical at times augmenting this experience. The opposite must be achieved, with the focus on reality augmented by digital content to expand upon existing context or conceptual meaning in a way that drives interpretation of the lived experience rather than attempting to offer a diluted alternative.

6. Closing Remarks

Those seeking to use AR in our cultural spaces to enhance engagement and facilitate positive participatory experiences have to clearly consider the attraction of the screen and the flow between the context offered by

layering the real and the digital if AR is to have the capacity to be more than a novelty. The challenges arise from an overemphasis on either the physical or, in most cases, the digital.

To conclude, augmented reality is at its best and most effective when it has a tangible impact on the lived experiences, actions, and interactions of those participating. AR should not be thought of as a window to look through but as a medium through which one can effect real-world change. Achieving this requires a minimization of the duality between the real and the digital to offer experiences that truly intertwine these contexts and help to facilitate positive behaviors and interactions to create meaning, be that conceptual, educational or political. The commercial world is beginning to see this potential. Instead of Google selling clicks on ads, Niantic is selling your presence — you come for *Pokémon* to stay for the hamburgers. The onus is now on the artists, designers, and curators to understand and harness this potential as a means to encourage audiences not only to reconsider the spaces they are in but also to take positive actions within them.

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