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Designing the experience
a model of production for immersive experiential 360-degree documentary

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By

Stephen Dawkins

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A thesis submitted in partial fulfilment of the University's requirements for the degree of Doctor of Philosophy

November 2022

Ethical Certificate

Certificate of Ethical Approval

Applicant:	Stephen Dawkins
Project Title:	Designing the experience: a model of production for immersive experiential 360-degree documentary

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Low Risk

Date of approval:	09 Nov 2022 Project Reference
Number:	P144567

Statement on Ethics

All the work in this portfolio was conducted with the four main principles of ethical production and/or academic research in mind:

1. Minimising risk and avoiding harm
2. Obtaining informed consent
3. Confidentiality and the right to privacy
4. Avoiding deception

In the practice outputs, standard established production protocols were observed: signage in public places to avoid deception and to alert the public that filming was taking place and, after discussion of the scope and purpose of the project, the completion of individual consent forms for participants to give informed consent. In the other outputs, informed consent was obtained through information sheets outlining the purpose of the activities and the outputs to be produced and the signing of individual consent forms. The community-based project further utilised the ethical frameworks and safeguarding protocols of the charity.

All outputs in the portfolio have been through a process of peer-review and no issues of concern were raised by reviewers around the ethics of the projects.

Discussion of the ethical implications of each of the outputs can be found in the critical analysis of the outputs in Section 2.2 below.

Abstract

The research in this PhD sits at the complex intersection of technologies, production cultures and ways of experiencing 360-degree documentary content, and interrogates the ways in which, through the practices of documentary film production, experience is constructed within 360-degree documentary narratives.

This thesis combines peer-reviewed practice-based outputs, academic journal articles and book chapters supported by a Critical Overview which contextualises these outputs and provides a critical examination of their interrelation. All outputs were produced between 2016 and 2019 at the moment of what Rose (2018) calls “the immersive turn” in documentary production: a period when the capability and cost of production and distribution technologies enabled the more widespread production of such documentaries. At that moment, there was a significant amount of writing about *how* to use such technologies to create immersive documentary but there was, initially at least, little interrogation of *why*. This research has led to the development and testing of a model to provide such an understanding.

The earlier outputs in the portfolio influenced and enabled the formulation of the manifesto and the model which is then tested and interrogated in the later outputs. The main foci of the manifesto that are impacted by, and impact upon, the individual outputs are:

- the emergence of new technologies of production and distribution and the corresponding need for new practices to fully explore their possibilities
- the capacity of 360-degree documentary to enable more immersive experiences than two-dimensional documentary, with an awareness of the possibilities and limits of such experiences
- the awareness of the move from ‘viewing’ to ‘experiencing’ and the implications that this has on documentary filmmaking practices
- the enhanced agency of the ‘experiencer’ of 360-degree documentary and the reduced role of the documentary producer in creating meaning
- the potential of new technologies to democratise documentary filmmaking practice for positive outcomes, socially and culturally
- the fact that immersive, 360-degree filmmaking is part of an emerging wider cultural economy of immersive media

The research repositions 360-degree documentary in the context of production. Although this is a model that emerged from original research and practice, it has a wider, ongoing applicability as it both enhances the existing understanding of 360-degree documentary production practice and narratives and can inform the future production of 360-documentary and other emerging immersive forms.

Key words:
360-degree documentary; production practices; model of production; inclusion and participation; immersive media

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I would especially like to thank my supervisory team: Mel Jordan, Kevin Walker and Jacqueline Cawston. All three of them were exceptionally generous with their time and their insights throughout the project significantly affected the final version of the PhD. I am grateful for the way that they guided it to completion with kindness but firmness.

A similar debt of gratitude is owed to my main collaborator, Sarah Jones, whom I worked with on five of the outputs in the portfolio. Her thinking and knowledge about VR and the, sometimes spirited, discussions we have had about it over the years have played a significant part in my thinking about VR. While we don't necessarily agree, we do share a passion for understanding how and why VR works in the ways that it does and for its possibilities.

Danai Mikelli and my co-contributors to the SPARK project (especially Jacqui Speculand and Bianca Wright) also deserve significant thanks. My work with Danai was instrumental in thinking through the 'political' possibilities of VR while the SPARK team, and the huge project we completed, reiterated the value of collaboration.

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Glossary of key terms

3DOF Three Degrees of Freedom a.k.a. orientation tracking. Refers to the movement of a rigid body inside space. The three degrees of freedom are yaw, pitch, roll.

6DOF Six Degrees of Freedom a.k.a. positional tracking. Refers to the movement of a rigid body inside space. The six degrees of freedom are forward/back, up/down, left/right, pitch, yaw, roll.

Augmented Reality (AR) Augmented Reality (AR) refers to technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.

Avatar An avatar refers to an image or figure representing individual users within a VR environment. It is particularly important when we progress into social interaction within VR.

Degrees of Freedom Degrees of Freedom (commonly abbreviated as DOF) refers to the movement of a rigid body inside space. It could be explained as “different basic ways in which an object can move”.

Eye Tracking Eye tracking is similar to head tracking but matches where the user's eyes are looking.

Field of View (FOV) Field of view is the angle of degrees in user's visual field within a headset. Having a higher field of view is important because it contributes to the user having a feeling of immersion in a VR experience. The bigger that angle is, the more immersive it feels.

Guardian system Guardian system is designed to display in-application wall and floor markers when users get near boundaries they defined while in VR. When the user gets too close to the edge of a boundary, translucent boundary markers are displayed in a layer that is superimposed over the game or experience.

Haptics Haptic feedback is basically tactile feedback. In VR, it refers to users feeling like they're touching something that's not really there.

Head Mounted Display (HMD) The current form of hardware delivering VR experiences to users. It's typically in the form of goggles, strapped to your head. Integrated with either a mobile phone (Gear VR) or display, and custom lenses, it is through the headset that you can view different VR content.

Head tracking Head tracking refers to the sensors that keep up with the movement of the user's head and move the images being displayed so that they match the position of the head.

Immersion Immersion refers to drawing a user completely into a virtual world. [It] tends to be a … general term for becoming entirely encompassed and forgetting about reality. In VR, immersion takes on a practical sense, as users’ eyes, ears, and sometimes even hands and bodies are engaged, thus, blocking out any cues or sensory inputs from reality.

Latency Latency refers to how quickly the visual keeps up with the movement of your head within the HMD. The higher the latency (or lag), the easier it is to break the sense of immersion within a VR experience.

Metaverse The Metaverse is a collective virtual shared space, created by the convergence of virtually enhanced physical reality and physically persistent virtual space, including the sum of all virtual worlds, augmented reality, and the internet.

Mixed Reality Mixed Reality is the merging of real and virtual worlds produce new environments and visualizations where physical and digital objects co-exist and interact in real time.

Nadir In 360 capture, Nadir refers to the camera(s) that captures the bottom of the sphere.

Positional audio Positional audio or "binaural" sound allows you experience sound in 3D, where every sound in your environment has its own position and orientation.

Presence Presence refers to the scale of immersion felt in a VR experience. Simply put, presence is achieved when users feel like they're there, wherever that immersive world is.

Refresh rate The refresh rate is how fast images get updated in the Head Mounted Display. Higher refresh rates mean less lag, and a smaller likelihood of feeling simulation sickness.

Stereoscopic Stereoscopic refer to the ability to view object in a Head Mounted Display with the illusion of depth. It is usually achieved through different processes by which an object and/or environment is captured with different angles (representing left and right eye) are viewed together, creating an impression of depth and solidity.

Virtual Reality (VR) Virtual Reality (VR) refers to computer-generated simulation of a three-dimensional image or environment that can be interacted within a seemingly real or physical way by a person using special electronic equipment, such as a Head Mounted Display.

VR discomfort Is considered a subset of motion sickness. It is often the result of perceived discrepancies between what your brain and body think they're doing. It can be induced without actual motion. Symptoms of VR discomfort include apathy, drowsiness, disorientation, fatigue, and vomiting.

Zenith In 360 capture, Zenith refers to the camera(s) that captures the top of the sphere.

Adapted from: https://creator.oculus.com/learn/vr-glossary/

Introduction

In a prescient journal article of 1992, Jaron Lanier (who coined the term 'virtual reality') outlined a vision for what was then still an emerging technology. In this vision, he described the types of space within virtual environments: computer-generated worlds that enable users to actively "design and manipulate those worlds quickly enough to make them useful" (Lanier and Biocca 1992: 154-156). He termed these types of space "pliant" (*ibid*: 160) as they enabled users to interact with and, more importantly, affect the space.

What Lanier could not fully explore were the technological and cultural developments that have moved virtual reality (hereafter, VR) on from these pliant, computer-generated worlds. Production and distribution technologies now have the ability, through the medium of 360-degree (hereafter, 360°) documentary film, to represent the real world[1] in ways that had not previously been possible.

The motivation for my research was an awareness that the development of documentary outputs for experiencing via head mounted displays (HMDs) has instituted an ongoing period of rupture. Towards the beginning of this period, Rose termed this "the immersive turn": a period characterised by "a heady mix of commercial excitement (hype) and techno-utopianism (hope)" (2018:132) along with an awareness that new technologies of production, distribution and consumption are leading to new cultures of documentary production, new forms of documentary content and new ways of experiencing that content.

To contribute to the field in terms of scholarship and practice, I produced a portfolio of original work that straddled the period of the immersive turn: a peer-reviewed chapter in a book, two peer-reviewed journal articles, a manifesto, two 360° documentary films (one with a peer-reviewed critical commentary) and one mixed reality immersive experience. The outputs are disseminated via peer-reviewed websites, peer-reviewed journal articles, at international academic conferences and screenings at international film festivals.

- The original documentaries were produced to explore the opportunities provided by, and limitations of, new technologies of production and consumption within VR.
- The book chapter and journal articles were written to further develop the insights from the documentary film research outputs and situate them in the broad academic and practice field in which 360° documentary for VR is being produced.
- The manifesto was developed as a provocation to practitioners and academics in the field of 360°documentary to bring together some of the key areas of debate within academic and practice communities at the time (and since).

[1] The term the real world is used in the knowledge that all documentary is, in Grierson's famous definition, 'the creative treatment of actuality' (Winston, 1995).

The research amounts to a critical exploration of how these emerging developments in the production and distribution technologies associated with VR are being used by documentary filmmakers to establish new ways of constructing and experiencing documentary narratives. While each output had individual research aims that are detailed in the discussions of the outputs below, the overall aim of the research was to develop a greater understanding of the production of 360° documentary narratives for experiencing within VR. With that aim in mind and to explore what these differences might be, there were several objectives to the research:

1. through the production of original 360° documentaries, develop knowledge of the specificities of constructing original 360° documentary narratives
2. through the production of these documentaries, develop an understanding of the possibilities and limitations (technical, aesthetic, experiential and political) of 360° documentary
3. through primary research, develop knowledge of the relationship between the production of 360° documentary and the person experiencing the content, to measure how that experience might differ from viewing two-dimensional documentary content, in what ways and with what effects
4. develop participatory, collaborative working partnerships to devise ethical and inclusive production practices
5. synthesise the knowledge gained, from both an academic and a production perspective, in the construction of a model of production for 360° documentary
6. synthesise the knowledge gained to contribute to the development of ways of thinking about how the insights gained in the production of 360° documentary can influence other existing and emerging immersive forms

These objectives were realised at different points in the production of the outputs. As the research progressed, the focus changed from the capabilities of the technologies of production and the experience within VR towards the enabling of collaborative, ethical and diverse production practices for 360° documentary and other emerging immersive forms. It is in this context that the model of production articulated in this PhD was developed.

The PhD integrates these diverse outputs into a coherent whole with this Critical Overview. It is not a PhD about VR *per se*: it is specifically about the production of spherical 360° documentary film that uses some of the technologies associated with VR to create immersive documentary experiences. There are currently three broad categories of image capture for experiential nonfiction film for VR that are “important to note because they have significant implications for participant experience”: 360° video/spherical film, Computer Generated Imagery (CGI) and volumetric capture (Rose 2018: 134-135). Although there is a wide range of research around these different areas, there is not currently a systematic model of production that focuses primarily on 360° video/spherical film in the production of documentary. This PhD uses the portfolio of original research to develop such a model.

Sinek's (2009) model of 'The Golden Circle' illustrates that to understand why certain individuals and organisations are successful, one must start with *why* they do what they do, rather than looking at *what* they do or *how* they do it. Taking inspiration from Sinek's model, the PhD outputs interrogate the what and the how of 360° documentary, but the key focus of my model is to detail the why: Why use 360 technologies? Why use them in certain ways and not others? Why might their use lead to significantly different experiences from two-dimensional documentary viewing? It is not an instrumental model of how to make 360° documentary but represents the issues that 360° filmmakers need to consider when designing a documentary experience. Although many of these issues are common to all documentary filmmaking, the model highlights some key areas of difference in 360°.

The key findings of the research are that new and emerging technologies lead to new cultures of production and new ways of constructing documentary narratives. Together, these have significant effects on the audience's experience of documentary content, with profound implications for the emerging types of relationship between the documentary film and the experiencer[2] of 360° documentary content.

The main conclusion is that 360° documentary does have very distinct characteristics in relation to two-dimensional documentary forms. In addition, it is that to fully realise the potential of the technologies, to ensure that these production cultures are as inclusive and diverse as possible, and to have the widest possible range of voices articulated within 360° documentary, a more transparent, sophisticated, and systematic understanding of the considerations around production is needed.

While this PhD provides a model of production that focuses on 360° video/spherical film, the conclusion also returns to the other two categories of image capture to provide a contribution to ongoing to debates within the field about how CGI and volumetric capture may in turn affect documentary film, and other emergent immersive media forms, in the future.

[2] Many commentators in the field struggle to find a term for the 'viewer' of content in VR. Following the terminology used in the research outputs and for the sake of consistency, I will refer to the experiencer of 360-degree content throughout this Critical Overview.

1: Development of the research portfolio

1.1. The research trajectory: from mainstream non-fiction to 360° documentary

My academic career is as a media educator of 25 years, primarily teaching on Coventry University's Media Production course, before moving into leadership as the Associate Head of School for Student Experience in January 2016.

At the start of my career at Coventry, I focused on mainstream fictional and factual narrative forms: documentary and dramatic short film. Later, I moved into the teaching of more experimental forms such as essay films and more overtly politically driven media. Alongside, I produced practice-based experimental or documentary work. Several projects I completed at this time serve as research practice in their own right[3] and, tangentially, have some part in the research trajectory that this PhD outlines. They include:

- *Terminal*: a 40-minute, reflective documentary exploring daily life in Grand Central Terminal in New York
- *Every Harlot was A Virgin Once*: an experimental essay film shot on a '*dérive*' down Broadway
- *Huldufolk*: a Royal Television Society shortlisted documentary investigating the belief in elves amongst many people in Iceland.

Throughout my teaching career, there have been three broad developments in media production that have had a bearing on the outputs cited in this portfolio.

- The range and scope of media institutions producing content have increased dramatically. A small number of large media conglomerates has been augmented by the emergence of both smaller production companies or massive conglomerates whose business models are not confined to content production, or even media, but who are now moving into the area
- In tandem with this, there has been a technological move from the technologies of production being professional, and therefore expensive and only available to a trained elite, to becoming more 'prosumer'[4]: cheap, affordable, and easy to use but producing nearly professional-quality output
- In terms of distribution, social media, new and emerging media platforms along with new technologies of consumption have emerged that undermine traditional distribution methods.

These developments have had a direct, significant impact on the ways in which media content is created and distributed, whom it is produced by and for what purposes. They have shifted the production and distribution of media away from solely

[3] They are not included in the portfolio of outputs for this PhD

[4] The term prosumer is a portmanteau word that conflates professional and consumer. So, prosumer cameras are generally accepted to be those that have the ease of use of consumer camera but have either the quality of output of professional cameras and/or the ability to more fully control the image.

professional production cultures towards a more democratic production base. In tandem with these broad developments has been the technological development of VR and other forms of immersive media. Together, these have had a significant impact on the production of documentary work.

It is against this backdrop of my career and the profound changes detailed above that the outputs in this portfolio developed.

1.2. Research Questions

The portfolio of outputs is linked in several ways, the discussion of which is developed throughout this Critical Overview. The overarching question that I sought to explore as the production of the outputs progressed was:

> How do existing and emerging technologies for 360° film production lead to new production practices and in what ways do they differ from established documentary practice?

To research this more fully, the following supplementary questions are addressed in varying degrees by one or more of the outputs:

1. How does the experience of viewing documentary narratives within VR differ from the experience of viewing a 2D documentary film
2. How does this differential experience affect documentary production practices?
3. What are the implications for future documentary production practices within a wider ecosystem of immersive media?

The outputs are concerned with the three key related concepts that have been central to the discussions of 360° documentary at both a practice and theoretical level: immersion, presence and empathy.

- As described in the glossary, "Immersion […] tends to be a […] general term for becoming entirely encompassed and forgetting about reality. In VR, immersion takes on a practical sense, as users' eyes, ears, and sometimes even hands and bodies are engaged, thus, blocking out any cues or sensory inputs from reality" (Unity, nd:np).
- Presence has been variously described but, in essence, refers to the sensation of the participant in a VR experience "being there" (Bailenson 2018: 5) in the virtual environment. Whereas immersion occurs largely as a result of the technical features of VR, presence is "a psychological, perceptual and cognitive consequence of immersion. Presence is thought of as the psychological perception of 'being in' or 'existing in' the [virtual environment] in which one is immersed" (Mestre 2005: 6).
- In her discussion of cinematic empathy, Stadler defines it as: "an emotional process that occurs when audience members perceive, imagine or hear about a

film character's affective and mental state and, in doing so, vicariously experience a shared or congruent state" (2016: 1).

1.3. Research Methods and Methodology

The specific research methods used in the creation of each of the outputs in the portfolio were different, but part of an iterative methodology that included practice-led research, literature review and critical reflection.

Kolb's model of experiential learning, which formed the basis of much of my teaching practice, posits a learning cycle consisting of four stages: concrete experience, observation and reflection, formation of abstract concepts and testing in new situations (Kolb, 1984). Smith and Dean (2009:19) represent a more comprehensive and sophisticated iterative methodology that covers all the outputs in this PhD in Figure 1.

Figure 1: Smith and Dean's iterative methodology

Both of my original documentary films can be defined as practice-led research (Smith and Dean, 2009, Nelson, 2013). The importance of such research in an emergent field is significant, especially as the "generative capacity [of such research] is derived from the alternative approaches it employs […] subjective, emergent and interdisciplinary approaches […] (Barrett and Bolt, 2010: 3) or because, as Kershaw notes, practice-led research tends to prioritise "radical creativity upsetting the traditional cautions of scholarship" (in Allegue et al, 2009:2)

As the work was made over time and for different purposes, I utilised an iterative methodology. A key part of my iterative methodology is critical reflection. Schön defines the characteristics required of what he terms a 'reflective practitioner': namely that any practitioner engages two levels of reflection. Firstly, 'reflection in action' which is the process of reflecting on the activity while it is in progress and, secondly, 'reflection on action' which is the post-hoc reflection after the activity has been completed (Schön, 1983). The outputs in the portfolio were the result of my existing professional competencies, or what Schön refers to as 'knowing in action' (1983:49) being supplemented with these two levels. Reflection-in-action provided the means to successfully complete a project coupled with a more systematic and sophisticated process of reflection-on-action that enabled me to move from the production of one output to the next effectively.

1.4. A chronological description tracing the development of the portfolio of research outputs

This PhD collects original research outputs completed at different points into a coherent whole through the development of a model of production for 360°documentary.

Output 1: *Contemplations in Chungking*

Contemplations in Chungking is a spherical 360° documentary film where we were acting as "technological explorers" (Nash, 2022:1): namely, using the opportunity of producing a documentary to explore the possibilities and limitations of newly introduced 360° camera technology.

Using the methods of Direct Cinema and cinéma verité documentaries, *Contemplation in Chungking* was shot over a very short period with very little pre-production planning. We used 'lo-fi' technology: a recently introduced consumer 360° camera and monopod. Utilising Debord's (1958) notion of the *dérive*, we planned to drift through the space of Chungking Mansions in Hong Kong (a vibrant market on the ground floor, with hostels, small businesses and brothels on the floors above) in a playful and political walking, allowing for the representation of, and reflection on, the complex social and political conditions that face the immigrant refugees living in Chungking.

> What the work does: The film and associated research commentary highlight the fact that, as an emerging form of documentary production using new technology, new production practices are needed to adapt to the changes that the form requires. It further highlights that the viewing experience in 360° documentary is significantly different from two-dimensional documentary in terms of its immersive capabilities.

Output 2: *The Sensorama Revisited*: *evaluating the application of multi-sensory input on the sense of presence in 360° immersive film in virtual reality*

The second output in the portfolio was the result of our analysis of *Contemplations in Chungking*. We concluded that the finished documentary did not 'properly' represent the experience of being there. The Mansions had two obvious characteristics to us as visitors: firstly, the intense heat of the space and, secondly, the 'zoned' nature of the smells in the space. Neither of these are experienced when viewing the film on an HMD. In order to more fully explore how immersion/presence in a 360° documentary could be enhanced, we engaged in a research project which added heat and smell to the experience of *Contemplation in Chungking*.

> **What the work does:** This project highlights the fact that, although providing a greater sense of immersion than two-dimensional documentary, the experience of 360° documentary in an HMD can be further enhanced to provide a greater sense of immersion/presence. It provides evidence that this can be achieved by the inclusion of additional stimuli to the experience.

Output 3: *The Harlot's Charter: A Manifesto for Immersive Experiential Film*

The Harlot's Charter was an attempt to respond to the notion that media production was at a moment of flux, similar to that experienced at the birth of cinema. The rules and grammar of continuity editing in mainstream cinema developed relatively quickly at the end of the 19th Century and beginning of the 20th Century: the use of different shot sizes, the 180-degree rule, the headspace rule, the use of shot-reverse shot, looking into space etc.

The two previous research outputs, and the fact that there were, at that point, relatively few 360° documentaries for VR, alerted us to the fact that the codes and conventions of 360° documentary were still to be defined but were already evidencing what we termed 'an unhelpful fixity'. Given the similarities to the beginning of the 20th century and the raft of artistic manifestos, I decided that a manifesto might be a way of avoiding technological determinism around spherical cameras and associated shooting practices. *The Harlot's Charter* was a manifesto providing a provocation to media practitioners who were moving into the production of 360° documentaries, to enable them to reflect on the possibilities of the new medium

> **What the work does:** The work provides a provocation for filmmakers working in what is still a relatively new form of documentary. Through the manifesto, filmmakers are encouraged to reflect upon why they are working in certain ways and, more importantly, to consider alternatives to established documentary practice that utilise the new technologies, and to pay attention to inclusion. It forms the basis for the model in the PhD.

Output 4: *Shameful Conquest*[5]

[5] The title is directly referenced from Shakespeare's Richard II

The fourth output is another original 360° documentary film that was screened in significant film festivals around the world. A response to the UK Brexit vote in June 2016, where 48% of people voted to remain and 52% voted to leave, the film was shot in Weston-super-Mare: a town that voted in the same proportions as the national vote.

Whereas *Contemplation in Chunking* was largely unplanned and mainly constructed in the edit, this film was more actively constructed at the pre-production stage.

Figure 2: Film poster for *Shameful Conquest*

What the work does: The work tests the model conceived in the manifesto, assessing the usefulness of the provocations in it. It enables the further refinement of the final model.

Output 5: *Walking in someone else's shoes: creating empathy in the practice of immersive film*

A term that is often used in discussions of VR was coined by a producer of 360° documentary, Chris Milk: "the ultimate empathy machine" (Milk, 2015). Clearly, empathetic responses to 2D film are central to the viewing experience (see, for example, D'Aloia, 2012; Stadler, 2016) but according to Milk, the *technological* form of VR and its associated content, especially 360° documentary film, offers their producers opportunities to create significantly more empathy on the part of experiencers than that for viewers of 2D film. This is, on the surface at least, an exciting sense of the liberatory possibilities of VR: if the means of cultural production can be used by those with different world views, then the opportunity for more diverse, more 'empathetic' visions of the world becomes possible (Mikelli and Dawkins, 2019).

What the work does: This output explores more systematically the notion of empathy to provide a critique of what had already become an established and, in many places, unquestioned term in discussions of VR. Through analysis of existing films and interviews with practitioners, it concludes that there is a continuity of practice between 2D and 360° film but that there are significant differences that require filmmakers to actively attend to in the production of 360° film, thus validating the need for a model of practice as provided in this PhD.

Output 6: *VR kaleidoscope: reconfiguring space and place through community-based media literacy interventions*.

Written contemporaneously with the previous output, Output 6 builds upon the conclusions of that output and critically explored and applied notions of media literacy and pedagogy to a community-based, participatory project working with users of a local charity. It sought to explore three areas:

> (1) How accessible and easy to use the technology was for people with knowledge of digital technologies and social media but no significant filmmaking skills
> (2) How these relatively new technologies would be used by VR novices to explore space/place and tell stories about their lives that would be accessible and engaging to a wider audience
> (3) How these technologies could be used in larger-scale projects both in formal and informal educational/community engagement settings. (2020:55)

Using a theoretical framework of media literacy and through practical workshops, young Muslim women were introduced to spherical camera technology and storytelling strategies for 360° documentary film, before making their own narrative documentaries. The subsequent films explored the women's relationship to specific significant places.

What the work does: This output provides evidence of how the emerging technologies of production can be used by non-professionals as part of participatory production practices to widen the pool of people making 360° documentary content to co-create more inclusive and diverse documentary content. It feeds into discussions about intersectionality and realigned social relations: for example, Black Lives Matter and the #MeToo movements.

Output 7: *Prison Break Mixed Reality Experience*

The *Prison Break* experience is an attempt to bring all the insights gained in previous outputs together, with the aim of producing an immersive experience for learners of English in Hong Kong. It was part of the British Council's SPARK Festival.

Figure 3: Webpage for the SPARK festival
https://www.britishcouncil.hk/en/programmes/spark-2019

It was a mixed reality (MR) or Spatial Augmented Reality (Bimber and Raskar, 2005), narrative experience that combined a physical set, animateurs as 'actors' in the set, and video and audio material delivered via screens and an AR app to participants' mobile phones.

Figure 4: Stills from the *Prison Break* MR experience

What the work does: This output is an outlier in this portfolio in that it is not a 360° documentary. However, its inclusion in the portfolio is deliberate as the practices that were used in its construction point to the how existing practices might be integrated into emerging immersive practices. In doing so, it provides some potential avenues and strategies for 360° documentary in the future, particularly around the ways in which immersive documentary content can work within, and be enhanced by, physical spaces and the integration of other technologies.

The relationship of the individual outputs to the development of the model is as follows:

No.	Title	Year	Output	Model
O1	*Contemplations in Chungking*	2016	Original 360° documentary and critical reflection on peer-reviewed website.	Foundational work for the model
O2	*The Sensorama Revisited: evaluating the application of multi-sensory input on the sense of presence in 360° immersive film in virtual reality*	2017	Book chapter	
O3	*The Harlot's Charter: a manifesto for immersive experiential film.*	2017	Published manifesto	Development of the model
O4	*Shameful Conquest*	2017	Original immersive, 360° documentary.	Testing and refining of the model
O5	*Walking in someone else's shoes: creating empathy in the practice of immersive film*	2018	Peer-reviewed journal article	
O6	*VR kaleidoscope: reconfiguring space and place through community-based media literacy interventions*	2019	Peer-reviewed journal article	

O7	*Prison Break*	2019	Mixed Reality experience. SPARK Festival: Hong Kong	Reflections on the future development of the model

1.5. The Model of 360° Documentary Production

In addition to his two categories of reflection, Schön proposes that professionals also act at the level of 'knowing-in-action' whereby:

> *In [their] day-to-day practice [they make] innumerable judgments of quality for which [they] cannot state adequate criteria, and [they display] skills for which [they] cannot state the rules and procedures.* (1983:49-50)

This identifies an unconscious, possibly unreflective and unquestioning, sense of doing what one has learnt to do and always done. As my portfolio of outputs developed, it was clear that we were working with technologies and practices that were leading to new ways of making documentary: at the end of the process, I reached an understanding that there needed to be a more holistic way of looking at the production process for 360° documentary and concluded that a model that draws the threads of the research together would contribute to the field.

Sinek's business model of the Golden Circle provided a starting point for the development of the model that forms the contribution of this PhD. In his model analysing why successful leaders or companies are so successful, he argues that they start with why, rather than what or how (Sinek 2011).

Figure 5: Sinek's Golden Circle
https://commonthreadco.com/blogs/coachs-corner/leveraging-sineks-golden-circle-part-i

The model was developed and refined in five main stages:

Stage 1: the foundational stage, where the focus of the research was on *what* new technologies of production were emerging and *how* to use them in the production of documentary

Stage 2: the development stage, where the manifesto that was the basis for the model was established.

Stage 3 the testing and refining stage, where the model was interrogated in the production of practice-based outputs and theoretically informed journal articles.

Stage 4: a reflective stage where the model's applicability to emerging forms of immersive experience was posited.

Stage 5: where the model was finalised in the form it is described and represented below for the purposes of this PhD.

The components of 360° production and their relationship to the final experience that form the model can be represented visually as follows:

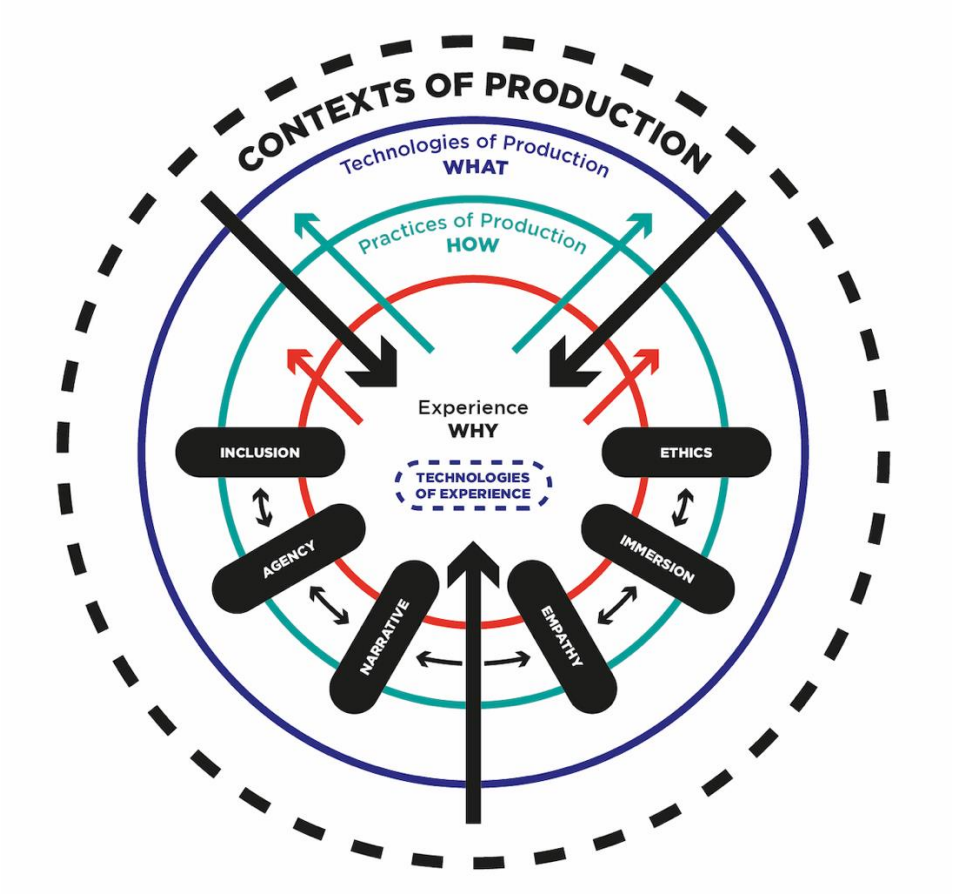

Figure 6: The model of 360° documentary production
Source: author's own creation

The Rings

- The outer Contexts of Production ring represents an awareness that every media output is produced within specific contexts that affect its production, form and distribution: economic, political, institutional, educational, industrial etc.
- The Technologies of Production ring is the ‘what’ in the model. In terms of 360° documentary, it is what technology is used: specifically, 360° spherical cameras, 360° binaural sound technology, and specific editing software.
- The Practices of Production ring is associated with the technologies of production. It is the ‘how’ in my model. How might those technologies be used, by whom, and for what purposes to design the final experience?
- The central ring is the ‘why’ ring. It represents the reason why those technologies and practices have been adopted: that is, to create an immersive, experiential documentary as opposed to a 2D one. It contains a box to represent the technologies of experience (for example, HMDs, haptics, room scale VR)

The Boxes

The black boxes within the rings represent the often taken-for-granted assumptions that need to be foregrounded in the thinking of 360° documentary producers. While it is obvious that *some* documentary makers working in 2D consider all these, *all* 360° documentary makers need to to address the differences between the two forms that will be explored in this Critical Overview.

The Arrows

The arrows move in both directions to signify the constant attention that needs to be paid to the black boxes if the final experience is to be significantly enhanced.

- The large black arrows pointing inwards represent the fact that technology (which is always developed because of external contexts) affects the practices of production which, in turn, determines the final experience.
- The green arrow pointing outwards represent the fact that, in the development of VR technology and 360° documentary, experiences provide an impetus for developers (technology companies) and users of the technologies of production (the filmmakers) to adapt them to make the experiences more immersive, experiential and interactive.
- The orange arrows pointing outwards represent the fact that previous 360° documentary experiences provide later producers with information about how their productions can utilise the technologies for more immersive experiences with an impact on the production practices used.
- The small black arrows in the Practices of Production ring articulate the need for practitioners to engage in a constant process of reflection-in-action around how the key areas of difference need to be integrated into the practice and the final experience.

Inherent in its form, the model encourages a process of reflection-in-action and reflection-on-action as an integral part of the practices of 360° documentary production. It prioritises why questions: Why *this* narrative? Why is it important? Why *this way* of telling the story? Why am *I* making this documentary? Why is 360° technology the best tool for making and experiencing this story? Why might it not be?

The model articulated in this PhD is useful for both educators and practitioners in the field. It is most appropriate for using in formal educational settings but given its purpose, to support practice, is also highly appropriate for informal settings and as a tool for the development of participatory practices as part of the process of co-creation.

In more formal educational settings, the model is likely to be most effective when used in situations where task, or experiential, learning takes place and learners are expected to make their own 360° productions. It will empower learners to fully understand the aspects of the storytelling process for 360° documentary. Formal teaching around documentary practice often starts with the *what* and *how* of production. The proposed model organizes learning from the perspective of the *why*, placing more significance on this at the beginning of the new 360° documentary productions. In this way, learners using the model are more likely to make work that more fully utilises the distinct characteristics of immersive experiential film.

The model will be beneficial in informal co-creation or participatory settings where individuals or communities work with educators/professionals to develop their stories into coherent documentary narratives, as well as developing cultural competencies in documentary filmmaking. In using the model, practitioners can focus as much on creating a truly collaborative, inclusive process of 360° filmmaking. The process instigated by the model aims at achieving a long-term, significant impact on those individuals and communities, supporting their role in dynamic and active social change.

The discussion of the development of the model, the detail of the ways in which the outputs are linked to the model, and its applicability to future production is explored in more detail in the following chapters of this Critical Overview.

2: Context for the research

2.1. The Empathy Machine Dismantled? Histories, Theories and Practices of 360° Documentary Film

The period in which the research outputs for this PhD were produced was a moment when high end consumer, and 'prosumer', production technologies such as spherical video cameras, and distribution technologies such as technologically sophisticated HMDs created an "immersive turn" in documentary production (Rose 2018: 132). At the beginning of the research trajectory, there was little academic research around the relatively small number of existing 360° documentaries. It is in this context that the main research questions were formulated and the outputs in this portfolio produced. This chapter addresses some of the emerging issues and problems that arose at the beginning of this new form of documentary, and which continue to be explored both in more recent 360° documentaries and other immersive forms.

At the time that the outputs were being developed, Bailenson made great claims for VR, arguing that:

> *… there are many ways the unique power of VR can be applied to make us better people, more empathetic […] VR will not only give us access to experiences that are difficult to obtain, it will also allow us to see impossible things, fantastic things, things that will allow us to see the real world in new ways and allow us to stretch our minds beyond anything we can imagine."* (2018: 5-6)

At the same time, Zimmerman and De Michiel noted in relation to documentary that:

> *New technologies, realigned social relations, and emerging political challenges call for a reexamination of documentary's forms, functions, and roles. No longer a fixed object, documentary is taking on iterative, shape-shifting contours and migrating across multiple interfaces.* (2018: vii)

It is these two linked ideas (the potential of VR technologies and the changing nature of documentary) that are central to both answering the main research question and developing the model for future production.

One of the key theorists of documentary, Bill Nichols, provides a useful framework for understanding the development of the documentary genre. He suggests that analysis in four main areas -the institutional context, the community of practitioners, the audience, and the corpus of texts - enables the systematic analysis of documentary at both a synchronic and diachronic level (2010:15-16). However, to fully understand the profound and significant changes that have occurred with the introduction of 360° documentary, I add one more area that is fundamental to this PhD in that it has a direct impact on the production cultures and productions themselves: technological changes.

Institutional Context of 360° Documentary for VR

Historically, the means of the mainstream production and distribution of documentary were mainly concentrated in the hands of a relatively small number of media institutions. Those institutions have recently been joined by newer ones – Google, Apple, Facebook, Amazon, Microsoft – who, despite originally being technology companies, have increasingly moved into the areas previously controlled by the historical media institutions – higher-end film and TV-based types of production that were previously the preserve of the traditional broadcasters – while maintaining their development of hardware, platforms and media forms. What these companies have also done, since their inception, is to create the technologies of 360° and VR and platforms such as Facebook and YouTube that have enabled more widespread cultural production and distribution (Rogers, 2019: Nakamura, 2020), including of 360° documentary (Aguayo, 2019).

Raab posits *Zero Point as* "the first movie ever shot in 3D, 360-degree video specifically for virtual reality" (2014: np) but in terms of 360° documentary, it is possible to date its emergence slightly earlier to around 2012. The VR Non-Fiction: A Mediography website[6] contains films produced from that date until 2018 when its research funding ended. The institutional basis of many of these films is unclear, but it is apparent that many of the 603 films listed were not produced within major institutions. Output 4 of this portfolio is, for example, included.

We can represent a basic matrix of cultural production for documentary as follows:

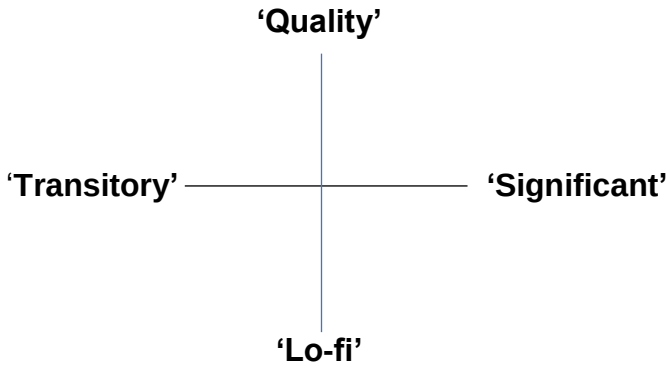

Figure 7: Representation of a basic model of cultural production
Source: author's own creation

- **'Quality**' refers to media products that are the result of the producers having access to high-end, professional kit and the necessary level of professional skills to produce significant pieces of work that distributed widely via established channels and reach large audiences.

[6] The project that funded it was a joint one between the University of Bristol, University of West of England, University of Bath and the Engineering and Physical Sciences Research Council.

- **‘Lo-fi’** refers to the type of user-generated content made by people with little or no access to high-end, professional level kit and/or the professional skills in terms of traditional media production.
- **‘Transitory’** refers the content of a production that has a limited significance or currency, often relating to either a specific event or to something that is culturally ‘insignificant’, and often seen by very few people (for example, family and friends) but which has the potential to go viral and reach significantly larger audiences.
- **‘Significant’** refers to a cultural production that obtains a wider cultural significance and longevity.

All these categories have inverted commas around them as it is increasingly difficult to have any fixed, ‘objective’ sense of what each of the words means. In terms of 360° documentary production, there is a noticeable move away from exclusively quality/significant content towards lo-fi/transitory content. It is here that we can situate much 360° practice: for example, in the preponderance of travel documentaries that exist. However, because of the wider political, cultural and economic contexts within which documentary work is produced, there is also a clear link between new digital technologies, participatory practice and political cultures to produce documentaries that may lead to positive social change (Aguayo, 2019; Özdem, 2021).

The production of 360° documentary films generally fall into the following institutional categories:

- Existing large media companies, such as the BBC, New York Times etc. who use such films to supplement their existing, often journalistic, offer
- Existing production companies, often producing work to experiment with the new technologies of production and distribution: for example, immersive.ly, Vice News and with.in
- NGOs seeking to promote a greater sense of empathy on the part of the people experiencing the documentary
- Academics and other staff at universities experimenting with new technologies of production and distribution to produce creative outputs and associated academic research
- Individual filmmakers, either amateur or professional.

Community of Practitioners

Many 360° documentaries were initially produced by larger, established media institutions and professional filmmakers. Google, for example, used expensive spherical camera technology to enable established documentary producers to produce a range of 360° documentaries. At the other end of the spectrum, they also introduced the Google Cardboard headset – an inexpensive headset that used the user’s mobile phone – and

produced content with organisations such as the *New York Times* to increase VR's reach in educational settings and to explore the possibilities for VR in news organisations.

As Rose (2018) suggests, spherical 360° technology is the most accessible form of technology for nonfiction film, and this has led to a significant number of 360° documentaries since the *VR Non-Fiction: A Mediography* website ceased archiving. As the cost of the tools of cultural production has gone down, access to the platforms which distribute content has gone up, and the skill level of many non-media professionals has risen, there is a weakening of the hegemony of traditional media institutions. Many people now regularly 'produce' 'media' that they share on social media platforms: from the punk, DIY aesthetic of many posts (transitory, seen by few) to the technologically and narratively sophisticated videos (quality, seen by many). This has had a significant effect on the community of practitioners producing 360° content.

The Audience for 360° documentary

As with other media forms, it does not make sense to talk of 'the audience' for 360° documentary. It is more productive to talk of *audiences* as there are essentially four main ways in which it is currently possible to experience VR content:

1. At film festivals, which often include 360° documentary
2. In specially organized, Location Based Experiences (LBE) experiences that often exhibit what I term 'spectacular VR'[7] but may not include specific documentary content
3. In the domestic sphere, using an HMD and online platforms such as YouTube VR and the Oculus (now Meta) Store, predominantly still focused on gaming
4. Online without using an HMD.

Fux (2020) discusses the rise of VR on the film festival circuit, noting that:

> *In 2014, only few film festivals were exhibiting VR as part of their regular programming. VR was a novel technology still underdeveloped, presented mainly in professional conferences examining its function through technological perspectives. By 2020, however, the festival submission platform Film Freeway listed no less than 1249 film festivals that include VR in their programs. (2020:np)*

But although there has been a significant rise in the number of festivals offering a 'premium' experience of 360° documentary, these experiences are relatively limited in terms of reach. The consequence for many 360° documentaries is that their exposure is confined to a niche audience of film festival goers. The fact that these documentaries need to be experienced on HMDs means that, within that audience, there are likely to be members who do not want to, or cannot, experience the content.

[7] By spectacular content, I am referring to content that is nonfiction, often highly produced but is not documentary work: for example, Cirque Du Soleil's *Through the Masks of Luzia and Ka: The Battle Within*

The types of immersive experience that many people currently access VR content through are the experiences within social, LBE environments fostered by organisations such as Limina Immersive and in, for example, theme parks and museums. Many of these spaces show educational content or 'spectacular' VR: content produced by organisations such as Cirque du Soleil to highlight their core activities. While this develops audiences for VR, it does not necessarily develop audiences for 360° documentary work.

Bailenson makes the hyperbolic claim that:

> *There is a major qualitative difference between VR and watching a video. It feels real. Good VR does that. When done right, VR experiences – intense, beautiful, violent, touching, erotic or whatever else you chose them to be – will feel so realistic and immersive they will have the potential, similar to experiences in the real world, to enact profound and lasting changes in us.* (2018: 6)

While there is a significant online presence of 360° documentary films on mainstream platforms such as YouTube VR, and more specific web spaces such as with.in and immers.ly, 360° documentary film does not easily lend itself to being experienced, experienced outside of VR. One only needs to view a 360° film on a 2D screen to realise that the things that enable immersion and a sense of presence in an HMD, such as the use of binaural audio and the use of sound cues to direct attention, simply do not function on the same level. The experience is diminished by the need to actively use, for example, the mouse pad to negotiate the 360° features of the film, with significant impacts on its immersive quality.
This has implications for access and democratisation that are explored in the conclusion of this Critical Overview.

The Corpus of Texts

Given the types of production and distribution mentioned above, it is difficult to ascertain how large the corpus of texts is in relation to 360° documentary. However, what is important in the corpus is not the number but the types of texts.

Nichols provides a still widely-cited taxonomy of six 'modes' of established two-dimensional documentary – expository, poetic, observational, participatory, reflexive, and performative (2010: 142 - 211) – with different production methods relating to their institutional basis and the ideological position of the filmmaker in relation to 'the creative treatment of actuality'.

Nichols' taxonomy and modes are not without their critics, though. De Bromhead, for example, argues that the focus on the informative and educational aspects of documentary mean that there is a prioritising of 'masculine' rationality and that documentary "has been taken up as an instrument that may serve male discourse and

so [is] burdened with the weight of rationality" (1996:2). Arguing against what she calls "… one of the most dishonest illusions" (*ibid:*11) surrounding documentary, she argues for "documentary as cinematic pleasure [which leads to] emotional response and empathy" (*ibid*: 5) on the part of the viewer. She posits five alternative modes which relate more closely to established fictional genres, "… *adapting* cinematic rules and devices used in fiction" (*ibid*: 5. Original emphasis) in the creation of documentary narratives: Linear (subdivided into Classic/ Hollywood and Detective), Discursive, Episodic, Poetic or Hybrid (sub-divided into diary film or road movie).

Given the differences between 2D and 360° documentary production that this PhD examines, de Bromhead's work and later research concerned with content produced for experiencing within VR suggests that re-evaluation of the modes and their function are needed for 360° documentary. Paino Ambrosio and Rodriguez-Fidalgo, albeit in the context of their discussion of categories of immersive journalism, argue for six distinct categories: Informative, Testimonial, Informative-testimonial, Descriptive, Dramatic and Experiential (2019). The model in this PhD and the suggestions made in the conclusion suggest that even these categories may be inadequate for 360° documentary. If, as argued in the conclusion, participatory practices and co-creation are to become a more significant part of future 360° documentary production, one significant new mode that I would propose would be Co-Created Participatory Documentary. In contrast to Nichols' mode of participatory documentary that is participatory only because of the participation and visibility of the documentary maker in the documentary, the new defining characteristics of the new Co-Created Participatory mode would include a more sophisticated understanding of, and attention to, the process of construction of the documentary as opposed to existing modes which tend to prioritise the finished documentary.

However, whichever method is used to capture the imagery for a film and whichever category we assign to it, the content shares certain characteristics. Bailenson's quote above implicitly refers to the three key motifs of VR that are fundamental to understanding how contemporary VR functions, especially in relation to 360° documentary film: the three interrelated concepts of immersion, presence, and empathy that we introduced above.

Immersion

One of the key platforms for the contemporary development of digitally constructed, 'pliant' virtual worlds is the game engine developer Unity. They define immersion as follows:

> Immersion' refers to drawing a user completely into a virtual world. [It] tends to be a … general term for becoming entirely encompassed and forgetting about reality. In VR, immersion takes on a practical sense, as users' eyes, ears, and sometimes even hands and bodies are engaged, thus, blocking out any cues or sensory inputs from reality. (Unity, nd: np)

For the purposes of this PhD to address the main research question and to understand the model more fully, I will focus on three types of immersion - technological, technical and narrative – that mark 360° documentary as different to 2D documentary.

Technological Immersion

There are real disparities between the different types of immersive media. A 360° documentary is different to a VR game which is different again to an augmented reality (AR) application, both in terms of the technologies used to produce and distribute the products, the user interface and the user experience.

In constructing a 360° documentary, one is constructing an experience that may be encountered in a social setting at a cinema, festival or event or individually in a domestic setting but one that, with relatively few exceptions, is experienced individually. The key technology for experiencing VR content and producing immersion is the HMD. Especially in higher end HMDs with high resolution displays, low latency and binaural spatial sound, the act of putting on an HMD enables a more sophisticated type of immersion than that of 2D film. Putting on an HMD immediately removes the user from the real world and the experience of the documentary content becomes a solitary experience, even in shared LBE experiences. Whereas for a 2D text, the audience member watches, or views, a closed text with a fixed frame and adopts an, essentially, third person position in relation to the text and its content, the experiencer in VR is able to more actively view the space of the spherical 360° content or, in the case of films with CGI/volumetric capture, interact with and/or affect it as they are, effectively, surrounded by the content in what Gillies terms a 'mobile' frame (2022:206)

I suggest that there is an eco-system of technological immersion emerging with distinct levels of immersion based on the technology used, where the film is experienced, the type of content and the type of experience required. In order of technological immersion, these levels include:

1. the use of an HMD, with basic models offering 3 Degrees of Freedom (3DOF) which track the movement of the head but do not allow for movement within a filmic world created using spherical cameras or more sophisticated models offering 6 Degrees of Freedom (6DOF) which track the participant's movement in the filmic world created by CGI or volumetric capture
2. the use of controllers to interact with, or control, elements of the filmic world
3. the use of wearable, haptic technology to replicate bodily movements in the filmic world. This ranges from haptic gloves through to full body suits.
4. the use of multi-sensory input to enhance the content of the experience. This might include the addition of smell, taste or the use of props to enhance the experience, for example, karts to enhance a kart race game (Melnik 2020: no page)

5. whole-body experiences whereby every bodily sensation is replaced with managed stimuli

However, as I will explore below, there is a paradox here. Even at the most basic level of the ecosystem, consumers seem unwilling to buy the HMDs and/or experience the well-known discomfort of VR: solitariness, motion sickness and dizziness (Ohyama *et al,* 2007). The further up the ecosystem of immersion one moves, the further one gets away from VR being a mass market consumer *product* to one being an 'extra-ordinary', 'premium' *experience* that many would be unwilling or unable to participate in owing to geographical location and cost. This has a potential to create and sustain a growing digital divide (Van Dijk 2020) especially, as we saw earlier, the diminished experience that experiencing 360° content on 2D screens provides.

Technical Immersion

Elmezeny *et al* (2018) propose a direct link between the narrative of a 360° experience and what they, following Sheikh 2016) call 'technical immersion'. For them, technical immersion is produced by the explicit choices of the filmmaker, rather than the technologies used to produce, or experience, the content:

> *Technical immersion manifests through cues to direct the viewer's attention and cues to acknowledge the viewer as part of the virtual environment.* (2018:1)

These techniques of technical immersion have a direct impact on the position that the experiencer of 360° content is able to adopt in relation to the film. While in 2D content, the viewer is in a third person position, within VR the experiencer is in either a first-person position or second-person position (Nash, 2018).

The camera in 360° documentary has historically tended to be at (male) eye level and shoots in what in conventional terms would be classed as wide shots. This, along with the inability of spherical cameras to provide close shots that can be cut away to in an edit, has a positive and negative effect. The positive is that it provides a more 'realistic' experience of a space that the experiencer can look around; the negative is that it does not enable close visual direction that the final edit of 2D film enables: for example, the use of close-ups and shot-reverse shot sequences to create empathy (Özdem, 2019:73; Stadler 2016: 2)

As in most audio-visual products, sound plays a large part in the technical immersion of the experiencer (Chion, 1994) Again, the advances in spatial sound recording technology and the means of experiencing it, mean that sound may play a more significant role in 360° documentary than in two-dimensional documentary. Butterworth (2022) notes for example, how sound cues can be used in the sound design of a 360° documentary to direct the experiencer's attention towards something but also away from what the filmmaker does not want the experiencer to see. She provides a detailed sense of the possibilities of creating both a literal truth, through the use of diegetic sound, and emotional truth about the space being represented, along

with a discussion of how the 'sonic distraction' of getting something wrong in the sound design of an immersive experience – through the sonic signature of a space being wrong or the lack of a visual source for a sound - is easily picked up by the human brain and can reduce the sense of immersion felt (Butterworth, 2022: 157).

Narrative Immersion

The narrative of the content, too, heightens the sense of immersion felt by the participant within VR content. Ryan (2015) provides a detailed analysis of narrative immersion within VR. For her, there are four 'varieties' of immersion'**:**

1. Spatial immersion
2. Temporal immersion
3. Spatio-temporal immersion
4. Emotional immersion

(2015: 85-116)

These types of immersion will be discussed in more detail below in relation to the research outputs all of which relate, to some extent or other, to issues surrounding the concept of immersion.

Empathy

Milk's definition of VR as the "ultimate empathy machine" (Milk 2015) articulates a position that the *technological* form of 360° documentary film offers producers opportunities to create significantly more empathy on the part of experiencers than that for viewers of 2D film. Owing to the increased sense of presence and immersion felt in in VR spaces, experiencers of 360° documentaries would *almost inevitably* have a much greater sense of empathy for the subjects of the documentaries. The result of this would be an increase in pro-social behaviour and a reduction in prejudice.

There is some evidence that empathy *is* increased through interactivity in other forms of nonfiction VR. One of the key figures in the development of the third wave of VR in the 2000s, Nony de le Pena, pioneered what has since become known as immersive journalism (Uskali *et al*, 2020). Through the construction of CGI worlds representing events or situations events such as homelessness, she has suggested that participants have increased empathy for people in that situation, even when they are relatively crudely constructed CGI avatars (De la Pena, 2010).

However, as Rose (2018) notes, this notion of increased empathy in VR was accepted relatively unquestioningly by many but has since been critiqued from a number of different perspectives, ranging from critiques of its existence and extent to its political purposes (Bollmer, 2017; Nakamura, 2020).

All the research outputs in this portfolio relate to these three key motifs and the links between them are discussed more fully below in the discussion of each output

3: Presentation, evaluation and synthesis of the outputs

3.1. Description of, and evaluation of the links between, the outputs

As outlined above, the initial outputs in this portfolio were produced before, or at the outset of, the immersive turn: what Rose has termed a period of “giddy claims” about the potential of 360° documentary (2018:132). In that respect they were, by nature, innovative, original and tested some of these giddy claims. Later outputs prefigured some of the later debates within the field: for example, around media literacy for 360° documentary and the established motif of empathy in VR.

In terms of the development of the model of 360° documentary, the outputs explicitly address the following areas:

	Technology	Practices	Experience	Ethics	Inclusion	Empathy	Immersion	Narrative	Agency
O1	✓	✓					✓	✓	
O2	✓	✓	✓				✓		
O3	✓	✓		✓	✓	✓	✓	✓	
O4	✓		✓				✓	✓	✓
O5	✓	✓		✓	✓				✓
O6				✓	✓	✓			
O7	✓	✓	✓				✓	✓	✓

Contemplations in Chungking: **Exploring the technology**

Contemplations in Chungking enabled the formulation of the main research question as well as acting as the kind of practice that Bolt (borrowing from Heidegger) characterises as 'praxical knowledge': namely, knowledge gained from practice 'that can inspire a shift in thought' (Bolt, 2007:29). It was shot over a very short period with relatively little pre-production planning using a recently introduced prosumer 360° spherical camera that records binaural sound, and a monopod. The aim was not to document, in an evidential or 'authentic' manner, the whole experience of the space but to use the method of the *dérive* to provide a focused, subjective sense of the place, in order to explore how the representations of that space differed between spherical shooting and 2D representations.

What I concluded from this project was that, while providing a sense of scopic agency for the experiencer, there are some key differences, some positive, some negative, in relation to established documentary practices and forms, with wider implications for the production of 360° documentaries.

- Firstly, the linearity of traditional two-dimensional documentary narratives and forms is potentially, at least, undermined in 360° documentaries. Whereas most

sub-genres of documentary, tell a ‘story’, our film starts out not with an explicit story but, rather, a space to experience[8].

- Secondly, although there is some sense of scopic agency in documentaries filmed with spherical cameras, there is little other agency or interactivity (Dolan and Parets, 2016). For example, one noticeable aspect of our film, as in many 360° documentaries, is the unsettling gaze of the subjects of the film. Partly owing to the newness of the camera technology, many of the participants in the film look directly at the camera. Especially in an immersive viewing of the film in an HMD, this is unsettling as it is a ‘blank gaze’: a gaze that an experiencer cannot engage with. Even more unsettling is when subjects move towards the camera (see Figure 8) as they feel like they are invading our personal space.

Figure 8: Still from *Contemplations in Chungking*

- Thirdly, there is a more significant problem. Despite Gilles’ claim above, there are of course editorial choices made of what to shoot, when and where. Rose notes that the immersive possibilities of 360° documentary and the agency ceded to the experiencer may make it harder to see the constructed nature of the 360° documentary than in more established documentary forms. The lack of overt editing and the more generally immersive experience can lead to the sense that the experiencer has ‘seen it with [their] own eyes’ (2018:130) which gives it an ontological status superior to 2D.

- Finally, there is a related ethical dimension to 360° documentary filming that, although present in all documentary filmmaking, is heightened in 360° documentary. As McLaughlin notes:

[8] This distinction is common to many 360° documentaries and, following Google, one which we characterised as being between storytelling versus what has generally come to be known as story-living (Google News Lab, 2017).

> *Technical and artistic decisions about recording and editing take on an ethical dimension, for they can deny or enable the ownership and control of the [participant's] representations of their histories, memories and identities* (2009: 73).

The key difference with 360° documentary is that the scopic agency afforded to the experiencer enables them to see things that that would have been 'editorialised' out of 2D film, leading to a voyeuristic or touristic gaze (Leotta and Ross, 2019). Using Chouliaraki's notion of improper distance (2011), Nash argues that this "… subordinate[s] the voices of distant others to those of the West, while distancing the Western spectator from their own position of privilege" (2018:125). This could be compounded when, as in our film, there is a "… dialectical conjunction of a real space and the filmmakers that invade it' (Bruzzi, 2000: 125). However, through a process of reflection-in-action we quickly realised that, although we were keen not to subordinate the voices of the participants, their status as unsettled refugees necessitated privacy.

O2: *Enhancing immersion and presence*

The Sensorama Revisited is an exploration of the possibilities of VR technology to enhance the visual and auditory experience of 360° documentary with additional sensory input. It addressed the finding in *Contemplations in Chungking* and of other people who had been to Chungking Mansions: namely the idea that the finished documentary did not 'properly' represent the experience of being there.

Adding multi-sensory input to the usual visual and auditory elements of film is not new (Heilig, 1955; Sutherland, 1957) and was being already used in immersive experiences: for example, immersive theatre and '4D' experiences (see, for example, Machon, 2013; Jerald, 2015, Kidd and Nieto, 2019). However, there was little or no visible exploration or published research on how it could be adapted for VR usage at the time we carried out our research. Our hypothesis was that adding additional sensory inputs to the existing experience would enhance the sense of immersion. So, we explored the extent to which immersion could be enhanced by the addition of thermoceptive (heat) and olfactory (smell) stimuli to the experience of a new cut of *Contemplations in Chungking.* After Debord, we titled this *Rapid Passage Through Various Ambiences* and tested it at the university and at a Royal Television Society VR event in London in 2015[9].

Although the research did suggest possibilities for enhancing the sense of immersion, it also points to some of the limitations of VR technology and the user experience.

As outlined in Chapter 2, there is an ecosystem of immersion based on the technology used, the type of experience required, and the level of immersion suitable to the

[9] A short video of the feedback from industry participants can be found at: https://www.youtube.com/watch?v=ocmk3OHkBmE

experience. Consumers seem unwilling to buy even at the most basic level of the ecosystem (the HMD) and, as Shen *et al* note, "more sophisticated approaches […] have yet to see even modest consumer adoption […] as the cost, complexity, aesthetics and size of these systems make consumer adoption unlikely" (2022: 1-2).

Technical considerations aside, there is a more significant question around enhancing immersion, especially within 360° documentary: namely, beyond VR discomfort, what are the less-positive effects of enhanced levels of immersion? The hierarchies of authenticity that come from increasing levels of immersion appear to increase the likelihood of 'improper distance' mentioned above. If an experiencer has both seen something with their own eyes *and* experienced it multi-sensorily, it makes its claims to be representing reality more acute.

O3: *Provocations to producers*

The Harlot's Charter responds to the notion that media production is at a moment of flux. The manifesto was the first attempt to codify for practitioners what an inclusive, diverse practice in 360° documentaries might look like.

The manifesto prioritised the following points that relate to the overall aims of the portfolio and the development of the model:

- **Technical issues:** it provokes filmmakers to be promiscuous in the use of technology to explore its potential and limitations.
- **Collaboration:** it acknowledges the importance of collaboration and calls for knowledge of the new field to be freely shared with others entering the field.
- **Filmic grammar:** it encourages filmmakers to "play promiscuously with film grammar to make sure that immersive filmmaking does not end up in vacuous cul-de-sacs, technologically, creatively, intellectually or politically".
- **Political purpose of immersive filmmaking**. It highlights the need for overt political purposes that may be at odds with notions of supposed documentary objectivity

Inspired by the raft of artistic manifestos at the beginning of the 20th Century, (Danchev, 2011), it was a playful but politically informed work that sought to be both a call to action and the start of a dialogue with practitioners in the area. The manifesto's title refers to the first line of a poem by William Blake[10] and the Vow of Promiscuity in the manifesto refers to Lars Von Trier and the Dogme95 movement's Vow of Chastity. It explores how important it was not to fix the practices of experiential filmmaking before their full potentialities had been explored and called for producers of immersive media to be 'promiscuous' in their outlook and practice. Whereas the insights contained in the manifesto could have taken the form of a traditional academic journal article, the polemical form of the manifesto enables a more polemical yet dialogic engagement with a wider audience.

[10] 'Every Harlot was a Virgin Once'

The manifesto was both a snapshot of our thinking about the possibilities of 360° documentary that drew upon the experience of the previous outputs, and also pre-figured some of the possibilities and concerns explored in the later outputs. Empathy, for example, was seen as integral to practice in the area but we extended this to ensure that, as filmmakers, we 'will strive to make our films change the world for the better'.

O4: Testing and refining the model

Shameful Conquest develops the theoretical and contextual insights and the practical production insights gained from the previous outputs in the production of an original 360° documentary film. Whereas *Contemplations in Chungking* was largely unplanned and mainly constructed in the edit, this film was more actively constructed in pre-production to in line with the provocations of *The Harlot's Charter*.

Visually, the film shares some formal characteristics with early 20th century 'city films' in its long-duration shots of the spaces within the town: for example, Vertov's *Man with a Movie Camera* (1929) and Ruttman's *Berlin: Symphony of a Great City* (1927)
It also shares characteristics with the documentary sub-genre of the essay-film. (Lopate, 1992, Darke, 2005). Lopate noted five defining characteristics of an essay-film, 'starting with the most questionable proposition first' (1992: 243-270):

- *an essay-film must have words, in the form of a text either spoken, subtitled or intertitled*
- *the text must represent a single voice. It may be either that of the director or screenwriter, or if collaborative, then stitched together in such a way as to sound like a single perspective*
- *the text must represent an attempt to work out some reasoned line of discourse on a problem; it must have a strong point of view*
- *the text must impart more than information*
- *the text's language should be as eloquent, well-written and interesting as possible*

Although these characteristics have been questioned (for example Stuckey-French, 2012), they are useful for situating the film within a specific tradition of documentary filmmaking. Many essay films explore the notion of the politicised nature of specific spaces, either explicitly or implicitly: for example, *London Orbital* (Petit and Sinclair, 2002), *London* (Kieller, 1994), and more recent examples in VR such as *A Machine for Viewing* (Misek *et al*, 2020).

Through the use of found footage and the intertitle screens, the film's opening gives clues to the factual intent and the political voice of the film that immediately mark it out as having a specific purpose. Without these, the first few minutes of the film might be the superficial type of immersive, touristic experience of place (Urry and Larsen, 2011; Leotta and Ross, 2018) discussed above, many of which now exist owing to the relative accessibility of the production technology.

The film then moves into a meditative, reflective sequence with little in the visuals to relate them to the political intention, but whose function is to immerse the experiencer in the space. The voiceover, a commissioned poem by Josephine Scanlon, uses quintessentially 'English' language, Shakespearean in tone, to articulate the 'voice' of the piece and to establish the 'reasoned line of discourse'. The eloquence of this poetic language is subverted by the heavily accented delivery of the native Polish speaker who delivers the words. This collision between the Englishness of the location and the voiceover and the otherness of the voice aims to provoke the person experiencing the film the reflect to upon the outcome of the Brexit vote in a manner that a more traditional documentary may not have. As Hamblin (2019) notes, for example, there has been a move away from didactic essay films with more radical aims towards films that "use slowness to train [their] spectator to see politically" (2019: 214) and it is this move that *Shameful Conquest* makes.

However, there is a possibility in the construction of the film of what Brown (1999) characterises as 'left melancholy': a 'narcissism with regard to one's past political attachments and identity that exceeds any contemporary investment in political mobilization, alliance or transformation' (cited in Hamblin 2019: 216), but the aim of this film was precisely to explore what had been lost by Brexit and to *require* the experiencer of the film to reflect upon what such mobilisation or alliances might involve.

The film adheres to *The Harlot's Charter* and relates to earlier outputs in a number of ways: primarily, around the notions of immersion and the agency of the experiencer. However, it also diverges. As we say in the section after the Vow of Promiscuity in the manifesto: '[…] we are driven by experience. If an experience can be made more real through filming and editing techniques, this needs to happen in a measured way'. So, in the production of *Shameful Conquest,* rather than 'only [using] natural sound effects recorded in the location' (as stated in the manifesto) we added the non-diegetic poetic voiceover to anchor the visual imagery.

This points to contradictions in the manifesto. Although the provocations are designed to be contradictory and to encourage dialogue and debate, they do, however, inform the later outputs substantially. Focusing on the production process in the first outputs meant that we were working with what, the *what* of the technology, the *how* of the process of production and the *why* of its relationship to the likely audiences for 360° documentary.

O5: Testing the theory

Walking in Someone Else's Shoes attempted to critically theorise some of the differences between what we call a 'fully-directed film' – a film that "through its mode of construction, actively directs how an audience views that [film]' - and 360° documentary in relation to the key motif of empathy, in order to provide a critique of what had already become an established, and mostly unquestioned, charactierisation of VR: Milk's description of VR as 'the ultimate empathy machine' (Milk, 2015).

A key finding of this output was the notion of intersectionality, which formed a more significant part in the understanding in the next output. Morgan's work on educational inequality (1996) has been adapted into a diagram (Fig. 10) of intersectional axes of privilege, dominance, and oppression by Roberts *et al* (2019), and is useful in informing how 360° documentary production is affected by these axes.

Figure 9: Intersecting Axes of Privilege. (Roberts *et al:* 2019)

Even given the comments above about cultural production, production of 'significant' 360° documentary is likely to be carried out by people in the privileged categories above. As such, it is likely to be producers' viewpoint that is reflected and one which the non-dominant groups are expected to empathise with. Scholars such as Nakamura, have gone further arguing that the 'ultimate empathy machine' actually produces "toxic empathy". She notes that "the invasion of personal and private space that documentary VR titles 'for good' create is a spurious or 'toxic empathy' that enables white viewers to feel that they have experienced authentic empathy for these others …" in a form of "digitally mediated compassion" (2020: 47) and not empathy as such.

O6: Democratising Production

The *VR Kaleidoscope* project links to previous outputs in technical terms (being lo-fi) but builds upon the conclusions of the previous output. It is an attempt to apply notions of collaborative production to a community-based, participatory practice project, working in this case with young female Muslim users of a local charity - people fitting a number of the categories on the non-dominant section in the diagram above.

McLaughlin notes that 'Participation in audio-visual production contains, by its nature, an imbalance of power' (2009:75), while Archibald and Lavery go further: '… the fact remains that new technologies institute new forms of oppression and resistance' (2019: 110). This output explored how new technologies of production could both oppress (owing to the 'unhelpful fixity' mentioned in the discussion of the manifesto above) but also enable resistance in both the form and content of documentaries produced by traditionally marginalised and/or non-professional producers (Aguayo, 2019). In looking at the particular experience of space of young women from a marginalised group, the film enables more systematic reflection about how space is represented, by whom and for what purposes.

O7: Future development of the model

In *The Harlot's Charter*, we made the point that "immersive filmmaking is one step on to something else that we currently don't know". In terms of the lack of take up of VR technology discussed above, AR and immersive MR experiences will arguably become more widespread than VR experiences. Immersive experiential film of whatever form will be one part of the mix of those experiences.

Prison Break was a project that enabled reflection on the issues raised in the previous outputs in the production of an MR narrative experience. It provides a number of key conclusions that point to the limits of VR that have a direct impact on the development of immersive media generally, and 360° documentary in particular:

1. The importance of the physical
2. The importance of the social
3. The need for onboarding as a pre-condition of entry to the physical and virtual space

The project builds upon the work around 360° documentary and notions of immersion, presence and empathy but, as I outline below, provides a broader future research trajectory.

3.2: Evaluative description of the originality of each output the contribution made by the portfolio of evidence to the subject area

The sections above have provided a sense of context to the development of the individual outputs in relation to the overall research question: How might existing and emerging technologies for 360° film production lead to new production practices and how might they differ from established documentary practice? In such a developing field, there are still gaps in knowledge that one thesis is unable to fill. However, the PhD does meet the objectives set out at the beginning of the research journey.

This table summarises which output meets these objectives.

	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6
O1	✓	✓			✓	
O2		✓	✓		✓	
O3			✓		✓	
O4	✓	✓			✓	
O5					✓	
O6				✓	✓	
O7					✓	✓

O1 was an original contribution to the nascent field of 360° documentary through its status as a 360° documentary with an associated, peer-reviewed critical commentary. At the point of production (2016), there were few 360° documentaries and even fewer that had been produced on the new consumer spherical cameras that were coming onto the market at that point. As such, even producing one at that point was innovative and *Contemplations in Chungking* was the first 360° documentary to be included on the peer-reviewed *Screenworks* website. However, as Nelson notes:

> Since each creative iteration is distinctive (even if it more or less follows a formula), it is in a weak sense 'original' […] But there is a significant difference between a fresh iteration of a creative practice and an original "academic" research inquiry to yield new knowledge (2013:24)

The critical commentary provides the critical reflection that contributed to the field through its analysis of the production process. The reviewers of the film on the Screen works website noted that:

> There is both a learning curve for filmmakers and viewers/experiences as to what the language of immersive storytelling is or might be. *Contemplation in Chungking* is asking the right questions in regard to production techniques and how to tell stories for immersive experience with new technologies, and at the same time are challenging some of the emerging best practices in regard to narration and stitching and editing, towards further experimentation in a nascent field.
>
> (https://screenworks.org.uk/archive/volume-7/contemplations-in-chungking)

O2 was original in applying the notion of multi-sensory input to the experience of VR generally and 360° documentary in particular. In the intervening period, enhancing immersive experiences has become a key area of academic research leading to development within universities and tech companies. As Shen *et al* note: "the delivery of rich tactile sensations [in VR] continues to be a significant and open challenge"

(2022:1) This suggests that enhancing the sense of immersion through additional sensory stimuli is integral to developing and enhance the user experience, both within VR and emerging immersive forms. The research from our paper has had a lasting impact. As of 22nd July 2022, this chapter has been downloaded 9761 times from the Springer website, with 10 international citations, read 1,339 times on ResearchGate, and cited 27 times in journal articles in areas such as healthcare (Pizzoli *et al,* 2021; Pawassar and Tiberius, 2022), tourism (Hopf *et al,* 2020; Alyahya and McLean, 2022) and education and training (Pawassar and Tribusean, 2020; Taborda-Hernandez *et al*, 2022; Zhao and Guo, 2022).

The impact of **O3** on the field was relatively slight in terms of the views that it received on the online spaces that we decided to publish on: as of 23rd October 2022, 105 views on Academia, with no figures available for Medium.com. In terms of its impact on the production of the future outputs and the model produced in this PhD, though, its importance cannot be overstated. What it did was to focus my mind as a producer of 360° documentaries, on the theoretical and practical aspects of the unhelpful fixity. The issues raised by the manifesto were issues that we, as researchers, raised in conference discussions and which prefigure later debates in the area. Other manifestos for VR appeared at the same time or just after (Ganz, 2016; Craig, 2018).

The originality of **O4** comes from its status as a 360° documentary in the essay film genre. Its impact is reflected in the fact that it was the first 360° documentary and is currently still the only non-journalistic 360° film about Brexit. It was selected for inclusion in several significant film festivals around the world: for example, Dublin, Seattle, Los Angeles, and Aesthetica in the UK. It won Best Experimental Film in the BAFTA-recognised Camarthen Bay Film Festival.

O5 is innovative in its critique of empathy through situating it with case studies of existing, canonical 360° films and through the inclusion of discussions with industry professionals. At the time of writing in July 2022, this article has had nearly 1200 views on ResearchGate and has been cited in eight peer-reviewed journals (Knudsen and Andersen, 2021; Zytko *et al*, 2021; Bender and Sung, 2021; Moyang, 2021; Jeong *et al,* 2021*;* Bimbisar, 2022)

O6: contributes to the academic areas of participatory practice, critical media theory and documentary practice. The research was presented at the CEMP Summit in Hong Kong in November 2019 to 170 delegates from 27 countries. As of July 2022, the subsequent journal article in the Journal of Media Practice and Education has been read 163 times and cited three times (Reading *et al,* 2021, Mills and Brown, 2021; Mills *et al*, 2022) The main impact has been professional in that this article, along with the previous output, led us to conclude that traditional forms of media literacy did not fully address the specificities of VR. This led to a book – *Understanding VR* – that provides a model for media literacy for VR (Jones, Dawkins and McDougall, 2022).

O7: was a significant international project that had reach across South-East Asia and beyond for the duration of the project. The experience itself had 5842 visitors from 16 different countries over a two-day period. Many of these were influencers in the HE sectors in the UK and HK. It received significant coverage in the Hong Kong media: press, TV and online, including Hong Kong's main arts and culture programme.

Figure 10: Webpage for *The Works*
http://www.rthk.hk/tv/dtt31/programme/theworks

Tatler's Hong Kong edition listed the experience as being "one of the 5 must see exhibits" in the SPARK festival[11].

4: Development as a research practitioner and discussion of collaborations

4.1. Critical reflection on my development as a research practitioner

Before the research detailed in this portfolio, my academic career was primarily as an educator. From a standing start as a researcher, the research trajectory enabled me to understand the praxis of 360° documentary more fully and to consolidate my research in this area.

The research required me, both independently and collaboratively, to decide upon each project, reflect upon its success, and use those reflections to undertake the subsequent project.

The different outputs developed me as a researcher in the following ways:

O1 used my 'concrete experience' and existing skills in media production but required significant reflection and learning around the process of filmmaking using spherical technologies. As detailed above, although the process shares some similarities with 2D documentary production, the differences required a significantly

[11] Students involved in the project produced a video that gives the flavour of the event as well as the reflections of the main collaborators.
https://drive.google.com/file/d/1Pmzu5eHBw523N1SfH4ywgNxVXx6rPtbN/view?ts=5cc96fa3

different mindset. The peer-reviewed commentary was rewritten based on the peer feedback from the reviewers of the manuscript. The reflection-in-action during the project and its subsequent dissemination was important in seeing the project to completion, but it was the reflection-on-action that led directly to the next output.

Although O1 was well-received, our reflections were that it could be possible to increase levels of immersion for an experiencer of 360° documentary. Reviewing academic research prompted reflection on how this could be done, as well as the practicalities of designing possible additions to HMDs to allow the addition of heat and smell to a domestic context in **O2**. This output was presented at two major international academic conferences.

O3 was a response to some of the early work in the field of 360° documentary. It required active research on the field and reflection upon where it might be heading. The decision to use a manifesto and to publish it on the internet, rather than in an academic journal, was based on the idea that many practitioners in the new field were not academics but filmmakers who would be more likely to access and respond to an artistic manifesto than an academic journal article.

O4 used our reflections on the production of the first output and the manifesto to produce an original work that was theoretically informed by the existing essay film genre. It was an attempt to move away from the many documentaries of place that were being produced, and towards a more politically progressive practice.

O5 further developed this sense of political progression through an examination of the motif of empathy. It required systematic desk research around the area, as well as an awareness of the developing critiques of the trope, some of which emerged during the writing of the article, thus necessitating a number of rewrites.

O6 required the development of skills in participatory practice, co-creation and desk-based research around existing theories of media literacy.

O7 was a significant international practice-based project that required the development of collaborative project development skills, based on significant desk-based (and other) research around MR and immersive experiences. It develops themes from previous outputs around accessibility and the possibilities of rapidly developing AR technologies that may be integrated into future documentary practice and productions. In this respect, it points to my possible future research agenda outlined in Part 5 of this Critical Overview.

4.2: Contributions of others to the production of the collaborative outputs

All the outputs in this portfolio were co-created with a range of practitioners and academic collaborators to produce the coherent, linked set of outputs that address the main research questions.

Five of the outputs in the portfolio were produced with Sarah Jones. All the conference papers, journal articles and the book chapter were co-authored. The films were jointly authored at all stages: from identifying research aims and objectives through to their creative and conceptual development and their production. Jones has described herself as an evangelist for VR, especially around immersive journalism and storytelling: I am more agnostic about it and its possibilities. This creative tension provided much of the impetus for our collaborative work.

O1 and **O4** in the portfolio are original co-authored 360° documentaries. Although there are significant filmmakers within the documentary field, most (if not all) documentary work is the result of collaboration for very good reasons: it enables a dialogue around an area rather than an auteurial vision, and it enables different skillsets and expertise to be fully utilised. Working collaboratively enabled a fuller exploration of 360° documentaries as well as strengthening my position as a researcher-practitioner in the field.

MacDougall (2020) notes that "collaboration has long been a common practice in documentary film production, with new forms of co-creation emerging with the advent of digital media" (2020:18). Both of these outputs required new forms of co-creation, especially at the editing stage, but both were the result of an equal sharing of responsibilities. My contribution utilised my existing understanding of 2D documentary praxis and documentary narratives, which complemented my co-author's background in VR and theoretical notions of presence and immersion. Together, these enabled a playful exploration of the possibilities of the technology and their role in documentary production. The ideas for the documentaries, the research, the planning of the narratives, the production and the overall direction of the edit were completely collaborative and the contributions equal[12]

O2 and **O5** are a co-authored book chapter and a co-authored journal article with Jones. The contributions for these were equal. My contribution was around documentary theory and practice, while the co-author's contribution was related to her academic and production expertise around VR.

My contribution in **O3** was slightly more significant in the development of the original idea. Whereas we initially intended to produce another academic journal article, my background in non-mainstream film and artistic practices led me to propose the manifesto. My knowledge of the historical function and shape of manifestos, along with the knowledge of Dogme95's *Vow of Chastity*, also meant that I was more active in crafting the manifesto's form and language. My co-

[12] Other roles adhered to MacDougall's notion of 'dispersed collaboration' in that 'specialised creative tasks are assigned to different members of a crew' (*ibid*:20): for example, filming and editing. However, this is where 'new forms of co-creation' in the production of 360° documentary requires a revaluation of the roles in the production crew and the extent of their collaboration.

author's contribution was again related to her academic expertise in issues around empathy and VR.

The final two outputs were co-created with different collaborators.

O6 was co-authored with Danai Mikelli who took the lead role. Her academic interest in media literacy and interactive documentary was coupled with my pedagogical interest in how non-professional media producers can be enabled to construct narratives about their own lives and for previously marginalised voices to be heard. She used an existing contact at the charity to initiate the project with them. We then collaboratively workshopped with the service users, with me taking a lead on 360° filming techniques and documentary narratives and working collaboratively with the users on their ideas. My co-author took the lead role in the first draft of the journal article but then we collaboratively and equally produced the final draft.

O7 was the most sophisticated collaboration with two main collaborators: Bianca Wright and Jacqui Speculand. The core team had specific roles. The idea to exhibit at the SPARK event was mine and I took overall responsibility for much of the organisation of the event but, after that, it becomes very difficult to neatly separate out the roles and responsibilities of the core team. The narrative, the set and the technologies used were jointly agreed. The detailed development of the narrative and the links to the technology were overseen and carried out by Wright. Other roles in the team – including student collaborators from the UK and Hong Kong - were those of creative assistance at key points in the process.

5: Conclusion and suggestions for future work

5.1. Conclusion

This Critical Overview has provided a discussion of the development of the portfolio, a contextually situated evaluation of the outputs and an examination of the research process. Given the varied nature of the outputs, the development of the model, and this Critical Overview, together they provide original insights into the field of 360° documentary by:

- *creating novel artefacts which answer new research questions in professional practice*,
- *developing a new* model *and testing it in application,* and
- *Adding progressively to the understanding of an issue, part of a field of a complex problem (e.g. multidisciplinary one), social or natural phenomenon or professional practice by a series of linked in-depth studies or experiments.*

From the research, there are definite conclusions that can be drawn. The main research question, for this PhD is: How do existing and emerging technologies for 360° film production lead to new production practices and in what ways do they differ from established documentary practice?

The main conclusion to be drawn from the research is that 360° documentary *does* have very distinct characteristics in relation to 2D documentary forms. Furthermore, it

highlights important taken-for-granted assumptions about the technology that need to be constantly interrogated and challenged. It articulates how technologies are better classified as socio-technical systems which are embedded in and perpetuate certain cultural values, power relations and politics. To fully realise the potential of the technologies, to ensure that production cultures are as inclusive and diverse as possible, and to have the widest possible range of voices articulated within 360° documentary, a more transparent, sophisticated, and systematic understanding of the considerations around production is needed. Finally, to overcome these potential problematics and to address the significant differences that 360° and VR technology has for the ways in which audiences engage with them, new competencies, literacies and practices are needed for filmmakers working with the technology.

Rapid developments in camera technology and the means of distributing and experiencing 360° documentary mean that documentary narratives and the ways in which they are produced and experienced are significantly different from established, 2D documentary forms. Spherical camera technology and HMDs put the experiencer of 360° documentary in a different subject position to the viewer of 2D screen-based documentary. The complex intersection of spaces within VR technologies, especially regarding the representational, narrative and empathetic spaces, means that in both its construction and in the experience of it for an audience, the differences mark 360° out as a new form of documentary.

However, this does not mean that it is accepted by widespread audiences or that it necessarily has a future. Although now widely used in certain sectors[13], VR has so far failed to take hold as a consumer technology (Green *et al*, 2020; Allen, 2021). VR kit has, in the past, had the capacity to be cheap[14]. However, much of the VR equipment that creators are currently creating content for is not. Despite the enhanced experience that 360° film can provide over 2D film even in the domestic space (Green et al, 2020), if it is to develop as a genre, it needs to make the move into the domestic space. Given the low numbers of people purchasing headsets, this looks unlikely.

One conclusion to be drawn from this is that VR could remain a niche technology, and that 360° documentary will only ever reach niche audiences at, for example, film festivals. There is also a sense that the limitations of 360° documentary may have been reached, and that it is already a declining sub-genre of documentary production[15]. A more techno-optimistic conclusion is that the much hyped 'metaverse' will lead to an increase in the sale and use of HMDs, with a corresponding increase in content

[13] for example, education, the military, medical and industrial training, and museums

[14] Google Cardboard, for example, was an early attempt to democratise access to VR and, in certain situations such as schools, was successful.

[15] Interestingly, though, Oculus's website with the article "Immersive films to watch in 2022" only has films produced between 2017 and 2019. (Oculus 2022).

production and newer, more engaging ways for users to access that content. This suggests that increasingly hybrid forms of documentary become possible and, if the optimistic predictions about the metaverse are correct, experienced immersively.

There are already videos online representing what the experience of the metaverse might look and feel like[16]. Interestingly, many of these gamified representations do not show the lived experience of viewing a film will be, or of what watching a 360° video will be like, but as Shackleton notes about current 3D virtual cinema environments, in merely replicating physical cinemas they are not a 'bold new vision of cinema but [instead] are hopelessly stuck in the past' (in Misek *et al*, 2020: np).

The notion of the digital divide is one that developed during the 1990s and, initially, was confined to discussions around access to the hardware and software of the internet. The term has since grown to include having access to the bandwidth needed to use emerging technologies such as VR, as well as having the necessary education and skills to use those technologies (Van Dijk 2020). One of the key priorities for researchers and practitioners in the area is to reduce or eliminate any potential divide, in access to the technologies and the new forms of literacy necessary to fully participate in VR cultures (Jones, Dawkins and MacDougall, 2022).

Many people across the world now have access to media technologies, including television, internet-enabled computers and smartphones. There is a reason that people use smartphones: they do more than one thing, they are personal and professional tools, and they help to create online communities. The same imperative for people to buy VR kit does not yet exist. However, newer social media platforms accessed via smartphones such as TikTok are now moving into VR and the metaverse (Business Standard, 2022) with non-fiction content. Although the content of these platforms is not, to purists at least, documentary, the lo-fi/transitory user-generated non-fiction that is uploaded to TikTok engages huge audiences and addresses many of the social issues or issues of identity mentioned in this PhD[17].

The platforms and practices of VR have largely been developed by white males (Nakamura 2020) and used predominantly by them (Bennett *et al*, 2020). Even VR for Good is problematic. As Nakamura notes: "Virtuous VR is a cultural alibi for a digital media culture that has taken a wrong turn, towards distraction, detachment, and misinformation" (2020:49).

If 360° is a new form of documentary that requires new production practices and new competencies and literacies to fully engage with it, newer hybrid forms of documentary within AR/MR will require newer ones still. We cannot expect developers of 360° content, by themselves, to address the types of discrimination that occur on all platforms.

[16] for example, https://www.youtube.com/watch?v=pXSx5G2ZYGc

[17] Nichols characterises the range of such material as "mock-, quasi-, semi-, pseudo and bona fide documentaries" (2010:2)

Content producers need to engage in practices that are truly reflexive and inclusive. The model articulated within this PhD actively encourages producers to consider how to design experiences within the emerging forms of documentary. Given the social and political forces shaping the internet and the metaverse, and the numbers of people experiencing sexist, racist, homophobic, and transphobic abuse – both verbal and virtually physical – it is hoped that the model will inform practice that is both inclusive and diverse.

Rather than a hope that the 'empathy machine' will do its job simply by being immersive, we need to move on to a more nuanced idea that 360° producers need to actively shape practices that encourage diversity, inclusion and social good. Bollmer's notion of radical compassion frees documentary makers from the tyranny of empathy-generation:

> Compassion is about the potentials of *not* understanding another, of *not* feeling what they feel, in a way that does not negate or ignore the experience of another but is open to it, even if it can never fully grasp it. (2017, 72. Original emphasis)

5.2. Suggestions for future work

The majority of outputs in this portfolio are related to 360° documentary experienced within VR. Notwithstanding its uncertain future, there are still critical questions that suggest directions for further research:

1. How do the motifs of VR – immersion, presence and empathy – actually work, and how critically should they be accepted? How do they relate to the notion of 'the real' that is fundamental to documentary?
2. How will issues of safety, ethics and morality of VR be addressed in relation to aspects such as the digital divide, data harvesting, representation and online bullying?
3. Is there a need for a new literacy for VR to ensure that both producers and experiencers of VR and 360° documentary can critically engage what, in Bailenson's words, a 'unique medium' (2018:5)?
4. How can equity, diversity and inclusion be assured at both the production stage and the experiential stage to avoid a VR digital divide and to realise the full possibilities of 360° documentary?
5. If, as suggested, VR is a powerful medium for distributing documentary, what strategies are needed to grow audiences for 360° documentary?
6. What impacts are other immersive technologies – mixed and augmented reality – and the metaverse going to have on 360° documentary? Can CGI and volumetrically constructed worlds represent 'reality' effectively or will pliant worlds remove the historical link between reality and representation?

However, in terms of an individual future research trajectory, the limitations of VR coupled with the potential opportunities that emerging immersive media offer for different types of experience, are the areas that most interest me researcher-practitioner. These critical questions are applicable to such media.

At the time that the later outputs in this portfolio were being produced, there was an increased interest in MR experiences within theatre (Masso, 2018:np; Kidd and Nieto, 2019). The final output in the portfolio points to some directions that immersive experiences may be heading into. **O7** - *Prison Break* - provided a first step into MR/Spatial Augmented Reality. Many organisations are experimenting hybrid experiences that contain a physical dimension overlaid with digital content, and it is in this area that my interest currently lies. The increasing popularity of AR applications on mobile phones suggest that it is likely that AR will be more widely embraced than VR, especially since many of the main players in technology (Google, Apple, Facebook and Amazon) are focusing their efforts and R&D money here (Nakamura, 2020). Forthcoming technologies such as AR goggles and 5G/6G phone technology could be game changers in ways that cannot currently be fully envisaged for the documentary genre. Carlton (2022), for example, hints at the ways in which developments by Google integrating AR technology with Google Maps could easily be used to create imaginative, interactive, constantly updating 'documentary' content which, especially if integrated into in an MR experience of place, could be exceptionally inclusive and powerful. Coupling these developments with the playful and explorative methodology arising from the manifesto provides exciting opportunities create significant exciting hybrid forms of documentary currently not conceived of.

References

Bibliography

Aguayo, A. (2019) *Documentary Resistance: Social Change and Participatory Media.* Oxford, Oxford University Press.

Alyaha, M.and McLean, G. (2022) 'Examining Tourism Consumers' Attitudes and the Role of Sensory Information in Virtual Reality Experiences of a Tourist Destination'. Journal of Travel Research, 61(3):004728752110377. DOI: 10.1177/00472875211037745. [Last accessed: 19th October 2022]

Allen, C. (2020) 'Beyond the early adopter: widening the appeal for virtual reality'. *Creative Industries Policy and Evidence Centre led by NESTA.* https://pec.ac.uk/policy-briefings/beyond-the-early-adopter-widening-the-appeal-for-virtual-reality. [Last accessed: 24th October 2022]

Archibald, D. and Lavery, C. (2018) 'From Street to Screen': Debord's drifting cinema'. Performance Research 23:7, 109 -119. DOI: 10.1080/13528165.2018.1558427. [Last accessed 20th May 2022].

Bailenson, J. (2018) *Experience on demand: what virtual reality is, how it works, and what it can do.* New York/London, Norton.

Barrett, E. and Bolt, B. (2019) *Practice as Research: Approaches to Creative Arts Enquiry.* London, Bloomsbury.

Bender, S. and Sung, B. (2021) 'Fright, attention, and joy while killing zombies in Virtual Reality: a psychophysiological analysis of VR user experience. *Psychology and Marketing* 38:6, 937-947

Bennett, J. Dalton, P., Goriunova, O., Preece, C., Whittaker, L., Verhulst, I. and Woods, A. (2021) 'Audience Insight Report: The Story of Immersive Users'. Story Futures, available at https://www.storyfutures.com/uploads/docs/Audience-Insight-Report-Complete-1.2.pdf [Last accessed 5th November 2022)

Bimber, O. and Raskar, R. (2005) *Spatial Augmented Reality: Merging Real and Virtual Worlds.* Wellesley, Massachusetts, A K Peters

Bimbisar, I. (2022) 'Virtual reality and celebrity humanitarianism: Rashida Jones in Lebanon. *Media, Culture and Society* 44: 1, 88-104

Bollmer (2017) 'Empathy Machines'. Media International Australia 165 (1): 63–76.

Bruzzi, S. (2000) *New Documentary: A Critical Introduction.* London, Routledge

Business Standard (2022) 'TikTok's parent company ByteDance likely to join VR space, says report'. https://www.business-standard.com/article/international/tiktok-s-parent-company-bytedance-likely-to-join-vr-space-says-report-122061200077_1.html. [Last accessed: 29th July 2022].

Butterworth, A. (2022) 'Beyond sonic realism: a cinematic sound approach in documentary 360° film'. Studies in Documentary Film, Vol 16, No. 2, 156-173. https://doi.org/10.1080/17503280.2022.2048234. [Last accessed: 29th July 2022].

Carlton, B. (2022) 'Google Wants to Deliver World-Scale AR Using Google Maps' https://vrscout.com/news/google-wants-to-deliver-world-scale-ar-using-google-maps/?utm_source=VRScout+Scouting+Report&utm_campaign=5e9857f7d6-VRScoutReport_052022&utm_medium=email&utm_term=0_f3642cd298-5e9857f7d6-161986801 [Last accessed: 24th October 2022)

Chion, M. (1994) *Audio-Vision: Sound on Screen*. New York, Columbia University Press.

Craig, E. (2018) https://edtechmagazine.com/higher/article/2018/04/how-we-can-prevent-digital-divide-20-virtual-reality-expands. [Last accessed: 10th December 2020].

D'Aloia, A. (2012) 'Cinematic Empathy: Spectator Involvement in the Film Experience' in Reynolds, D. and Reason, M. (eds) (2012)

Danchev, A. (ed) (2011) *100 Artists' Manifestos: From the Futurists to the Stuckists.* London, Penguin.

Darke, C. (2000) *Light Readings: Film Criticism and Screen Arts.* London, Wallflower Press

de Bromhead, T. (1996) *Looking Two Ways: Documentary Film's Relationship with Reality and Cinema.* Walnut Creek, California: Left Coast Press.

de Jong, W., Knudsen, E. and Rothwell, J. (2012) *Creative Documentary: Theory and Practice.* Harlow, Pearson.

Debord, G. (1958) *The Theory of the Dérive.* Available at: https://www.cddc.vt.edu/sionline/si/theory.html. [Last accessed: 20th November 2020]

Dolan, D. and Parets, M. (2016) 'Redefining the Axiom of Story: The VR and 360 Video Complex'. https://techcrunch.com/2016/01/14/redefining-the-axiom-of-story-the-vr-and-360-video-complex/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAAZ9WChvdr5EkfjjwFuTpoiSuDPuwcoQ47V1SPY15b0wQ-GJt5YaX6ELjAyWvhXQeir8cIEB7YUqDUh1c7jM4MRX3KB4CzgJHm2gZwQVivKaBTAdMNrqusyDsHiDM9lBng_2Ae4xgggU7PnTRv5GcvapDvgSxX5eqOwdZJn1iJR_. Last accessed [9th November 2022].

Elmezeny, A., Edenhofer, N. and Wimmer, J. (2018) 'Immersive Storytelling in 360-Degree Videos: An Analysis of Interplay between Narrative and Technical Immersion'. In Journal of Virtual Worlds Research, 11(1). 1-13. https://doi.org/10.401/jvwr.v11i1.7298 [Last accessed 1st August 2022)

Fux, N (2020) 'VR on the film festival circuit: IDFA and IFFR 2017-2019' Accessible at https://necsus-ejms.org/vr-on-the-film-festival-circuit-idfa-iffr-2017-2019/. Last accessed 6th August 2022

Ganz, J. (2016) 'A Virtual Reality Manifesto: The Good, Bad and the Ugly'. https://singularityhub.com/2016/05/19/a-virtual-reality-manifesto-the-good-bad-and-the-ugly/. [Last accessed: 26th July 2022)

Gillies, S. (2020) 'Screen grammar for mobile frame media: the audiovisual language of cinematic virtual reality, case studies and analysis' in Knight-Hill (2020)

Google News Lab (2017) Story living: An ethnographic study of how audiences experience VR and what that means for journalists. https://newslab.withgoogle.com/assets/docs/storyliving-a-study-of-vr-in-journalism.pdf [Last accessed: 10th July 2022)

Green, D., Rose, M., Bevan, C., Farmer, H., Cater, K. and Fraser, D. (2020): "'You wouldn't get that from watching TV!': Exploring audience responses to virtual-reality non-fiction in the home". Convergence, 27:3, 1-25. https://doi.org/10.1177/1354856520979966 [Last accessed 8th August 2022]

Hamblin, S (2019) 'Slow cinema and contemplative politics: radical documentary in the twenty-first century'. Studies in Documentary Film. Vol 13, No. 3, 214-232. https://doi.org/10.1080/17503280.2019.1672917 [Last accessed 8th August 2022)

Heilig, M. (1955) 'EL Cine del Futuro: The Cinema of the Future'. *Presence: Teleoperators and Virtual Environments* 1992; 1 (3): 279-294. https://doi.org/10.1162/pres.1992.1.3.279. [Last accessed 17th July 2022]

Hopf, J., Scholl, M., Neuhofer, B. and Egger, R. (2020) 'Exploring the impact of multisensory VR on travel recommendation: a presence perspective' in Neidhardt, J. and Wörndl, W. (Eds.) Information and Communication Technologies in Tourism Surrey, UK. Springer Verlag, 169-180. DOI: 10.1007/978-3-030-36737-4_14. [Last accessed 17th July 2022]

Institution of Engineering and Technology (IET) (2022) 'Safeguarding the metaverse: a guide to existing and future harms in virtual reality (VR) and the metaverse to support UK immersive technology policymaking'.: https://www.theiet.org/media/9836/safeguarding-the-metaverse.pdf [Last accessed: July 13th 2022)

Jeong D., Han, S., Jeong, D, Kwon, K.and Choi, S. *(20*21) 'investigating 4D movie audiences' emotional response to motion effects and empathy' in Computers in Human Behaviour 121, 106-197

Jerald, J (2015) *The VR Book: Human-Centered Design for Virtual Reality.* ACM Publishing.

Jones, S., Dawkins, S. and McDougall, J. (2022) *Understanding VR: Challenging Perspectives for Media Literacy and Education.* London, Routledge.

Kellner and Share (2007) 'Critical Media Literacy, Democracy, and the Reconstruction of Education'.In Macedo, D. and & S.R. Steinberg, S.(Eds.), *Media literacy: A reader.* New York: Peter Lang Publishing.

Kidd, J. and Nieto McAvoy, E. (2019) 'Immersive Experiences in Museums, Galleries and Heritage Sites: A review of research findings and issues'. https://pec.ac.uk/discussion-papers/immersive-experiences-in-museums-galleries-and-heritage-sites-a-review-of-research-findings-and-issues. [Last accessed 13th October 2022].

Knudsen, G. and Andersen, L. (2021) 'Changing masculinity, one ad at a time. Westminster Papers in Communication and Culture 15: 2, 63-78.

Kolb, D. (1984). *Experiential learning: experience as the source of learning and development.* Englewood Cliffs, NJ: Prentice Hall.

Lanier, J. and Biocca, F. (1992) 'An Insider's View of the Future of Virtual Reality'. *Journal of Communication*, Volume 42, Issue 4, December 1992, Pages 150–172, https://doi.org/10.1111/j.1460-2466.1992.tb00816.x

Leotta, R. & Ross (2018) Touring the 'World Picture': virtual reality and the tourist gaze, Studies in Documentary Film, M., 12:2, 150-162, https://doi.org/10.1080/17503280.2018.1503859 [Last accessed 8th August 2022].

Limina Immersive (2018) 'Immersive Content Formats for Future Audiences'. https://www.digicatapult.org.uk/news-and-insights/publications/post/immersive-content-formats-for-future-audiences/. [Last accessed 8th August 2022].

Lopate, P. (199?) 'In Search of the Centaur: the Essay-Film'. The Threepenny Review No. 48 (Winter, 1992), 19-22. https://www.jstor.org/stable/4384052. [Last accessed 8th October 2022].

MacDougall, D. (2020) ‘Seven types of collaboration’. Studies in Documentary Film, M., 12:2, 150-162. https://doi.org/10.1080/17503280.2020.1854150 [Last accessed 8th August 2022)

Machon, J. (2013) *Immersive Theatres: Intimacy and Immediacy in Contemporary Performance.* Basingstoke, Palgrave.

Masso, G. (2018) ‘How immersive technologies have sparked a theatre revolution’. Available from https://www.thestage.co.uk/features/how-immersive-technologies-have-sparked-a-theatrical-revolution. [Last accessed 31 July 2022)

McCarthy, J. and Wright, P. (2007) *Technology as Experience*. Cambridge, Massachusetts, MIT Press.

Milk, C. (2015) How virtual reality can create the ultimate empathy machine. *TED.com* [video]. March 2015. Available from: https://www.ted.com/talks/chris_milk_how_virtual_reality_can_create_the_ultimate_empathy_machine [Accessed 20 March 2022].

Mills, K. and Brown, A. (2021) ‘Immersive virtual reality (VR) for digital media making: transmediation is key’. Learning, Media and Technology, 47:2, DOI: 10.1080/17439884.2021.1952428. [Last accessed: 21st August 2022)

Misek, R., Raby, O., and Shackleton, C. (2020) ‘A Machine for Viewing’. https://necsus-ejms.org/a-machine-for-viewing/ [Last accessed: August 19th 2022]

Morgan, K. (1996) ‘Describing the Emperor’s New Clothes: Three Myths of Educational (In)Equality’ in The Gender Question in Education: Theory, Pedagogy & Politics (1996). Diller, A. et al. (1996)

Moyang, L. (2021) ‘Research on physical phenomenological innovation technology in virtual reality movies’. Journal of Physics: Conference Series 1952: 22-58.

Nakamura,. L. (2020) ‘Feeling good about feeling bad: virtuous virtual reality and the automation of racial empathy’. Journal of Visual Culture, 19:1, 47-64 https://doi.org/10.1177/1470412920906259. [Last accessed: 25th October 2022]

Nash, K. (2018) ‘Virtually real: exploring VR documentary’. Studies in Documentary Film. Vol 12, No. 2, 97–100. https://doi.org/10.1080/17503280.2018.1484992. Last accessed 23rd June 2022

Nash, K. (2018) ‘Virtual reality witness: exploring the ethics of mediated presence’. Studies in Documentary Film. Vol 12, No. 2, 119–131. https://doi.org/10.1080/17503280.2017.1340796. Last accessed 23rd June 2022

Nash, K. (2022) *Interactive Documentary: Theory and Debate*. London, Routledge.

Nelson, R. (2013) *Practice as research in the arts: principles, protocols, pedagogies, resistances*. Basingstoke, Palgrave Macmillan.

Nichols, B. (1997) *Introduction to Documentary.* Bloomington, Indiana, Indiana University Press.

Oculus (2022) “Immersive films to watch in 2022” at https://www.oculus.com/blog/best-vr-documentaries/?locale=en_GB. Last accessed 23rd June 2022.

Özdem, Ö. (2021) ‘360-Degree Video and Social Change: A Comparative Analysis of the Documentary Films Exiled (2019) and Behind the Fence (2016)’. Kültür ve iletisim Year:24, Issue: 47. https://doi.org/10.18691/kulturveiletisim.830028 [Last accessed: 8th August 2022)

Paíno-Ambrosio, A and Rodríguez-Fidalgo, M. (2019) ‘A proposal for the classification of immersive journalism genres based on the use of virtual reality and 360-degree video’. Revista Latina de Comunicación Social, Issue 74: Pages 1132 to 1153. DOI: 10.4185/RLCS-2019-1375/58en

Pawassar, C. and Tiberius, V. (2022) ‘Virtual Reality in Health Care: Bibliometric Analysis’. DOI: 10.25932/publishup-55041. [Last accessed: July 15th 2022]

Pizzoli, S., Monzani, D., Mazzocco, D. and Pravettoni, G. (2021) ‘The Power of Odor Persuasion: The Incorporation of Olfactory Cues in Virtual Environments for Personalized Relaxation’. Perspectives on Psychological Science 17(1). DOI: 10.1177/17456916211014196. [Last accessed: 15th July 2022]

Raab, J. (2014) ‘Here's What It's Like Inside the First Virtual Reality Documentary’. https://time.com/3812608/oculus-rift-virtual-reality-documentary/. Last accessed 4th August 2022.

Ranasinghe, N., Jain, P., Nguyen, T., Chuan, K., Koh, R., Tolley, D., Karwita, S., Lien-Ya, L., Liangkun, Y., Shamaiah, K., Tung, C., Yen, C., Yi-Luen Do, E (2018) ‘Season Traveller: Multisensory Narration for Enhancing the Virtual Reality Experience’. CHI '18: Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems April 2018 Paper No.: 577 Pages 1–13 https://doi.org/10.1145/3173574.3174151. [Last accessed 23rd July 2022]

Reading, A., Bjork, J., Hanlon, J., and Jakeman, N. (2021). ‘The Labour of Place: Memory and Extended Reality (XR) in Migration Museums’. In Memory Studies, 14(3):606-621. https://doi.org/10.1177/17506980211010697. [Last accessed 19th August 2022)

Roberts, J. D., Mandic, S., Fryer, C. S., Brachman, M. L., & Ray, R. (2019). Between Privilege and Oppression: An Intersectional Analysis of Active Transportation Experiences Among Washington D.C. Area Youth. *International Journal of Environmental Research and Public Health*, *16*(8), 1313. https://doi.org/10.3390/ijerph16081313

Rodriguez-Fidalgo, M. and Paino-Ambrosio, A. (2020) ‘Use of virtual reality and 360° video as narrative resources in the documentary genre: towards a new immersive social

documentary'. Catalan Journal of Communication and Cultural Studies 12(2), 239-253. https://doi.org/10.1386/cjcs_00030_1 [Last accessed 8th November 2022)

Rogers, R. (2019) *Doing Digital Methods.* London, Sage.

Rose, M. (2018) 'The immersive turn: hype and hope in the emergence of virtual reality as a nonfiction platform'. Studies in Documentary Film, 12(2), 132-149, https://doi.org/10.1080/17503280.2018.1496055. [Last accessed 13th August 2022].

Rosario, F. and Villarmea Alvarez, I. (eds.) (2020) *New Approaches to Cinematic Space.* Abingdon, Routledge.

Ryan, M. (2015) *Narrative as Virtual Reality 2*. Baltimore, Johns Hopkins University Press

Schön, D. (1983) *The Reflective Practitioner: How Professionals Think in Action*. Hampshire: Ashgate.

Scott-Stevenson, J. (2019) 'Virtual Futures: A Manifesto for Immersive Experiences'. https://immerse.news/virtual-futures-a-manifesto-for-immersive-experiences-ffb9d3980f0f. [Last accessed: 26th July 2022].

Sinek, S. (2009) *Start with why: how great leaders inspire everyone to take action.* London, Penguin

Stadler, J. (2016) 'Empathy in Film'. http://bitly.ws/wti7. [Last accessed 8 h November 2022]

Stuckey-French, N. (2012) 'The Video Essay' in American Book Review 33 (2): 14-15. https://doi.org/10.1353/abr.2012.0011. [Last accessed 20 May 2022]

Sutherland, I. (1965) 'The Ultimate Display'. http://worrydream.com/refs/Sutherland%20-%20The%20Ultimate%20Display.pdf [Last Accessed: 23rd June 2022)

Swierczynska_Kaczor, U., Kotlinska, M., Zelazowska, M. and Wachowicz, J. (2019) 'Online interactive storytelling: evaluation of the viewer experience of 360-degree videos'. Journal of Economics and Management 236(2), 106-122. https://doi.org/10.22367/jem.2019.36.06 [Last accessed: 22nd July 2022)

Tabordo-Hernandez, E., Rubio-Tamayo, J., and Fernández, M. (2022) 'Analysis of the narrative communication characteristics of virtual reality experiences: meaning-making components of the immersive story'. Journal of Science and Technology of the Arts, 14(1):9-31. DOI: 10.34632/jsta.2022.10055. [Last accessed 8th November 2022]

Tatzgern, M., Domhardt, M., Emshuber, G., Dinic, R., Wolf, M., Cenger, M., Gerner, N. and Hartl, A. (2022) 'AirRes Mask: A Precise and Robust Virtual Reality Breathing Interface Utilizing Breathing Resistance as Output Modality'. Paper presented at CHI '22, April 29-May 5, 2022, New Orleans, LA, USA. https://doi.org/10.1145/3491102.3502090 [Last accessed 23rd July 2022]

Tong, L., Lindeman, R. and Regenbrecht, H. (2021) 'Viewer's Role and Viewer Interaction in Cinematic Virtual Reality'. Computers 2021, 10, 66. https://doi.org/10.3390/computers10050066. [Last accessed 6th August 2022)

Unity (No date) 'What is AR, VR, MR, XR, 360?'. https://unity3d.com/what-is-xr-glossary. [Last accessed: 5th November 2022]

Uskali, T., Gynnild, A., Jones, S. and Sirkkunen, E. (eds) (2020) *Immersive Journalism as Storytelling: Ethics, Production and Design.* London, Routledge

Urry, J. and Larsen, J. (2011) *The Tourist Gaze 3.0*. London, Sage.

Van Dijk, J. (2020) *The Digital Divide*. Cambridge, Polity Press.

Winston, B. (1995) *Claiming the Real: The Griersonian Documentary and its Legitimations.* London, British Film Institute.

Zhao, K. and Guo, X (2022) 'Analysis of the Application of Virtual Reality Technology in Football Training'. Journal of Sensors 2022(1):1-8. DOI: 10.1155/2022/1339434. [Last accessed 8th November 2022)

Zytko, D.,Ma, Z., Gleason, J. Lundquist, N. and Taylor, M (2021) 'Immersive stories for health information: design considerations from binge drinking in VR. *Diversity, Divergence, Dialogue*, 313-321. [Last accessed 23rd July 2022]

Appendix 1

Contemplations in Chungking: Exploring the Possibilities of Immersive Film on a Psychogeographic Journey Through Hong Kong

https://screenworks.org.uk/archive/volume-7/contemplations-in-chungking

Appendix 2

The Sensorama Revisited: Evaluating the Application of Multi-Sensory Input on the Sense of Presence in 360-degree Immersive Film in Virtual Reality

https://link.springer.com/chapter/10.1007/978-3-319-64027-3_13

Appendix 3

The Harlots' Charter: A Manifesto for Immersive Experiential Film

https://www.academia.edu/34731762/The_Harlots_Charter_A_Manifesto_for_Immersive_Experiential_Film

Appendix 4

Shameful Conquest

https://vimeo.com/228955587

Appendix 5

Walking in someone else's shoes: creating empathy in the practice of immersive film

Media Practice and Education, 19:3, 298-312

https://doi.org/10.1080/25741136.2018.1520538

Appendix 6

VR Kaleidoscope: reconfiguring space and place through community- based media literacy interventions

Media Practice and Education 2020, 21:1, 54-67

https://doi.org/10.1080/25741136.2019.1681223

Appendix 7

Prison Break Mixed Reality Experience

Documentary Evidence