**Thesis presented in part fulfilment for the degree of
Doctor of Philosophy**

Four shades of science festival:
A qualitative study exploring the business and management dimensions of
science festivals in the United Kingdom

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Declaration

I, Gary W. Kerr, candidate for the degree of Doctor of Philosophy in the School of Science, Engineering & Environment at the University of Salford, Manchester, hereby declare that this thesis is my original research work. I further declare that this thesis has not been submitted to any other university or academic institution for the award of any degree or diploma.

Abbreviations

ADSF	Abu Dhabi Science Festival
BIS	Department for Business, Innovation & Skills (UK Government)
BME	Black and Minority Ethnic
BSA	British Sociological Association
BSF	British Science Festival
BSW	British Science Week
BVEP	British Visits & Events Partnership
CBA	Cost-Benefit Analysis
CEO	Chief Executive Officer
CO_2	Carbon Dioxide
EISF	Edinburgh International Science Festival
EUSCEA	European Science Events Association
HEFCE	Higher Education Funding Council England
IOM	Input-Output Modelling
PER	Public Engagement with Research
PES	Public Engagement with Science
PUS	Public Understanding of Science
REF	Research Excellence Framework
SIMD	Scottish Index of Multiple Deprivation
SRA	Social Research Association
STEM	Science, Technology, Engineering & Mathematics
UAE	United Arab Emirates
UK	United Kingdom
UKSFN	UK Science Festivals Network

Abstract

Science festivals are a global cultural phenomenon with at least 60 such festivals taking place across the UK every year. Science festivals fulfil a unique function within civil society: providing a platform for science communication, education, and public involvement. They are a focal point of investment from the science industries, as tools for engaging with a range of audiences and meeting a wide range of objectives: from encouraging more people to study science, technology, engineering and maths (STEM), to demonstrating socially responsible values. Since the term 'science festival' was coined over thirty years ago, there has been a rise in not only the number of science festivals, but a proliferation and diversification of different formats and audiences.

Despite their 30 year history, modern-day science festivals are still largely under-researched, with scholars focusing mostly on audience experiences, advancing inclusivity and diversity, and on the science festival's function as a vehicle for promoting science literacy.

This thesis builds on such research by examining science festivals from the perspective of critical event studies. In so doing, data evidences the business and management dimensions of science festivals via 27 in-depth semi-structured interviews conducted with science festival figureheads across the UK. These figureheads represented science festivals of all shapes, sizes and formats: from small science festivals run by volunteers, to universities producing their own science festivals, and to large charitable organisations that produce science festivals.

Data generated from the semi-structured interviews establishes a theoretical framework that explains the diversity of science festivals and how these are shaped by their business models, strategic leadership, operational management, values and approaches to curating content. The theoretical framework distinguishes four broad realms of science festival: corporate science festivals; community science festivals;

public engagement with research festivals; and music and art festivals (with science). This theoretical model provides a valuable tool for science festival practitioners and researchers by articulating the sector's diversity, while also establishing how festivals operate across different realms. These findings reveal why there cannot be a singular approach to programming, producing and leading a science festival. The study concludes by assembling a number of recommendations for science festival practitioners, including using the theoretical framework as a means to enhance collaboration and reduce competition. In sum, this thesis identifies a gap in the skill set of some science festival figureheads, and proposes a sector-wide training programme on festival management for those who lead science festivals to more effectively deliver on public policy expectations of their social function.

Chapter 1: Introduction

1.1. Background and Context

Modern science festivals have certainly come of age, with 2019 marking the 30th anniversary of the Edinburgh International Science Festival (EISF), a science festival that is widely recognised as the world's first modern science festival. Indeed, Edinburgh is credited with having established the term 'science festival' in popular culture, since its origins in 1989. Yet its roots are found in a much longer history, arguably first with the British Association for the Advancement of Science (now known as the British Science Association) holding annual meetings as early as 1831 which subsequently developed into the modern day British Science Festival - a festival which is held in a different UK city each year.

Since its first delivery in 1989, EISF has become an annual, city-wide event, the principles of which have been emulated all over the world. From the World Science Festival in New York (established in 2008) to the Abu Dhabi Science Festival in the United Arab Emirates (UAE; established in 2011), there are now hundreds of science festivals taking place each year throughout the world, with at least 60 science festivals taking place each year in the UK and this research explores their history, development, strategic value for the knowledge economy, and the key values and principles by which they operate.

As a research area, science festivals can be examined from a number of perspectives and this thesis explores the business and management dimensions of these festivals which serve as vehicles of science communication - an area of study that has become an increasingly important agenda within social scientific research since Edinburgh's first science festival. In recent years, public interest in science communication has been made evident by a variety of policy interventions, which speak to its importance. For

example, in 2016, the UK Parliament launched an inquiry into science communication, after it was published in a report from the UK Government's Department for Business, Innovation & Skills (BIS) that there was significant lack of trust around science journalism (Department for Business, Innovation & Skills, 2014). The public inquiry found that 67% of people say they have no option but to trust those governing scientific information, despite 28% of people thinking journalists check facts when reporting about science (House of Commons, 2017). This trust in mainstream media despite awareness of inaccuracy means that science communication events such as science festivals are an important social scientific research area in order to understand whether science fulfils its public obligations to advance science for the benefit of society.

In just 30 years, science festivals have developed a unique function within civil society, as a means of science communication, education, and public involvement. They are a focal point of investment from the science industries, as tools for engaging with a range of audiences. Moreover, the last thirty years has given rise to a diversification and proliferation of festivals, warranting a close scrutiny of the state of the science festival today. From universities running their own science festivals; to science festivals being set up by local communities; independent charities and national museums; to arts and music festivals that contain an element of science and technology, there is a huge diversity of science festivals out there reaching various audiences and trying to engage them with science. Yet, there is no study that locates their value within a broader understanding of the role of festivals within society, nor research undertaking to assess their development and scrutinise whether their goals are achieved.

As critical event studies have matured, so too has the research that surrounds science communication. Such work has developed conceptually, methodologically and in terms of the range of disciplines contributing to this new body of literature. In part, the rise in science communication studies may be attributed to the increasing emphasis within academia on 'public engagement' – where scientists are increasingly expected to engage with the public and communicate their research in ways that a wide variety of

people can understand. Yet, it might also speak to wider changes within society, the expansion of the university's wider role in the community, the rise of the blogosphere as a place for intellectual discussion, and the changing circumstances of the public intellectual within these configurations.

With the introduction of the Research Excellence Framework (REF) for UK higher education institutes, creating research impact is, now, a key indicator of success for universities and has become a new form of determining value within higher education. In this respect, the communication of science to a variety of audiences has emerged as a pathway to impact (although not an impact in its own right). This trajectory towards impact means that universities are interested, now more than ever, in becoming proficient in effectively communicating and engaging with the public.

Yet, even these ideas are complex and require investigation. For instance, there are various models of public engagement, each with their own set of principles, values, and range of merits. As such, research is needed to build more understanding of how these different approaches function and where best they can be used. Since the publication of the Royal Society's Bodmer Report (Royal Society, 1985) and the introduction of REF, there has been a cultural shift towards scientists engaging the public, but there is still some stigma associated with such roles, which many active researchers regard to be a distraction from research activities (Nisbet et al., 2002).

Indeed, the appearance of scientists who communicate their work has, at times, exacerbated these concerns. For example, Shermer (2002) describes what is known as the 'Sagan effect' in science outreach - where taking part in outreach activities, writing popular science books and appearing on TV and media is seen to have a negative effect on a scientist's academic career. The Sagan effect refers to Carl Sagan's experiences at Harvard University where he published a novel Cosmos (Sagan, 1980) which was made into a TV series that reached over half a billion people across 60

different countries (Shermer, 2002). Despite the fame and fortune (Sagan was awarded $2 million in advance of the publication of his second book 'Contact'; Sagan, 1985), Sagan was refused both tenure at Harvard and fellowship to the US National Academy of Science (Shermer, 2002).

Arguably, things have changed since the publication of that paper, as scientists such as the University of Manchester's Professor Brian Cox has been able to progress within his career as a research scientist, whilst creating what is known as the 'Brian Cox effect' (Telegraph, 2013). The Brian Cox effect is what has been attributed to the increased popularity of physics and astronomy within the UK's popular culture and has resulted in an increase of over 50% of applications to study physics at university level within the UK (Telegraph, 2013). Professor Brian Cox - a literal rock star scientist (not least because of his former career as keyboardist in pop-rock band D:Ream which had a number 1 hit in the UK singles chart) - has had an entirely different experience at the University of Manchester than Carl Sagan had at Harvard University, perhaps demonstrating a cultural shift within universities towards reward and recognition for outreach activities.

It is unclear what impact Brian Cox has had on other academics in the UK who are involved in science communication activities, but celebrity scientist Professor Jim Al Khalili has pointed out that his promotion to Professor came years earlier than it should have and he puts this down to his science communication work and not his scientific research (Research Councils UK, 2010).

There is also a wider historical context to understanding the role of science festivals in society, which reveals a longer trajectory of publicly shared science, which can inform discussions about the state of present-day science communication. For instance, public science events date back centuries to the days of the Ancient Greeks when the likes of Plato and Aristotle would speak in public about their theories in science and philosophy. A critical examination of this history, compared with present day, public engagement may reveal important differences in terms of the potential social function of such work. For instance, research might reveal that science has become less democratic than the

days of the Ancient Greeks, where once it was conducted under public scrutiny. In contrast, today's scientists undertake their research in places that are inaccessible to the public, publish their findings within journals that are also locked behind paywalls, and use language that non-specialists do not understand. Arguably, science festivals provide a platform for the democratisation of science – bringing scientists out of the laboratory and providing space for dialogue with the public and translation of work that can be publicly understood, valued, and interrogated. In this respect, they are critical components of functioning democracies, where transparency and accountability are born out of the open exchange of ideas and activities. Indeed, this is why activities that support such work - like science festivals - are so crucial to understand.

There is also an important instrumental underpinning to much science festival work that demands scrutiny. Science festivals may be understood as vehicles of advancing public support for science, technology, engineering & mathematics (STEM) within society. They do this by using a range of methods to engage non-specialist audiences with STEM in ways that build public support for the science industries (Bultitude, 2011). In this respect, science festivals are, firstly, festive occasions, which are characterised as being in the service of some subject, whether it is art, music, or a religious festival such as the Christian festival of Christmas celebrating the birth of Jesus Christ; the Hindu colourful festival of Holi celebrating the triumph of good over evil; and the Islamic festival of Eid al-Fitr celebrated by Muslims worldwide to mark the end of the month-long dawn til dusk fasting in the Holy month of Ramadan.

Yet, while the modern origins of science festivals may be explained through this instrumental desire to build support for science, science festivals now claim a wider range of values and this thesis seeks to reveal and interrogate this complexity. For instance, science festivals can be perceived, developed or utilised as mechanisms for engaging and inspiring future scientists and engineers, and to spark discussion or awareness of a particular issue. Alternatively, they can become spaces of interrogation and criticism over science. As an example of this, the Edinburgh International Science

Festival in 2015 awarded the moral philosopher Mary Midgely the Edinburgh Medal – an award jointly awarded by the city council and the science festival – for her contribution to philosophy and the wellbeing of humanity. Over the past 30 years, Midgely's writings have informed debates on animal rights, the environment and evolutionary theory. Midgely is a staunch opponent of reductionism, scientism and scientific pretension – so her award by the science festival sent out a clear message that science in public can – and should – embrace criticism and respond to it. This shift may also speak to the critical community that operates around science festivals, the growth of their professionalisation, and the degree to which such producers, curators, and presenters have fostered a more critical and creative approach to their work that is less didactic and more participatory.

In this respect, the term science festival has expanded its range of application to a host of different events and has been reinterpreted by practitioners in many different ways over the past 30 years, in accordance with a range of dynamic conditions which surround their development and implementation. Science festivals are shaped by their geographical location, the community it seeks to serve, its funders, sponsors, partners, and the people themselves curating and producing the programme. For example, science festivals in Islamic countries may omit events on evolution and science festivals in rural farming communities may have a tendency towards food and agricultural events. As such, they are entry points into understanding cultures and societies.

Like other festivals, a science festival is a time-bound event that consists of various activities, which engage various audiences with ideas emerging from the knowledge industries (such as universities or research facilities) using a variety of formats. They are manifestations of a certain way of interpreting the world, science, and the relationship between the development of science and the wider public who are its stakeholders and beneficiaries. One can observe the precise indicators of such change in the range of formats presented within festivals, which may include shows &

performances, public lectures, panel-discussion events, art installations, workshops and other digital and/or interactive activities.

The instrumental function of science festivals - and the research that follows this function - can be explained by the need for skills development within countries. For example in the UK, there are clear STEM skills shortages, with employers finding that 43% of current vacancies in science and engineering roles are difficult to fill – due to a lack of applicants with the relevant skills, training, qualifications and experiences, compared to the national average of 24% for all other sectors (UK Commission for Employment and Skills, 2015). Engineering roles are the most difficult to fill with employers finding suitable candidates in only 60% of engineering roles (UK Commission for Employment and Skills, 2015). There are known problems associated with encouraging young children to progress interest in science from primary school to university-level, with an especially leaky pipeline for women, Black and minority ethnic communities and those from deprived backgrounds. The 'leaky pipeline' is a metaphor used in the literature to illustrate the progressive loss and invisibility of these communities as the career ladder progresses (Blickenstaff, 2005). These circumstances provide further rationale to understand what is happening around science festivals as they may be a tool to enhance social justice and equality in STEM.

The circumstances outlined above evidence the importance of science festivals in contemporary society and, especially, their role in conveying to young people the importance of STEM subjects in society, and how fun and rewarding, albeit challenging, a career in STEM can be. In so doing, these parameters articulate a rationale for such investigations, as science festivals are crucial vehicles for a range of national aspirations, from education to cultural enrichment. They also speak to how festivals are expanding as units of public engagement with science, which is giving rise to new, hybrid events. Consequently, research into science festivals is essential in order to understand, not only their economic value to a skilled workforce, but also their social

and cultural value in creating an equal society where people of all backgrounds can access science for personal enrichment.

1.2. Aim and Objectives

This thesis aims to investigate science festivals in order to understand the various forms that they take and to make a valuable contribution to the science festival sector about the diversity of the sector and on the value and contribution of science festivals to wider civil society. Despite their 30-year history, science festivals are still largely unresearched. As such, it is unclear how science festivals are organised; what impact they have on society; and what their ambitions are for the future. To answer these questions, this thesis adopts a novel theoretical lens through which to analyse the science festival, drawing on research in critical event studies and approaches in science communication. In order to achieve the aim of this thesis - to understand more about the diversity of science festivals - there are a number of objectives, as outlined below:

Objective 1: To evaluate academic literature within the fields of critical event studies and science communication in order to identify gaps within current academic literature pertaining to our understanding of science festivals.

Objective 2: To conduct semi-structured interviews - until the theoretical saturation point is reached - with science festival figureheads in order to generate data on their experiences and perspectives on leading a science festival and to create a theoretical model that helps categorise the diversity of science festivals that exist based upon the festival values, strategic objectives, operational management and business models.

Objective 3: To analyse interview data in order to: understand what makes a science festival unique in comparison to other genres of festival; analyse whether current definitions of a science festival are accurate and appropriate; and to understand both

the future aspirations for science festivals and the barriers for achieving those aspirations.

Objective 4: To create recommendations for science festival practitioners on how to develop and enhance the sector. In addition, the researcher will create recommendations for future researchers on research avenues to explore.

These objectives recognise that, prima facie, there is a plethora of science festivals taking place within the UK and that there is a need to disaggregate them to more clearly understand the range of objectives, aspirations, and interests that support their development. In doing so, the research sets out to develop a typology of science festivals, which can assist objective clarification, strategic development, and to help understand where there remain gaps in delivery, when set against a range of wider societal aspirations for science communication work.

The value of developing this theoretical framework will be found in helping science festivals to better understand their impact and function. Knowledge in this area could provide economic and political benefits for science festivals. For example, science festivals with similar values and strategic objectives may discover points in common, which may permit a more aligned approach to seeking funding or developing collaborative service provision, such as jointly owned production teams for touring new work.

Clarifying where specific festivals sit within their wider environment is also likely to benefit those who seek to establish their own science festival by reaching out to science festivals that share their vision for advice on setting up a festival. This research will also reveal where science festivals deliver or fail to deliver on wider societal aspirations. For instance, it will show how science festivals vary in terms of their celebration of science or as platforms for interrogating science. Each of these insights are useful ways of informing public policy about the way science integrates within society on a number of

levels. This is important as it may discover that some science festivals omit a crucial set of values to nurturing grass root engagement or local involvement with the festival, which may be crucial to securing the value of science within the community.

This research also seeks to reveal the aspirations of science festivals in the UK and identify the barriers that exist towards their realising those aspirations. Insights from data generated in this study will allow for the creation of recommendations on how science festivals may overcome such barriers in order to achieve their aspirations.

Collectively, these objectives address an area of science festivals that is seldom analysed, namely a focus on the business and management perspectives of science festivals. This is in contrast to what most existing research on science festivals - and science festival figureheads themselves - seek to evaluate, as the focus of the bulk of science festival research is on audience engagement, audience development, and making science accessible to those audiences who are not traditionally engaged with science. Thus, the focus of this thesis is unique, as it blends science communication literature with critical event studies, allowing for the focus of the research to be on the business and management dimensions of traditionally science communication research.

1.3. Methodological approach

This research study takes an entirely qualitative approach to the creation of knowledge presented in this thesis and makes sense of the world of science festivals through interpretation of over 250,000 words produced in the transcription of interviews with research participants. Knowledge is something that is created and qualitative research is amongst the most creative of research (Minchiello et al., 2008). Unlike quantitative research that may take place in a laboratory or scientific setting, the qualitative researcher does not transition easily from data collection to the writing up of results (Minchiello et al., 2008) and this is the experience of the researcher in this instance.

Interpretations of interview data generated in this thesis are constructed interpretations that have led to theory being produced by this thesis.

Data for this thesis is generated from 27 semi-structured interviews that took place either face-to-face or over online video calls (using Microsoft Skype). These semi-structured interviews comprised a series of open-ended questions based on topics that would help the researcher meet the aim and objectives of this thesis. Taking a semi-structured approach to the interviews allows the researcher to follow various lines of enquiry depending on the responses given by the research participant and provides a more natural and conversational approach to data collection that would otherwise not be possible with a more rigid structured approach (Mathers et al., 1998).

Semi-structured interviews were carried out with science festival figureheads - the most senior figure of the science festival. On 22 occasions, these interviews were conducted face-to-face and on 5 occasions they were conducted via Skype. Face-to-face interviews are incredibly labour intensive (Mathers et al., 1998). Due to the geographic distribution of science festivals across the UK, there was extensive travel and overnight stays involved in order to meet face-to-face with science festival figureheads. Although face-to-face interviews come with a high time commitment and with travel, accommodation and subsistence costs, they do provide the advantage of allowing the researcher to come face-to-face with the research participant (Boyce, 2006). In addition, face-to-face interviews are the first choice for researchers who want to maximise the quality of data collected (Lavarkas, 2008). The remaining 5 interviews were conducted via Skype due to a depleted project travel budget. Skype interviews provide the benefits of having no travel, accommodation or subsistence costs attached to them but there are some drawbacks such as not being able to fully build up a rapport with the research subject and leave the researcher feeling that there is something missing from the richness of data generated (Carter, 2011; Rowley, 2012).

Interview audio-recordings were manually transcribed and analysed using thematic analysis. Thematic analysis is a data analysis technique widely used in social research,

but rarely acknowledged (Braun & Clarke, 2006). Thematic analysis is used in order to identify, analyse and report patterns within the data (Braun & Clarke, 2006). Thematic analysis is a messy process and there is no universal agreement amongst social researchers on how it should be conducted (Tuckett, 2005). The processes used for thematic analysis in analysing over 250,000 words of manually transcribed interview data are discussed in detail in Chapter 6.

1.4. Structure of this thesis

This thesis is structured into eight chapters, as outlined below:

Chapter 1: Introduction. This chapter sets out the background and rationale for this thesis; outlines the aim and objectives of the study; and introduces the philosophical and methodological approaches undertaken in this study.

Chapters 2, 3 and 4: Literature Review. This extensive literature review which spans three chapters of this thesis is conducted for several purposes. Saunders et al. (2012) discuss three ways in which the researcher is likely to use academic literature within their research. Firstly, preliminary research helps the researcher come up with ideas for research, by identifying gaps in the literature (Saunders et al., 2012). Secondly, a critical literature review (which is the basis of Chapters 2 - 4) critically analyses existing literature, highlighting controversies and competing claims, whilst going into more depth about the known and unknown (Saunders et al., 2012). Thirdly, academic literature is used to bring the findings of the research into the wider body of knowledge (Saunders et al., 2012).

According to Creswell (2014), the purpose of the literature review is to examine the findings from other research that have already been conducted within the subject area. Conducting an extensive literature review helps the researcher identify what is known

and what is unknown within the specific subject area, and this allows the researcher to make a decision on whether to pursue research within the subject area (Creswell, 2014). A literature review is not just a summary of what books, journal articles and other sources have to say about a particular topic; rather, a literature review is a critical overview of different arguments, opinions, research findings and ideas (Saunders et al., 2012). Moreover, it is this analysis of different arguments, opinions, research findings and ideas that helps the researcher create constructive critical analysis of key literature related to the research questions which supports or opposes the researchers ideas (Saunders et al., 2012). Academic literature is used throughout the entire research process, from the process of ideation towards establishing a research question, through to designing the study, conducting the research, and analysing and writing up results of the research (Bryman & Bell, 2011). Consistent engagement with academic literature, and the continual development of the literature review help the researcher verify the relevance and originality of their research findings (Bryman & Bell, 2011).

This thesis makes a unique contribution to the literature in the sense that it analyses and develops its theoretical lens from two distinct bodies of literature in order to understand science festivals both theoretically and practically. Chapter 2 provides a literature review of critical event studies, and examines the social, cultural, political, economic and environmental impacts of festivals. In this chapter, and indeed in the field of critical event studies, the focus of research and knowledge creation has focused on arts festivals. This is important in our understanding of science festivals, as science festivals have never been analysed from a critical event studies perspective. Chapter 3 provides a review of the literature in the field of science communication. It is in Chapter 4 that the literature surrounding science festivals is examined. Most of the existing research on science festivals, has positioned science festivals within the broader science communication literature. However, this thesis seeks to further understand science festivals, not just from a science communication perspective, but from a critical event studies perspective. Chapter 4 concludes with a discussion on the identified gaps in theory, knowledge and practice relating to science festivals, which set out the parameters of the present inquiry.

Chapter 5: Philosophy of Research. This chapter explores the philosophy of research that underpins the methodological approach of this thesis. Easterby-Smith et al. (2012) describe that the philosophical stance is the most important aspect of a methodology for all research and is such a fundamental aspect of research. As such, it must be duly considered by any researcher before they embark on their study. In this chapter, the choice of an interpretivist philosophical worldview is justified and the concepts of ontology, epistemology and axiology are discussed in relation to this study.

Chapter 6: Methodology. This chapter discusses the methods used for data generation and analysis and justifies the methodological approach. This chapter focuses on the interview data with 27 science festival figureheads, discussing the process that underpinned the interviews, along with the different modes of face-to-face and Skype conversations that formed the basis of the semi-structured interviews. This chapter also critically describes the process for recruiting research participants, conducting the interviews and the approach to transcribing, coding and analysing the data. This chapter also explores the ethical issues relating to this research and how such issues were managed by the researcher. This includes the ethics of conducting research interviews with close friends, ensuring participant confidentiality, and working to reduce concerns over deductive disclosure that could occur when otherwise anonymous quotes could be identified by others in the community (Sieber, 1992). As the science festival community within the UK is a small community, then navigating deductive disclosure was of paramount concern to the researcher and is explored extensively in this chapter.

The methodology chapter discusses the problematic use of discussing themes as things that emerge from data, as this notion downplays the role of the researcher in actively identifying the themes and patterns in interview transcripts (Taylor & Ussher, 2001). The reality is that if themes reside anywhere, they reside inside the researcher's head from their thinking about data and creating links between different interviews as they interpret

what research participants are all individually telling him (Ely et al., 1997). The themes identified are presented and discussed in Chapter 7.

Chapter 7: Results and Discussion. This chapter presents the results of the research interviews conducted in this study. As with all qualitative research with an interpretive philosophical stance, the approach for data analysis assumes that data is open to refinement that can illuminate how research subjects construct reality (Chesebro & Borisoff, 2007). The critical discussion in this chapter does not presume that there is a generalisable truth about reality. Rather, the aim of this chapter is to identify the meaning that people construct to the social world of science festivals. Data presented include the feelings and interpretations of what research participants reveal both explicitly and tacitly and presents an impression of the world of science festivals as co-constructed by both the researcher and research participants, as is the norm in research with an interpretative epistemological philosophical stance (Chesebro & Borisoff, 2007).

This chapter presents the final stage - stage 6 - of thematic analysis as described extensively in the methodology chapter. Stage 6 of thematic analysis is the production of the report whereby the researcher selects the most compelling examples and abstracts from the data to support new theory being produced (Braun & Clarke, 2006). In this chapter, major themes from this research are presented and discussed.

Chapter 7 is broken down across 11 major sub-headings which represent the prominent themes identified by the researcher in the data analysis phase of research. These 11 major themes are interlinked and as such are presented in one large chapter, rather than breaking up into multiple chapters.

Chapter 8: Conclusion and Recommendations. This chapter provides a summary of the conclusions drawn from the research and makes recommendations for both industry

practitioners (i.e. those working in the science festival sector) and for those researching science festivals, whereby proposed research avenues are explored in relation to the research findings.

Chapter 2: Festivals

2.1. Introduction

Festivals come in many shapes and sizes. From the religious festivals of Christmas, Eid, Easter, Hanukkah, to contemporary music, arts, comedy, community and science festivals that we see in the modern world, there is such a huge diversity in genre and scope of festivals. Festivals are all around us: religious festivals, music festivals, arts festivals, fringe festivals, comedy festivals, science festivals, climate change festivals, even cheese toastie festivals: it seems that we live in a world where festivals can be found with ease. Festivals have been a part of people's lives since human interactions began. Yet, the academic study of festivals is still in its infancy and much of the current research focuses around audiences and is of a quantitative nature (Newbold et al., 2015). Although attending a festival might be a liminal or rite of passage for the festival attendees, it is something different for the organiser: it is a series of negotiations and actions within a wider political, economic, social and cultural climate (Newbold et al., 2015).

Various academics have endeavoured to define a festival; however, there is no single universally agreed definition of a festival. Festivals are social events, and the creation of a festival is a social and collective act. Festivals provide opportunities for drawing on shared histories, shared cultural practices and shared ideals (Quinn & Wilks, 2013). As well as creating the setting for social interactions, festivals engender community and provide an arena for local knowledge to be produced and reproduced (Quinn & Wilks, 2013). Festivals provide the opportunity to pass on cultural inheritance, history and social structures from one generation to another generation and provide an opportunity for such social structures and cultural norms to be revised, rejected or recreated (Quinn & Wilks, 2013). Through critical event studies, festivals and events scholars have sought to understand how festivals provide opportunities for social groups to perceive and experience their society, location, and the basis in which individuals interact with

each other (Getz, 2012). Festival scholars seek to understand the social meanings of the content and rituals that are evident at festivals (Quinn & Wilks, 2013).

From a historical perspective, festivals are associated with gluttony, over-consumption of meat, feasts, indulgence, hedonism, abandonment and the mocking of authority (Newbold et al., 2015). We can trace the modern day festival back to medieval carnivals (Stallybrass & White, 1986). Throughout European history, carnivals have been waxed and waned, been suppressed and brought back (Stallybrass & White, 1986).

There are four elements of the carnival, some of which can be seen to various extents in modern festivals (Stallybrass & White, 1986). The first of these elements is the free and familiar interaction between people (Stallybrass & White, 1986). Those who are normally socially separated are encouraged by the carnival to meet, engage and express themselves to each other, and to share cultures and ways of life. The second element of the carnival is that eccentric behaviour is legitimised (Stallybrass & White, 1986). This eccentric behaviour is not only permitted and encouraged, but in fact may be an opportunity to reveal our true selves or parts of our personality that we hide from the rest of the world. Thirdly, carnivals provide opportunities for misalliances (Stallybrass & White, 1986). Those who are normally kept apart are permitted to engage. The misalliances of heaven and hell; sacred and profane; high society and working class; young and old; are brought together in a level playing field where these misalliances are equals, only for the duration of the shared experience of the festival. The final element of the carnival is that anything goes, and that the rules of normal life go out the window (Stallybrass & White, 1986). Sacrilege, profanity, blasphemy and parody is all the rage and encouraged at the festival (Stallybrass & White, 1986). But why would society allow this? Why does high society interact with the working class and allow them to misbehave and blaspheme? One explanation is that it is society's way of striking a blow for the working class but perhaps the carnival is a way of high society controlling the working class: a day to let off steam, whilst also demonstrating the consequences of a life without rules (Stallybrass & White, 1986).

Over time, as societies have evolved, so too has our relationship with festivals. Although some festivals may still retain some elements of the medieval carnival, festivals have diversified and applying a universal definition to the word 'festival' is almost impossible. Festivals are public facing events that are embedded in social and cultural life (Newbold et al., 2015). They are often short-term and include a mixture of both cultural and commercial elements, with sources of entertainment and artistic innovation included within the festival (Newbold et al., 2015). Some festivals are transformative, challenge the status quo and advance cultural democracy; whereas others may create a source of community pride, identity and/or cohesion, and improve the quality of urban life (Newbold et al., 2015).

In this context, what can contemporary festivals learn from historic carnivals, and do we still see elements of the carnival within festivals? Richards and Palmer (2010) explore the over-use of the word 'festival' and see one category of festivals as a label that is applied to events as a marketing tool, for activities stretched to the definition. Negrier (2015) discusses festivalisation and the impact this has on culture. Festivalisation is defined as the process by which cultural activities, previously regular activities, are branded to form a new event e.g. a series of events rebranded as a festival (Negrier, 2015). Alternatively, festivalisation arises from the process by which cultural institutions orient part of their programme around particular themes, concentrated in time and space e.g. a new programming strand within an art gallery or museum, to create a festival (Negrier, 2015). The increasingly prominent phenomenon of festivalisation provides many opportunities and challenges for festival managers, including the creation and management of multiple events within their festival.

2.2. Festivals and experience

2.2.1. Experience

Experience is at the heart of both festival design and motivation for attending festivals (Shedroff, 2011). To have an experience is "the sensation of interaction with a product, service, or event, through all of our senses over time, and on both physical and cognitive levels. The boundaries of an experience can be expansive and include the sensorial, the symbolic, the temporal and the meaningful" (Shedroff, 2011, p.7). The term 'experience' is both a noun and a verb. As a noun, people discuss having experience e.g. "I am a person with lots of festival management experience". As a verb we talk about how to experience e.g. "I want to experience the excitement of a live music festival" (Getz & Page, 2016). One broad area of literature that explains the vital importance of experience within festivals is from the field of Leisure Studies. There are three main approaches to understanding leisure (Getz & Page, 2016). Firstly, leisure is a period of time focused on an activity or a 'state of mind' in which choice is a dominant feature i.e. a form of free time for an individual (Getz & Page, 2016). Secondly, from an objective view, leisure is perceived as the opposite of work, so leisure time is seen as something that is extra - it is the time that is 'leftover' after all other obligations have been fulfilled (Getz & Page, 2016). Thirdly, from a subjective view, leisure takes on meaning from the individual in relation to their subjective perceptions and belief systems; in other words, it can occur at any time and in any context (Getz & Page, 2016). Thus, delving into leisure studies helps us understand more about experiences within festivals. Leisure studies literature views leisure and recreation as a basic human need (Berridge, 2007). Leisure, conceptualised as a component of lifestyle is a combination of activity, free time, meaningful, satisfying and purposeful experiences (Berridge, 2007). Festivals, when attended for 'intrinsic' worth are leisure activities, and thus experience is a vital concept for both leisure studies and in critical event studies (Berridge, 2007; Getz & Page, 2016).

Attendee experiences of festivals can be broken down into five parameters (O'Sullivan & Spangler, 1998). Firstly, there are different stages of feelings that occur prior to, during and after the festival experience. Secondly, during the actual experience (i.e. at the festival) there are factors or variables that influence participation and shape outcomes of the experience. The third parameter are needs being addressed by the

experience. Fourthly, the roles of participants and others involved in shaping outcomes need to be considered, and this includes personality, expectations and behaviour. The final parameter is the relationship with the provider of the experience e.g. customisation and control of experience (O'Sullivan & Spangler, 1998). Attendance at festivals can be viewed as leisure experiences (Shedroff, 2011). Experiences (and the meaning we attach to experiences) are the core phenomenon of festivals (Getz & Page, 2016).

2.2.2. The experience economy

A demand for experiences rather than products or services is known as the experience economy (Getz & Page, 2016). The experience economy was first defined by Pine & Gilmore (1998) who argue that the pace of technological change causes people to collect experiences, as they once collected objects. Consequently, they argue that festival managers should shift their focus from traditional service perspectives towards customer experiences (Pine & Gilmore, 1998). Pine & Gilmore (1998) argue that experiences are a fourth economic offering (after basic commodities, products and services). The customer experience created by organisations is most important in today's competitive, technology-driven marketplace; thus experiences are the next step in the progression of economic value (Pine & Gilmore, 1998). Experiences, therefore, are a vital source of value for organisations (Pine & Gilmore, 1998). Within the experience economy, every business is a stage and, therefore, work is theatre (Pine & Gilmore, 1998). This theatre metaphor is often literally applicable, but also in the sense that today's festival attendee seeks memorable and engaging experiences (Berridge, 2007). Afterall, staging experiences is not about entertaining customers; it is about engaging them (Pine & Gilmore, 1998).

There are 5 key steps that festival and event managers need to take in order to stage memorable experiences: the so-called THEME of experience staging (Pine & Gilmore, 1998):

T: Theme the experience e.g. Disneyland was designed in 1957 as a cartoon that immerses the audience.

H: Harmonise impressions with positive cues. Signals in environment (decor) and behaviour of staff should be consistent with the theme e.g. in Disneyland the staff are cast members.

E: Eliminate negative cues. This is achieved through the manager or producer ensuring consistency of the experience e.g. Disney cast members remain in character, unless they are backstage.

M: Mix in memorabilia. Consumers purchase memorabilia as physical memories of the experience they want to remember: postcards, ticket stubs, posters, programmes, branded merchandise etc.

E: Engage the five senses. Tune each positive cue to integrate senses with the theme: visual, aural, touch, flavour, aromatics.

2.2.3. The four realms of experience

Pine & Gilmore (1998) created a theoretical framework that categories experiences such as those people may have at festivals into four realms. These realms are mutually compatible domains that co-mingle with each other in order to form "uniquely personal encounters" (Pine & Gilmore, 1998, p.30; Figure 2.1).
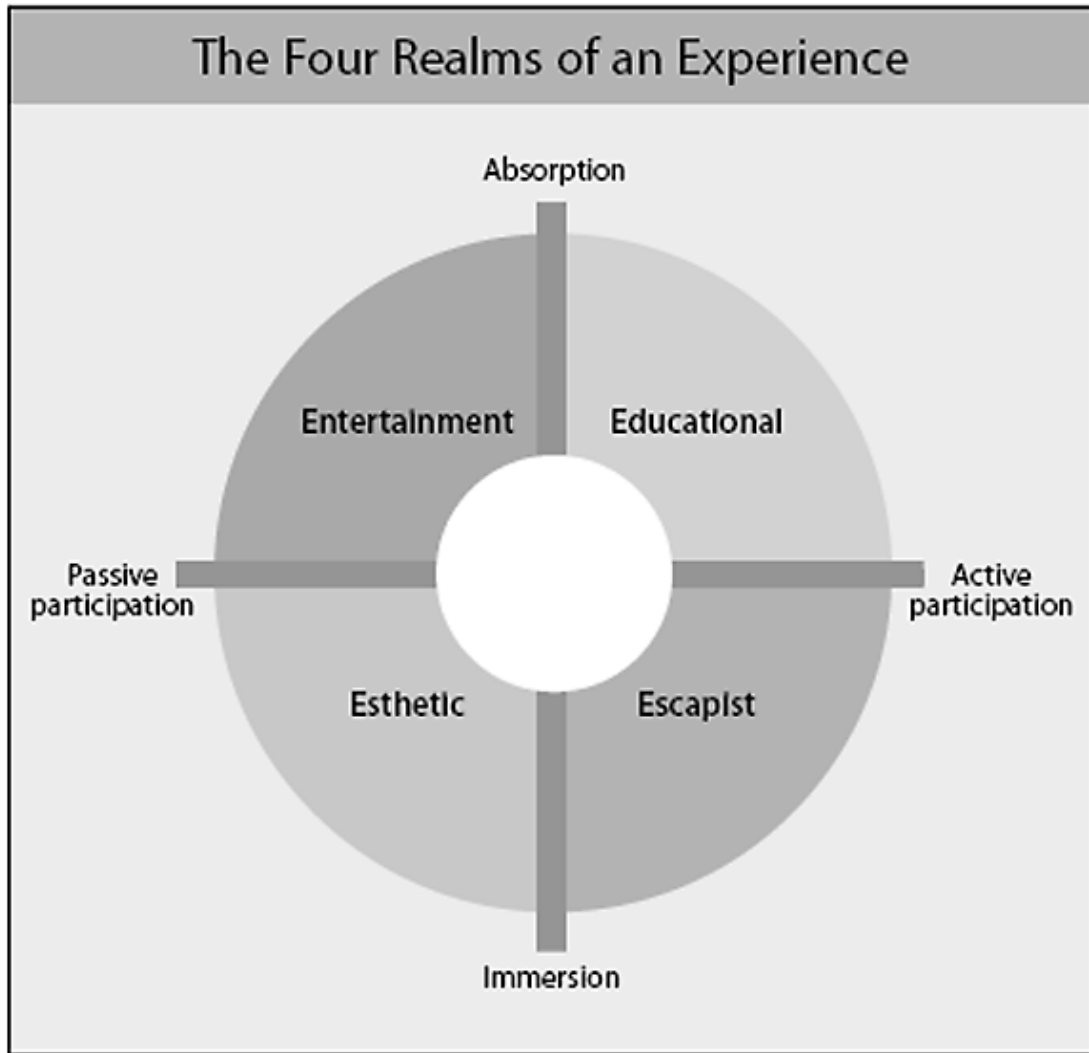
Figure 2.1: The four realms of experience (Pine & Gilmore, 1998, p. 102). The four realms of experience are entertainment, educational, escapist and aesthetic

The four realms of experience are entertainment, educational, escapist and aesthetic. The realms relate to the nature of the experience and how it is created (Pine & Gilmore, 1998). Entertainment generally provides passive absorption through the senses (Pine & Gilmore, 1998). This passive absorption through entertainment includes viewing of artistic performances (e.g. viewing a dance troupe) and listening to music. Entertainment is one of the oldest forms of experience, and thus one of the most developed forms of experience, making it the most commonplace and familiar forms of

experience (Pine & Gilmore, 1998). Of course, there are opportunities to combine entertainment experiences with the three other realms of experience to make more unique entertainment experiences.

Educational experiences generally involve active participation (Pine & Gilmore, 1998). This can be in the form of lessons, demonstrations, guided tours, conferences, and science festivals. In order to be truly educational (i.e. to inform people and increase their knowledge or skills) then a festival must actively engage the mind (Pine & Gilmore, 2011).

Escapist experiences are generally a form of active immersion where people embark from one place and voyage to another place (Pine & Gilmore, 2011). Such escapist experiences include theme parks, simulator rides, and sports such as snowboarding and skiing. These experiences can be natural (e.g. theme park) or artificial (e.g. simulator ride, VR or AR experiences). In the escapist realm, people become actors, who are able to "affect the actual performances" (Pine & Gilmore, 2011, p.48).

Within the aesthetic realm of experience, passive immersion is dominant (Pine & Gilmore, 1998). Consumers are immersed in the experience but have little or no effect in it; for example, in viewing art within an art gallery, or artefacts within a museum. The Rainforest Cafe in London is an example of a cafe that falls very much within the aesthetic realm of experience as it is a staged aesthetic experience. As the management now includes educational tours within the cafe, then it has moved beyond being solely within the aesthetic realm to include the educational realm.

The richest experiences do perhaps encompass aspects of all of the four realms of experience and centre of the "sweet spot" in the middle of the framework (Pine & Gilmore, 2011, p.48). Some of the richest experiences can bring the four realms together in compelling ways; for example, edu-tainment can include events that bring together education and entertainment, and this could include science festivals.

Having considered the importance of the realms of experience and the contribution that this theoretical framework makes to the festival sector and to festival managers' understanding of events, festival managers must be able to design experiences and apply this framework in practice (Berridge, 2007). The main focus of experience design is to create "desired perceptions, cognitions and behaviour amongst users, customers, visitors or the audience" (Berridge, 2007, p.161). From a festival management approach, experience design requires expertise and skills from various festival and event management specialisms, including design and non-design professionals (Berridge, 2007). Experience design must emphasise the consumer experience and engage the consumer in a personal, bespoke way (Berridge, 2007). When designing experiences, festival managers must consider the design of spatial dimensions, the five senses, interactivity, personal meaning, emotional context and customer value (Shedroff, 2001).

Any discussion on experiences would not be complete without a discussion on experiencescapes, which are defined as the servicescape (physical) setting where the service takes place, plus experiential elements such as ambiance and theming (Frochat & Batat, 2013). In other words, experiencescapes are landscapes of experience, spaces of pleasure, enjoyment and entertainment, as well as the meeting grounds in which diverse groups of people move around and come into contact with each other (O'Dell & Billing, 2005). Festivals that have taken an experiencescape approach to experience design include the UK's Glastonbury Festival, which invests heavily in immersive and interactive experiences for attendees. Theme parks and guided tours are also examples of experiencescapes.

2.3 Impacts of Festivals

Festivals always have purpose and goals, and these intended outcomes are something the festival organiser has in mind - either consciously or subconsciously - when organising their event (Getz, 2012). This means that certain outcomes are both desired and predicted, but also that there may be unanticipated and negative outcomes associated with the festival (Getz, 2012). Through these positive and negative outcomes of festivals, they may have a wider impact that has a notable change to society, culture, politics, the economy or the environment (Getz, 2012). These outcomes are the impacts of festivals. There are four main categories of festival impacts, namely social & cultural, physical & environmental, strategic & political, and tourism and economic (Bowdin et al., 2011).

2.3.1. Political impacts of festivals

Festivals are intrinsically celebrative events, but often find themselves located in a wider political context. Indeed, many of the stakeholders of festivals are political actors (Getz, 2012) and it would be naive to separate politics from festivals and to see them as two separate entities (Bowdin et al., 2011). As such, festivals have the opportunity to legitimate political priorities in the short term and can change or legitimise political ideology in the long-term (Heitmann and David, 2010). Ever since the days of the Roman Empire, politicians have used festivals to keep people happy and keep themselves in power. Roman Emperors used festivals (or rather, circuses), to deflect criticism from themselves and to increase their own popularity among their people (Allen et al., 2011). In modern times, we can see politicians use festivals and mega-events to increase their own popularity, including Boris Johnson, Prime Minister of the UK, and former Mayor of London. As Mayor of London, he used the Olympics as a platform to promote himself and gain popularity among voters (Mulholland, 2012). More recently, the UK's 'Festival of Great Britain and Northern Ireland' due to take place in 2022

emerges from the post-Brexit outcome, aimed at marking off a new chapter in British history.

Figure 2.2: Prime Minister of the UK, Boris Johnson, as Mayor of London, stuck on a zip wire in East London, whilst promoting the Olympic Games (Image source: The Guardian, 2012).

In turn, politicians from all political parties endeavour to take credit for festivals and mega-events. Tony Blair, then Prime Minister, said in the official bidding document for London to be named host city: "Winning the Games would be good news for London and for all of the UK. I hope everyone in the country will get behind the campaign" (London 2012 Olympic Bid, 2003).

The notion that festivals and mega-events can be used to legitimise political ideology in the long term (Heitmann and David, 2010) can be seen clearly in the 1936 Berlin

Olympic Games, which was used by Nazi Germany to legitimise the fascist and anti-semitic regime. An ideology is a fundamental philosophy that is used to guide political parties (Holmes et al., 2015) and the fascist and anti-semitic ideology was used by Nazi Germany in the Berlin Olympics for the purposes of symbolic politics, or in other words a public display of the ideology (Holmes et al., 2015). Hitler had hoped to use the Olympic Games as a way to prove his racist theory of Aryan superiority, thus legitimising Nazi ideology of German supremacy. The official Nazi party paper wrote in the run up to the Games that Jewish and Black people should not be allowed to compete in the Games; however, when threatened with a boycott of the Games by other competing nations, the Nazi's reversed this policy and permitted one token Jewish athlete to participate on the German team. Notwithstanding, the Games also provided the Nazis with an opportunity, or rather excuse, to arrest and deport all of Berlin's Romani population who were sent to their deaths at the Berlin-Marzahn concentration camp; thus further demonstrating the value of festivals and mega-events to politicians in helping them achieve and legitimise their ideology. Of course, this is an extreme example of a government using such festivals and mega events to legitimise their ideology; however, neoliberal governments such as the UK Government also use festivals and events to advance their ideology, and a critique of such motivations is discussed later in this chapter.

The political environment, processes, and institutional arrangements all influence how festivals are run, who is involved, and how they are managed (Getz, 2012). Ultimately, politics in festivals is about who gets what, where, and how (Yeoman, 2004). Legislators have a key role in festivals, most-notably festivals of national importance or mega-events. This can include elected representatives voting and strategically delivering large-scale events such as the Olympic or Commonwealth Games. For example, the Commonwealth Games in Glasgow 2014, which took place just before the referendum on Scottish independence from the UK was used by nationalist politicians to gain momentum for the independence movement, with the then Deputy First Minister Nicola Sturgeon arguing that Scotland's sporting success within the games was contributing to a feel good factor, that could be translated into votes for independence (Boffey, 2014).

Politicians at a local level also have a strategic role as key festival stakeholders and must make political and strategic decisions with regard to local road closures and licensing of alcohol sales (Getz, 2012).

Government agencies and quasi-governmental organisations have a role to play in supporting festivals of interest to the public sector. Agencies related to economic development, tourism, sports and other cultural agencies have a role to play in delivering the political will of politicians and in strategically delivering such festivals, including the management of finance and delivering the marketing strategy (Getz, 2012). Governmental organisations can be at national level, e.g. Visit Scotland or Visit Britain, but they may also operate at a local or regional level. For example, in 2016, Manchester was designated the European City of Science and, as such, a conference and city-wide festival was organised and delivered strategically by Marketing Manchester whose role is to promote Greater Manchester on the national and international stage (Marketing Manchester, 2020).

Other political stakeholders of festivals include law enforcement agencies such as the police service who make sure festivals operate within the law. Regulators such as health & safety and food hygiene authorities also have a role to play in ensuring festivals operate within relevant public sector guidelines and legislation (Getz, 2012). It is also important to point out the role of local community groups as key political stakeholders for festivals. Festivals must recognise local community groups as key partners that should be consulted in the planning of festivals (Getz, 2012).

There are of course both positive and negative political impacts of festivals. Positive impacts include international prestige and improved profile of a city where the festival takes place (Bowdin, 2011). To understand the international prestige that festivals bring to cities, we only have to look at the example of the City of Edinburgh - dubbed the world's leading festival city - which boasts an all-year round calendar of festivals and

brings together people from more than a third of the world's countries to the city each year to join the festivals (Festivals Edinburgh, 2020). The City of Edinburgh is home to the largest arts festival in the world - the Edinburgh Festival Fringe, an open-access arts festival that sets out to democratise access to the arts (Edinburgh Festival Fringe, 2020). The world-leading Edinburgh International Festival first started in 1947 after World War 2 in order to "create a flowering of the human spirit" (Festivals Edinburgh, 2020). In that same year, the Edinburgh Festival Fringe and the Edinburgh International Film Festival also began (Edinburgh Festival Fringe, 2020; Edinburgh International Film Festival, 2020).

With other festivals soon to follow: The Royal Edinburgh Military Tattoo (1950); Edinburgh Jazz and Blues Festival (1978); Edinburgh International Book Festival (1983); Edinburgh International Science Festival (1989); Edinburgh International Children's Festival (1990); Edinburgh International Storytelling Festival (1990); Edinburgh Hogmanay (1994); and Edinburgh Art Festival (2004), Edinburgh has established itself as the world-leading festival city, with festivals celebrating all aspects of arts, culture and science (Festivals Edinburgh, 2020). There are of course many more festivals that take place in the City of Edinburgh, but the above festivals are the ones that are represented nationally and internationally by Festivals Edinburgh (Festivals Edinburgh, 2020). Other festivals (i.e. those which are not represented by Festivals Edinburgh) include religious festivals and community grassroots festivals. The example of the City of Edinburgh therefore provides sound evidence that positive political impacts of festivals include international prestige and improved profile (Bowdin, 2011). In addition, other positive political impacts of festivals include promotion of investment, development of skills, and social cohesion (Bowdin, 2011).

Notwithstanding the positive political impacts of festivals, negative impacts include propagandising, legitimation of ideology and the potential misallocation of funds (Bowdin, 2011). Other negative political impacts of festivals may also include loss of community ownership and control, particularly when a festival is not co-created or co-

produced by host communities (Bowdin, 2011). For instance, the Olympic Games is often criticised for the manner in which it leads to the marginalisation or disempowerment of certain local communities who are made vulnerable by the imposition of the mega-event's infrastructural needs.

2.3.2. Social and cultural impacts of festivals

Festivals, as celebrations, can have social and cultural impacts, both positive and negative. Festivals have always played a role in the social life of communities. In pre-modern times, a festival was a time for celebration, relaxation and recuperation which took place at the end of the harvest period - a period of hard physical labour sowing crops (Rolfe, 1992). Although the artistic and creative content of the harvest festivals were variable, many of them had ritualistic and/or religious elements to them, but music and dance was always an important feature of such celebrations (Rolfe, 1992).

Socio-cultural impacts are defined as impacts that have the potential to impact the quality of life of local residents (Fredline et al., 2003). Furthermore, festivals have the ability to alter people's values, morals, conduct, behaviour, relationships or how people express themselves (Fredline et al., 2003). Socio-cultural impacts of festivals can be felt across many areas. Festivals, especially traditional festivals, help shape culture in terms of beliefs, customs, values and dance (Raj and Musgrove, 2009). Festivals can also provide a sense of community cohesion and contribute to the health and wellbeing of communities, and in particular festivals can have positive mental health outcomes (Raj and Musgrove, 2009). Holmes et al. (2015) categories social and cultural impacts of festivals into two categories: positive and negative. Positive impacts include increased community participation and expansion of cultural services; opportunities for entertainment; increased commercial activity in tourism services; increased diversity and community pride; and capacity building and skills development through volunteering and temporary employment opportunities (Holmes et al., 2015). Negative social and

cultural impacts of festivals include increased noise, traffic and overcrowding; increase in anti-social behaviour including drug and alcohol abuse, vandalism and crime; displacement of local government spending i.e. money diverted away from local community services; limited job opportunities post-festival; negative community image; and negative media coverage that can create a negative destination image (Holmes et al., 2015).

Festivals as a whole can be viewed as vehicles for improving social relationships, improving intercultural understanding and increasing the wellbeing (both physical and mental) of a community (Rolfe, 1992). Festivals provide opportunities to bring together different cultures, lifestyles, ethnicities, languages and social classes (Rolfe, 1992). Festivals also free people from the everyday social and economic constraints, linking back to the liminality of festivals (Rolfe, 1992).

Host populations must also reconcile economic gains as a result of tourists spending money to attend festivals with the social costs of living with strangers (Rolfe, 1992). However, this interaction between host communities and tourists (or festival attendees) does have the potential to lead to social change (Accordia and Whitford, 2006). The festival attendee or the local community may change as a result of the transfer of social norms, values, fashions and other customs of the other, and this social change may or may not be a positive social interaction (Accordia and Whitford, 2006).

Social impacts of festivals can be measured through the festival social impact attitude scale (Delamere, Wankel & Hinch, 2001) or through the social impact perception scale (Small, 2007). These are resident surveys that employ largely quantitative approaches, but combined with qualitative approaches such as focus groups and interviews, a true understanding of the social and cultural impacts of festivals can be understood (Delamere, Wankel & Hinch, 2001; Small, 2007). There are of course theories that can help conceptualise social and cultural impacts of festivals - and two of these theories

are that of social capital and cultural capital. Simply put, whereas economic capital refers to how much money we have and the value of our assets, social capital is about the possession of resources that derive from membership of different groups, relationships, networks and influence and support (Getz and Page, 2016). In communities where people have high levels of social capital, people are more likely to be polite, talk to strangers, behave as equals and perform random acts of kindness and this leads to a greater sense of community spirit (Arcordia and Whitford, 2006). Cultural capital on the other hand refers to the knowledge, skills, education and other advantages possessed by a person that results in a higher social status (Getz and Page, 2016). Cultural capital is linked to upbringing, and is something that parents transmit to children (Getz and Page, 2016).

Attendance at festivals contributes towards increasing levels of social capital (Arcodia & Whitford, 2006). Festivals provide opportunities for interaction between people that leads to a sense of cooperation, goodwill, belonging and reciprocity (Arcodia & Whitford, 2006). Putnam (2000) discusses social capital in relation to being part of networks that facilitate cooperation for mutual benefit. We can apply this definition of social capital to festivals as they create a sense of belonging with people who are experiencing the same festival as them. Festivals further help develop social capital in the sense that they provide people with the capacity to secure benefits by virtue of the membership of such social structure (Portes, 1998). Festivals are inherently communal events and provide opportunities for people to develop social capital (Quinn & Wilks, 2013). Individuals benefit from being members of communities, such as volunteering communities, or staffing communities at festivals. People can develop relationships, connections, trust and this is all linked to different festival stakeholders being able to increase social capital at festivals (Quinn & Wilks, 2013). Notwithstanding, the development of volunteer and staff skills at festivals helps develop cultural capital too.

Of course, not all social and cultural impacts of festivals are as authentic as they may seem. Shaw and Williams (2004) discuss pseudo-cultural events which can be planned

and designed with the tourists and festival audiences in mind, giving the impression that the festival is an authentic cultural experience, whereas the reality is somewhat different. This staged authenticity can have a negative impact on host community and festival attendee relationships (Shaw and Williams, 2004); however, authenticity as a concept is elusive and comes down to individual perceptions of what is authentic and what is not authentic. Measuring the authenticity of a festival is hard to measure and this can further cause tensions between festival audiences and host communities.

So, how should festival producers create and deliver festivals in a way that maximises positive social and cultural impacts of festivals? Frost and Laing (2011) argue that the negotiation and collaboration with a range of stakeholders who bring multiple meanings to the event is vital. In other words, inclusion of different communities is vital to maximise social and cultural impacts, particularly host communities who live in the area where the festival is taking place (Frost and Laing, 2011). Arguably, the media also have a role to play in promoting the place where the festival takes place as a positive destination (Getz, 2012).

2.3.3. Economic impacts of festivals

Major festivals are primarily regarded as economic generators (Raj and Musgrove, 2009). The projected economic impact of a festival can be a major determinant in the decision on whether a festival goes ahead, and whether it will receive public funding (Raj and Musgrove, 2009). Economic impact of festivals is the net change in the economy resulting from the festival (Lee, 2008). Economic impacts are generated when festivals can demonstrate that they have attracted new (or more) money into an area from investment, sponsorship, tourists, and other funding (Getz, 2012).

With regards to festivals, economic impact is based on the theory that money flowing into an area from outside the area where the festival is taking place will benefit the local

economy. These benefits could be through stabilising the local economy; taxation through visitor spending; creation of jobs and business opportunities as a result of the festival; and attraction of additional businesses and services to support the festival and tourist industry (Lee, 2008). Economic impacts of festivals should be considered tourist impacts (Bowdin, 2011). Positive economic impacts of festivals include destination promotion, thus increased tourism; promotion of investment; development of skills; extended length of stay for tourists; and other such business opportunities (Bowdin, 2011). Potential negative economic impacts of festivals include opportunity costs; economic exploitation of local workers and festival volunteers; inflated prices; and financial mismanagement and/or loss of money (Bowdin, 2011).

Economic impact studies are often undertaken not to provide an accurate assessment of the impact, but rather to legitimise the decision to invest in the festival and/or justify public sector support of the festival (Raj and Musgrove, 2009). Economic impacts can be broken down into three different areas: direct impacts, indirect impacts, or induced impacts (Raj and Musgrove, 2009). Direct economic impacts are those which are directly attributable to the festival and includes all purchases made that remain within the region or community which holds the festival. This includes visitor spending on accommodation, food, drink, transport etc., but does not include purchases that would take place even if the festival was not taking place. Ultimately, direct economic impacts are purchases that relate to the event itself. Although these direct impacts may seem relatively straightforward to calculate, they do not give a true picture of the economic impact of events, and thus indirect and induced impacts should also be considered.

Indirect economic impacts are secondary effects derived from direct impacts to other businesses and sectors. This relates to purchases of local suppliers that remain within the region. For example, a festival attendee who pays for a meal at a local restaurant (direct expenditure) means that money will flow on to the restaurant's suppliers as indirect expenditure (the restaurant might, for example, purchase local ingredients from local wholesalers who get their supplies from local farmers). Thus, indirect economic

impact complicates the calculation of the total economic impact of a festival; but it is still too simplistic to calculate the direct economic impact of the festival alone.

The third area of economic impacts of festivals is induced impacts. Induced impacts are secondary effects derived from both direct and indirect impacts. For example, this could mean the increased spending of wages by restaurant staff who have worked overtime or extra shifts during local festivals. If these wages are spent locally, then this is an induced economic impact of the festival. Of course, considering direct, indirect and induced economic impacts is a challenge, and something that may be beyond the skill set of festival organisers; however, many large festivals do have the financial means to hire external consultants to conduct such economic research. Festivals Edinburgh, the umbrella organisation that represents the interests of twelve of the festivals taking place across The City of Edinburgh, hired external consultants to conduct such research into the economic value the festivals bring to the city. The consultants undertook extensive quantitative and qualitative methodologies to understand the economic impacts of the festivals and found that the cities festivals generate £245 million of additional output for the city (BOP Consulting, 2016). These 12 festivals also generated an extra £261 million of additional spending in Scotland, and the festivals alone supported 5242 jobs in Edinburgh, which makes the festivals industry in The City of Edinburgh bigger than the golf industry (BOP Consulting, 2016).

Without rigorous economic impact assessment carried out by trained economists, it is difficult to get an accurate representation of the economic impact of a particular festival. However, there are frameworks that festival organisers can apply to estimate economic impacts. One such framework is cost-benefit analysis (CBA). CBA is a simple approach that looks at identifying potential benefits and weighing them up against potential costs (Davies et al., 2013) CBA is often used in festival feasibility evaluations. Another framework is input-output assessment (IOA) which measures the summary of flows of goods between services and industries (Davies et al., 2013). IOA allows festival organisers to map out direct, indirect and induced economic impacts of festivals;

however, it can be over-exaggerated and can ignore negative economic impacts of the festival (Davies et al., 2013).

2.3.4. Environmental impacts of festivals

Environmental sustainability is a topic that is becoming increasingly important for festival organisers (Holmes et al., 2015). In order to become a truly sustainable planet, the earth's resources must be used in moderation; which is at odds with festival production as festivals require lots of 'stuff', much of which can only be used once (Allen, 2011). Research, based on 279 UK summer music festivals, finds that the music festival industry in the UK alone is responsible for producing 20 kilotonnes of CO_2 annually (onsite emissions); 100 kilotonnes of CO_2 (audience travel); 23500 tonnes of waste; 5 million litres of diesel consumption; and all of this combined with a recycling rate of less than 32% (Johnson, 2015).

Aspects of festivals associated with environmental impacts are transport and traffic; crowds; infrastructure and construction; energy use and resource consumption; and waste production (Holmes et al., 2015). As with other types of festival impacts previously discussed, environmental impacts can be categorised into both positive and negative impacts. Positive environmental impacts of festivals include showcasing the natural environment; urban transformation and renewal; improved transport links; and encouraging pro-environmental attitudes and behaviours (Holmes et al., 2015; Bowdin, 2011). Alternatively, festivals can cause air and water pollution; litter; destruction of heritage; traffic congestion; noise disturbance; and environmental damage including trampling and soil erosion (Holmes et al., 2015; Bowdin, 2011). Thus, environmental impacts of festivals can either enhance or degrade the natural environment, so there is a fine balance to be struck when using festivals as a means to showcase the natural environment (Getz, 2012).

Studies show that visible negative environmental impacts of festivals, combined with reduced aesthetic quality impacts on the festival attendees perception of the quality of life of host communities, and also reduces stakeholder and host community support of the festival (Getz, 2012). So, what can be done by festival organisers to measure the environmental impacts of their festival? Measuring the environmental impact of the festival can be achieved by detailed monitoring of all of the festival-related activities of attendees, staff and suppliers before, during and after the festival (Holmes et al., 2015). By calculating the amount of CO_2 per unit of activity linked to the festival, this provides the basis for calculating carbon footprint (Kerr, 2012). Many carbon footprint calculators are freely available online for festivals to use; however, some of these are at a fairly basic level and mainly focus on travel to the festival, whereas others are slightly more complex. Environmental input-output modelling (IOM) is an aggregated indicator of global ecological impact similar to the way in which GDP is used to represent dimensions of the financial economy (Collins et al., 2009). IOM demonstrates the challenges that festivals pose to different regions, sponsors, and public sector organisations, as it is clear that the economic impact of festivals can be huge, as can environmental impact which can generate consequences to negate the financial benefits (Collins et al., 2009). There are, however, some issues in measuring environmental impacts of festivals such as using IOM methods. It is often difficult to determine the boundaries for impact measurement and attributing specific environmental impacts to a particular festival (Collins et al., 2009). Furthermore, it is often difficult to measure the extent to which environmental management measures put in place by festival organisers have reduced negative impacts that would otherwise have occurred (Collins et al., 2009). Finally, measurement of carbon footprint is often seen as less than transparent to non-specialists. However, analysis of carbon footprint does provide the opportunity to identify where negative impacts are most extreme, thus providing the festival organiser with an idea of where to focus in order to reduce negative environmental impacts of the festival (Collins et al., 2009).

Solutions to negate the negative environmental impacts of festivals are readily available to festival organisers. These include carbon offsetting, greening of festivals, and green

certification. Carbon offsetting means that instead of reducing the carbon footprint of a festival to zero locally, actions are taken to reduce negative environmental impacts at a regional or global level. These carbon offsets are created through a variety of methods such as using renewable energy, implementing energy efficiency, carbon capture at the point of production, or by absorbing carbon present in the atmosphere. Carbon credits are awarded to projects and organisations that are certified to be carbon-reducing. Such organisations that wish to offset their own emissions can purchase carbon credits, thus supplying direct funding to support carbon-reduction projects. One carbon credit is the removal of one tonne of CO_2 from the environment. Festivals may include the cost of offsetting within the ticket price so that the costs can be passed on to the attendees.

Festival organisers can also take a more proactive approach to reducing negative environmental impacts of their festival by greening their festival. Areas where greening can occur are around transport; purchasing and resource use; waste; energy; marketing and raising awareness. A particularly proactive festival in this regard is Latitude Festival. Latitude Festival has been proactive in using priority car parks for people who are car sharing at the event, and in putting on shuttle busses from train stations and bus stations to the festival site (Latitude Festival, 2020). They also encourage bike travel to the festival and have infrastructure to support bike racks close to the entrance. In 2012, Tour de Latitude was introduced and this scheme was designed to give VIP festival treatment and media coverage to people who travelled to the festival by bike (Latitude Festival, 2020).

Burning Man - a festival that takes place in the Nevada desert every year - is another festival that stands out as being particularly proactive in its greening agenda. During the live festival, everything is completely money-free, and purchases work on the basis of barter and gift giving (Burning Man, 2020), thus promoting creativity in reusing what would otherwise be waste. Of course, festivals may claim to be pro-environmental which is at odds with the reality of the festival. Glastonbury Festival, for example, claims to be committed to enhancing the environment through their operations and to minimise any

negative impact of the festival (Glastonbury Festivals, 2014). Furthermore, they claim that the festival works to the principles of 'reduce, reuse, and recycle' (Glastonbury Festivals, 2006). However, the festival is estimated to produce 52,500 tonnes of waste each year, with only 54% of this being recycled (WT Skip Hire, 2017).

Another solution available to festival organisers to help reduce the negative environmental impacts of festivals is to comply with existing environmental sustainability frameworks. One such framework is the International Standards ISO 20121 Events Sustainability Management System. Although this standard was designed for mega-events and indeed London 2012 was the catalyst for this ISO, it does provide a framework that festival organisers can use to identify the potentially negative social, economic or environmental impacts of festivals by removing or reducing them, and capitalising on more positive impacts through improved planning (ISO 20121, 2012). Festival organisers can also work to achieve certification through 'A Greener Festival' - a not-for-profit organisation that provides consultancy, training and certification to festivals to have taken credible steps to achieve positive environmental impacts of their festival (A Greener Festival, 2020).

2.4. The public sector and festivals

Governments, and public sector organisations, have a particular interest in festivals. Festivals can help public sector organisations and governments achieve their objectives (Richards and Palmer, 2010). Festival and event tourism describes a destination development and marketing strategy to realise all the potential benefits of festivals and events, with a particular focus on economic benefits (Getz, 2005). From the perspective of festival organisers, tourists are potential customers (and for many festivals, the main customer), so knowledge of the tourists, their motivations and desires are important (Getz, 2005).

The value that festivals bring to governments and the means for allowing public sector organisations to achieve their objectives can be divided into five categories (Getz, 2005). These categories see festivals as: tourist attractions; image makers; catalysts; animators; and placemakers (Getz, 2005). When festivals are viewed as tourist attractions, they are seen to attract tourists; increase demand for visiting the place, and increase visitor spending and length of stay (Getz, 2005). As image makers, festivals can create and enhance themes and combat negative imagery (Getz, 2005). Festivals as catalysts view festivals as opportunities to stimulate infrastructure, assist with urban renewal, stimulate businesses and small traders, and support other tourist destinations (Getz, 2005). As animators, festivals can encourage first and repeat visits at facilities, services, and other festivals and attractions (Getz, 2005). Finally, festivals can contribute to placemaking by creating positive images and improving quality of life, whilst attracting residents and investors (Getz, 2005).

In order for governments to realise all of these ambitions for festivals, they must create an infrastructure and culture that supports festivals (Richards and Palmer, 2010). Cities must remove some of the uncertainty and financial risk of creating and staging events (Richards and Palmer, 2010). Globally, there is a trend for cities to support large and small events, both in terms of creating a suitable infrastructure, but also in terms of supporting such festivals financially (Richards and Palmer, 2010). This of course leaves political decisions to be made about which festivals should and should not be supported and opens up the door to the world of public funding policies. As public funding policies are political decisions, they are subject to change depending on the notion of the government of the day. A contemporary example of changing public funding policy can be drawn from Boris Johnson's stint as (Conservative) Mayor of London. In 2008, Johnson reduced funding for the arts and culture, justifying this by saying that under the previous (Labour) Mayor of London - Ken Livingstone - that there was an expectation of public financial support from the Mayor (Richards and Palmer, 2010). Johnson wanted to avoid continuous applications for funding and to encourage festivals, events and arts organisations to seek commercial and private sector funding opportunities (Richards and Palmer, 2010). Another example is that in 2003, the Irish Arts Council suspended

all multi-annual funding and cited uncertainty over government spending commitments for having to make this tough decision (Richards and Palmer, 2010).

It is in the political interest of governments to be seen to be supporting festivals (Hall and Rusher, 2004). Governments may set up new government departments, advisory bodies, or sections within existing departments to demonstrate that "something positive is being done" with regards to a specific issue, including festivals, events, arts and culture management (Hall and Rusher, 2004, p231). British Visits and Events Partnership (BVEP) is an umbrella organisation that represents government agencies within the festival and events sector. BVEP are heavily focused on the economic benefits that festivals and events bring to the UK, both present and in our post-Brexit future (BVEP, 2020). BVEP are advocates of an environment that is conductive towards entrepreneurial activity within the festival sector and this includes promoting an investment in infrastructure; making taxation more competitive; avoiding regulation within the sector; and supporting new business opportunities within the sector (BVEP, 2020). This all links to neoliberal government rationale for supporting festivals and events.

Of course, the rationale for neoliberal governments, such as the UK government, for supporting festivals seems uncomplicated until we apply a critical eye over neoliberalism. Thus, understanding festival policy with a critical perspective requires close attention to be paid to the political, economic, social and cultural environments in which festivals are created and consumed (Foley et al., 2012). Neoliberalism is a political philosophy that is prevalent in the western world, with notable roots in the UK and USA. Neoliberalism was first applied by (Conservative) Prime Minister Margaret Thatcher in the UK, and her counterpart (Republican) President Ronald Regan in the USA, and has widely become the accepted political philosophy of the day (Harvey et al., 2006). Neoliberalism is a philosophy that advocates support for economic liberalisation, free trade, open markets, privatisation, deregulation, decreasing the size of the public sector whilst simultaneously increasing the size and role and the private sector in

society (Harvey et al., 2006). The neoliberal ideology was adopted by Tony Blair when he became (Labour) Leader of the Opposition and went on to win an election, becoming Prime Minister, thanks to his rebranding of the Labour Party, which had moved away from its traditionally socialist ideology to partly adopt a neoliberal philosophy (Belfiore, 2009). In the USA, (Democrat) President Bill Clinton also adopted a neoliberal philosophy, and this philosophy lives on to contemporary times as the dominant political philosophy of the West. Neoliberalism is now the complete mainstream viewpoint among all political parties in the UK, so much so that the former (Labour) Leader of the Opposition Jeremy Corbyn was labelled a 'cult leader' (even among members of his own party) and a 'threat to our economic security' because he does not support neoliberalism and remains an 'Old Labour' socialist (Dorey, 2017; Crines, Jeffrey and Heppell, 2017).

A critique of neoliberal government motivations for publicly supporting festivals and events can be found in the case of the government support for the London 2012 Olympic Games. Although the Olympics are a mega-event, and in a different league from many festivals, the mega-events literature can be applied to festivals and other events (Getz and Page, 2016). Rojek (2013) examines the London 2012 Olympic Games bid and compares that to the reality of the legacy. One of the key policy headlines for the Olympic Games was the opportunities that it would provide young people, particularly disadvantaged young people, and that the games would promote social inclusion (Rojek, 2013). However, the reality of the Games is that the intensification of policy 'stop and searches' disproportionately affected young people, and in particular young Black men from East London (Rojek, 2013). Another example of the reality being at odds with the public intentions of government can be seen in the London Olympics bid to put environmental sustainability at the heart of the Games. This reality is that the building of Olympic Park stadia closed the Manor Garden allotments, despite the allotments already fulfilling objectives of the Games: promoting a sustainable healthy living in an urban environment, to the benefit of the working class community (Rojek, 2013). These double standards in what governments say they want mega-events to achieve and what they actually achieve are clear to see. So, is the

temporary curtailment of civil liberties and the acceptance of pro-event spending the price to pay for national and international prestige of holding such events? Rojek (2013) thinks otherwise, and argues that mega-events and large festivals are disruptive and that they provide governments and businesses with opportunities for moral regulation and economic exploitation of workers and small businesses.

Other studies seek to critique the entire festival and events literature, which is predominantly researched, studied, taught and published under neoliberal ideologies (Rojek, 2012). Rojek (2012) criticises the wider festival management literature and argues that it accentuates the positive images of festivals and presents the negative images as a mere management challenge. Rojek (2012) accuses festival organisers as 'appropriators of culture' that promote a commercial agenda. Live 8 (2005) is an example of a large music event that took place across the G8 countries and in South Africa whilst the G8 summit was being held in Gleneagles, Scotland. Both the G8 and Live 8 coincided with the 20 year anniversary of Live Aid, a music concert held in the Wembley Stadium to raise money for the 1983 - 1985 Ethiopian Famine (Sanders et al., 2008). Events such as Live Aid and Live 8 unite people in a common cause, and it is difficult for people to critique to goodwill of the attendees and those who organise the events, but arguably such events are diversion tactics supported by governments who should be doing something to help solve global challenges in the first instance, rather than relying on the charitable acts of individuals (Rojek, 2012).

2.5. Festivals and the arts

Not only are the arts an important creative element of festivals, but they also have a powerful social role (Dunkley, 2015). Through experiencing the arts, individuals may discover reasons for rejecting prevailing cultural attitudes and embracing new interpretations of the world (Dunkley, 2015). Arts are said to de-familiarise the familiar and encourage reflection on social and cultural norms and give a fresh appreciation of reality (Dunkley, 2015). Art forms such as comedy, tragedy, lyrical and spiritual arts

challenge thinking, promote creativity, spark imagination and provide audiences with unique and profound experiences that can leave lasting impressions (Dunkley, 2015). In particular, contemporary art forms can have an immediacy that make them a potent medium for invoking emotions and highlighting social and environmental issues (Dunkley, 2015). When a person becomes emotional, they have a tendency to pay more attention to events and consequently commit the experience to their long-term memory (Atkinson et al., 1990). Emotions are an important influence on people's behaviour, particularly with regards to their environmental behaviour (Jackson, 2005). Unlike emotions, scientific knowledge (which relies on cognitive process) is generally ineffective in bringing about changes to people's attitudes (Fox and Amichai-Hamburger, 2001). Thus, art that provokes emotions that are more likely to change behaviour and attitudes than other methods such as the transmission of scientific knowledge (Fox & Amichai-Hamburger, 2001). Emotional appeals through art are easier to remember than the transmission of scientific knowledge, and can make the audience more familiar with the subject thus increasing people's involvement with the subject (Fox & Amichai-Hamburger, 2001).

2.5.1. Arts, culture and sustainability

Culture is a major dimension of sustainability and should be viewed as the fourth pillar of sustainability, alongside the environment, economic and social pillars of sustainability (Hawkes, 2004). Afterall, a sustainable society depends on a sustainable culture, as cultural action is required to lay the groundwork for a sustainable future (Hawkes, 2004). Cultural diversity is essential in this process: preservation and advancement of diversity (both biodiversity and cultural diversity) toward an optimal level is a fundamental target for sustainability (Hawkes, 2004). Thus, the culture of sustainability can be nurtured through aesthetics of sustainability (e.g. eco-arts) as a catalyst for change. Creative initiatives that engage people with biodiversity and cultural diversity can contribute towards the transition to a more sustainable society (Hawkes, 2004).

Society makes meaning of social, environmental, political, scientific, technological and political issues through arts that society produces (Kagan and Hahn, 2011). The arts can be seen as open, lively and influential cultural engagement activities as opposed to refined cultural artefacts (Kagan and Hahn, 2011). However, cultural diversity and democratisation of arts practice is crucial and the arts need to engage all citizens with democratisation of the arts at the forefront of political strategies (Kagan & Hahn, 2011). Arts should be seen as open, lively and influential cultural activity engagement as opposed to refined high-brow cultural artefacts (Kagan & Hahn, 2011).

Artistic movements for sustainability can be broken into three categories: educational initiatives that communicate 'hard' science through art and creative practice; third-sector bodies and initiatives that provide advocacy for particular issues; and artistic movements that focus on practical action through creative design-for-change (Dunkley, 2015). For example, ASCUS Art & Science is an Edinburgh-based non-profit volunteer organisation that is dedicated to building a community of artists, designers, scientists and other individuals interested in how art and science can engage new audiences in the fields of science communication, science, art, design, collaborative projects and trans-disciplinary research (ASCUS, 2020). ASCUS set out to use various artistic platforms to engage audiences with science and challenge people's perceptions of science (ASCUS, 2020).

Platform London is an example of an organisation that provides artistic advocacy for particular issues. They combine art, activism, education and research in order to create unique projects driven by the need for social and environmental justice (Platform London, 2020). Platform London has worked to lobby the oil and gas industry (by working with artist groups such as 'Art Not Oil') to bring attention to the negative impacts of oil & gas companies such as Shell and BP on human rights, the environment and climate change (Platform London, 2020).

The third category of artistic movements for sustainability are those which focus on practical action through 'design for change' (Dunkley, 2015). Design plays a role in achieving sustainability through building architecture, service/product design and graphic design (Dunkley, 2015). Design for Change UK is a global education initiative that aims to empower children and young people by helping them bring about social and environmental solutions (Design for Change UK, 2020). Many initiatives like this are relatively small in scale - and it can be argued that artists and art need to become more courageous about their role in leading social transformations towards sustainability (Dunkley, 2015).

2.5.2. Arts festivals & sustainability

Arts festivals foster an opportunity for community interaction and involvement with environmental issues and provide a medium for a variety of stakeholders to express their attitudes and values (Curtis, 2006). The celebratory, liminal nature and visual and performing arts aspects of festivals also make them a useful tool for affirming ecological restoration and environmental repair activities (Curtis, 2006). Artists themselves have the ability to synthesise complex ideas into powerful symbolic images, songs, or performances and this is important in influencing the behaviours of individuals and the greater community (Curtis, 2006).

One framework that helps us understand the value of the arts in driving changes to audiences' environmental behaviour and attitude is the transtheoretical model (Prochaska et al., 1992; Figure 2.3). The transtheoretical model is a dynamic framework, where people move between stages: moving forward in the process of change, but also slipping backwards at times. It is a sequence of five stages that people go through as they adopt voluntary changes in their life: pre-contemplation; contemplation; preparation; action; and maintenance (Prochaska et al., 1992). There can be points where individuals get stuck and remain in one stage for a very long period of time, but exposure to art that challenges people's opinions and perceptions of the world can help push people along to the next stage (Prochaska et al., 1992).
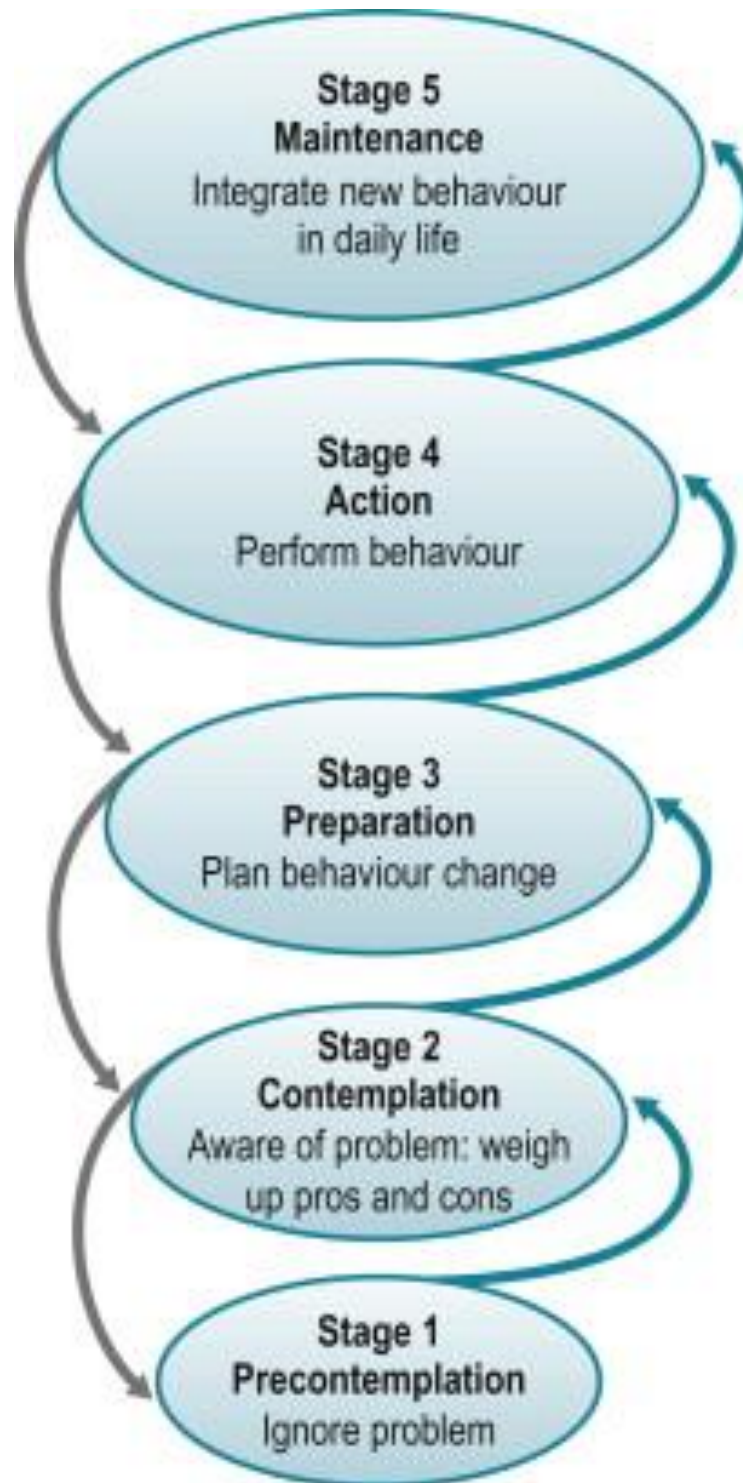
Figure 2.3: Five-stage transtheoretical model of behaviour change

(Laranjo, 2016). The five stages are precontemplation, contemplation, preparation, action and maintenance.

The first three stages of the transtheoretical model (precontemplation, contemplation and preparation) can be considered to have an attitudinal dimension, focusing on changing attitudes, whilst the latter two stages, and their associated processes, can be conceptualised as having a behavioural dimension involving actual behaviour change (Prochaska, 1992 in Mair & Laing, 2013). In terms of the attitudinal dimension, a sustainable festival can provide a platform to raise awareness about environmental issues and provide information on which individual behaviour changes can be made, which is a form of consciousness raising or inspiration for an individual to consider changing their behaviour (Prochaska, 1992 in Mair & Laing, 2013). Environmental re-evaluation may occur by the festival publicising and demonstrating that pro-environmental behaviour can have a positive impact on society. Furthermore, a sustainable festival can encourage self-evaluation, a belief that a change to more pro-environmental behaviour would have a positive impact on the life and lifestyle of the individual and self-liberation, by providing experience and encouragement that pro-environmental behaviour is possible and achievable for any individual (Prochaska, 1992 in Mair & Laing, 2013). Regarding the behavioural dimension of the transtheoretical model, sustainability-focused festivals can facilitate helping relationships through providing easy access to exhibitors such as support organisations and services (Prochaska, 1992 in Mair & Laing, 2013).

Arts festivals have a huge role to play in sustaining communities, beyond challenging people's existing attitudes and behaviours. Quinn (2006) discusses how arts festivals contribute to area-based sustainable development. Arts festivals help create cultural infrastructure (Quinn, 2006). They achieve this through creating demands for arts and related services; acting as a catalyst for further creativity within the locale; making arts central to the local economy; raising the profile of the arts; and creating demand for enhancing existing infrastructure (Quinn, 2006). Arts festivals also sustain communities through providing opportunities for communities to experience, participate and appreciate the arts (Quinn, 2006). Arts festivals achieve this through challenging the social construction of the arts; responding to gaps in place-felt artistic needs; and prioritising the development of local arts and artists (Quinn, 2006). Arts festivals also

sustain communities through community animation and pride in place. This is achieved through engaging active interest of the local community; generating a sense of ownership of festival activity; and stimulating external affirmation enhancing pride in place (Quinn, 2006). Through attracting visitor demand, arts festivals also enhance communities. This visitor demand generates visitor revenue that can be invested in the festival; generate increased visitor spending in the local economy; and help establish the festival and the arts as a key component in place-making imagery (Quinn, 2006).

These roles that arts festivals have in sustaining communities are not without policy implications. Quinn (2006) argues that festivals oriented externally will have more economic and tourism impacts, whereas those that focus more on the locale and emphasise the needs of the community will be more sustainable, as well as bringing in more positive social and cultural impacts. Arts festivals' engagement with tourism forces therefore needs to be carefully managed, both in the interests of sustaining festivals and promoting sustainable approaches to tourism development (Quinn, 2006).

2.6. Festival stakeholders

Festivals and their creative content do not operate in isolation and are, instead, a series of negotiations between the festival organiser and the various stakeholders (Getz, Andersson & Larson, 2006). Stakeholders are defined as groups without whose support the organisation would cease to exist (Friedman & Miles, 2006). Festivals are dependent on their stakeholders for their continued survival (Friedman & Miles, 2006). Stakeholders need not be financial or in-kind sponsors of events, but can be any group or individual who can affect, or is affected by, the achievement of the festivals objectives (Getz, Andersson & Larson, 2006). Indeed, people and organisations with a legitimate interest in the outcomes of a festival are stakeholders (Bowdin, 2011).

A festival is created and delivered through relationships within a network. Central to this network is the organisation producing the festival, working collaboratively with various partners who are major stakeholders (Figure 2.4).
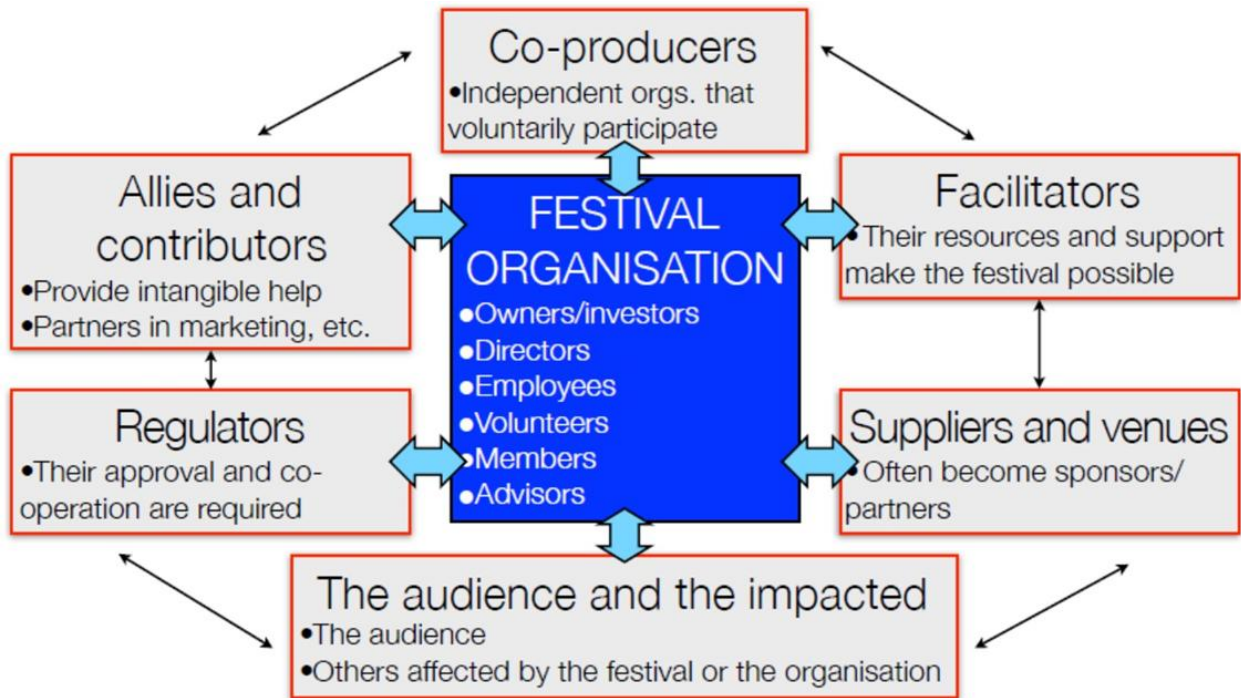
Figure 2.4: **Major stakeholder roles in festival networks (Getz, 2007, p.109).** The major stakeholders are co-producers, facilitators, suppliers & venues, the audience & the impacted, regulators, and allies & contributors.

Major stakeholders within festivals are the festival organiser, the industry (this depends on the genre of festival and could be music, art, comedy, science etc), local trade and industry, public authorities, associations and clubs, and the media (Getz, Andersson & Larson, 2007). It is the role of the festival organiser to manage these stakeholder relationships (Getz, 2007). There are a number of academic theories that help understand relationships between festival stakeholders. Collaboration theory is the theory that key stakeholders, including the festival organiser, need to give up some control in order to work towards common goals - though often retaining independence

(Getz & Page, 2016). Resource dependency theory helps us understand that all organisations need resources - they are dependent on them. A festival's power is limited if it is too dependent and relies on building too many relationships (Getz & Page, 2016). Conversely, a festival's power is increased if others are dependent in return (Getz & Page, 2016). Examination of agency helps us understand more about the interactions between festival owners and leaders (e.g. CEO's, Festival Directors, Artistic Directors) and those who are employed to carry out the will of the owners or leaders: managers, freelancers and other contractors (Getz & Page, 2016). Consideration of agency helps us understand who is acting in their own self-interests, and what the pitfalls are if interests do not align (Getz & Page, 2016).

To operate effectively, festivals should continuously and critically analyse their relationship with stakeholders. Stakeholder analysis is the process of systematically gathering and analysing information to determine whose interests should be taken into account when developing and/or implementing a new programme or policy (Schmeer, 1999). Stakeholder analysis is fundamentally about analysing the politics and agendas of stakeholders (Clecc, Kornberger & Pitsis, 2009). There may be structural divisions between stakeholders and their different values, approaches, and styles (Clecc, Kornberger & Pitsis, 2009). Indeed, there may be complexity and uncertainty over an issue and festival organisers should conduct regular stakeholder analyses in order to understand external pressures of their stakeholders (Clecc, Kornberger & Pitsis, 2009).

2.7. Strategy and festival content creation

Strategy is defined as "the direction and scope of an organisation over the long term, which achieves advantage in a changing environment through its configuration of resources and competences with the aim of fulfilling stakeholder expectations" (Johnson et al., 2008, p.3). Johnson et al (2008) provides a model for helping festival owners and leaders to explore corporate strategy within their organisation. This strategy model can

be broken down to three components: strategic choices, strategic position, and strategy in action (Johnson et al., 2008). Strategic position is any factor which can have an impact on strategy, and these include the environment, strategic capability, purpose and culture (Johnson et al., 2008). Strategic choices are things that festival owners and leaders have control over, and these choices include corporate-level, business-level, international, innovation and evaluation choices (Johnson et al., 2008). Finally, strategy in action relates to a chosen strategy that is put into place by the organisation: this can be about processes, resources, and organisational change (Johnson et al., 2008).

Festivals do not operate and create content in isolation from their stakeholders (Crowther, 2014). Rather, festival managers are becoming strategic in their approach to creating content within their festivals (Crowther, 2014). This strategic approach to creative content creation is a fine balance between having complete creative control over the festival and giving up some of the creative control in order for continued support (financial or otherwise) from key stakeholders (Crowther, 2014). Industry insights help us understand more about the mindset of festival leaders who put strategy at the centre of festival content creation:

> Many people have asked me, with strategy and execution, which is the most important? Let me leave you with a little fable: Strategy and Execution walk into a bar and immediately spot a Client. They both do their best to impress, but Client lets them know, 'Tonight it's all about Strategy.' Dejected, Execution starts to walk away, but Client says, 'Wait, your day will come.' And that was the start of a beautiful Partnership. Oh, and for a 'twist' – Strategy and Execution turn out to be twins so Client could never tell them apart – and never really needed to.

> Mark Sharon (Proscenium, New York)

> as quoted in Crowther (2014) p.265.

20-30 years ago events were generally reactive, all about hospitality and having a good time. It was ill thought out and the business held the power… those days are over. Events today are (or should be) a strategic led marketing/communication initiative… The power has now shifted to the audience, customer centric, employee engagement, etc. We must focus on their needs, requirements, feelings and align our event strategy… Strategy, creativity and operations are three interlocking circles of success. Success lies at the centre.

Richard Waddington (Events Marketing Association, UK)

as quoted in Crowther (2014) p.265.

Being strategic in festival content creation comes from a shifting environmental landscape in which festivals operate across four key areas. Such factors include heightened attendee expectations and the importance of event experience and the rise of the experience economy (Crowther, 2014). Secondly, an increasingly competitive festival marketplace has resulted in increased levels of competition which demands differentiation, meaning that festival organisers need to deliver higher quality experiences (Crowther, 2014). Thirdly, festivals are becoming increasingly strategic in their purpose with funders seeking and expecting outcomes and/or a return on their investment (Crowther, 2014). Fourthly, there is an increasing outer layer of consciousness regarding festivals and their environment; a moral shift in mindset to take sustainability on board; and in increasing responsibility to ensure that there are positive socio-cultural and environmental impacts of the festival; whilst being expected to mitigate negative festival impacts (Crowther, 2014).

Thus, this shifting landscape in which festivals exist has created "both a mindset and management approach" to the creation of festivals, that is preoccupied with characteristics, goals and concerns of stakeholders involved in the festival (Crowther, 2014, p.4). Crowther (2014) propose five principles of strategic event creation:

1. Outcome obsessed. Festival organisers must look beyond the "here and now" to think about the "why and how" (Crowther, 2014, p.4). Operational proficiency and financial probity should be a precondition for successful festival creation, not the end-purpose (Crowther, 2014).

2. Stakeholder-centric. The more stakeholders there are, the more interests there are to consider. Festivals are multifaceted, which can be demanding for festival organisers. Focusing on stakeholders helps reflect this, as well as encouraging a collaborative approach of involvement. Alternatives to being stakeholder-centric are being creator-centric, investor-centric and attendee-centric (Crowther, 2014).

3. Purposeful design. Festival organisers are architects of experience journeys for their attendees and facilitators of outcomes for other involved stakeholders. Through understanding of how festivals can be best designed, how attendees experience the festival, and how the festival content can best trigger wider outcomes, festival organisers can become effective facilitators and designers. Design increases the predictability of experience outcomes with inept festival creation (i.e. festival creation without purposeful design) leading to mismatches between expectations and outcomes (Crowther, 2014).

4. A strategic persona. Festival organisers are an integral, strategic part and partner in festivals, and this strategic persona is far removed from the lower-grade identity that sometimes often prevails (Crowther, 2014).

5. Reflective practitioner. By reflecting upon the perceived and achieved outcomes of the festival and by capturing all possible learning from a festival, reflectivity is a key component of strategic event creation. This reflectivity is good for the festival, its stakeholders, future festivals, and for the festival organisers future career (Crowther, 2014).

2.8. Summary

This chapter has explored various aspects of the critical event studies literature, bringing in relevant literature from the field of leisure studies. By exploring in depth what

experience means and the four realms of experience (Pine & Gilmore, 1998), context has been provided for what experience means in relation to science festivals. Similarly, this chapter provides a critical discussion on the four categories of festival impacts: social and cultural; tourism and economic; physical and environmental; and strategic and political (Bowdin, 2011). This lays the groundwork for exploring the wider impacts of science festivals, beyond the measurement of educational value. This chapter also explores the role of the public sector in support of festivals. With the emergence of science mega-events such as the European City of Science, we are able to understand the motivations and rationale of public sector agencies becoming involved in their support of science festivals. This chapter explores the transformative power of the arts and arts festivals, and provides a theoretical framework for understanding how exposure to the arts can transform society through the transtheoretical model (Prochaska, 1992). This model is useful in helping us understand the power of science-art exhibitions. Finally, this chapter explores stakeholder and strategic content creation within festivals. As science festivals become increasing in their number, and thus more competitive, it is inevitable that they need to adapt critical festival management approaches to the running of their organisations.

Despite the detailed review of literature presented here, the field of critical event studies is still somewhat under-developed (Getz, 2012). While there is a broad range of literature that can be applied from critical event studies to the study of science festivals, much of the research within critical event studies focuses on arts and music festivals. Instead, the study of science festivals is seen as a branch of science communication, something that is discussed further in the next chapter. The exclusion of science festivals from critical event studies highlights that science festivals are indeed missing out on opportunities to learn about themselves, enhance themselves and to apply various frameworks and theoretical contributions from the critical event studies field. Indeed, the total absence of science festivals from critical event studies literature supports the presentation of this thesis as an original and important contribution to knowledge.

Chapter 3: Science Communication

3.1. Introduction

Science communication is the communication of scientific and technological knowledge to audiences both internal and external to the production and creation of that knowledge. Unsurprisingly, there are a diverse number of definitions of science communication in the literature about what constitutes science communication. Perhaps the most high-profile examples of science communication are popular science TV shows such as Brian Cox's 'Wonders of the Universe' (BBC) and David Attenborough's 'Planet Earth' (BBC) where these two esteemed science communicators - one a university professor of physics and the other a broadcaster - engage millions of people on prime time TV with their charismatic and contagious enthusiasm for the natural world and its curiosities. Of course, not all science communication activities can be as high-profile as prime time television, so science communication does come in different shapes and guises.

From scientists communicating their research to each other; to scientists writing articles for journals, newspapers and magazines; to scientists communicating with the public on social media and creating digital content for websites and apps; to scientists doing talks, discussions, creating activities to schools, community groups and at science festivals and science centres, the list of what constitutes science communication activities is extensive and increasing. However, science communication is not something that is limited to scientists communicating their research with the wider public. Some forms of science communication come from those outside the world of science, such as artists and performers who engage unsuspecting audiences with science and technology by connecting with the audience on an emotional level.

This chapter begins by examining the concept of science communication, as a pivotal concept within the establishment of the worth of science festivals. It examines the range of concepts that operate around the term science communication, so as to analyse and

synthesise their points in common, and understand how and where they apply in the context of festivals, as one manifestation of science communication work. It assembles a taxonomy of language that shows where science communication work is done across a range of sectors, encompassing outreach, citizen science, public understanding, public engagement and widening participation. Together, these strategic initiatives help to explain why there is a lack of agreement on what is an appropriate definition of science communication and how science communication should be conducted.

3.2. What is science communication?

Gregory & Miller (1998, p.116) define science communication as the "process of generating new, mutually acceptable knowledge, attitudes and practices… The process of negotiation involves trust that leads to mutual understanding, rather than through statement of facts". However, a more tangible definition describes science communication as "the appropriate use of skills, media, activities, and dialogue to produce one or more personal responses" (Burns et al., 2003, p.190). These personal responses are explained using the vowel analogy 'AEIOU' of science communication. These are described as promoting awareness of science (A); providing entertainment and enjoyment through science (E); sparking and developing an interest in science (I); shaping opinions in science (O); and developing the public's understanding of science (U) (Burns et al., 2003). Arguably, fulfilling some or all of the vowels within the 'AEIOU' concept of science communication is something that all science communication activities set out to achieve.

A more sociological definition of science communication is "the process by which the culture and knowledge of science are absorbed into the culture of the wider community" (Bryant, 2003, p.7). This is a particularly useful definition of science communication as it foregrounds such work as a process rather than a product or outcome. This is useful especially given the literature on media effects (the area of study concerned with the impact and influence of the media) which often highlights the complexity drawing a causal connection between communication and audience impact (Valkenburg et al.,

2016). Bryant's (2003) definition conceptualises science communication as involving a number of phases, rather than simply being a matter of transmitting something to an audience. Thus, the definition refers to a wider community rather than the general public, as science communication may involve communication with a wide range of communities and social groups. For instance, it might involve communicating with media professionals who have positions of responsibility to commission new television programmes. Indeed, the impact of science communication on the community may be for a much longer period than the time-life of any individual product itself, suggesting that science communication must first have a place within a community in order for it to achieve an impact, but what does this mean and how is it achieved?

An alternative view of science communication is that it is a term that involves "communication between groups within the scientific community, including those in academia and industry; the scientific community and the media… the public… and the Government or others who influence policy; industry and the public; the media (including museums and science centres); and the Government and the public" (Office of Science & Technology and Wellcome Trust, 2000, p.12). This is an all-encompassing broad definition of science communication and reflects the diversity of careers within the science communication sector. Thus, it adequately captures the work of science media professionals, government science advisors, university public engagement officers, science centre staff members, science festival teams, and those who work in the science industries.

Within these sectors, the term science communication can be applied across a range of professional responsibilities, such as outreach, public engagement, citizen science, widening participation, knowledge exchange, and public understanding of science. Given this range of avenues through which science communication can be undertaken, there are challenges in determining which are the priorities for any particular body or individual. In some cases it may be paramount to focus on engaging audiences with science, to ensure that the public are connected to science work, perhaps to promote a more science literate society, which is populated by people who can collectively consent

to the progress of science or raise questions about such progress. It is important for those working in the field to understand the terminology in order to accurately reflect what it is they hope to achieve with their endeavours. Indeed, it may be more productive to work with the science industries directly to help them understand how best to communicate with audiences, or to think about their wider social responsibilities.

It may also be necessary to study the variance within these definitions to understand better where there are inconsistencies, which may limit strategic objectives. For instance, Illingworth et al. (2015) found that only 64% of those working as active science communicators felt that the definitions within the field that they used matched with those of their institute. This suggests that there is a lack of clarity within the science communication field about the diversity of roles within the field and the diversity of objectives that science communicators want to achieve. In addition, there is a need for consistency in language used in science communication, especially when it comes to writing grants where there is an increasing focus on 'Pathways to Impact' and 'Research Impact' as an output of the Research Excellence Framework used in UK higher education institutes. In such contexts, the specific interpretation of science communication and its application through labour may or may not have the desired route towards impact or may fail to appreciate that public engagement with science does not necessarily create research impact. These circumstances demonstrate the need to investigate science communication further and to unpack the specific applications that surround such work.

The following sections explore three prominent forms of science communication efforts: outreach, widening participation, and citizen science.

3.2.1. Outreach as a form of science communication

Science communication often finds itself aligned with a range of other strategic priorities that, in particular, surround the work of public institutions and outreach is a key example of this. Outreach is a type of activity that provides a service to people who would otherwise not normally have access to that service (Hardy et al., 2016). In the case of

science communication, it generally falls to academics - or those working in higher education institutes - leaving their institution to do activities or give talks to the general public. Outreach has been defined as "any activity in which scientists translate their research or broader scientific concepts to those outside their academy" (Burns et al., 2003, p.183). However, outreach generally involves communicating science with groups of school children - either in schools or at after-school science clubs (Kelter et al., 1992) and it tends to focus either on recruitment strategies, or for building community which is a very different set of values than simply performing some kind of public service. Although over 50% of university scientists now do some form of outreach, it is just 5% of those who do more than 50% of outreach activities (Jensen et al., 2008). There is also a career-stage disparity in those who do outreach with early career researchers - such as PhD students, postdocs and junior academics more likely to be involved in school outreach and senior academics more likely to do one-off appearances on TV or radio (Jensen et al., 2008).

3.2.2. Citizen Science as a branch of science communication

Another concept that has emerged in recent years and become closely allied with science communication is citizen science, which describes a process that involves scientists collaborating with the general public to collect and/or analyse data for a research project (Lewandowski & Oberhauser, 2015). The term citizen science first appears in the academic literature in 1995 when used to describe how expert knowledge can exist in what was previously thought of as lay people - or in other words people who do not hold professional qualifications in science (Irwin, 2002).

Citizen science is constituted by the participation of people who are not working professionally as scientists (Hecht & Spicer-Rice, 2015). This is an important distinction from the Irwin (2002) definition as someone who is not working professionally as a scientist may still have some degree of scientific knowledge, or indeed a science qualification. Citizen science projects provide a two-way benefit - both for the scientists and for the citizens involved in the project. Cohn (2008) argues that scientists are able

to generate large quantities of data from citizen science projects. These data are supplied to scientists by the public (or the citizen scientists) i.e. those who are not traditionally involved in data collection and scientific research. On the other hand, the public who choose to take part in the project benefit from being involved in a research project which may lead to an increase in their personal understanding of science (Cohn, 2008). In addition, scientists who use citizen science as a tool for data generation benefit from being able to generate large quantities of data over a large geographical area (Cohn, 2008).

However, there is some disagreement about what does and what does not constitute citizen science. For example, Hecht & Spicer-Rice (2015) argue that citizen science can include any type of public involvement in research such as completing surveys or participating in qualitative research, whereas Trumbell et al. (2000) argue that for something to be truly a citizen science project, the public must be involved directly in data collection and/or analysis.

Despite these variations, citizen science may still be treated as a form of science communication since it engages the public with science, and engagement is always underpinned by some form of communication transaction. Unlike outreach, the aim of citizen science is to provide data that is purposeful for scientists, whereas outreach is traditionally scientists explaining their research to the public (notwithstanding some forms of upstream engagement).

3.2.3. Widening Participation as a socially responsible form of science communication

Widening participation is a term that is widely within the higher education sector, and is used to describe initiatives that are aimed at targeting socially disadvantaged and under-represented groups in order to get them to go to university. The UK Government's Office for Students states that these groups include students from disadvantaged backgrounds (e.g. those from single parent families or low socio-

economic status), people with disabilities, carers, those who could only study part-time or would be classified as mature students, people estranged from their families, refugees, people from gypsy and traveller communities, children from military families, people with mental health issues, and people from Black and minority ethnic backgrounds (Office for Students, 2020). Universities in England that charge students over £6,000 per year in tuition fees are legally required to sign up to the Office for Students Fair Access Agreements, and their involvement in this is scrutinised by the Higher Education Funding Council England (HEFCE; McCaig & Adnett, 2009). University widening participation programmes tend to target children of secondary school age from disadvantaged backgrounds who come from backgrounds in the lower phases of the Index for Multiple Deprivation or target those who benefit from the UK Government's free school meals initiative (Deas et al., 2003). Widening participation initiatives can be a form of science communication, where for example a scientist goes to a deprived school, or a youth group, to give a talk or run some interactive activities. We know that young people from deprived backgrounds see universities as some sort of ivory tower that are for people of middle-class backgrounds or others unlike themselves (Mangan et al., 2010).

During the course of this doctoral study, Theresa May had been appointed as Prime Minister of the UK. When Mrs May delivered a speech on the doorsteps of 10 Downing Street after she had been asked to form a Government by Her Majesty The Queen, the newly appointed Prime Minister said in her speech that white working class boys are "less likely than anybody else in Britain to go to university"[1] (Figure 3.1). This is consistent with findings from the Sutton Trust - an independent charity focused on improving social mobility – which has used free school meals as an indicator of poverty and identified that just 45% of white working class British boys go to university after school - the lowest for all ethnic/gender groups (Sutton Trust, 2013). The University of Oxford has created a widening participation summer school for white working class boys in order to try and increase representation of this group at university (University of

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[1] BBC News (2016, July 13). Theresa May: First Speech as Prime Minister – BBC News. [video file]. Retrieved from: https://www.youtube.com/watch?v=FDyZ8trge2E (Accessed 8 December 2020).

Oxford, 2020). Arguably, therefore, widening participation is a socially responsible form of science communication, where the communication of science is a tool for permitting social mobility and can be quantitatively measured by universities collecting data on the diversity and backgrounds of student applicants. It is worth highlighting that despite an extensive literature search, the author of this thesis was unable to find any evidence that Mrs May had actually enacted any legislation or attempted to implement any policies to make universities places that are more diverse or are representative of society.

Figure 3.1: Theresa May, in 2016 as the newly appointed Prime Minister of the UK, delivers a speech outside 10 Downing Street before she enters Number 10 for the first time as the new Prime Minister (The Independent, 2016).

3.3. Public Understanding of Science (PUS)

'Public Understanding of Science' "(PUS)" is a term that precedes science communication, but is sometimes used in discussions within the science communication

literature. Public Understanding of Science can be traced back here in the UK to the Royal Institution who first began annual lectures in 1802 and then their Christmas Lectures (which are aimed at children) in 1825 when Michael Faraday gave his first of 19 annual Christmas Lectures. It was in 1831 that the British Association for the Advancement of Science (now the British Science Association) was founded in order to give greater attention to science in the public sphere (British Science Association, 2020).

PUS and science communication are terms that are used relatively interchangeably, but they have slightly different connotations. The Wellcome Trust and the Office of Science & Technology define PUS as "print and broadcast media services; traditional museums; government and voluntary sector public understanding of science programmes; existing and new science centres; efforts of private industry; and the scientific community's activities more widely" (Office of Science & Technology and Wellcome Trust, 2000).

In 1985, the Royal Society commissioned Dr (now Sir) Walter Bodmer to undertake a review of the Public Understanding of Science in the UK. The report published - widely named the Bodmer Report - made a series of recommendations about improving the public understanding of science (Royal Society, 1985). In the report, Bodmer rightly pointed out that most of British industry and national prosperity relied on science and explains, in detail, why a public understanding of scientific knowledge is important and valuable to them - to make informed personal decisions on issues such as vaccinations or taking part in a screening programme. It is here that he writes about the importance of increasing the public understanding of science as a tool for increased democracy (Royal Society, 1985). Bodmer makes a number of recommendations about how scientists should engage with the public, how science is taught at schools, how science is portrayed in the media, and how science is important in cultural spheres such as public lectures, children's activities, museums and libraries (Royal Society, 1985).

3.4. Public Engagement with Science (PES)

A report by the House of Lords (2000) marked a shift in the UK from public understanding of science (PUS) to Public Engagement with Science (PES). The report stated that public interest in science is high and negative opinions about science and scientists were due to a lack of trust. The report further noted that there had been a cultural shift in the UK amongst scientists in favour of science communication activities. However, the crisis of trust had put the scientific community in the mood for a two-way dialogue, and resulted in a shift from PUS to PES, with the aim being to regain trust in scientists from the public.

Like science communication, PES also has no universal agreement in what it is. It has been defined as something that "describes the myriad of ways in which the activity and benefits of higher education and research can be shared with the public" (National Coordinating Centre for Public Engagement, 2020). Furthermore, public engagement is by definition, a two-way process, involving interaction and listening, with the goal of generating mutual benefit (National Coordinating Centre for Public Engagement, 2020). Borchelt & Hudson (2008) claim that public engagement in science focuses on regular dialogue (two-way, symmetrical communications), transparency of the decision and policy-making process and meaningful incorporation of public input into that process.

Public engagement is sometimes confused with science communication or the terms are used interchangeably, but the literature argues that public engagement refers to a two-way dialogue, whereas science communication refers to a one-way flow of information from scientist to public (Borchelt & Hudson, 2008). Research Council UK (2010) take a broad definition of public engagement and view science communication (one-way flow of information) as a public engagement activity. They define public engagement as any activity that engages the public with research, from science communication events, outreach events, science festivals, to consultation and public dialogue (Research Council UK, 2010). This definition is a step away from public engagement being a two-way dialogue to being an anything-and-everything term for

science communication. The disagreement in what constitutes public engagement has led to three sub-concepts of public engagement - science communication, public consultation and public involvement (Rowe & Frewer, 2005). There three sub-concepts relate to the flow of information: science communication is a one-way flow from scientist to public; public consultation is a one-way flow from public to scientist; and public involvement is a two-way dialogue between scientist and public (Rowe & Frewer, 2005).

There are three defined rationales for PES (Delgado et al., 2010). These are instrumental rationale i.e. where a particular aim is predetermined (e.g. in increasing trust in scientists); substantial rationale i.e. belief that involvement in PES activity will enhance the scientific output; and normative rationale i.e. belief that PES is the democratic and morally right thing to do (Delgado et al., 2010). Science festivals, like other science communication events, provide a unique platform for scientists to undertake PES activity, but their expansion in numbers, audiences, and funders may speak to a growing diversification of their value.

There are three levels of PES - upstream, midstream and downstream. Upstream engagement provides "the opportunity for social values to be disclosed, debated and consciously incorporated into technological development before particular trajectories and attitudes become set" (Delgado et al., 2010. p.45). This engagement can form dialogue about the effects of one issue or another. Midstream engagement refers to engagement at the level of laboratory research and downstream engagement refers to applications and commercialisation of scientific innovations (Delgado et al., 2010). There are three models of public engagement that have been proposed - deficit model, dialogue model and participation model, and understanding these models is paramount to unravelling the models of public engagement that take place at science festivals.

3.4.1. Deficit model of public engagement

There is evidence that science communication activities and events operate on the belief of an existence of a deficit model of science communication (Dickson, 2005). This

model focuses on a gap of knowledge between scientists and the public (Wooden, 2006). The deficit model "conceptualizes the lay mind as an empty bucket into which the facts of science can and should be poured" (Gregory & Miller, 1998, p.23). The idea of the deficit model is that if the general public knew more about science, then they would view it in a more positive light. This is perhaps best articulated by the Nuffield Council on Bioethics in a report they published in 1993 on the ethical issues of genetics screening programmes:

> If an individual is to be well enough informed to be able to give consent to genetic screening, he or she needs to have some general understanding of genetics. This means that the public as a whole needs to have a greater knowledge and awareness of the genetic processes that can affect us all.
>
> Nuffield Council on Bioethics (1993)

This statement - a clear statement of a belief in the deficit model - assumes that the public's lack of knowledge about genetics is the root cause of public scepticism about genetics screening programmes. Without any depth of thought, this might seem like a reasonable position: surely it stands to reason that if the wider public had a basic understanding of genetics then they would feel more positive and less sceptical about genetics screening programmes?

Clearly, there are some inherent problems with this model, not least of which is the fact that underpinning the assumption is the desire for the science industries to simply educate in order to gain support, rather than to engage for its own sake. Marks (2009) points out that attempts to increase the public's knowledge of science has not led to greater support for science, but in fact an increased understanding of science could lead to a decrease in support for science. A study by Kerr et al. (1998) proposes that in the context of genetics screening programmes knowledge, there are 4 types of knowledge: technical, methodological, institutional and cultural. They find that increasing technical knowledge of medical genetics does not alter their cultural knowledge of genetics medicine. Kerr et al. (1998) coin the term lay expertise which

recognises the social and cultural expertise that people have through their experiences of living with genetic conditions, or through their social understanding of the world. Thus, events and activities that set out to educate the public on the technicalities of genetics medicine do not necessarily lead to an increased support for the genetics screening programmes.

Low levels of public scientific literacy are not the reason why there is sometimes conflict between science and the wider society (Nisbet & Scheufele, 2009). Social groups which have greater scientific knowledge are not necessarily more positive about science than social groups with less scientific knowledge (Nisbet & Scheufele, 2009). Another fundamental problem with the deficit model is that it assumes 'the public' to be a homogenous group and plays to the idea that science is a separate entity from society, or in other words, scientists are separate from the public. Marks (2009, p.243) articulates that "the public is not a uniform group that passively awaits information; rather, publics are active participants in their relations with science". This is true in the sense that the public comprises several audiences, many of which are intersectional: different social groups and individuals with very different relationships with science. The pluralisation of public to publics is commonplace within science communication research literature, and can be traced back to the work on vernacular rhetorics (Hauser, 1999). Hauser (1999) argues that vernacular rhetoric - the discourses within a particular group within society - are messy and chaotic, and thus it cannot be assumed that they have the same lived experiences and share the same viewpoint. Hauser (1999, p.7) defines the public as "independent members of society who hold different opinions about a mutual problem" therefore demonstrating that there is no single general public. Through the work of Hauser, the pluralisation of public to publics - although seemingly grammatically incorrect - is used to highlight the different viewpoints, lived experiences and needs of different audiences, or publics.

An individual's attitudes and opinions towards science are shaped not by their knowledge of science, but by their own experiences with science, their culture and religion (Davies, 2009). Despite clear evidence that belief in a deficit model is

unfounded, there may yet be a strong conviction of its merit within the scientific community.

3.4.2. Dialogue model of public engagement

Whereas the deficit model is focussed on a one-way flow of information from scientist to publics, the dialogue model conceptualises an even flow of information between scientists and publics. The dialogue model sees the public as "contributors to social intelligence, fulfilling their responsibilities as citizens… shaped by common values, concerns and aspirations" (Gregory et al., 2007, p.127). Instead of explaining research to the public, the dialogue model involves a two-way discussion on a particular issue - and that can explore the social, political, cultural and technical dimensions of research; its pros and cons, and can be framed in a number of ways (Wooden, 2006). Wooden (2006) also claims that in order for public engagement to be successful, it must always involve some degree of two-way communication. The dialogue model assumes that the public has interactional expertise whereby they can express their own expertise (based on their own experiences and interactions) of a particular field, without being a technical expert or contributing knowledge to that field (Evans and Collins, 2010). An example of the dialogue model in action can be seen in citizen juries where members of the public are brought together to discuss a particular topic or range of topics. In the emerging field of synthetic biology, citizen juries (sometimes called consensus conferences) have taken place where non-experts come together, identify problems and propose solutions (Bubela et al., 2012). This upstream shift in public engagement allows participants to be involved with research and define the research questions that scientists can then address.

3.4.3. Participation model of public engagement

The third model of public engagement that has emerged is the participation model. This model tries to involve various publics in doing science and carrying out the scientific research (rather than being passive recipients of knowledge) and therefore members of

the public can bring their own interactional - or lay - expertise to the process (Hetland, 2016). Citizen science is a method of participation as citizens are essential for the data generation process, thus demonstrating the existence of the participation model in public engagement (Dickinson et al., 2012).

3.5. Science communication in practice

3.5.1. Humans of science communication

While the main focus so far has been on how scientists carry out communication work, there is a growing number of professional science communicators across the UK. These comprise people who work within universities (such as those with responsibility for public engagement, outreach, widening participation or researcher development), people who work within museums, science centres, science festivals, learned societies, and those who are freelance science communicators. In 2016, the British Science Association published a report on the state of science communication sector within the UK (British Science Association, 2016). This report is the first of a longitudinal study on the ever changing landscape of science communication. The research looked at data collected from over 500 people within the UK who identify as science communicators. The most common jobs of those who identified as science communicators are those working in education (25%), research (18%) and communications/PR (15%; British Science Association, 2016). The most common organisations that those who identify as science communicators work at are universities (36%), museums (12%) and learned societies (9%; British Science Association, 2016).

The survey found that those working in science communication are predominantly female (66%), white (88%; this is not statistically different to the ethnic composition of the UK), and relatively young (68% are between ages 25-44; British Science Association, 2016). Despite these interesting results, it is important to bear in mind that women are more likely to respond to online surveys than men (Curtin et al., 2000); younger people are more likely to respond to online surveys than older people (Moore &

Tarnai, 2002); and that white people are more likely to respond to online surveys than Black or minority ethnic people (Curtin et al., 2000).

Science communicators tend to be well educated with over 30% having a PhD and nearly half of them having at least a Master's degree of some sort (only 23% have a formal science communication qualification; British Science Association, 2016).

In addition, the survey mapped out the geographical locations of science communicators across the UK. Unsurprisingly, most of those surveyed permanently worked in London (26%, compared to 13% of the UK population living in London; British Science Association, 2016). This is unsurprising considering the number of museums, universities, science centres and medical charities based in London - many of which have professional science communicators as part of their communications teams. With much of the UK's mass media based in London, it is also unsurprising that the capital is disproportionately well-served with science communicators as science journalism and writing is a form of science communication. Scotland is also disproportionately well-served by science communicators with 11% of respondents from Scotland (again, compared to only 8% of the UK being permanently based in Scotland; British Science Association, 2016). The UK region with the smallest proportion of science communicators is Northern Ireland, where only 1% of respondents were from this region (compared to 3% of the UK population in this region; British Science Association, 2016).

3.5.2. Motivations for science communication

Science festivals rely on scientists and science communicators actively participating in the festival, and there are a number of factors as to why people do science communication. For some, it is their career choice and for others, such as those who are scientists at universities, it can sometimes be a choice to engage in science communication activities that are not linked to research funding. At the level of the institution, Osborne (2000) proposes four key arguments for science communication be embedded at a strategic level. These four arguments are the utilitarian, economic,

cultural and democratic (Osborne, 2000). At institutional level, organisations may rely on one or more of these arguments in justification of their science communication activities.

The utilitarian argument sees science communication as an opportunity for those involved in activities to develop technical skills and knowledge that will be useful for them (Osborne, 2000). In the case of medical research being communicated to the general public, then we can use this argument to say that by educating people about health benefits of a particular drug or lifestyle can have an impact on behavioural decisions they may make, thus benefiting them in the long-run. Similarly, this argument can be applied to the scientist who is involved in creating or delivering the activity. The development of soft skills such as communicating with children or audiences not engaged in their subject can help the scientist develop transferable skills that could be useful for them in their workplace.

Another argument that Osborne (2000) proposes for institutional support for science communication is the economic argument. In this argument, science communication is seen vital for a nation to become economically powerful. In the UK, there is a STEM skills shortage where 43% of STEM vacancies are difficult to fill due to applicants not having sufficient training or experience, and this impacts heavily on the industrial and economic output of the nation (UK Commission for Employment and Skills, 2015). Organisations in the UK such as Siemens have recognised that the skills gap will impact significantly on them, and as such have created their own strategies for filling the gap. In Siemen's (2015) report on bridging the skills gap in the energy technology sector, they make science communication a strategic priority for the organisation and as such have invested hundreds of thousands of pounds into science communication events - such as science festivals - in order to engage the next generation of their workforce.

The cultural argument for science communication (Osborne, 2000) sees science as fundamental and integral to our culture. The British Science Association's vision is for science to be at the heart of culture (British Science Association, 2020), although some

may argue that this is somewhat problematic as it implies that science is not already central to our culture, despite being a nation rich in scientific heritage and advancement.

The democratic argument for science communication recognises that science affects major decisions in society and therefore is important for the publics to be able to understand the basics of science and the scientific method (Osborne, 2000). Although this is a reasonable argument and is used at institutional level, it is simply problematic as it does not stand up to sociological scrutiny and relies heavily on the deficit model, whereby publics are seen to have a knowledge deficit and scientists are there to fill it.

Of course institutional support for science communication does not always lead to investment from individual staff members. Consider the case of universities in the UK - most institutions at university strategic level are committed to science communication and public engagement as part of their social responsibility strategy, but it is just 5% of staff who do over 50% of the outreach output (Jensen et al., 2008). However, there are benefits to individuals taking part in science communication activities. Research Council UK (2010) identify these benefits which include:

- "Skills development
- Career enhancement
- Enhancing research quality and impact
- New research perspectives
- Higher personal and institutional profile
- Influence and networking opportunities
- Forming new collaborations and partnerships
- Enjoyment and personal reward
- Additional funding
- Increasing awareness of the value of research to society
- Increasing student recruitment [this is arguably more of an institutional motivation than an individual motivation]
- Inspiring the next generation of researchers" (Research Councils UK, 2010).

3.5.3. Where does science communication happen?

Science communication can happen in a huge variety of places: from articles in newspapers and magazines, to science centres, festivals, schools, community centres and shopping centres. Broadly, these venues for science communication take place across three mediums - traditional journalism, live events and digital interactions. These mediums each have their own unique set of advantages and disadvantages, as described in Table 3.1.

Table 3.1: Advantages and disadvantages of science communication mediums.

(Adapted from Bultitude, 2011).

Medium	Advantages	Disadvantages
Traditional journalism (both print and broadcast) e.g. newspapers, magazines, TV and radio	Large audiences (potentially to millions of people) Perception of being high quality due to being overseen by professionals (e.g. journalists and editors) Traditionally recognised as agenda-setting Audience selection is possible through appropriate choice of publication/programme	Scientists lack control of how the media covers their work Tends towards one-way communication Frequently provides a limited or superficial focus

Live events (face-to-face) e.g. public lectures and debates, science festivals, science centres and museums, science busking, sci-art, science cafes	More personal – involves a direct interaction between scientists and public Scientists are able to better control the content Engenders two-way communication Can involve partnering with other external organisations with complementary expertise	Limited audience reach (tens to thousands of people) Resource intensive, leading to low sustainability of activities Can be criticised for only attracting audiences with a pre-existing interest in the subject
Digital interactions e.g. online journalism, blogs, podcasting, vlogs, facebook, twitter, YouTube, other social media, citizen science	Large audiences (potentially thousands or more) Can allow direct interaction between scientists and publics Initial content can be controlled by scientists Caters for both one-way and two-way communication, depending on audiences preference Always accessible; suits the audience's time preferences	Can encourage superficial or 'jokey' interactions May be difficult to control how content is picked up by others Requires regular attention to maintain profile and respond to online interactions with various publics Requires key communication skills that may not be immediately apparent

3.6. Summary

This chapter has provided a broad introduction to the literature within the academic study of science communication. There is a wide discussion over the definition of science communication within the literature, but it is clear that science festivals provide

a platform for science communication to happen. Whether it is scientists engaging with their audiences, or professional science communicators engaging audiences with science, science festivals can provide both space and place for science communication activity to occur. This chapter has also examined the role of scientists in engaging with science communication efforts. It is important to bear in mind that Chapter 2 discussed key stakeholders of festivals, and thus scientists and their institutions should be recognised as key stakeholders at science festivals. The exploration of literature surrounding science communication in this chapter, and critical event studies in the previous chapter, leads on to a critical discussion of academic literature on science festivals which is presented in Chapter 4.

Chapter 4: Science Festivals

4.1. History of science festivals

As noted earlier, since 1989, science festivals have emerged across the globe and many countries now have a science festival. In the UK alone, there are at least 60 such festivals (Kerr, 2017), 11 of which are deemed large science festivals (Office for Science & Technology and Wellcome Trust, 2010). A global survey of science festivals found that over half of science festivals had started between 2006-2008, with only five starting prior to 1995 (Bultitude et al., 2011), suggesting that the explosion of science festivals has taken place within the last 10-15 years. The fairly recent growth of science festivals is consistent with a growth in other types of festivals – such as arts festivals, which grew exponentially in numbers in the 1990s (Cassidy, 2006).

Although the term 'science festival' was not coined until the 1980s, public events in science date back centuries, albeit not in the form of a festival. The most notable early contribution to public science communication events here in the UK can be traced back to the Royal Institution of Great Britain's Christmas Lectures series, which first took place in 1825 by Michael Faraday (Royal Institution, 2020). The Christmas Lectures have taken place every year since then, with the exception of the World War 2 years, where it was deemed too unsafe for children to visit Central London (Royal Institution, 2020).

A rival to Edinburgh International Science Festival's claim to be the world's first science festival is the British Science Association (formerly the British Association for the Advancement of Science) who also make the claim to be the world's first science festival (British Science Association, 2020). The British Association's annual conference was founded in 1831 with the vision of bringing together natural philosophers (the former collective title we now refer to as 'scientists') and the leading gentlemen of society in order to discuss and promote science (British Science Association, 2020). Dr

Simon Gage, the Festival Director of the Edinburgh International Science Festival, is clear on the difference between the then British Association for the Advancement of Science's annual meeting which re-branded its history by calling the annual meeting a 'festival' in the early 1990s, when he states that Edinburgh Science Festival "was a 'festival' not a meeting, conference or centre, this gave it an energy that was higher than you could find anywhere" (Gage, 2001, p.211).

So how did the term 'science festival' become established? It was in the 1980s that The City of Edinburgh's local authority was competing with its long-standing rival - the City of Glasgow Council - in terms of developing economically and culturally (Ian Wall, personal communication). In the late 1980s, Glasgow was awarded the title 'European City of Culture 1990' - also a relatively young title - and Glasgow framed its identity with the slogan "Glasgow Smiles' Better", which was unavoidably seen as an indication of how it may be seen differently to The City of Edinburgh by visitors, with Glaswegians traditionally being seen as more friendly and welcoming (albeit more formidable) than their City of Edinburgh counterparts.

By the late 1980s, the City of Edinburgh local authority had set up an 'Economic Development Department' (which still exists to this day) with the remit to "ensure Edinburgh has a strong sustainable economy and is seen as a prosperous place in which to live, work, study or visit" (The City of Edinburgh Council, 2020). Edinburgh's Economic Development Department decided in the late 1980s that despite The City of Edinburgh's rich culture and architecture, a new approach was needed in order to compete with the City of Glasgow. The committee decided to adopt the idea suggested by (now Professor) Ian Wall that the city should rebrand itself as 'City of Science' in order to improve its image and develop economically (Orkney International Science Festival, 2020). The 'City of Science' vision was seen to be a great idea by many, as it could build upon the City of Edinburgh's historical reputation as a world leader in science and philosophy. The city can boast impressive links to the era of the Scottish Enlightenment, where great thinkers such as David Hume, Adam Smith, Dugald Stewart, Joseph Black and James Hutton created ideas that have revolutionised how

we live. From this vision for The City of Edinburgh to rebrand itself as 'City of Science', grew the idea of a festival – one that is entirely devoted to showcasing and celebrating science and technology in society. Although it was initially difficult to conceptualise the words "science" and "festival" (Gage, 2001), the Edinburgh International Science Festival celebrated its first festival in 1989 and in 2018 celebrated its 30th birthday. The popularity of science festivals has grown and many science festivals have taken different trajectories and evolved to become different things. These trajectories are partly shaped by their geography, their values and the communities they serve.

4.2. Definition of a science festival

In a similar vein to science communication, there is no agreed definition of what constitutes a science festival, so the term itself is open to interpretation. Perhaps the most convincing definition of a science festival comes from Bultitude et al. (2011, p.166) who define a science festival by the following characteristics:

- "The main focus is a 'celebration' of science, technology, engineering and related aspects.
- The intention is to engage non-specialists with the scientific content.
- The event is time-limited and recurring, usually on an annual or biennial frequency.
- There is a common theme and/or branding to the component activities."

Although this is the most up to date definition of science festivals in the academic literature, it is somewhat problematic. For example, the "common theme and/or branding" discourse may not be prevalent in all science festivals – something that requires further investigation. The intention to engage non-specialists with scientific content may not always be the intention of all science festivals. Indeed, some science festivals very much intend to engage specialists and those with high science capital, who are likely to pay to come to some high-brow science events. Science capital is a term that primarily refers to science-related forms of social capital (Archer et al., 2013).

This includes social networks, personal connections and knowing people who work in STEM industries. However, science capital also includes elements of cultural capital including having science qualifications, understanding the scientific method, and having some degree of science literacy (Archer et al., 2013). Science capital, like social capital and cultural capital, is also loosely linked to economic capital which might be deployed to increase science capital; for example, through purchase of resources such as visits to science centres, science festivals, having a science tutor or having science kits (Archer et al., 2013).

In the past, a number of other attempts have been made to characterise a science festival. Most notably, the UK Government's Office for Science & Technology defined a science festival by differentiating them from science weeks (Office for Science & Technology, 2004). They claim that the National Science Week (now known as the British Science Week) which takes place in different venues (schools, museums, universities) across the entire country as being something separate and distinct from a science festival, which is limited to a specific town or city (Office for Science & Technology, 2004). With the exponential rise of science festivals since the publication of this report, it is unclear whether it is still the case that a science festival is limited to a particular town, city or region. What is clear is that science festivals serve as an example of informal science communication (Burns et al., 2003).

A second distinction to be drawn between a science festival and a science week is highlighted by Nolin et al. (2003) who claim that the presentation or vibe of both events are very different. Nolin et al. (2003) claim that science festivals are designed by non-scientists to be fun and celebratory events, whereas science weeks are organised by scientists in universities, thus rendering science weeks as more serious events than science festivals. Whilst this may be true for the experiences and findings of Nolin et al. (2003), it does not represent the diversity of science weeks and science festivals that exist. For example, here in the UK, the British Science Association spearheads both the British Science Week and the British Science Festival. The British Science Week (BSW) describes itself as:

A ten-day celebration of STEM – featuring fascinating, entertaining and engaging events and activities across the UK for people of all ages. BSW provides a platform to stimulate and support teachers, STEM professionals, science communicators and the general public to produce and participate in STEM activities.

(British Science Week, 2020).

This definition is in stark contrast to the definition of a science week provided by Nolin et al. (2003) because the nature of events do not need to be serious and the focus is not on universities or scientists engaging the public. In fact, arguably it is the science week that is more serious in its tone and presentation than the science festival. Consider the British Science Festival – also hosted by the British Science Association. The British Science Festival takes place in a different city in the UK each year and partners with a local university (or group of universities) to transform a city into a vibrant celebration of STEM (British Science Festival, 2020). On its website, the British Science Festival claims to connect the public with scientists, engineers, technologists and social scientists (British Science Festival, 2020). One of the priorities for the British Science Festival is to engage the public in open discussion about issues that affect our culture and society (British Science Festival, 2020), so arguably the British Science Festival is more serious and high-brow than British Science Week, thus suggesting that the distinctions made by Nolin et al. (2003) cannot be applied universally.

4.3. Public engagement at science festivals

Despite some disagreement in what constitutes a science festival, one thing that science festivals have in common is the desire to bring different communities together and improve relations between science and society (Neresini et al., 2009). Science festivals generally achieve this by bringing together a range of exhibits or exhibitions; activities, science organisations, school children and other publics to create time-limited special events (Jensen and Buckley, 2012).

Science festivals provide a platform for interaction between scientists and the public in a meaningful and explicit way (Brito, 2008). Despite a lack of research and published literature on science festivals, there have been two notable reports: one published by the European Science Events Association (EUSCEA, 2005) and another by the UK Government's Office for Science & Technology (Office for Science & Technology, 2004). The UK Government reported that science festivals are good at engaging the public in two-way public engagement dialogue and found that science festivals have moved away from the deficit model's one-way method of science communication. At a similar time of the publication of both of these reports, Miah (2005) suggests that there is potential for science festivals to still develop into a role that engages the public with the ethical dimensions of emerging scientific research. He suggests that involving the cultural industries in science festivals could lead to greater critical engagement between the publics and emerging research (Miah, 2005).

Within a science festival, there are a number of different types of events and formats for events – and this creativity is essential to their success (EUSCEA, 2005). Science festivals tend to be delivered by a number of different partners who may each have different motivations, aims and objectives (Jensen and Buckley, 2012). It is this diversity of partnerships, agency-working and different modes of engagement that define the modern day science festival (Jensen and Buckley, 2012). As outlined by Jensen and Buckley (2012), clarity is provided over the role of science festivals in science engagement when we consider Irwin (2008)'s taxonomy of orders of science engagement.

Irwin (2008) proposes three orders of science engagement. In the first order, science engagement is focused on promoting awareness, learning and interest in STEM subjects. This first order is underpinned by the assumptions of the deficit model, where the scientist's role is to dispense their knowledge to the publics in order to make the publics better informed and provide key learning experiences. This order of science engagement is highly evident at science festivals (Jensen and Buckley, 2012).

Furthermore, the EUSCEA (2005) report on science communication events evidences how the number one priority for many science festivals is to raise public awareness of science. Irwin (2008) describes the second order of science engagement as a two-way dialogue between scientists and the publics. Although many science festivals tend to focus on raising awareness and learning in science (first order), there is some evidence of second order science at science festivals, but certainly not to the same extent as first order engagement (Jensen and Buckley, 2012). The third order of science engagement is defined by Irwin (2008) as connecting to the social world, whereby the scientific discourse is directed to the needs of society (Irwin, 2008). Usually, third order science engagement does not happen at science festivals (Jensen and Buckley, 2012), despite this frame being the most likely to democratise science and allow scientific discourse to be directed by the publics.

4.4. Activities at science festivals

Within science festivals, there are usually a number of different types of events and various event formats, each of which help the festival engage the publics. Alongside more traditional engagement methods that exist in science centres and museums, science festivals usually have the capacity to be more creative than other science engagement events (Jensen and Buckley, 2012). Drawing from discussions in Illingworth (2017) on different science communication event formats and from the researcher's own experience as a science festival creative producer, various events and engagement formats within science festivals may include:

Doors open days - such events provide the public with an opportunity to see places that are normally inaccessible to them, such as laboratories and research institutes (Figure 4.1). Guided tours of laboratories allow the public to meet scientists and the people who work in them, thus allowing a closer connection with the places in which scientific discoveries and knowledge creation take place. They provide the public with an opportunity to talk to scientists, ask questions and see where public money, charity donations and private investment is spent. Yet, this is not simply a one-way transaction.

Rather, such tours also provide an opportunity for scientists to meet the people who may benefit from their research. In turn, these encounters may provide fresh motivation for scientists to continue their research by being directly confronted with its value, although there is a lack of research to evidence such impacts.

Figure 4.1: Biomedical scientist Dr Gemma Lace-Perrin gives a guided lab tour to members of the public at the University of Salford (Lace, 2018).

Workshops - these can be either timed workshops or drop-in workshops where the audience is invited to visit at any point across a period of time. Workshops are popular at science festivals, but their effectiveness relies on establishing learning objectives linked to the curriculum (EUSCEA, 2005). An example of a workshop at a science festival is shown in Figure 4.2.

Figure 4.2: A workshop, created by Dr Gary Kerr, for children aged 4-7 at the Abu Dhabi Science Festival. This workshop "Lego Sports Stars" sets out to engage children with coding skills through the use of Lego and a sports theme, where children use Lego to build their own sport star and then use the laptops to programme their Lego Sport Star as a goalkeeper and see if they can beat the goalkeeper (which they programmed). Image source: Gary Kerr, 2017.

Public Lectures - these are perhaps amongst the most comfortable of science communication activities for scientists, since many scientists from academic institutes will be used to lecturing students as part of their day job. If lectures are pitched at the right level for a non-specialist audience, they can be a great way to communicate their research with the public (Figure 4.3). However, many science festivals tend to avoid this format, as it does not lend itself to a festive experience. Furthermore, the lecture format relies on a belief in the deficit model where the scientist's purpose is to educate and impart knowledge upon the public, which does not typically describe how science festivals operate.

Figure 4.3: Dr Gary Kerr delivers a public lecture on the social, cultural and economic value of science festivals at the International Science Literature & Film Festival, a programming strand of the India International Science Festival in Lucknow, 2018. Image source: Gary Kerr, 2018.

Shows and Performances - these are a common component of any science festival and provide an opportunity for science and the performing arts to blend together. Science shows can be performed by charismatic scientists, science communication professionals or trained actors and can be used to show science demonstrations in a fun and creative manner (Figure 4.4). Performances can be character-driven and can tell a story about science and peoples experiences with science, in the same way that a theatre show tells a story about a character's journey.

Figure 4.4: Pop-up street theatre show taking place on the grounds of the University of Salford. Actors from Eureka Edinburgh perform a show produced by Dr Gary Kerr about the life and times of Dr Alan Turing OBE and share the story of his work at Bletchley Park, and tell the emotive story about how he took his own life as a result of being convicted and chemically castrated for being gay (University of Salford, 2016).

Interactive activities - many science festivals have some sort of interactive programme that brings together various scientists and people from other organisations to run interactive activities, usually aimed at children, with an emphasis on dialogue through doing, as the mode of interaction. Such events might take the form of theme days or university open days. The format usually involves producing fun and engaging table-top activities, each designed to deliver a learning point (Figures 4.5 and 4.6). This format allows the public to directly engage with the scientist over a fun activity.

Figure 4.5: Biomedical scientist Dr Gemma Lace-Perrin leads a team of students from the University of Salford to deliver interactive activities on neuroscience and dementia at the 'Brain Box Manchester' event (Miah, 2016a).

Figure 4.6: Science communicators at the 'Dementia Public Engagement Event' creating 'brain hats' and discussing the structure of the brain in health and disease with members of the public visiting the event, including former MP Hazel Blears (Kerr, 2018).

Panel discussions and debates - these are very common at science festivals and are generally not aimed at children. Panel discussions provide an opportunity for scientists to discuss various viewpoints and show agreement or disagreement on a particular topic (Illingworth, 2017; Figure 4.7). Typically, panel discussions are employed to bring people together who may have different perspectives on a topic so that a broader social, political and cultural perspective can be presented in relation to that topic. The most successful panel discussions are hosted by an experienced chair who can keep to timings, make sure everyone has equal input, allowing sufficient time for audience interaction (EUSCEA, 2005). Although the focus of this format is on the panellists discussing ideas and debating, there is usually an opportunity for audience Q&A.

Figure 4.7: Panel discussion at Sheffield Doc Fest on VR and mental health (Navin, 2018).

Demonstrations - these are a popular choice where a scientist wants to demonstrate a particular experiment that is too dangerous for the audience to do themselves. They are sometimes like a science show, but usually focused on one demonstration and can be quite brief in nature.

Film screenings - these can take place at a science festival and are usually accompanied by an introduction to the film or a discussion afterwards. For example, Manchester Science Festival held a 'Back to the Future' film screening event to celebrate 20 years since the film first hit the screens (Figure 4.8). The screening was accompanied by a scientist discussing the science behind the film.
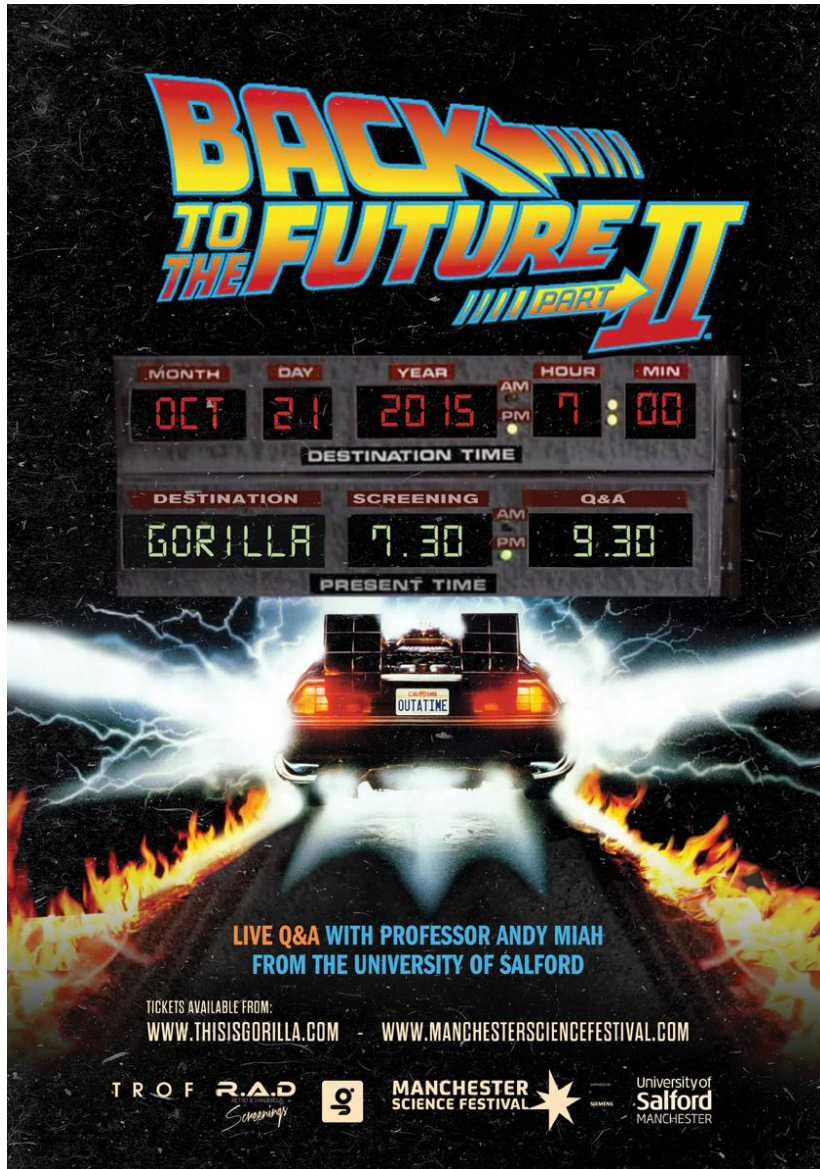
Figure 4.8: Poster for 'Back to the Future' film screening followed by Q&A event with Professor Andy Miah at Manchester Science Festival in 2015 (Miah, 2015).

Exhibitions. Venue permitting, exhibitions are a low-staffing activity for science festivals, as they rely on investment from the exhibition venue host. Examples might include science photography exhibitions or exhibitions of historic and current science & technology artefacts.

Citizen science - although citizen science projects usually take place over a longer period of time than a time-limited science festival, there is an opportunity at science festivals for scientists to engage with the public and share information about their citizen science project and how people can get involved.

Busking - this usually takes the form of street performances, where enthusiastic scientists or professional science communicators use their performance skills to draw in a crowd and perform busks. Busks are designed to be short-burst fun activities, each with their own learning objective. The most successful busks are performed by skilled and enthusiastic performers (Figure 4.9). However, busking does have the risk of superficially exciting the audience, rather than allowing any deep engagement or learning to take place (Illingworth, 2017).

Figure 4.9: Science buskers from Edinburgh Science Festival entertain guests by creating ice cream using liquid Nitrogen, at an adults-only event at the National Museum of Scotland (Edinburgh Science Festival, 2015).

Immersive experiences - these events are centred on the participant's self guided discovery of science. Whereas other event formats rely on the scientist to take the lead and tell the audience what to do or how to do it, immersive experiences allow the public to explore the content themselves. In these experiences, the public can take a journey and meet scientists, actors and immerse themselves in a virtual reality or an interactive performance. An example of an immersive experience at a science festival is 'The Forest of Curiosity' - an immersive instalment at Manchester Science Festival in 2016 which was designed to allow the audience to take an "interactive journey of discovery" through an indoor forest, meeting scientists, geographers, environmentalists, actors and poets (Manchester Science Festival, 2016, p.6; Figure 4.10).
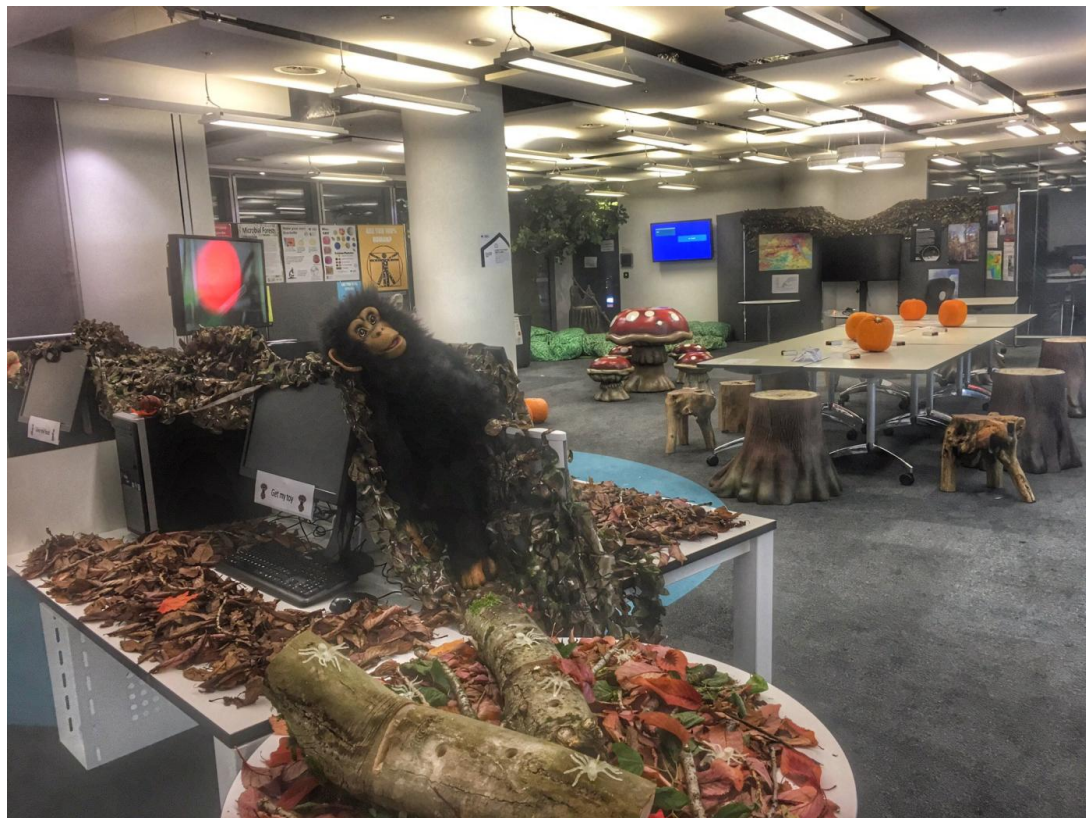
Figure 4.10: Forest of Curiosity at Manchester Science Festival (2016). This immersive experience allowed participants to immerse themselves in a forest and meet scientists, environmentalists, geographers along the way, whilst also introducing the audience to poets and performers telling stories of the forest. The instalment, created by Dr Gary Kerr, included plants, animals and sounds of the forest, allowing the audience to immerse themselves in the natural environment (Images: Kerr, 2016).

Digital content - many science festivals now include some form of digital content, such as Augmented or Virtual Reality experiences. For example, Alzheimer's Research UK regularly takes their virtual reality activity 'A Walk Through Dementia' to various science festivals across the UK. This activity allows people to see directly through the eyes of a person with dementia and appreciate what it is like living with the condition so as to increase awareness about its impact on people's lives (ARUK, 2020).

Other creative events - some of the most innovative science festivals create content that does not naturally fit into any category described above. For example, in 2016, Manchester Science Festival programmed the 'Amorance' event which took place inside a high-street restaurant. The audience consisted of couples who were invited to come out on a date, to then be treated to a three-course meal and table-service from poets, scientists, psychologists, all of whom were sharing information about the science of falling in love. The event also engaged participants in a faux science experiment, whereby their feelings of intimacy as couples were measured across the evening to assess whether its impact had brought them closer together (Manchester Science Festival, 2016). These unique event formats have the capacity to attract new audiences and provide an opportunity to challenge people's perceptions of what a science festival involves.

Figure 4.11: A team of staff, students and associates from the University of Salford produce an event 'Amorance' as part of Manchester Science Festival (Miah, 2016b).

4.5. International and overseas science festivals

Beyond the UK, science festivals have become a global phenomenon with events happening all over the world. Perhaps one of the best known examples is the World Science Festival which takes place in New York every year. The World Science Festival was established in 2008, and since then has attracted over 2 million visitors with millions more viewing recorded events online (World Science Festival, 2020).

Nevertheless, some science festivals in the UK claim to be so international that they use the word 'international' within their title (e.g. Caithness International Science Festival). Therefore, it is important to understand what is meant when a festival calls itself an international science festival, so as to distinguish between such festivals and those

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which exist overseas. The researcher is not aware of any literature examining and comparing science festivals in other countries to those that exist in the UK, but the remarkable growth of science festivals across the globe is consistent with the rise of other festivals, such as arts festivals (Cassidy, 2006).

Firstly, a distinction should be made between self-proclaimed international science festivals in the UK (e.g. Caithness International Science Festival and Edinburgh International Science Festival) and then science festivals that exist overseas. Edinburgh International Science Festival is a unique example of a science festival that was set up with an ambition to boost tourism over the Easter holidays – which take place across two weeks in spring – in the city of Edinburgh (Gage, 2001). With a focus on using the festival as a means to generate tourism – both nationally and internationally – to the city, the word International within its title was used to express this ambition. In recent years, the Edinburgh International Science Festival has also developed its international credentials by helping develop and programme overseas festivals (Edinburgh Science, 2020). For example, the Edinburgh International Science Festival are the lead programming partners for the Abu Dhabi Science Festival in the United Arab Emirates – the first and largest science festival in the Middle East (Edinburgh Science, 2020, and Abu Dhabi Science Festival, 2020).

Expectedly, science festivals across the globe differ in the motivations of their sponsors and producers. As Yeoman et al. (2004, p.81) point out, there are festivals at "international and national levels, in cities and towns, villages and hamlets, and in rural and coastal areas. Everyone wants to celebrate their particular form of culture, tradition, difference or similarity with others. Festivals and events can help promote their destination and attract tourists". For example, the Sasol SciFest in South Africa focuses on securing international participation from speakers outside of South Africa and gaining international support from the festival from foreign organisations (Joubert, 2001).

While not all science festivals are set up with the primary motivation to attract national and international tourism, the economic benefit associated with tourism is recognised by

national and local government as a measurable outcome of festivals (Bultitude et al., 2011). In the absence of any international comparisons of science festivals within the academic literature, it is possible – and highly likely – that festivals from different countries would benefit from sharing ideas and best practice. For instance the German idea of "Wissenschaft" is used across Europe (e.g. in Germany, Austria and in Scandinavian countries) to describe academics or researchers as a collective, broader than just scientists, as it also includes social scientists, along with arts and humanities scholars. Thus, European festivals may benefit from the broader notion of "Wissenschaft" which allows for a more inclusive festival that is not narrowed to the physical and natural sciences (Nolin et al., 2003). It is not clear from the literature to what extent the arts, humanities and social sciences feature in science festivals here in the UK, and content of UK science festivals has not yet been explored in any detail to understand how heavily science festivals focus on the natural and physical sciences. However, some festivals have emerged which allow space for a variety of disciplines, such as the research council festivals of the Arts and Humanities Research Council 'Being Human' and the Economic and Society Research Council 'Festival of Social Science'.

Science festivals may also be set up by national governments with the motivation of providing non-tourism related economic benefits. For instance, the Abu Dhabi Science Festival was established and is funded by the Abu Dhabi Government's Technology Development Committee with the view to providing a STEM-skilled workforce of the future that will help drive the UAE's economy from an oil-based economy to a knowledge-based economy (Technology Development Committee, 2016). The Abu Dhabi Science Festival is a festival that is aimed at the UAE's children and young people with a view to developing human capacity in STEM-based subjects. It is a key strategic priority in enabling the realisation of the Abu Dhabi 2030 vision and the UAE National Innovation Strategy (Technology Development Committee, 2016). In addition to the economic benefits that science festivals may bring, science festivals could also be a key driver of social and cultural change, not just in terms of science knowledge, but

also in terms of belief systems. Further research is required to examine the social and cultural impacts of science festivals in greater detail.

4.6. Who goes to a science festival?

Despite there being over 60 science festivals in the UK, only a small number of the population has ever attended a science festival: 3% according to the Department for Business, Innovation & Skills (2014) and 2% according to Wellcome Trust (2016). A number of serious questions arise from these data for science festival producers. First, it compels organisers to ask who is attending their science festival. Second, it requires asking whether the audience who is reached is, in fact, already supportive of science. If so, then it is unlikely that the messages will bring any significant change of behaviour or support for science, since these will already be supportive individuals.

To answer the first question, we simply do not know who visits science festivals, as there is a lack of research in this area. Although individual festivals sometimes collect quantitative data about their audiences, these data are not available in the literature. To that end, the UK Science Festivals Network (UKSFN) has taken on the role of collating data from individual festivals that have signed up to be members of the network in order to generate an understanding of the wider picture on who attends UK science festivals (UKSFN, personal communication). The second question posed is whether the impact of science festivals is negligible - in terms of behaviour change - since their audiences may already be scientifically educated and supportive citizens. Do science festivals succeed in engaging non-specialist audiences with STEM, or do they attract those who have a high science capital or are already engaged in science? This is a fundamental question that all science festivals need to address, especially when bidding for sponsorship and funding from both the public sector (e.g. local and national government) and private firms. Yet, there is a lack of research in this area, especially longitudinal studies on the impacts of science festivals on audiences that attend them.

4.7. Gaps in the Literature

To conclude this chapter, it is appropriate to highlight the significant gaps within the literature in relation to science festivals. Perhaps one of the reasons for this is due to a lack of multidisciplinary researchers whose experience can span multiple disciplines. Arguably, to undertake such research requires knowledge from a range of disciplines for which there simply have not been such pathways for researchers thus far. Indeed, there is a lack of science communication researchers with social scientific expertise, and critical event scholars with knowledge of the sciences, or inclination to focus on what is a very niche aspect of our festival and events culture. It is this void that the present study seeks to fill. Nonetheless, these past three chapters that make up this study's literature review have highlighted the knowledge that exists within these various fields. A unique and original contribution of this thesis is the positioning and analysis of science festivals within the critical event studies field.

More widely, the literature review has revealed that there is a lack of understanding on the various models of science festivals that exist. Science festivals are so diverse in their business models, aims, objectives, values and in terms of what their content looks like, that some science festivals are unrecognisable to others. There has been no study examining the various models of science festivals and how these models fit with their community's needs and helping the festival achieve its purpose. Nolin et al. (2003) describe three categories of science festivals: international, and local/regional but the problem with these categorisations is that they give no insight into the diversity of models that exists within each of these categories. Furthermore, Bultitude (2011) discusses how some small science festivals fail to become successful large science festivals and this is problematic because it assumes the success of a science festival depends on the size of the audience. Perhaps, some small science festivals achieve meaningful public engagement that cannot be achieved by larger science festivals. To understand these circumstances, one objective of this thesis is to formulate a clear understanding of the different models of science festivals that exist and how these business models impact upon their goals, direction and strategies of their festival.

Additionally, no existing research has examined how science festivals produce and curate content, or how different types of festivals approach programming for their unique audiences. Yet, a comprehension of such processes is also necessary in order to evaluate the effectiveness of science festivals and to better understand their social role. As such, this thesis seeks to develop a theoretical framework that helps categorise diversity within the science festival sector based upon geography, values, strategic objectives, values and business models. Indeed, this thesis also seeks to interrogate the business and management dimensions of science festivals to understand how their strategic leadership sets the direction and scope for the festival.

Science festivals, like all other types of festivals, must operate on business models that meet the demands of the festival and their stakeholders. This thesis sets out to examine the professionalism of science festival management, including exploring how business functions such as human resources, marketing and sponsorship are delivered within the sector. Ultimately, this thesis sets to bridge the gap between the study of science festivals from both science communication and critical event studies perspectives and to develop a novel approach to the study of science festivals by applying these different conceptual lenses.

Chapter 5: Philosophy of Research

5.1. Introduction

This chapter explores the philosophy of research that underpins the methodological approach adopted within this thesis. The philosophical underpinning of a research project is the most important aspect of a methodology and is a fundamental aspect of research that the researcher must consider before they embark upon their studies (Easterby-Smith et al., 2012). This chapter discusses the meaning of philosophy in research and why philosophy is fundamental to any study. The philosophical concepts of axiology, ontology and epistemology are discussed, as are the philosophies of interpretivism, positivism, pragmatism and critical theory. This chapter justifies why an interpretivist philosophical stance is the basis for the methodological qualitative approaches discussed in Chapter 6.

Easterby-Smith et al. (2012) discuss three key reasons for why exploring and understanding underlying philosophical stances are crucial to researchers. Firstly, it helps the researcher to develop an appropriate methodology that will help them reach the answers to their research questions (Easterby-Smith et al., 2012). Secondly, it helps them evaluate the different options available to them; and thirdly, it helps to create designs according to particular knowledge structures (Easterby-Smith et al., 2012). Criticisms and debates about philosophy of research are important for researchers to engage with (Easterby-Smith et al., 2012). Engagement with these debates are said to be vital for researchers in order to reflect on their own philosophical assumptions that underpin their research (Easterby-Smith et al., 2012).

'The structure of scientific revolutions' (Kuhn, 1962) is an important text for modern day philosophers, particularly those interested in the philosophy of research and the construction of knowledge (Crotty, 1998). Kuhn (1962) proposes the notion of scientific revolutions and how these revolutions result in a new way of thinking about knowledge. These structural revolutions create a shift from one paradigm into a new paradigm

(Kuhn, 1962). An example of such revolutionary shifts in knowledge are Copernicus' findings that the universe revolves around the Sun and not the Earth, which led to the creation of a new way of philosophical thinking, rendering all previous knowledge obsolete (Kuhn, 1962).

The research onion (Saunder & Lewis, 2012) provides a framework for understanding the different layers of research from the inner layer (data collection and data analysis) to the outer layer (philosophy) with inner layers representing methodological approaches, strategies and choices that a researcher has to make (Figure 5.1).
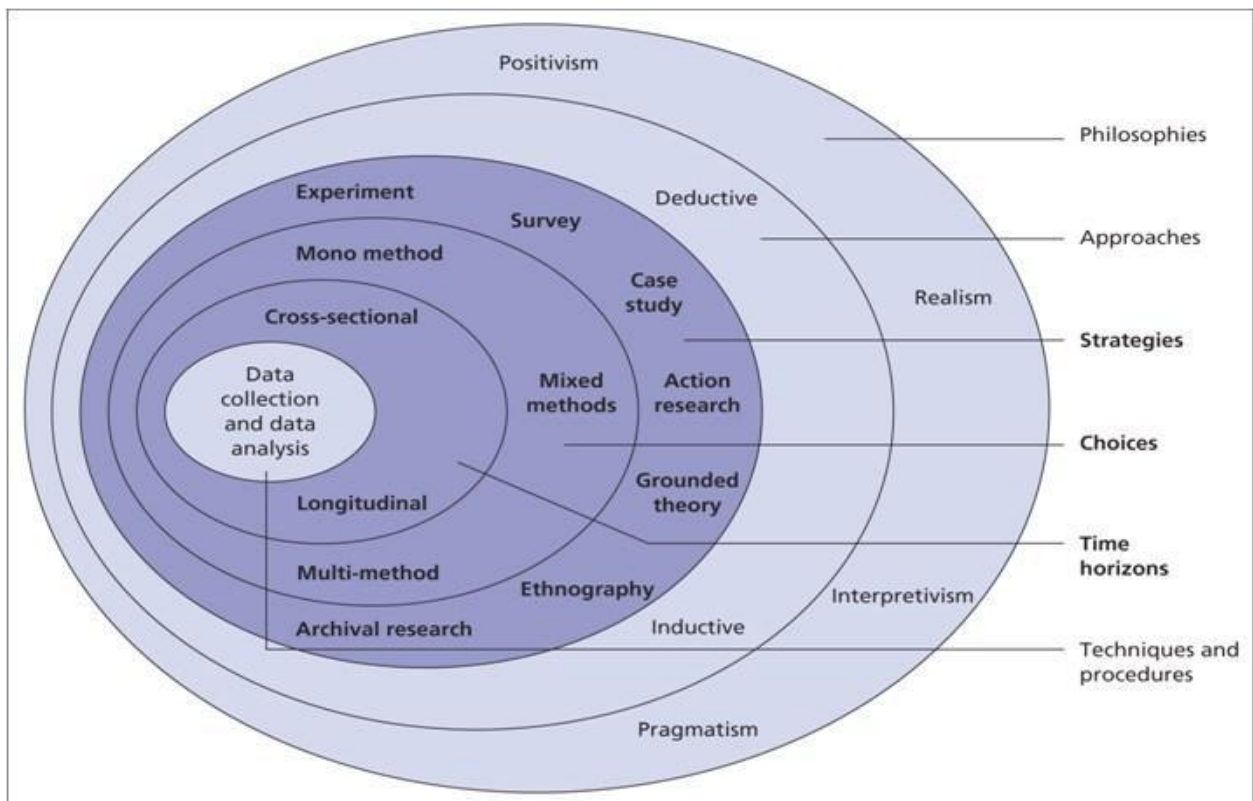
Figure 5.1: The research onion (Saunders & Lewis, 2012).

5.2. Research paradigm

A research paradigm is a set of beliefs that aid research (Guba & Lincoln, 1994). Oates (2006) states that all research has an underlying philosophical paradigm and defines it as "a set of shared assumptions or ways of thinking about some aspect of the world" (p.282). There are a number of different paradigms in research, each of which agree the way that research should be conducted (Christensen & Klyver, 2006). Paradigms that exist can be positivist, interpretive, critical theory or pragmatist (Jennings, 2001). Broadly speaking, quantitative research applies a positivist approach whereas qualitative research applies an interpretative approach. Gibson & Morgan (1979) argue that researchers need to become familiar with paradigms that are outside their own philosophical stance, in order to better appreciate their own underlying philosophy of research.

It is noteworthy that there is a lot of confusion about philosophy amongst researchers (Collins & Hussey, 2014). There is a lack of consistency in the use and application of various terminologies used within philosophical discussions about research, and this lack of consistency is sometimes contradictory (Crotty, 1998). This lack of consistency between different researchers could be explained by differences in culture, geography, discipline and education (Collins & Hussey, 2014). An example of this lack of consistency can be seen in the definitions used of the word paradigm. The Oates (2006) definition of paradigm used above is somewhat more straightforward than another definition produced by Crotty (1998, p.35) who defines it as "a unitary package of beliefs about science and scientific knowledge".

Returning to the research onion framework (Saunders & Lewis, 2012), philosophical paradigms are highlighted as different layers of the research onion, that researchers may choose from depending on how appropriate they are to their research. The outermost layer of the research onion highlights the four key philosophical paradigms relevant to scientific research, science communication studies, and critical event studies. Interpretivism and positivism are generally regarded as the two main

philosophies (Collins & Hussey, 2014). Indeed, whilst this thesis takes an interpretivist stance, a previous doctoral thesis by the author has taken a positivist stance (Kerr, 2013).

The second outermost layer of the research onion identifies another choice for the researcher: to take an inductive or deductive approach. An inductive approach is about developing a theory from the analysis of the empirical data collected during the research (Saunders & Lewis, 2012). Inductive approaches are associated with interpretivism and it is no coincidence that the position of inductive within the second outermost layer is next to interpretivism in the outermost layer of the research onion. Conversely, a deductive approach is about testing a theoretical position, such as trying to test (or disprove) a hypothesis (Saunders & Lewis, 2012). This is common within the natural sciences, and is thus positioned next to positivism within the research onion. Historically, most research, and indeed most knowledge, is based on positivist approaches, with interpretivism only becoming more common in recent times (Mingers, 2001).

5.3. Ontology, epistemology and axiology

To add further complexity, philosophical underpinnings to research can be further analysed and separated by their ontology (world view), epistemology (how we know reality) and axiology (values). It is the analysis of ontology, epistemology and axiology that helps researchers differentiate between different research philosophies (Gibson & Morgan, 1979). The construction of theories requires researchers to consider debates between different perspectives (Gibson & Morgan, 1979). Of particular relevance to this thesis is the notion that social scientists need to consider the fundamental ontological question of whether the social reality they are investigating is internal to the individual (both researcher and research participants) or whether there is a social reality out there that may be discovered independent of such subjectivities (Gibson & Morgan, 1979).

5.3.1. Ontology

Ontology is the starting point for research in the social sciences (Grix, 2002). Ontology is the claims and assumptions that are made about the nature of social reality (Blaikie, 2000). In essence, ontology is about the nature of reality and the way the world works, constructing reality and asking questions about how things really are and how they work (Denzin and Lincoln, 1998). Ontology involves asking questions on the nature of social reality and whether reality is external to social actors. There are two possible approaches to ontology and these are objectivism and subjectivism (Chesebro & Borisoff, 2007). Subjectivism is the belief that social phenomena (behaviour) is created through people's actions (social actors) and perspectives (Saunders & Lewis, 2012). In contrast, objectivism views social phenomena as external to social actors (Saunders & Lewis, 2012).

5.3.2. Epistemology

Whereas ontology asks about the nature of social reality, epistemology is concerned with how we know the reality (Chesebro & Borisoff, 2007). It relates to what constitutes both acceptable and valid knowledge (Mingers, 2001). Crotty (1998, p.3) defines epistemology as "the theory of knowledge embedded in the theoretical perspective and thereby in the methodology". The purpose of this thesis is to create original knowledge, so as a researcher it is important to reflect on how one knows that something is true. Crotty (1998) argue that knowledge is something that is at the centre of belief and truth, and thus the researcher (especially those undertaking qualitative approaches) should openly acknowledge their own motivations, beliefs, biases and values.

In this thesis, knowledge is created from an interpretivist standpoint. The creation of knowledge has some degree of subjectivity and this is considered within the literature to be a positive thing for interpretivist researchers (Kozinets, 2015). In interpretative research, epistemology focuses on the reality of a situation and on the details which motivate peoples actions (Saunders & Lewis, 2012).

5.3.3. Axiology

Whereas ontology is about world views and epistemology is about how knowledge is created, axiology is about human values (Saunders & Lewis, 2012). Axiology is a dimension of the philosophy of research that deals with judgement about values and ethics (Saunders & Lewis, 2012). In order for research findings to be truly credible, Saunders & Lewis (2012) argue that the researcher who conducted the study should be analysed. As researchers are human, then they have their own value systems that make them who they are and it is difficult to separate this from their working life (Creswell, 2013). All researchers bring their values to their research, but as Creswell (2013) points out, qualitative researchers need to make their values known within the study, as the researcher's values affect their co-construction of knowledge that takes place in dialogue with the research participants through the research design and analysis.

To acknowledge this presence of subjectivity, the following paragraph uses the first person to describe and reflect on my own values as a researcher. I am deeply committed to both justice and social justice issues and in my work and voluntary roles I try to make the world a better, more equal and more just place. For example, over the course of my doctoral studies, I have taken on roles as a Magistrate, NHS Governor, Independent Prisons Monitor, Chair of the Board of Trustees for a charitable organisation. In doing so, I have enriched my social capital (but not economic capital) in a way that enhances my appreciation for the complexity of our social world. However, I am not motivated by increasing my social capital (nor economic capital), as the sole motivation in both my academic studies and volunteering and external roles is to help people and to improve people's quality of life. I acknowledge that, in the past, I have had (and continue to have) prominent roles within the science festival sector - both within the UK and at overseas festivals - and that I am well connected within the science festival sphere; thus having a personal interest in the findings of this research. I have come into this PhD study hoping that there is something unique and special to be said about the value of science festivals, and it is important that, to be fully objective and

transparent, as a researcher I am honest about this. I hope there is a way that science festivals help those who are most disadvantaged in society, and I hope that science festivals help make science a more inclusive and accessible place for people from minority communities, because I want things to get better and I thoroughly hope science festivals contribute towards positive social change, improved quality of life, and advancement of society. As a qualitative researcher, I am co-constructing knowledge with research participants, so although I feel that I have been able to be as objective as possible in the creation of this knowledge, it is important that I point out my own values and account for these when necessary, as highlighted as good practice for qualitative researchers by Creswell (2013).

5.4. A comparison of different philosophies of research

For this study, an interpretivist approach is adopted, based on the assumption that the social study of science festivals is fundamentally different from positivist studies that take place within the natural sciences. This study sets out to explore the points of view of science festival figureheads about the social reality in which their festival exists. In this manner, interpretivism makes sense of the world from the point of view of individual science festival figureheads in order to develop broad insights into the nature of the reality of science festivals that may be constructed and reconstructed by festivals. Indeed, this interpretivist approach is a completely different world view from a previous doctoral thesis by the author, which was entirely positivist in its approach. Table 5.1 provides a comparison of these two dominant philosophies.

Table 5.1: Positivist versus interpretive paradigms.

Table adapted from Chesebro & Borisoff (2007).

	Positivist	Interpretive
World view	The real world and truths it holds are waiting to be discovered	The world is made real through people's actions and thoughts - it emerges and does not exist in some external and readily discovered form
Example	Laboratory-based Quantitative research	Sociological studies Qualitative research
Key terms	Data, statistics, empirical, numbers	Quality, meaning, process, values
Readability	With a calculator	Great fun
Method for analysis	The approach assumes a systematic set of methods that can lead ultimately to discovering truths about reality that will yield testable theories	The approach assumes methods that are open to refinement that can illuminate how subjects construct reality It does not presume a generalisable truth about reality. The aim is to identify the meaning people construct as they interact
Role of the researcher	The researcher's stance is as observer, recorder, and analyst of the data The researcher stands apart from the research	The researcher's interactions with subjects contribute to the emerging concepts and categories The researcher functions as a participant as well as an observer The data collected are co-constructed by the researchers and the participants of the

		research
Nature of data	Rich data yield categories, ultimately categories that are privileged over experience	Data include the feelings and interpretations of what subjects reveal both explicitly as well as tacitly

Ultimately, it is possible that the data may remain at a more intuitive and impressionistic level |
| Trustworthiness of findings | Reliability and validity can be achieved, allowing for the study to be replicated | Hypotheses and concepts can be generated which other researchers can apply to similar research problems |

Positivism and interpretivism are generally seen as the two polar philosophies of research (Creswell, 2013). On one hand, positivism creates knowledge that can be generalised, whereas interpretivism sees this knowledge as specific to its context and not necessarily generalisable, because it acknowledges that knowledge and culture are continually changing the circumstances in which knowledge is discovered (Boellstorff, 2012). Many researchers with a positivist worldview claim that positivist research produces the "clearest" and "most ideal" knowledge (Cohen, 2007, p.11). Alternatively, some interpretivist researchers question whether positivism is suited to any social scientific study (Mack, 2010). In order to research the complexity of society and human interactions, Klein & Myers (1999) argue that interpretivism must be the preferred option. Indeed, interpretivism has stemmed from criticisms of positivism (Collins & Hussey, 2014).

5.4.1. Positivism

Positivism is the most prevalent philosophy used within research (Atkinson & Hammersley, 2019). Positivism is very prevalent within the sciences where quantitative, numerical analysis is used to analyse data from experiments or surveys (Gray, 2020). Oates (2001) outline the characteristics of positivism: measurement and modelling; objectivity; testing hypotheses; quantitative data analysis; and universal laws. Researchers who adopt a positivist approach view the social world as external to the researcher and as something that can be put aside in conducting research and analysing data (Gray, 2020). Crotty (1998, p.27) states that "positivism is objectivist through and through" and that it is closely linked to the empirical sciences. Saunders & Lewis (2012) also highlight the strong relationship between the natural sciences and positivism. Positivist researchers view knowledge as something that is objective and not affected by those conducting the research (Collins & Hussey, 2014), or in other words positivist researchers see the truth as something that is out there simply waiting to be discovered. Some researchers in the natural sciences only see social scientific research as legitimate if it adopts a positive stance (Lee, 1991), something all too clearly seen as a researcher with an interpretive philosophical stance working within a life sciences department.

To add another layer of complexity to positivism, in recent years post-positivism has emerged as a critical response to positivism, arguing that it is questionable that positivism can ever claim to be truly objective (Creswell, 2013). Post-positivists claim that it is impossible for the researcher to be completely independent of their research, even in a laboratory setting (Creswell, 2013). Although post-positivists do still try and pursue true objectivity, they recognise that researchers bring their own biases, values, and assumptions, and that these factors affect the research (Creswell, 2013).

The tensions between the two dominating philosophies of research: positivism (natural sciences) and interpretivism (social sciences) is seen within the world of academic publishing. Journal editors tend to have a preference for research that is based on a

positivist philosophical stance (Black, 2006). Black (2006) further notes that journals that accept non-positivist work tend to have restrictive guidelines that make it difficult for interpretivist work to get published, or for authors to fully express the research findings. Scholars such as Sandelowski (1998) have called for journal editors to be flexible in allowing qualitative researchers to use any method that is appropriate to best communicate their findings, including the use of colour, animation and video. However, in recent times there has been a visible shift in policy from journal editors who are becoming more amenable to interpretivist, critical theory and pragmatism philosophies (Mingers, 2001).

5.4.2. Interpretivism

Researchers who take an interpretive philosophical stance consider that social reality exists in people's minds and that it is both subjective and affected by the act of researching it (Collins & Hussey, 2014). Interpretivism is a viewpoint that helps the researcher understand the complexity of human meaning (Black, 2006). Ultimately, the goal of interpretivism is to ensure that the research findings are representative of the research participants' experience of the phenomenon being studied, and that rigorous analysis of multiple interpretations of the social phenomenon will produce a plausible theory (Shah & Corley, 2006). Interpretive approaches mean that the researcher has a role in the co-creation of knowledge with the research participant and, thus, every researcher undertaking the study will produce unique findings (Labianca et al., 2000).

Support for interpretivism can be traced back centuries. Boas (1989) discusses civilisation as something that is not absolute and that our ideas, conceptions and interpretations of the world are only true in so far as civilisation, and our understanding of civilisation goes. One of the fundamental differences between positive and interpretive approaches is that the collection of data is not enough to provide meaningful results in interpretive approaches, as the researcher must add meaning to data generated within the study in order to create theory (Van Maanen, 1979).

Interpretivism is not without criticism. A major criticism applied to interpretive researchers is that research findings lack verification and are, therefore, lacking in generalisability (Mack, 2010). This criticism stems from interpretivism "abandoning the scientific procedures of verification" and thus results cannot be generalised (Mack, 2010, p.8). Consequently, many positivist scholars question the worth and value of interpretivist research (Mack, 2010). Another criticism of interpretivism is that it applies a subjective rather than objective ontology (Mack, 2010). Mack (2010) argues against this being problematic by saying that the interpretivist researcher is objective when it comes to the final stage of data analysis. The third, and perhaps the most fierce criticism of interpretivism discussed by Mack (2010) is that interpretivism fails to acknowledge political and ideological influences on knowledge and social reality. Indeed, Mack (2010) argues that interpretivism is not radical enough to challenge political and ideological influences on knowledge. This criticism takes us into a new philosophical stance of critical theory, which is a philosophical stance concerned with political influences on knowledge.

5.4.3. Critical research

Critical research is underpinned by a philosophical stance that seeks to identify "power relations, conflicts and contradictions" (Oates, 2006, p.296) so as to empower "people to eliminate them as sources of alienation and domination" (ibid). Researchers who adopt this stance - critical theorists - argue that "human actions can lead to change in order to improve situations" (Klein & Myers, 1999, p.69). Critical theorists have much in common with interpretive researchers. Creswell (2013) points out that critical theorists, like interpretive researchers, believe that reality must be understood as a *social* reality, which is created and recreated by people. However, critical theorists deviate from traditional interpretive research in that critical theorists analyse patterns of power and control, and look for ways to empower people through their research (Creswell, 2013). Furthermore, critical theorists also seek out to empower their research participants from constraints such as race, gender and social class (Creswell, 2013). Critical theorists

seek to highlight power imbalances and social structures that constrain people; and use their research as a tool to empower people and transform society (Creswell, 2013).

There are some tensions between critical research and interpretive research (Crotty, 1998). Critical theorists argue that interpretivist researchers are overly optimistic and ignore manipulation, oppression and injustice in society (Crotty, 1998). Indeed, interpretive approaches do not seek to transform society and address power struggles; rather, they intend to theorise about how society organises itself (Crotty, 1998).

Although critical research is becoming more prevalent, it is still not a particularly mainstream philosophical approach taken by researchers (Oates, 2006). Similar to interpretive research, critical research is not yet particularly well established within the literature, especially when compared with positivist research. Thus, it is a risky philosophical stance for researchers to take, and especially risky for doctoral students and early career researchers (Oates, 2006).

5.4.4. Pragmatism

The final philosophy of research to discuss here is pragmatism. Unlike the other three philosophies discussed, pragmatism is not dedicated to any one system of philosophy or reality (Creswell, 2013). Within the pragmatist worldview, there can be multiple interpretations of the world i.e. there is no single point of view that is correct (Saunders & Lewis, 2012). Rorty (1982) argues that a combination of various philosophies and methodological approaches is important for the development of quality research. Pragmatism involves taking pragmatic approaches to carefully consider and select appropriate ways to think about research philosophy and undertake research (Mertens, 2010). Whereas interpretivist researchers set out to create understanding and interpretation, pragmatism relates to action and to change (Goldkuhl, 2012). Whilst interpretivist researchers create interesting knowledge that helps us understand social systems, pragmatism creates useful knowledge that helps create action (Goldkuhl, 2012). The interpretivist researcher is engaged in understanding whereas the pragmatist researcher is engaged in change (Goldkuhl, 2012). These underpinning

assumptions about the social world inform the present study, which seeks to understand the social reality of science festivals. As such, the philosophy of knowledge falls into the interpretivism paradigm.

5.5. Summary

This chapter has explored the four different philosophies of research: positivism, interpretivism, critical research and pragmatism. In doing so, the choice of an interpretive philosophical worldview was employed for this study and has been justified in this chapter. Indeed, philosophy is about more than methods. It is about ontology (the world view), epistemology (how knowledge is gathered) and axiology (values of researcher). The role of the interpretivist researcher is to co-construct knowledge with the research participants, and to be open about their values and biases, which will of course affect both the gathering and interpretation of qualitative data. In this chapter, the authors' values and biases are outlined. This interpretivist philosophical stance lays the groundwork for designing the methodological approaches that are discussed in Chapter 6.

Chapter 6: Methodology

6.1. Introduction

This chapter outlines, discusses and justifies the methodological approaches taken within this study. It begins with a justification for taking a qualitative approach over a quantitative approach to data collection. The choice of utilising semi-structured interviews is discussed and justified as opposed to a structured or unstructured approach. This chapter also justifies why face-to-face interviews were the preferred option; with some Skype interviews also being used in this project. Information on how data was transcribed, stored, managed, and analysed is also presented in this chapter.

In this chapter, some degree of reflexivity and self-reflection is also provided. Self-reflexivity of researchers within their research (particularly those approaching research from a non-positivist standpoint) is accepted and encouraged within the social sciences (Ortlipp, 2008). Indeed, social scientists are encouraged in their research publications to talk about themselves, their biases, presuppositions, experiences, choices and actions during the research process (Mruck & Breuer, 2003). Such reflexivity makes it clear to the reader that the research findings, like the research subject, are socially constructed and ultimately depend on the experiences, behaviours and actions of the researcher as much as the researched (Mruck & Breuer, 2003). This chapter also discusses how the researcher set out to guarantee participant confidentiality and anonymity which are vital in generating high-quality qualitative data (Mruck & Breuer, 2003).

6.2. Qualitative or quantitative

Social science is the scientific study of society: how society functions; relationships in its broadest sense; human behaviour, interactions; and how society organises itself. Social research is about understanding the social world in which we live and making sense of our social hierarchies, interactions and behaviours. As described earlier in this thesis, this research project sets out to understand the social world of science festivals within

the UK. Easterby-Smith et al. (2012) point out that there are two styles of social scientific research. Firstly, there is quantitative research, which makes sense of the social world through numbers and statistics. Alternatively, then there is qualitative research, which attempts to make sense of the world through observations and the interpretation of words (Easterby-Smith et al., 2012). Some social researchers employ a mixed-methods approach that uses a combination of both quantitative and qualitative methods (Creswell, 2012). Indeed, in this thesis the research methodology is entirely qualitative, as justified in the previous chapter by adopting an interpretivist philosophical stance.

Qualitative research is creative and interpretive (Minichiello et al., 2008). Unlike quantitative researchers, the qualitative researcher does not transition easily from data collection to a neat writing up of results, as this is when the construction of theory begins (Minichiello et al., 2008). Interpretations of qualitative data are constructed and this constructed interpretation leads to the theory produced by the qualitative research (Minichiello et al., 2008).

Conceptually, qualitative data is concerned with understanding human behaviour and society through the perspective of the research participant, whereas quantitative data is concerned with discovering new facts about a particular phenomenon (Minichiello et al., 2008). Researchers undertaking qualitative research assume that reality is something that is dynamic and can be negotiated, whereas quantitative researchers often assume that reality is something that is fixed and can be measured (Minichiello et al., 2008). Methodologically, qualitative and quantitative differ significantly. Qualitative data is collected through such tools as interviews and observations, whereas quantitative data is collected through measurement (Minichiello et al., 2008). Data analysis differs too: qualitative data are analysed by the construction of themes from the researcher, whereas quantitative data analysis involves numerical analysis and statistical verifications (Minichiello et al., 2008). A final comparison to be made between qualitative and quantitative data is that qualitative data are reported in the language of

the research participants, whereas quantitative data are reported through graphs and statistical verifications (Minichiello et al., 2008).

6.3. Interviews

Many people are familiar with interviews, whether it be for a new job, a promotion, or politicians being interviewed on TV. There are a diverse range of interviews including the traditional face-to-face interview, Skype interview, telephone interview, down-the-lens interview or group interview. During interviews, people hold the role of either interviewer and interviewee, or, in the case of a research interview, the roles of researcher and participant. Society's fascination with interviews is demonstrated by the popularity of TV programmes such as 'The Job Interview' (Channel 4) and the interview episode in each series of 'The Apprentice' (BBC) where confrontational interviewers put interviewees through a challenging interview process. Common to all interviews are the uneven power dynamic whereby the person conducting the interview (interviewer or researcher) can be deemed to hold power over the person being interviewed (interviewee or participant). Interviews are a tool for the person holding the power to generate insights into the thoughts, behaviours, experiences and aspirations of the person being interviewed.

Interviews are the most widely used form of data generation in social scientific research (Edwards & Holland, 2013). Research interviews exist on a spectrum that ranges from structured to semi-structured and unstructured with structured interviews being more quantitative, and semi-structured and unstructured interviews providing the space for qualitative researchers (Edwards & Holland, 2013). Structured interviews are when the interviewer asks each research participant the same set of questions in a standard way, much in the same way to reading out a questionnaire (Mathers et al., 1998). In structured interviews, all the questions are planned in advance of the interviews and are likely to have been informed by a pilot study to help refine the quality of questions (Mathers et al., 1998). Structured interviews tend to employ more closed questions than

other types of interviews, with a number of pre-coded answers being available to the research participant (Mathers et al., 1998).

At the opposite end of the scale to structured interviews are unstructured approaches to interviewing (Mathers et al., 1998). These are sometimes referred to as 'in depth' interviews because they have little to no structure at all. The purpose of an unstructured interview is to discuss only a small number of topics and frame successive questions depending on the response to the questions already asked (Mathers et al., 1998). As opposed to structured interviews, unstructured interviews involve no preconceived plan or expectations about how the interview will proceed (Mathers et al., 1998).

For this thesis, neither structured nor unstructured approaches to interviews were utilised. Rather, this research takes a semi-structured approach to conducting interviews, as there were specific areas of interest that informed the research design. Semi-structured interviews involve asking a series of open-ended questions based on the particular topics that the researcher wishes to cover (Mathers et al., 1998). For this research, the questions posed to interviewees relate to the objectives of the thesis and are shown in Table 6.1. These questions arose from a critical examination of the literature pertaining to science festivals from a science communication angle and from critical event studies. The questions relate to what the researcher perceived as gaps in the literature about the strategic leadership of science festivals and wider social questions about the value of science festivals.

Table 6.1: Questions posed to research participants during the semi-structured interview. The language used is exactly as spoken by the researcher.

Semi-structured interview questions as asked by the researcher

1. Can you give me a brief introduction to your festival: who are you; what is your festival; and what is your role within the festival?
2. Tell me about the history of your festival: where has it come from and how has it developed to become what it is today?
3. How do you position your festival within the broader network of festivals?
4. Is your festival a member of the UK Science Festivals Network?
5. What is your relationship like with other science festivals?
6. Can you tell me about the content of your festival: what does your festival look like in terms of content, and how do you go about curating the content?
7. Can you tell me a bit about the investment structure around your festival? Who are your investors, sponsors, partners… and what is your relationship with them?
8. Who are the people that make up your festival? Can you tell me a bit about the human resources infrastructure and business model of your festival? Do you have year-round staff and then volunteers or additional staff to support you in festival delivery?
9. Who are your audience, and how does that compare with your target audience?
10. What values does your festival hold?
11. I want to ask you a bit about the value of your festival in more detail. Firstly, for the local community and for people who come along to the festival, what do they get from it?
12. Secondly, what value does the festival bring to you and/or your organisation. To put it more bluntly, what is the point of your festival?
13. Can you tell me a bit about how you evaluate your festival and how important evaluation data is to you?
14. What are your aspirations for your science festival? Where would you like it to be in 5, 10, 20 years?
15. What barriers are in the way of you achieving those aspirations sooner?
16. Is there anything you think is unique about your festival compared to other science festivals or other festivals in general?
17. Final question - and I've saved the most difficult question until the very end. What is a science festival?
18. Great, thank you so much. Is there anything else you'd like to say before I switch off the tape-recorder? Perhaps something you want to elaborate on or anything you wanted to say but didn't get the chance to?

As with all semi-structured interviews, the researcher has the freedom to probe the interviewee and use cues or prompts to consider the question further (Mathers et al., 1998). The flexibility of the semi-structured interview allowed the researcher to follow different lines of inquiry depending on what the research participant said; and to alter the structure of the questions if it felt that asking questions in a different order would provide a better flow to the conversation. Semi-structured interviews were conducted either face-to-face (22 occasions) or via Skype (5 occasions).

6.3.1. Face-to-face interviews

Face-to-face interviews are incredibly labour intensive, but are the best method for collecting high quality qualitative interview data (Mathers et al., 1998). Face-to-face interviews are the oldest form of qualitative data collection and are the first choice for researchers who want to maximise the quality of the data collected (Lavrakas, 2008). The main advantage of the face-to-face interview is the presence of the researcher and the research participant in the same room at the same time having a discussion (Boyce & Neale, 2006). This can help create a better rapport between the researcher and the research participant; with the researcher being able to reassure the participant as necessary (Boyce & Neale, 2006). Indeed, for long interviews, a face-to-face approach is the most suitable type of interview (Boyce & Neale, 2006). Other advantages of the face-to-face interview are that it is easier to overcome any language barriers than it would be to do in other interview formats (Boyce & Neale, 2006). It cannot be ignored that, for the purposes of this doctoral research, one major advantage of face-to-face interviews is that it is likely that fewer people will refuse them, than they would for telephone or other types of interviews (Boyce & Neale, 2006).

Notwithstanding the many advantages of face-to-face interviews, there are some disadvantages to this format. A high financial cost is associated with conducting extensive face-to-face interviews (Boyce & Neale, 2006), and this is something that became very apparent to the researcher, who conducted 22 such face-to-face interviews across a six-month period. The researcher conducted these interviews

across a wide geographical area from the most northerly parts of Scotland to the southern coast of England; and from Northern Ireland to Wales. Consequently, the cost of travel, accommodation and subsistence was not insignificant. Indeed, the researcher had to seek freelance work within and outside the science festival industry in order to finance the research. Furthermore, face-to-face interviews may also heighten concerns from research participants about the lack of anonymity (Boyce & Neale, 2006), but this is something that was carefully discussed at the beginning of all interviews.

Whilst on fieldwork conducting face-to-face interviews, the researcher would agree to meet with research participants usually in their office or a public place such as a cafe. On two occasions research participants suggested the researcher meet them in their own home but this was politely declined and pointed out that it would be in breach of the research risk assessment to do so, and that it would be in breach of ethical guidelines set out by the British Sociological Association (British Sociological Association, 2020). Research participants generally suggested lunch time as a good time for the interview, however as the study progressed the researcher actively steered participants away from lunch-time meetings as participants found it difficult to eat their lunch due to the one-sided nature of the interview where the participant does most of the speaking.

At the beginning of each interview, the researcher presented participants with a printed copy of the participant information sheet (which they had already received by email; Appendix 1) and then asked to read through and sign a participant consent form (Appendix 2). Participants were given the opportunity to read through the information sheet and ask any questions. Whenever the interview was conducted in a closed office, participants were asked if they would be more comfortable with the door open and/or whether they would be preferred to be sat next to the door. In most cases, participants laughed at this but they understood that it was necessary for the researcher to put them at ease and make them feel comfortable. As there was a tendency to find this funny, it turned out to be a good way to break the ice and help build up a rapport with the research participant before the interview began.

6.3.2. Skype interviews

After 22 face-to-face interviews had been conducted, due to financial reasons, the method of interviewing was changed to Skype interviews for the remaining 5 interviews. Skype interviews provide benefits to researchers, by eliminating travel costs and saving time which would otherwise be spent on travel, however, they do not completely replace the benefits of face-to-face interviews (Iacono et al., 2016). Skype interviews allow researchers to focus their research away from particular geographic locations which can allow researchers to study a wider variety of locations (Johnston, 2001).

Deakin and Wakefield (2013) point out that Skype is a useful tool for research interviews with inaccessible participants. Although, in this study, the researcher had been able to recruit participants in some of the most remote areas of the country in face-to-face interviews, it was the depletion of budget that was the limiting factor in the number of face-to-face interviews that could be performed. Iacono et al. (2016) point out that Skype is a convenient way to conduct interview-based research on a tight budget. Not only are Skype interviews more cost-effective and less time-consuming (in terms of travel to-and-from the interview) than face-to-face interviews, but they provide a logistical advantage in that time need not be spent suggesting and agreeing venues for the research interview to take place. As Deakin and Wakefield (2013) point out, Skype interviews allow the place of the interview to become fluid and the location can take place somewhere convenient and comfortable for both the interviewer and participant. Skype interviews also eliminated a problem that the researcher found during face-to-face interviews in that meeting a person in a busy, public place, when both researcher and research participant have no idea what each other look like, and are thus unable to identify each other.

Although Skype as an interview tool provides many advantages, there are some downsides to this technology. Although Deakin and Wakefield (2013) find that participants interviewed over Skype are more responsive to the interviewer and that the

interviewer can build up a rapport quicker over Skype with the interviewee than in a face-to-face interview, the experiences of the researcher found that not to be the case. Rather, in this study, the researcher's experiences are more aligned to Cater (2011) who found that establishing rapport over Skype is more challenging than in face-to-face interviews. Indeed, in the face-to-face interview, rapport was established almost immediately, from meeting and greeting the interviewee to walking to the interview location, having a pre-interview coffee if the participant suggested that and having a general discussion before the tape recorder was switched on. Indeed, the richness of the interaction was felt by the researcher to be somewhat lost, compared with face to face interviews, which is consistent with similar claims made by Rowley (2012). For example, in the face-to-face interview, the researcher has a real person in front of them and can see everything and can interpret their body language, hand movements in addition to the facial expression and verbal communication available over Skype. Bayles (2012) points out that not being able to see this body language leads to the loss of non-verbal cues the participant is giving the researcher. Consequently, although there are a number of drawbacks to utilising Skype interviews in the generation of qualitative data, financial constraints mean that the researcher was limited in the options available to them.

6.4. Participant identification and recruitment

The first stage of identifying research participants involved identifying science festivals across the UK. To do this, the researcher curated a list of UK science festivals and placed these on his website[2]. These science festivals were identified using pre-existing knowledge working in the industry both before and during embarking upon the doctorate, and from various Google searches using the term 'science festival'. A link to the list curated by the researcher was then sent out over two mailing-lists used by the UK science communication activity, members of which were asked to get in touch if they knew of any festival that was missing from the list, or if they thought that another festival

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[2] See Kerr (2020).Science Festivals 2017. Available at: http://www.garykerr.net/festivals/ [Accessed 11 December 2020].

should be added to the list[3]. The response from the mailing lists was overwhelmingly positive and members commented that a curated list of science festivals across the UK would benefit them personally. Freelance science communication practitioners, in particular, noted the value of a curated list of UK science festivals and were instrumental in identifying additional festivals - some of which did not contain the term 'science festival' in their name. This process allowed the researcher to identify 60 science festivals within the UK.

In order to make the research project manageable, a decision was made to interview one person from each festival who would be able to provide a broad overview of the festival: its history, development, aspirations, values, processes and relationships with sponsors, audiences and other festivals. Many larger festivals are structured into various departments (EUSCEA, 2005) that are focused on their niche remit, so it was decided to approach the public facing leader of each festival to take part in the research study with the view that they will have more of a broader view of all aspects of the festival and its future strategy and aspirations. In most cases, the figurehead of each festival held the job title of Festival Director or Chief Executive Officer. However, in some cases it was more difficult to identify the festival leader as some consisted of such titles as Public Engagement Officer, Outreach Coordinator or even Professors in fields other than science communication. Nevertheless, through research on LinkedIn and by directly telephoning festivals, the researcher was able to identify their festival lead and curate a separate list of festival leaders and their contact details.

Festival figureheads were contacted initially via email to provide them with some information about the study and to gauge their willingness to participate in the research. Some participants responded immediately and those who did not respond within 3 weeks were contacted by email a second time. When there was no response after 1 month, they were contacted via telephone or Direct Messaging on Twitter to find out whether they would be willing to participate in the study. Most figureheads responded,

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[3] PSCI-COM mailing list (https://www.jiscmail.ac.uk/cgi-bin/webadmin?A0=PSCI-COM) and British Interactive Group mailing list (BIG-Chats: http://www.big.uk.com/page-1856039)

noting busy schedules; however some festival figureheads did not respond to the study. It was unclear whether the lack of response was a negative response or the festival figurehead had not been able to respond due to time commitments.

After responses were received from festival figureheads, a process began that was concerned with the project management and planning of the interview schedule. Participants were contacted via telephone or email to discuss suitable dates for interviews and they were each sent a copy of the Participant Information Sheet (Appendix 1) and asked to get in touch if they had any questions. Once potential dates for a research interview were discussed with festival figureheads, they were grouped together based on their geography within the UK and arranged dates and times for interviews that were logical and economical in terms of minimising transport and accommodation costs, whilst considering environmental options. Festivals were grouped together that were in close geographical proximity and this was used as the basis for the interviewing schedule. However, due to busy schedules of festival figureheads, it was not always possible to conduct interviews with neighbouring festivals on the same day or even in the same week, so an element of flexibility was built into the researchers travel schedule.

Research interviews with festival figureheads were conducted over a six-month period of fieldwork. Funding for the research project came from a small research fund available via the University of Salford's Graduate Teaching Studentship and it was found that travel by car was more cost-effective than using trains or other forms of public transport that would require heavier use of overnight accommodation. Notwithstanding, the researcher was aware of the environmental impact of this, but did prioritise economic self-sustainability over environmental sustainability. At least 20 out of the 60 or so science festivals identified within the UK were geographically located in Scotland, which is well-served by science festivals in comparison to the rest of the UK. Consequently, costs were cut due to the researcher being from Scotland, and having family and friends based across the country, thus reducing the need for overnight accommodation.

6.5. Theoretical saturation of data

Interviews were conducted until the researcher was convinced through recollection of interviews that the theoretical saturation point had been reached, at which point it was not necessary to continue arranging more research interviews. After 24 interviews had been conducted, the researcher was satisfied the data had become theoretically saturated. However, as 27 interviews had already been scheduled, the researcher continued until these 27 interviews were complete; but ensured that no more interviews were arranged with potential research participants. Saturation is defined within the social scientific literature in a number of ways. Glaser & Strauss (1967, p.61) define saturation as the point at which "no additional data are being found whereby the sociologist can develop properties of the category". They further say that saturation is the point at which "the researcher becomes empirically confident that a category is saturated" (p.61). Urquhart (2003, p.194) defines saturation as "the point in coding when you find that no new codes occur in the data". For this study, thematic analysis took place after data collection was complete, and theoretical saturation was confirmed during this process. Reaching theoretical saturation is the point at which qualitative researchers can claim their work is rigorous (Morse, 2015) and it is known as the gold standard in which the sample size for the research is determined (Guest et al., 2006). Noting that the researcher was convinced theoretical saturation had been reached at 24 interviews, the remaining 3 interviews were conducted, in part not to disappoint or isolate the remaining research participants, but they did provide fruitful in confirming that no new codes were occurring within the data being generated.

6.6. Data management

Participant consent forms (Appendix 2) were scanned and stored on the university's secure local disk drive. The original hard copy of participant consent forms were securely destroyed. Interviews were dual recorded using a SONY ICDBX130 Digital Voice Recorder and on the in-built voice recording app on the researchers mobile device. Once a copy of the audio file was transferred to the secure University of Salford

local disk drive, the audio recordings on both the mobile device and the digital voice recorder were deleted. No person other than the author of this thesis has access to the audio files on the secure network drive. Interview recordings were transcribed manually by the researcher, using a foot pedal. Transcripts of interviews are stored securely on the University of Salford network disc drive.

6.7. Ethical considerations

Before this research study took place, full ethical approval was applied for and granted by the University of Salford's Research Ethics Committee (Appendix 3 - ethics approval). The research study was conducted in accordance with the ethical principles and guidelines set out by both the Social Research Association (SRA)[4] and the British Sociological Association[5]. There are a number of ethical dimensions to this research study that have taken into account and adapted. These are discussed below.

6.7.1. Informed consent

This study relied upon research participants providing volunteered informed consent. Informed consent is described by the SRA as a procedure for ensuring that research subjects understand what is being done to them, the limits to their participation and awareness of any potential risks they incur (SRA, 2003). Research participants were provided with a participant information sheet (Appendix 1) ahead of the interview and on the day of the face-to-face interviews they were provided with a participant consent form (Appendix 2) that they were asked to read, tick the boxes if they agree and sign the form. They were then given another opportunity to ask any questions before the interview began and the audio device recorder and mobile device recorder was switched on. In the case of Skype interviews, participants were given a copy of the consent form ahead of the interview for them to read and were asked to sign and return by scanning and attaching to email. Research participants were also made aware that

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[4] The Social Research Association (SRA) is the professional membership body for social researchers in the UK. Website: www.the-sra.org.uk
[5] The British Sociological Association (BSA) is the national subject association for sociologists in the UK and its primary objective is to promote sociology. Website: www.britsoc.co.uk

they could withdraw consent after the interview and were given a timeframe to do so. This deadline for withdrawal was set for the date that the interview transcripts were to be anonymised - so withdrawal after this process could not be guaranteed.

6.7.2. Confidentiality and anonymity

Maintaining confidentiality is a fundamental aspect of qualitative research and is an important ethical consideration in all sociological research (British Sociological Association, 2020). In this study, it was made clear to research participants that their anonymity would be protected both in the thesis and in any publications arising from the research. Participants were informed that they would be given a research participant number so that they cannot be identified. Similarly, the researcher has taken care on social media sites such as Twitter and Facebook not to mention who is being interviewed or the geographical location of interviews, for fear of inadvertently breaching participant confidentiality by allowing people to make inferences about where the researcher is and what science festival figurehead is being interviewed.

On one occasion, a participant had revealed on social media that they had taken part in the research and indeed had written a blog post about their experience and thoughts about the interview. Although the researcher was wary of acknowledging this (by commenting liking or retweeting the post), it was concluded that it was the participant themself who decided to waive their anonymity and that consequently, no harm could be brought to the participant by positively responding to their social media posts.

The researcher remains committed and concerned about any deductive disclosure that could occur either in this thesis or in any publication that may arise from this thesis. Deductive disclosure could occur when otherwise anonymous discussions can be identified by others within the community (Sieber, 1992). For example, Ellis (1995) describes how her previous ethnographic study (Ellis, 1986) of a small community had led to problems in that community after the publication of the study. Ellis (1986) had

anonymised participants' names but inferences could easily be made by the community about who the research participants were. As the science festival community is relatively small in the UK, the researcher is aware of the need to prevent any inadvertent breach of confidentiality which could lead to a breakdown in trust between the science festival community and researchers in future research studies.

6.7.3. Interviewing friends

Before embarking upon this doctoral study, the researcher worked with a large well-known science festival in the UK. In this role, he worked as part of the festival's creative team, responsible for creating, producing and curating the science festival, and the researcher has since rejoined the organisation throughout his doctoral studies in various freelance capacities. Since leaving this role, a number of former colleagues - including a close friend and a former flatmate - have also left the organisation in order to establish their own science festivals and/or take up directorships of other science festivals. Consequently, two of them were included in this study in their current capacities as figureheads of UK science festivals. Interviewing friends and acquaintances within the social sciences is addressed by Blichfeldt & Heldbjerg (2011) who highlight some criticisms of interviewing friends such as the researcher being uncritical to the participant. Feyerabend (1979) points out that social researchers should not be bogged down in the technicalities of research methodology and should instead exercise freedom and their own moral judgement in their research approach. Gummesson (2003) articulates that social scientific research is about maximising the volume of data collected and that researchers are best-placed to make decisions about what data to collect, and from whom. In this instance, as the sample size of science festivals in the UK is small (indeed, only limited to around 60 festivals), the researcher wanted to generate data from new, less-well established festivals and interviewing friends provided the limited opportunity to do so. In this respect, there was no way of avoiding interviewing people who the researcher considered friends, but rather than for this to introduce bias into the findings, it was concluded that this enabled the data collection to be more honestly received, as interviewees were already in positions of trust with the researcher. In this respect, the approach has some resemblance to techniques of

ethnographic research where close relationships may be established in the process of data gathering.

6.8. Validity, reliability and generalisability

Qualitative research is influenced by those who conduct the research and those around them (Denscombe, 2014). A qualitative researcher cannot fully put aside personal ideas and assumptions regarding the topic they are researching (Denscombe, 2014). Within the social sciences, reliability refers to the consistency of the results and the truthful representation of the people under study (Golafshani, 2003). Due to the subjective nature (and underlying interpretive philosophical stance) of qualitative research, there may be doubts about the reliability of the data and the theories that are created as a result of the research (Denscombe, 2014). The concept of reliability refers to whether a certain methodological technique would produce the same results each time the topic is studied (Jennings, 2001). This thesis produces data, the reliability of which is secured by the in-depth nature of the study and from the researcher's honesty about his values, biases and underlying assumptions about the social world of science festivals which he is studying. Following guidance from Marczyk et al. (2005), the researcher familiarised himself with the data collection methods and analysis process beforehand and ensured that interview transcripts were accurate. This was achieved by listening to the audio file and reading the transcript word-for-word at the same time to ensure accuracy. This also served as a tool to help the researcher familiarise himself even further with the data. The findings of this study are based on systematic and logical methodological processes, and therefore they are reliable, replicable and trustworthy (Sarantakos, 1998).

The validity of a study indicates that the data, the process, and the tools used are appropriate (Leung, 2015). Validity refers to the quality and merit of a research study (Gilner and Morgan, 2000) and the production of accurate and valid conclusions (Adams et al., 2014). In this thesis, theory is constructed based on interviews with

science festival figureheads. As such, in order to fully understand management perspectives of science festivals, it is arguably the most valid source of data, as the science festival figureheads are best placed to provide truths about their own experiences with festivals in which they lead. Arguably, if the same interviews were conducted with any other stakeholder - such as audiences, freelance science communicators or junior science festival staff - then the data would be less valid. As findings in this study come from science festival figureheads themselves, then the findings are credible and transferable research results, leading to enhanced levels of validity (Crang and Cook, 2007).

Generalisability in qualitative research refers to what length the findings of a research can be enforced to other frameworks in which they were initially tested (Leung, 2015). Generalisability is important for all forms of research, but especially important for qualitative research (Smith et al., 2017). It is important within all research studies to produce generalisable data that explain "the same or similar phenomenon at all times and in all places without necessarily having to study it directly at all times and in all places" (Adams et al., 2014, p. 253). It is proposed that aspects of the findings of this thesis are generalisable to science festivals outside the UK. Although this study was conducted only amongst science festival figureheads from the UK, aspects of the findings are to an extent applicable to science festivals in other countries, demonstrating solid levels of generalisability, particularly around business models (Adams et al., 2014). However, as knowledge itself is socially constructed, then there are aspects of the thesis that will not be generalisable to other science festivals in different geographies and cultures and that is an accepted limitation of this study. Excerpts from interviews are provided in the following chapters in order to clearly demonstrate that interpretations of data are transparent and consistent (Noble & Smith, 2015).

6.9. Thematic analysis

There are a number of techniques that qualitative researchers can use in order to make sense of their data, including content analysis, grounded theory (Glaser & Strauss, 1967), content analysis, discourse analysis, and thematic analysis (Braun & Clarke, 2006). For this thesis, thematic analysis was chosen as the methodological approach to data analysis, as it is well-suited to "identifying, analysing, and reporting patterns (themes) within data" (Braun & Clarke, 2006, p.6). The process of thematic analysis is a messy one and there is no agreement on what it is or how a researcher should do it (e.g. Tuckett, 2005; Boyatzis, 2009). Rather, thematic analysis is something that is done a lot, but which varies considerably. In this respect, there is no uniform approach to such analyses, unlike that used in grounded theory or narrative analysis (Braun & Clarke, 2006). Indeed, there are many studies published in the academic literature where the authors claim they use a different approach to data analysis instead of being open about using thematic analysis (Braun & Clarke, 2006). This suggests that thematic analysis can be a relatively haphazard approach to research, but there are some guiding principles offered by researchers to ensure the process is rigorous and effective. Notably, Braun & Clark (2006) describes 6 phases to thematic analysis, which provided guidance for this study:

1. **Familiarising with the data.** In this phase, the researcher transcribes the data, reads and re-reads the transcripts and notes down initial ideas and thoughts about the data;

2. **Generation of initial codes.** In this phase, the researcher codes interesting features of the data in a systematic fashion, across the entire dataset that has been collected. The researcher collects data that are relevant to each of the potential themes;

3. **Search for themes.** Codes are collated into potential themes and all relevant data is gathered for each potential theme;

4. **Review the themes.** Here, the researcher checks to see if the themes work in relation to the codes and check that the themes work in relation to the entire dataset. The researcher must review all the data to search for additional themes.

5. **Define and name the themes.** The penultimate phase is continued analysis to refine the specifics of each theme and the overall story or theory being created. In this penultimate phase, the researcher generates clear definitions and names for each theme.

6. **Produce the report.** This is the final phase and requires the researcher to select the most compelling examples and extracts from the data. These final samples (or quotes) are analysed to ensure that they reinforce the themes and the theory being produced. The researcher links back the analysis and the theory created back to the original research question, aim and objectives of the study and previous literature reviewed, to discuss how the new theory is original in its contribution to knowledge.

Phase 3 of the Braun & Clarke (2006) framework deals with the search for themes. There is a tendency within the literature to discuss the emergence of themes, but this in itself is a controversial notion (Ely et al., 1997). Taylor & Ussher (2001) argue that it is improper to discuss themes emerging or themes being discovered. They argue that using such language is to represent the process of data analysis as being passive, and say that it downplays the role of the researcher in actively identifying the patterns and themes, which the researcher constructs from the data (Taylor & Ussher, 2001). Furthermore, by saying that themes emerge can be "misinterpreted to mean that themes 'reside' within the data" (Ely et al., 1997, p.205). The reality is that "if themes 'reside' anywhere, they reside in our heads from our thinking about our data and creating links as we understand them" (Ely et al., 1997, p.205).

In this thesis, the thematic analysis framework proposed by Braun & Clarke (2006) was employed for the purposes of data analysis. The themes that were constructed from the data are reported and discussed in Chapter 7.

6.10. Summary

This chapter outlines the methodological approaches taken in this study. The methodological decisions taken by the researcher are presented and justified. A discussion of the merits and limitations of qualitative and quantitative methods are presented, with a justification to take a qualitative approach. The choice of conducting semi-structured interviews face-to-face and over Skype are presented, with detailed discussions highlighting how and why these choices were made by the researcher. Consideration is given to the ethical dimensions of this researcher, and discussions are presented on how the researcher navigated ethical dilemmas that were presented at various points throughout the research journey. The choice of thematic analysis as the tool for data analysis is presented and discussed. The themes and codes that resulted from the thematic analysis are discussed in the following chapters.

Chapter 7: Results and Discussion

7.1. Introduction

Storytelling is of paramount significance for social scientific research (Gough, 2008). Indeed, the world we inhabit can be understood as a composition of stories, a notion which is applicable across the natural sciences, social sciences, arts and humanities (Gough, 2008).

> If a story is central to human meaning why, in the research world, is there not more storytelling?
>
> Lewis (2011)

Scientific knowledge is in itself a story, and the idea that the universe is made of atoms is in itself a story (Gough, 2008). Claims of truth within biological sciences are themselves stories, with organisms and cells being key actors within the stories and their live performances under scrutiny by scientists being transferred into scientific truths or knowledge (Haraway, 1989). Social researchers present and discuss research findings as stories, or as a narrative about research enquiry (Ellingson, 2009). These stories themselves reflect how the research was conducted and the cultural setting in which the research took place (Ellingson, 2009).

In keeping with such ideas, this research study is based on an interpretative philosophical worldview, whereby the discussions in the semi-structured interviews embody the values and beliefs of not only the individual, but of the organisation in which they are figureheads. Indeed, within qualitative research, the researcher is a key actor within the story (Ellingson, 2009). In this chapter, the stories told by research participants are presented. Semi-structured interviews with research participants were recorded and those audio recordings of the interviews were manually transcribed, resulting in over a quarter of a million words available for data analysis. This chapter

discusses the data that was generated in the 27 interviews conducted and the themes - or rather, stories - that were co-constructed by both the researcher and the participants.

Importantly, there is a lack of agreed guidelines for writing up findings of qualitative research (Caan, 2001). Indeed, the endless variations on how qualitative researchers write up and present their results lead to flexible approaches that provide logical findings based on quotes (Guest et al., 2012). One of the major problems in qualitative social research is not finding data, but getting rid of data (Wolcott, 2002). Through the data analysis process, this chapter is able to synthesise the quarter of a million words manually transcribed in 27 separate interviews into a story that draws out the major themes and uses data to tell the story of science festivals from the viewpoint of science festival figureheads.

As with many forms of qualitative research from an interpretative philosophical viewpoint, practical insights are discussed as lessons for practitioners, which in this case are the research participants themselves (Ellingson, 2009). This chapter contains many quotes from research participants, and in some cases extended quotes from research participants who can be viewed as actors within the story (Ellingson, 2009). These extended quotes help construct stories and nuanced portrayals of particular contexts in which science festivals are being discussed. Qualitative researchers have an obligation to ensure that the write-up of their findings are lively and thought-provoking and as such, the most illuminating quotes from research participants are used in this chapter (Padgett, 2012).

The focus of this findings section is on quotes from interview data, but this does not detract from the insights generated by the literature review. Rather, the focus on quotes allows a story to be told that emerges from the process of co-construction between the research participants and the researcher. The quotes - and thus the story - being told in this chapter provides the evidence for the theoretical framework being produced as a result of this research study (Guest et al., 2012).

7.2. Models of science festivals

This thesis proposes a theoretical model that helps us understand the diversity of science festivals that exist. This is an original contribution to knowledge, as categorising science festivals in such a way has never been achieved before. Furthermore, this theoretical model is important in that it will help science festival figureheads to understand the diversity of the sector and help them to develop strategically, by taking a more considered approach to fundraising, business development and being able to recognise that science festivals differ significantly from each other, so thus it is perfectly acceptable to have aims and objectives that differ from other such festivals. This theoretical framework may even lead to increased cooperation (and reduced competition) between science festivals by allowing science festival figureheads to clearly see how some festivals that they currently see as competitors are actually totally different organisations.

The theoretical model proposed in this thesis - hereinafter referred to as the four realms of science festival - proposes that there are four broad realms of science festival: corporate science festivals; community science festivals; public engagement with research festivals; and music or art festivals with science (Figure 7.1).
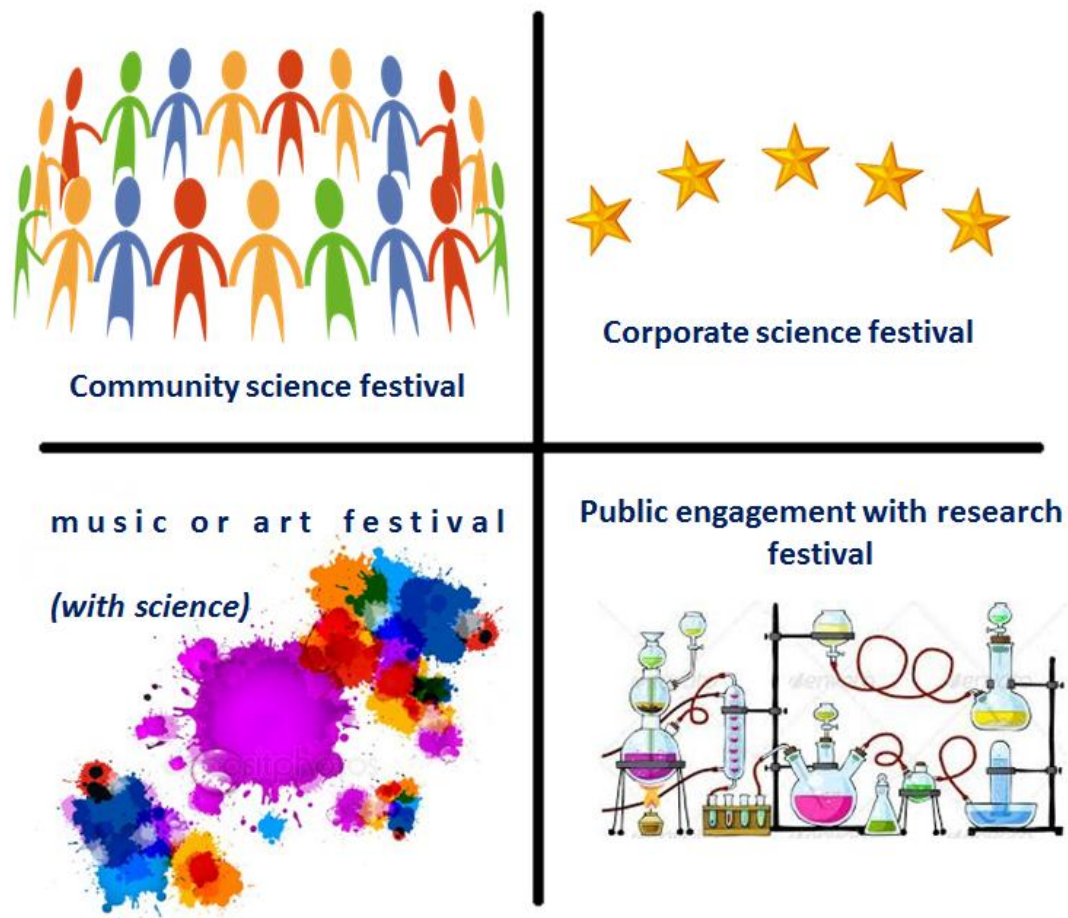
Figure 7.1: The four realms of science festival: community; corporate; public engagement with research; and music/art festivals with science

Some science festivals fall very clearly into their respective realm. However, this model does not suggest that science festivals are easily placed in just one of these realms. Instead, festivals may transcend realms over time, and may move from one realm to another. Furthermore, some festivals may contain elements of two or more realms of science festivals. This does not disprove the theoretical model; rather, it demonstrates that science festivals are unique and indeed utilise elements of each of the realms (Figure 7.2).
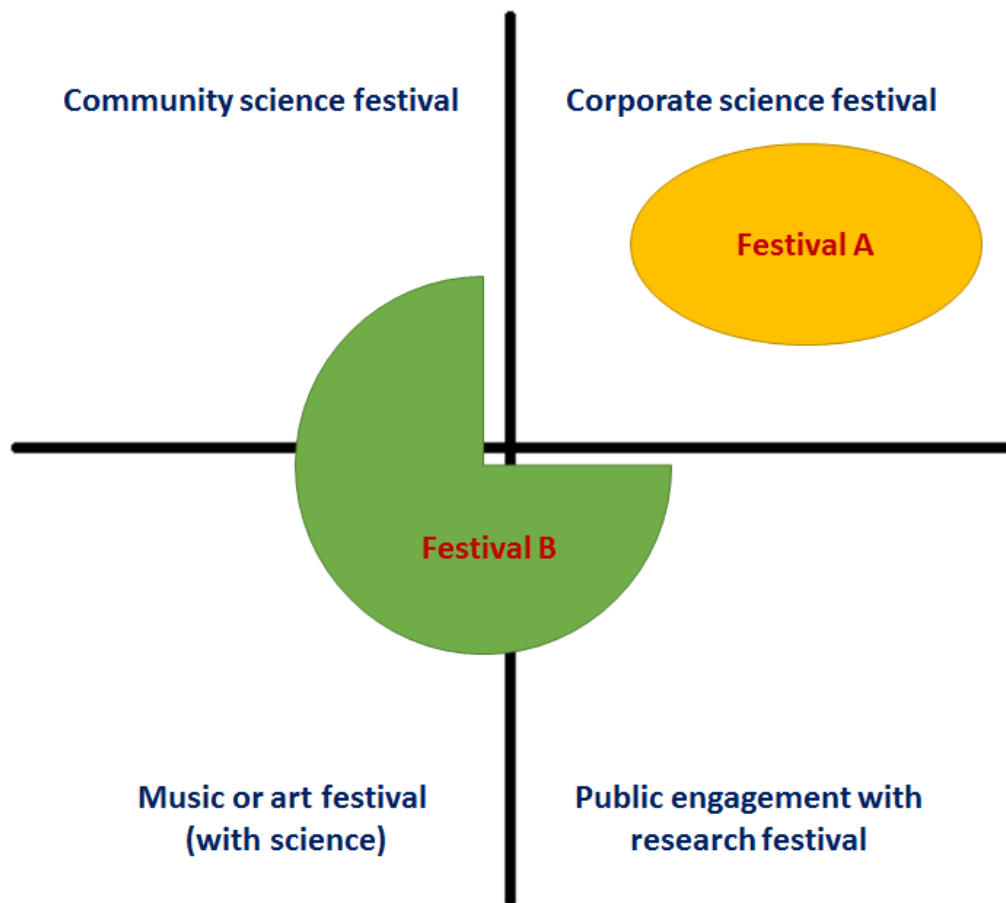
Figure 7.2: Science festivals applied to the four realms. Festival 'A' clearly fits into one realm whereas festival 'B' spans three out of the four realms of science festival

Each of the four realms of science festivals are discussed further below, exploring what makes a festival fit into the realm.

7.2.1. Corporate science festivals

Corporate science festivals are unique to other realms of science festivals, in the sense that they are run as corporate entities. These science festival figureheads are strongly focused on the strategic leadership of the festival; whereas in other realms of science

festival, festival figureheads are focused on the operational management and delivery of the festival. Participant 8 spoke about these science festivals as having "prestige":

> I would call them prestige. Because that's how they would class themselves and I would class them. It's like being in a five-star hotel or something. You're not going to reach everyone with a five-star hotel. Right?

Participant 8

The use of the five-star hotel analogy by Participant 8 to refer to corporate science festivals is interesting and valid. By exploring this analogy further, specifically the use of the phrase: "You're not going to reach everyone with a five-star hotel", one can use this analogy to further understand the advantages and disadvantages of being a visitor to such a science festival. Of course, a five-star hotel has prestige and visitors can expect a high level of quality in terms of content and service, but not everyone would feel comfortable about going to a five-star hotel. For a start, it is probably going to be more expensive than other hotels, and secondly, people who are not used to five-star hotels might feel out of place. They might feel that they are not welcome by the staff, and might feel intimidated by other guests, who one might presume has a high economic capital and thinks nothing of splashing out money to stay in a five-star hotel. So, applying this analogy to corporate science festivals is useful in helping us understand accessibility issues about who feels comfortable attending such a science festival.

Furthermore, the use of the word "prestige" by Participant 8 is interesting and has caused much reflection on the part of the researcher. Originally, this realm of science festivals had been named 'prestigious science festivals' but it was felt that this title did not get to the roots of why other science festival figureheads saw these science festivals as 'prestigious'. Through data analysis, it became clear that science festivals were seen to be prestigious by other science festival figureheads because of the corporate nature of the organisation. In particular, the quality control and curation of festival content was

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highlighted as something that corporate science festivals do particularly well. Indeed, a figurehead of a corporate science festival identified that taking a strategic decision "to go from being an inclusive festival to an exclusive festival" was a turning point in the development of the festival:

> It was getting too big for the number of people that were here, so mistakes were made. But one of the main things was we recognised we needed to go from being an inclusive festival to an exclusive festival. By that I mean a curated festival.

> Participant 22

When participant 22 was pressed further on why they took the decision to go from being an inclusive festival to an exclusive festival, they gave the following response:

> There were two really strong reasons for doing that. One was to guarantee to the visitor that there was a certain level of quality around what was being offered, because in the early couple of years it was extremely patchy. There were some awful things in the festival and some stunningly brilliant things. And we had to guarantee the same for sponsors as well, because from the outset we needed commercial money, and you can't have a festival that's got gash in it because you're trying to ask a commercial sponsor to support you.

> Participant 22

This reinforces the idea that corporate science festivals become 'corporate' because of the quality control processes around curating content. Interestingly, this quote also highlights the vital importance of sponsorship and the generation of commercial income to corporate science festivals. Participant 22 points out that corporate sponsors demand high-quality content and I propose that corporate sponsors have a greater role in corporate science festivals than the other three realms of science festivals. This is because quality is seen to be guaranteed within corporate science festivals. Ultimately, what sets corporate science festivals apart from the other realms of science festivals is that they have adopted a strategic approach to event creation, as described by Crowther (2014). Crowther (2014, p.4) discusses a shifting landscape within the festival

sector in which festival figureheads have adopted "both a mindset and management approach" to the creation and curation of festivals. Arguably, corporate science festivals have adopted many of the principles of strategic event creation as described by Crowther (2014). Firstly, corporate science festivals are indeed stakeholder-centric, rather than attendee-centric. Corporate science festivals see investors as key stakeholders, and although there is no suggestion that sponsors influence the programme directly, corporate science festival curators may indeed purposely design the experience to suit the needs of the investor. Indeed, corporate science festivals adopt a strategic persona. Crowther (2014) discusses this strategic persona as being removed from the lower grade identity that sometimes often prevails in other types of festivals. Corporate science festival figureheads are focused on the strategy of the science festival, but are not bogged down by operationally delivering the festival - a luxury in which science festival figureheads in the other three realms generally do not have.

Corporate science festival figureheads not only spoke about the exclusivity of their content setting them apart from other science festivals, but they were keen to emphasise the boldness, creativity and ambition within their content:

> So, I think that, for me, it was really important that the festival started really developing a programme that truly reflected the vision of the festival to be the most bold, the most ambitious and the most creative science festival in the UK.
>
> Participant 25

Corporate science festival figureheads spoke of having a curator of content: a person within the organisation solely responsible for controlling the quality of content within the festival:

> I think that, for me, the role of the curator is mainly focussed on the programme and it's about selecting, or developing or selecting. We can

talk about how we programme the programme for the festival a bit later, but in terms of the curator, for me, it was about developing, you know, the right experiences for us but selecting those experiences that they really made the vision for [corporate science festival].

Participant 25

Indeed, this curator can be viewed as a gatekeeper to the festival. The curator may have had a different job title, but the function of the role is to ensure exclusivity. As a corporate science festival is exclusive rather than inclusive, then understandably this causes tensions between actors who would like to deliver content within the festival and the corporate science festival. On making a strategic decision to become a corporate science festival, and taking exclusive control over the content of the festival, Participant 22 said:

We had decided that we needed to be quite tough on what the entry criteria were, so that required a little bit of delicate management, because at that stage, universities felt a certain entitlement to be in the festival. They knew they were the people that knew about science. This was their domain, and we were just sort of helping out, whereas we tried to say, "Well, actually, it turns out quite a lot we are rapidly learning about communication and ways of doing it well", and they naturally felt, "we might be a bit better than you at telling what's good and what's not so good, so we're actually going to be the judge."

Participant 22

This highlights a tension between corporate science festivals and university researchers, or more specifically - those who manage and coordinate public engagement activities on behalf of the researchers. For corporate science festivals, it is simply not good enough for researchers to deliver activities that are not bold enough or cutting-edge enough. Participant 23 highlights the competitive nature of university research groups securing a place at their corporate science festival:

We have exhibits from research groups, and some from industry, and lots of collaborations from groups all across the country. So, they're selected in a competitive process, that is reviewed here. We're looking for whether their science is cutting edge, whether it's relevant to the public, and whether they've got some good ideas for hands-on activities and how to actually communicate that to the public.

Participant 23

This tension between corporate science festivals and university researchers (albeit those who did get through the screening stages and were allowed to participate in the corporate science festival) was highlighted by Participant 1:

And I think there's a real feeling amongst a lot of researchers that they feel taken advantage of [at corporate science festivals], not well treated, not well looked after, exploited, and in some cases in particularly with commercial companies when they charge such huge sums, they kind of go, "Aye you're taking the piss." I worry for [corporate science festival] that that could turn around and bite them in the near future, particularly if their funding's getting tight, and they're even more reliant on ... and I know there's always tension in venues and stuff that happens there and stuff that goes wrong. Yeah, so that kind of worries me a little bit because, obviously, [corporate science festival] is so important. And it needs to be leading the way, you know like a flagship. So I think it's making sure that these festivals that are so reliant on researchers from universities and from commercial companies don't forget that they're also volunteering their time.

Participant 1

Participant 1 was keen to highlight that university researchers taking part in science festivals are generally volunteering their time and are not paid extra for giving up their time to deliver activities at science festivals. Participant 1 went on to discuss the quantity of content taking place within corporate science festivals:

I wouldn't say it's too much, but it's such a huge program. It's a little overwhelming, a little intimidating.

<div align="right">Participant 1</div>

This links back to Participant 8's analogy that a corporate science festival is "a bit like a five-star hotel." Participant 1 has reinforced that a corporate science festival can be seen as intimidating, and part of this is because of the vast amount of high-quality content within the festival.

Corporate science festival figureheads spoke about their business skills in learning how to persuade organisations to financially support their festival:

> The commercial sponsorship has always been a really big part of what we do, so there was a whole bunch of learning to be done there about how to persuade people to give you serious money for this sort of activity. The reasons for giving have changed a bit over the years. I don't think many people much care these days about the science and society agenda. It's the skills agenda now. It's the inspiring-young-people agenda.

<div align="right">Participant 22</div>

This business acumen, and running of the science festival as a corporate entity sets the corporate science festival apart from figureheads of science festivals within the other realms. This was further highlighted by Participant 22, who went on to say that their focus on business development and sponsorship allowed them to develop more targeted marketing campaigns, and this further set them apart from other science festivals. On discussing corporate science festivals, Participant 22 said:

> We all go about life slightly differently. We're all doing slightly different things, which is fine. It's nice. Yeah, I suppose the three big ones probably behave differently from the majority of the science festivals, the smaller ones, because we've got more resources and we commission things. We've got money. We've got funding. So we have much more concerted marketing campaigns and all that sort of stuff, and we can afford to do

things that would probably raise more money as well, so we're able to do things in a different way.

Participant 22

Attending corporate science festivals is something that is useful for figureheads of science festivals in other realms, in terms of generating ideas for their own festival and for networking with performers and presenters. On attending a corporate science festival, Participant 16 said:

> Being able to see how big science festivals run and getting ideas from that and the network opportunities. You know, sitting in their green room being able just, you know, go and grab people and get their contact details is a really useful way to find content.

Participant 16

Notwithstanding, some figureheads of science festivals outside the corporate science festival realm did not aspire to produce and/or curate the content delivered at a corporate science festival:

> Because the big festivals, of course, it's such a different thing. You feel, sometimes, okay, what have I got in common with [corporate science festival]? Literally nothing. We want different things, we do different things, and if they are there as a standard, it's not the standard to which I work. It's not the standard of what I want to achieve. It's a completely different thing.

Participant 15

This further highlights the need for the theoretical framework - the four realms of science festival - as this framework proposes that science festivals in different realms are so different from each other in terms of strategy, delivery and ambition. Thus, the theoretical framework will reduce unnecessary competitiveness between science festivals, and allow them to better focus on best serving their own audiences and

communities by focusing on their own unique aim and objectives and being true to their own values.

7.2.2. Community science festivals

Community science festivals operate within a different realm from corporate science festivals, and have identified themselves as being in a different (but importantly, not a subordinate) league from corporate science festivals. Indeed, the term 'community science festival' arose from the research participants themselves:

> You know, we are just in a completely different league to them [corporate science festivals]. But we felt there was a lot of what they do that we could cherry pick from and do on a smaller scale. And for us, that [local town] root, that being a community science festival that's grown out of a community initiative, very much a grassroots thing, is terribly, terribly important. So a big part of it is always showcasing research and stuff that's happening with people who live locally.

> Participant 1

Community science festivals strongly identify as being in the service of the grassroots within our society, generally set up by local people to support and enrich local communities. The motivations for setting up community science festivals derives from philanthropic interests, rather than entrepreneurial motivations, as discussed by Participant 18:

> I feel obliged to carry on because this is my local area, I was born and bred in [location]. I missed out on all of these sorts of things I'm trying to implement in here. And, I think it's just vital and I want kids from this area to be something to do something and to bring back that to the community.

> Participant 18

Community science festivals appear to be value-driven rather than revenue-driven. Engaging grassroot communities and giving back to society are common themes that

community science festival figureheads speak about. Participant 1 highlighted how important the grassroots element to the science festival is, and this was further supported by Participant 24. Participant 24 pointed out that they did not want their community science festival affiliated with a corporate science festival, and highlighted that in their business model, the festival is locally run and completely staffed by volunteers:

> We're a local festival for the hippy community. That's liberal, because actually, we have a number of big cities around. We're locally run. We don't want to get caught up in the juggernaut of the bigger festivals. We haven't affiliated with them deliberately, because we need to be able to do it in our own way, because the whole thing is run by volunteers.
>
> Participant 24

Participant 24 states that their festival is created for the local "hippy community" and this highlights the primary importance of local communities for community science festivals. Indeed, for community science festivals, local communities are primary stakeholders, whereas for corporate science festivals, local communities fall into the category of secondary stakeholders. Primary stakeholders are voluntary stakeholders and hold a degree of power over the festival, whereas secondary, or involuntary, stakeholders may have reduced levels of power and are thus dealt by the festival with lower urgency than primary stakeholders (Richards & Palmer, 2010).

Community science festivals provide a platform for communities to create connections between each other including local businesses to connect with each other and help develop a sense of placemaking. Participant 15 highlighted that a community science festival is a good way to connect with local businesses:

> We live very much in the community, in the environment. And so, having a community festival seemed just a really good way to connect more with small local businesses.

<div align="right">Participant 15</div>

Place is at the heart of community science festivals, but place is more than a specific location (Andrews & Leopold, 2013). There are other ways to interpret what place means, rather than only considering it as a geographic location. Places are constructed through meanings that retain and encourage social relationships and create memories (Andrews & Leopold, 2013). Indeed, the meanings of festivals and events are created through shared practices and understandings within a place (Crouch, 1999). Community science festivals develop relationships with local businesses and provide opportunities for local businesses to contribute to events within the science festival:

> So, a lot of festival events come out of working with other partners, rather than getting the best speakers in. It's about finding someone from the local fish shop to do something, or from the gardening club. Or the girl guides.

<div align="right">Participant 15</div>

Unlike corporate science festivals which practice exclusivity in the curation of their programme, community science festivals actively seek out local businesses and work with them to help them produce events. In terms of curation of festival content, it is clear that community science festivals practice inclusivity. This inclusivity is demonstrated through community science festivals reaching out to local businesses to help them co-produce festival content, rather than focusing on ensuring only high quality content is included within the festival programme:

> I sat down with people from the cinema, from the outdoor communities, from the schools, from everywhere, and said, "Fancy being part of this?" And "What do you see you could contribute?"

<div align="right">Participant 15</div>

Working with local businesses and encouraging them to participate in the community science festival without paying them to do so, can be framed as an opportunity for business development and engaging with local consumers of their products or services:

> We try and get businesses and other groups to do this either for free, or for their own training purposes, and for their own needs. And so, we've been very lucky that this philosophy of making it a community festival keeps the costs hugely down.

<div align="right">Participant 15</div>

The philosophy of community science festivals that Participant 15 discusses can be unpicked by exploring belonging and identity associated with geographic communities. A sense of belonging is created by community science festivals and this sense is linked to our values and is shaped by our identity (Yuval-Davis, 2006). Often, we express and perform our identity (or identities) by joining communities, and festivals do play a part in this. It has, however, not escaped our attention that some people are excluded from festivals - and community science festivals are no exception to this - through their own choice or that of the community. Excluded persons will of course have alternative interpretations of both belonging and identity in the context of their geographical community (Yuval-Davis, 2006).

It is worth noting that many science festivals that fall into the community science festival realm are geographically located outside of cities and large towns, although this is not always the case. I have found that community science festivals generally occur in places where a community is geographically isolated from major science research centres and universities. Participant 11 discusses the geographical isolation in detail:

> We had to build a home market in [geographical location] of a total of [population size] people. Also, we had to do it at a big, big distance from the sources of University lecturers, hands-on demonstrations, equipment, all these different things. Right from the start, we were very, very focused on visitor numbers and numbers generally.

<div align="right">Participant 11</div>

This reveals how community science festivals have had to adopt a different approach to corporate science festivals (the latter of which are generally located in cities and large towns) when producing and curating content within their festival. Participant 11 highlights the importance of quantity of audience engagement - as opposed to quality of engagement. On the topic of audiences, community science festivals are keen to highlight that their audiences are different from that are corporate science festivals, due to geographical isolation:

> This is a community that has no university, so you don't have the normal, probably the average, science festival audience here. So it's quite a different audience.

> Participant 15

On a number of occasions, community science festival figureheads were keen to state how their festival operated in isolation from academia and this seemed to be something that many participants were proud of:

> We live here in a part of the world which is very different to a normal university in the city kind of environment, where you can live much more in your own circle in a city, where probably all your friends would be associated with academia, or the university. From different disciplines, but there is a world in its own right. We don't have that here. Thankfully. Praise the Lord [laughs].

> Participant 15

Without academics and researchers in close geographic proximity, this of course begs the question about who delivers content within the community science festival? Curating content within science festivals is something that is discussed later in this thesis, but within community science festival, there is a reliance on parents and carers to volunteer time to create activities, in addition to using professional science communicators as opposed to research scientists:

So we thought we'll set up a science festival, and we will make it a mixture of activities delivered by working parents, and then we'll bring in like professional science communicators as well. But by having a high proportion of it being working parents, kids can say, "Oh, that's so-and-so's mum or so-and-so's dad." Then that demystifies and it makes kids aware that anybody that they know can be a scientist and they can be doing something really cool. And the idea is you could live in [location] and do some really cool stuff, and that's all good. So that was how we started.

Participant 1

The close-knit nature of local communities is both a blessing and a curse for community science festivals. As Participant 1 pointed out, being able to rely on locals to provide content is a blessing, but this makes it difficult to reach new audiences, especially when doing so is a priority for the festival:

And when I come into a room and I know half the people in the room, I know that I've not really reached any new audiences. I'm just providing some entertainment for existing audiences. I'm not going to achieve any shifting of attitudes and awareness.

Participant 15

Providing events for those already engaged with the community science festival, and science in general, is important; however, many community science festival figureheads highlighted the importance of working with community groups to engage audiences that are not engaging with the community science festival:

The events were more kind of the science behind food and cocktails and that kind of thing, we perhaps engaged people who were already engaged with science. So over the years now, we've developed them so they're more community led and the focus of them is to engage hard to reach audiences.

Participant 26

Some community science festivals have not always been in this realm. Indeed, the theoretical framework proposed in this thesis, articulates that festivals transcend realms and evolve over time. Participant 8 discusses their festival which was a public engagement with research festival before becoming a community science festival. Fundamental to this shift in realm, is the ownership of the festival. It is clear that local communities (as opposed to universities) have a sense of ownership over community science festivals:

> Such a level of anarchy here, that most of the people don't know what I'm doing, where I'm doing it, how I'm doing it. I tell them. I'm not keeping anything a secret. I don't know if they remember. They certainly never question it. They did say a few years ago, "You really need to get your finances out of the University." I was like, "Yeah, you're right." And we did because at one point all of our finances were internal. Starting a bank account can be quite difficult but then we did that and that was all fine. Do they feel a level of ownership? I don't know. Don't know, don't know. The people who are involved feel a level of ownership.

Participant 8

Community science festivals play a significant role in the lives of ordinary citizens. This thesis argues that community science festivals help create meaning of place, and that like other festivals, they allow the rediscovery and expansion of local social life (Harcup, 2000). By shaping social experiences in local places, community science festivals continue to create new channels for social engagement, which provides opportunities to enrich identity and build social bonds (Stevens & Shin, 2012). Community science festivals are critical success factors for place-making. By this, I mean that such festivals have a vital role in creating distinctiveness. Richards & Palmer (2010) discuss how the creation of festival communities, festival atmospheres and relevant festival spaces are important in creating a sense of pride and enhancing place-making. It is clear that community science festivals have an important role in bringing communities, businesses and individuals together to further enhance the social and educational life of the place, not to mention an important cultural role to play.

7.2.3. Public engagement with research festivals

The next realm of science festivals are public engagement with research festivals, and such festivals are firmly embedded within universities, research institutes and/or learned societies. The naming of this realm of science festivals comes from research participants themselves:

> It's very firmly a public engagement with research festival. I said already about it being a pop-up festival, it's smaller than many, it's a one day festival. First year we did two days, but we decided now to stick to one day; aimed at as broad an audience we can get. And based very firmly in practical hands on public engagement activities rather than lectures, because it's basically a one day. So, it's probably quite like the family day that many festivals have as part of a bigger festival, but it's that bit that we concentrate on.
>
> Participant 2

Participant 2 highlights that public engagement with research festivals generally occur across a shorter time frame than science festivals from other realms. Participant 2 is figurehead of a 1-day festival, whereas festivals from other realms of science festival - particularly corporate science festivals - can last much longer, sometimes up to 10 days or more. Public engagement with research festivals tend to come in the guise of doors-open days or open weekends. One of the primary objectives of public engagement with research festivals is to provide researchers with a platform for engagement. This is a theme that came through strongly in interviews with figureheads of public engagement with research festivals:

> So the primary focus of my science festival has always been to work with researchers to give them a platform for engagement.
>
> Participant 2

It's a whole weekend, where we open up the university as much as we can to members of the public, and give our community of academics and researchers and students a platform to discuss their work and what actually goes on here 365 days of the year, with members of the public.

Participant 7

On dissecting what research participants meant when they said that their public engagement with research festival provided a 'platform' for engagement, participants discussed the importance of researchers from their institutions being able to have conversations with members of the public who attended their festival:

Let's put scientists and researchers who are at the cutting edge of their field, in a space where they can have conversations with members of the public.

Participant 14

This reinforces the definition of public engagement with research provided by Borchelt & Hudson (2008) who argue that public engagement is about regular day-to-day dialogue rather than a one-way flow of information that is commonly seen in science communication events.

Importantly, public engagement with research festivals set out not only to educate the public and to engage them with research going on inside universities. Rather, this research has identified that there is a strong focus on a substantive rationale for public engagement with research (Delgado et al., 2010) in the sense that researchers are encouraged to engage in such festivals in order to enhance scientific outputs. Participant 7 highlights that public engagement with research festivals benefit the public as much as the researchers:

It also, the festival, we see it as giving a platform, which is a benefit for our researchers as much as the public, it's not just an event which we think the public will come away educated. The researchers should benefit huge

amounts, and our students should benefit huge amounts. Both developing their skills, like communication and engagement skills, which are really important, but hopefully benefiting their research themselves. Especially ones which have research which has a public implication, and where greater awareness of how the public see and view their research will actually stand them in good standing as an academic, and as a researcher and trying to improve the application and implications of their research going forward.

<div align="right">Participant 7</div>

Participant 7 makes clear the value of the public engagement with research festival in developing the communication and engagement skills of the researchers, but also in terms of enhancing the quality of their research. But the motivations for producing public engagement with research festivals is about more than enhancing quality of research. Indeed, this research identifies multiple motivations, including securing future research funding:

They [researchers] recognise that research funding is linked now, increasingly to public engagement, and they need to show that they are getting their research out in a particular light, or a way. And the festival provides a nice package for them, because it takes away the need for them to recruit people, for example, because the people come to them. That has positives and negatives, it can lead to researchers maybe becoming reliant on the festival as their only forum of public engagement, and that's something we're trying to, working with the public engagement team much more than we have done in the past.

<div align="right">Participant 7</div>

It is not just public engagement teams involved in producing festivals from professional services directorates within universities, research institutes and learned societies. Indeed, widening participation teams and alumni teams are also key stakeholders in these festivals:

There is the widening participation team do the real legwork and making sure the festival happens.

<div align="right">Participant 17</div>

The public engagement team provides a lot of support because it gives them a great opportunity to do, real life evaluation and to work with very specific groups on making something a bit more two way engagement-y, rather than just ... and the alumni team obviously work with us because they, the bigger the festival is, the more alumni they can attract for their weekend.

<div align="right">Participant 7</div>

Indeed, public engagement with research festivals not only provide an opportunity to achieve objectives related to research, public engagement, widening participation and alumni relationship development, but they also provide an opportunity for universities to demonstrate their commitment to equality (particularly around women in science) and demonstrate support for equality initiatives such as Athena Swan, which is a UK-wide charter that "recognises and celebrates good practices in higher education and research institutions towards the advancement of gender equality, representation, progression and success for all (AdvanceHE, 2020):

The reason it [the public engagement with research festival] setup was the university was looking at ways in which we could communicate our support for Athena Swan. So Athena Swan, its original scope and its scope has now moved to encompass lots of different topics, like university subject areas and in general, equality, but its original focus was looking at supporting the careers of women in science.

<div align="right">Participant 10</div>

Collectively, the objectives around public engagement, widening participation, alumni relationship development, and equality initiatives highlight the strong predetermined objectives, or instrumental rationales that are discussed by Delgado et al. (2010). Notwithstanding, the theoretical model proposed does not try to suggest that all festivals within each realm of science festival are the same. Indeed, not all public engagement

with research festivals are exclusively about providing platforms for researchers to engage the public attending the festival, as highlighted by Participant 5:

> There's some more university based festivals, which I think they are a wee bit of a different feel than we have because we don't have to be all about academia really, even though we've got...that's quite a strong part of what we do.

> Participant 5

On a final point, public engagement with research festivals tend to be driven by early career researchers and researchers with young children who are keen to motivate people to get involved with research, and to get their message out there:

> Often [the public engagement with research festival] it's driven by that generation of researchers having kids, that age, so it makes sense.

> Participant 19

> So we're quite passionate about just getting across what we do and how we do science to try and motivate people and get involved in wanting to be part of the research movement. But taking on this leadership role [figurehead of public engagement with research festival] as part of the institute, it became more than that, so we wanted to help other people across the university, promote the research they were doing and get across the messages that they've got.

> Participant 27

Ultimately, public engagement with research festivals allow universities, research institutes and learned societies to perform upstream engagement, that allows social values to be debated, attitudes to be debated and gets researchers out of the laboratory to have control over their own engagement activities; unlike a corporate science festival, where a researcher will be generally given a very clear role - speaker within a debate or otherwise - by the curator of that festival. Public engagement with research festivals

allow researchers to develop skills in public engagement and allow researchers and professional services departments to achieve specific instrumental objectives, which can be linked to research funding, marketing, alumni development, widening participation and so on.

7.2.4. Music and arts festivals (with science)

Another realm of science festivals are categorised as 'music and arts festivals (with science)'. In this realm, the festival itself is not traditionally a science festival, and the emphasis is on music and/or arts, hence why I use brackets to include the word science. Science is an add-on that provides added value to the festival, but it is not the primary content focus of the festival. Festivals within this realm may be a music festival - such as Glastonbury, Reading, or Latitude - or an arts festival - such as Edinburgh Festival Fringe; perhaps even a literature festival. The commonality is that science events and activities within such festivals provide added value to the existing content. Participant 5 discusses how many music festivals are embracing such additions to their content:

> A lot of music festivals have got like really embracing it as a music festival and science festival all in one, isn't it. That's really interesting actually because that means that you are bringing people further out here for different reasons, not just science.
>
> Participant 5

Festivals within this realm tend to rely heavily on bringing in external content, so the festival figureheads of such festivals act as curators of external content, rather than producers of their own science content. I have found an enthusiasm for science festivals in the other three realms to collaborate with music and art festivals (with science) in order to promote their own festival and achieve their own objectives. Participant 15 discusses how they - a community science festival - engage with a local music festival:

We attend, as we use ... and send in my STEM and outreach activities, various of the music festivals. So, there's lots of music festivals round here, just been in contact with [town] Music Festival, who are looking at funding and what can we do for them. So, we do, often, things with music, art festivals and such ... and the thing's like science of sound of music, sound of whales, and science of singing, and so on.

<div align="right">Participant 15</div>

Attendance at music and art festivals (with science) is of particular interest to figureheads of public engagement with research festivals. Such figureheads produce and/or curate science festivals within their university, research institute and/or learned society. However, there is an appetite for some of these festivals to do more outreach, and to attend music and art festivals (with science) in order to engage with larger audiences. Participant 19 discusses the shift away from the university focusing their festival within the realm of public engagement with research festival, and onto music and art festivals (with science):

We try and attend, every year, two or three other festivals. We get invited to festivals, and to be honest, and that's one of the reasons why I'm starting not to do so much of our own festival.

<div align="right">Participant 19</div>

Music and art festivals (with science) provide an opportunity for science content providers (science communicators; university outreach; other science festivals) to achieve their objectives and to engage with wider audiences, who perhaps might not traditionally come to a science festival within the other three realms. Within this particular realm, it is science that is stumbled upon by unsuspecting audiences - audiences who are there for other reasons, be it music, art, literature and so on. Collaborations with music and art festivals (with science) is not a particular focus for corporate science festivals, as such festivals are focused on practicing exclusivity, developing and strengthening their own audiences, and developing relationships with new and existing corporate partners. Community science festivals are keen to

collaborate with music and art festivals (with science) and this enthusiasm for collaboration is driven from philanthropic and community values of developing a sense of belonging and identity for the geographic location. Notably, it is public engagement with research festivals that are most keen to collaborate and involve themselves in music and art festivals (with science) as such festivals are created and driven out of necessity for achieving specific intrinsic objectives such as engaging new audiences, promoting university brand and creating marketing value, and reaching new audiences for potential student recruitment.

It has not escaped my attention that it is the researchers themselves - not necessarily figureheads of public engagement with research festivals - that are most keen to engage with music and art festivals (with science). Of course, there will be multiple motivations for this, from trying to get their research findings out there; to inspiring people to study science subjects; but also to develop their personal brand and reputation, which may be linked to promotion criteria within universities.

7.3. Approaches to curation of content at science festivals

Festivals across the four realms of science festivals take subtly different approaches to the curation of content within their festival. When discussing different types of content included within science festivals, figureheads were keen to explain the rationale for adopting a particular approach or preferring one style of event over another. The content of each festival was closely linked to the objectives and core values of the festival itself and of the festival figurehead. On linking the content of the festival to the purpose of the science festival, Participant 15 noted that learning was not a key objective of their science festival:

> And it doesn't matter, sometimes, whether they have learned something, right? Or what they know. But it is more about shifting awareness than about improving knowledge.

<div align="right">Participant 15</div>

This highlights that the focus of the festival is not developing the public's understanding of science, as discussed by Burns et al. (2003) but rather highlights the objective of using the science festival to shape people's opinions towards science. Other research participants were also keen to highlight that the focus of their festival is not about educating the public, but rather that they saw their festival as a cultural offering. Participant 3 in particular viewed their festival as a cultural offering and was keen to stress that this was different from a science festival comprising mainly activities for children:

> So, I mean, one of the things with science is you're very well aware is always trying to position science engagement as a cultural offering. In a way that it's, you know, it's not all education, and some of it should just be an enjoyable night out, in the same way that going to the cinema or going to the theatre is, and a lot of the adult strand of the programme has always been about things like that. I know a lot of festivals do exactly the same. So, yeah, it's interesting to see a bit of a shift now. More festivals are now concentrating on the adult strands as well, and it does help to embed you in that kind of cultural offering, rather than it just being a, for the schoolkids kind of science festival.

<div align="right">Participant 3</div>

This demonstrates an enthusiasm for science festival figureheads to position their science festivals outside the educational realm of experience and into the other three realms - entertainment, aesthetic and/or escapist, as defined by Pine & Gilmore (1998). This begs the question: if science festivals are positioning themselves outside the educational realm of an experience, then where do they position themselves? Participant 25 notes that whilst some science festivals are "more traditional" in terms of their content, their festival (a corporate science festival) sets out to create experiences that ignite curiosity, positioning their festival within the escapist and entertainment realms of an experience:

> We are here to really create experiences that really ignite that curiosity in science for people. I think that there are some festivals, you know, that I

think that they take that approach as well, there are some festivals that they are more traditional, I would say, in terms of their programme.

<div align="right">Participant 25</div>

Pine & Gilmore (1998) categorise event experiences not only into the four realms, but whether participation is active or passive (Figure 2.1). Science festival figureheads set out to make the events within their festival as active in terms of participation as possible. Participant 25 discussed the rationale for this:

> Our skill as a science festival, it really needs to make sure, you know, that we create really exciting, really engaging, really participatory experiences that they are very attractive to the audience, but the scientific content, it really needs to be embedded. You know, it really needs to be part of that experience. The main reason why I say that is because, from the evidence that we have, I think that even presenting an experience as science, or even presenting an event or a festival as science, that might put some people off.

<div align="right">Participant 25</div>

It is interesting that Participant 25 notes that the scientific content within the festival needs to be embedded so much that even presenting their festival and the events within the festival as science is off-putting for some of their audience segments. Indeed, many audiences - those engaged already with science - may relish the opportunity to passively participate in festival events such as public lectures and panel discussions amongst scientists, but Participant 25 highlights that audiences who may be put-off by science prefer to actively participate in festival content rather than passively consume the content. This viewpoint was prominent across all four realms of science festival, with Participant 13 also noting the importance of active participation for audience segments who are not only disengaged with science, but find it intimidating:

So my approach is very much gonna be like, what would an average person, who may a bit intimidated by science, find interesting and appealing? And how hands on they say, is very important that stuff be interactive, very important that stuff be presented in an engaging manner that doesn't intimidate or exclude. Stuff that may be a bit different.

Participant 13

Thus, this research has identified the importance of positioning science festival events not only outside the educational realm of experience, but the importance of active participation in engaging audience segments that are not traditionally engaged with science. This can be achieved by creating unique events that bring out the creativity of science and making links to creative arts, as discussed by Participant 1:

Our subliminal message is that science is creative. And we wanted to make a strong link with the creative arts scene to sort of make that link more obvious.

Participant 1

Whereas audience segments already engaged in science, or indeed those audience segments with a high science capital may be satisfied with passive participation e.g. debates, public lectures, panel discussions; such events are not suitable for audiences with lower levels of science capital.

The way that I see that happening is that you really create a great experience. Those people who might not be interested in science might still come because of the experience, you know? Then, for us, it's about making sure that, as part of that experience, yes, there is some scientific content.

Participant 25

Developing and strengthening audience segments who are not engaged with science and indeed may have low levels of science capital came through quite strongly as a theme during interviews with science festival figureheads across all four realms of science festival. Participant 13, a figurehead of a public engagement with research festival, highlighted that they are trying to move their festival away from the 'hard science' audience:

> It [the festival] is supposed to be for, you know, for people who are like generally interested in the world rather than people who have, you know, a passionate love of physics and you know, that particular culture that's always been attached to science and hard science, which I'm very keen to kind of move away from.

> Participant 13

When science festivals programme passive immersion events, it is important that the speakers are able to connect with their audience and are passionate about their subject area. This is important for audience segments already engaged with science, and for those audience segments who are not engaged with science, and indeed are attending the festival as a night out as part of a cultural offering:

> The key for us is: you need a good speaker, but they've got to care about what they're talking about, and they've got to take the audience with them. And there are members of the public who will just turn up because they're looking for a night out, and that's great.

> Participant 20

The following sections explore data generated from the interviews around approaches to curating content within science festivals. One limitation of this study is that it was difficult for the researcher to gain access to figureheads of music or art festivals (with science) so there is a lack of data about how festivals in these realms approach content curation. This gap does, however, provide an opportunity for further research in this area, as discussed further in Chapter 8.

7.3.1. Corporate science festivals

On the topic of speakers at science festivals, corporate science festivals noted the need for festivals within this realm in particular to have high-profile speakers who are easily recognisable:

> I suppose we do want people that are recognisable and that's probably relayed backed to our funding. Unlike a university, a lot of universities will have the venues in place because they've got big holes and spaces, we don't so we have to pay for them. So we've got a huge expense to start of with, which is really trying. It's something that a lot of science festivals won't have.
>
> Participant 5

The unique requirement for corporate science festivals to have easily recognisable speakers - or big names - is important as not only a box office revenue stream, but also important in terms of gaining support from corporate sponsors, as discussed by Participant 22 when discussing various aspects of curating content within their corporate science festival:

> There's a number of approaches to curating. So what are the dimensions on the matrix? They are popularity: you want to do things that appeal to your audiences, which means you ought to understand the audiences. Not everything has to be super popular, but there's a revenue stream that comes from people buying tickets, so you have to do that. So that's popularity. Content and form, subject and form, that's important, getting the balance of that. There is the sponsor angle. When you're reliant on sponsorship, you have to programme things that people want to sponsor, so that requires you understanding what people want to sponsor and putting some of that on. Big names that grab attention. One then just goes out to be as imaginative as one can be, I suppose.
>
> Participant 22

Participant 22 again reinforces the importance of 'big names' (high-profile speakers) within corporate science festivals in terms of generating box-office revenue and in being able to agree corporate sponsorship of events as corporate sponsors want high profile events to generate media attention, as noted by Participant 14, below, a figurehead of a corporate science festival:

> And also I think, the festival went through a time where it was quite for families and a lot more explosions and comedy and fun and stuff, which is great. But that doesn't really draw a journalist because you can't come away from your desk for that, but you need to have that kind of clear, "I'm gonna get a story out of this". And that story in their newspaper is important for us and our supporters.
>
> Participant 14

As previously mentioned, corporate science festivals practice exclusivity in programming content for their festival, and will work with partners to select only the proposed events that reflect the corporate science festival's vision and ambition for their festival:

> We support the delivery of some events, but we are responsible for really assessing those proposals and really selecting those ones that we feel that they really reflect the vision for our festival.
>
> Participant 25

This is all well and good, but can be problematic when a call for proposals for external partners to contribute content for the science festival does not meet the festival's vision or perceived quality standards. Participant 22 discusses the problems in generating external partners to contribute towards their active participation activities and events, namely science workshops:

> We couldn't find enough good content, particularly in the workshop area. So we decided, or I decided, that we were just going to make some stuff, so we started creating workshops. I think that's one of those things that

helped us get good quite quickly, was having the capacity to design things that were unusual, good, but design them in such a way that you can run them non-stop for the duration of the festival.

<div align="right">Participant 22</div>

The ability to create workshops in-house by the corporate science festival proved to be key in helping the festival develop its unique selling point. Other corporate science festivals saw their approach to curating content as their unique selling point. For example, Participant 25 spoke of involving partners and potential partners in the process of reviewing submissions to the call for proposals as a unique approach to curating content:

> Our partners or potential partners, they submit those ideas and, using the programming criteria that we have and the vision for the festival, we are responsible for curating that programme. So, we'll decide what we feel that they should be part of the festival and what not. Something that we are looking at doing and I think that is unique to us and really worth doing it, is about how we involve external partners in the curation of the programme and act as kind of peer reviewers, critical friends, and ultimately make recommendations to me about what we should and should not programme.

<div align="right">Participant 25</div>

7.3.2. Community science festivals

Whereas corporate science festivals pride themselves on attracting high-profile speakers to their festival (resulting in increased revenue from ticket sales, corporate sponsorship, and indeed in marketing revenue generated via journalists), community science festivals pride themselves on remaining as local as possible. Participant 20 - a figurehead of a community science festival - discusses the importance of locality within their festival, but also highlights different rationales for bringing in high-profile speakers:

We do pride ourselves on being a local festival, so where possible we're looking to use local providers, local speakers, as well as bringing in perhaps talks from outside so that people have the opportunity to see someone off the tele, or perhaps cover a popular topic.

Participant 20

Indeed, the use of high-profile speakers is not a priority programming element for community science festivals, but when they are brought into the festival, the rationale for this is very different from corporate science festivals. Whereas corporate science festivals programme high-profile speakers to generate and develop ticket sales, corporate sponsorship and for media coverage, community science festivals do this for the primary motivation of allowing their audiences to "see someone off the tele" (Participant 20). Nonetheless, community science festivals tend to avoid public lectures and panel discussions generally, citing this form of passive participation as not engaging enough for their priority audiences who are not engaged with science, and may have lower levels of science capital. Participant 10 discusses the rationale for moving away from lectures and "straight down the line talks":

We tend to stay away from having a lot of lectures, straight down the line talks, because again one of our audiences that we're trying to reach are those hard to reach audiences. Not necessarily those that would normally either work or study at university. So quite often we'll go out into the community to run those activities.

Participant 10

Participant 10 makes an important point about the venue of science festival events and stresses that they go out to the community to run their activities. This viewpoint was very common amongst figureheads of community science festivals. Participant 3 helps us understand the reasoning as to why they community science festivals take their activities and events out to community spaces:

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Community groups won't necessarily travel far. And so we'll curate an event around them in their space for free.

<div align="right">Participant 3</div>

The notion that community groups do not want to travel far for science festival events is fairly ubiquitous amongst community science festival figureheads. In fact, this is such a fundamental point for many community science festivals who base their programming around community groups and venues where community groups tend to meet up. Participant 8 - although they use inappropriate and somewhat condescending language - do stress the importance of building up a relationship with communities and community groups in their areas:

> But we also put things into shit areas, to be, you know, rubbish places. That's my thing. People don't want to travel for science. But you put it right in the middle of their community then someone who wouldn't normally engage will come and engage. And then the next year they know what it is. They're like, "Oh, I came to that last year." Gradually you kind of build up a relationship. So there's quite a few of those.

<div align="right">Participant 8</div>

Community science festivals do not limit themselves on going to community spaces *per se*, but indeed to large communal spaces where many people gather for shopping, such as a shopping centre or even an IKEA:

> IKEA. I'm all for locations like that. Put the science where the people are. Not expecting the people to come to the science if they don't already feel invested. I think you need to make it easy.

<div align="right">Participant 26</div>

In terms of curating content, it is worth stressing the inclusive approach to including as many responses as possible to a call for proposals from the local community, as Participant 1 highlights:

> We very rarely turn somebody away. We'll find a way to accommodate them, even if it's a case of saying, "We like what you propose, but could you do..."

<div align="right">Participant 1</div>

This viewpoint is consistent - and indeed prevalent - amongst figureheads of community science festivals. Participant 2 stated how keen they are to be as inclusive a festival as possible, in terms of accommodating all submissions to their call for proposals:

> And really, if I'm completely honest, we curate in terms of who responds to the call, but as long as we fulfil our objectives, there will be an appropriate mix of all of those activities. We're keen to say 'yes' to local businesses, community groups, and well, anyone really. We cover the breadth of science the best we can. Our big driver is getting kids exposed to as many different branches of science as possible or STEM.

<div align="right">Participant 2</div>

Taking an overwhelmingly inclusive approach to curating content within community science festivals is not without its problems. Participant 1 discusses how this approach does mean that the quality of content at their festival might be lower than that of bigger science festivals (which I now understand as corporate science festivals):

> So sometimes the calibre of the activity or events here may not be quite as good as we'd like, certainly not as good as the bigger ones [corporate science festivals], but we don't think that matters so much because it's that ability to talk to somebody about what research they're doing.

<div align="right">Participant 1</div>

This comment from Participant 1 reinforces that science festival figureheads already distinguish themselves from each other and demonstrates the usefulness of the theoretical framework that this thesis proposes - the four realms of science festival - in terms of allowing festival figureheads to better understand the different approaches to curating content that each festival takes. Taking an inclusive approach to curating content - and indeed saying 'yes' to all or most proposals - is something not unique to community science festivals, but also to public engagement with research festivals, as noted by Participant 19, the figurehead of a public engagement with research festival:

> And as a result of saying yes to whatever is proposed, some of the activities that are delivered by especially some of the university teams who are inexperienced, may not be as high quality as you'd like.
>
> Participant 19

A motivation for community science festivals to curate content from universities, regardless of the quality of the content or the engagement, comes from the reality that universities provide content for community science festivals free of charge, as discussed by Participant 1 - a figurehead of a community science festival:

> A significant proportion of the budget is spent on event providers who we pay for. Obviously, it usually works out as kind of a third, two-thirds; paid and unpaid. The universities are great because they do everything pretty much for free, which is fantastic.
>
> Participant 1

7.3.3. Public engagement with research festivals

Public engagement with research festivals take a similar but subtly different approach to curating content as community science festivals in terms of taking inclusive approaches:

We leave it to the contributors to decide what they want to do.

Participant 27

Public engagement with research festivals - curated and produced by universities, research centres and learned societies - do practice inclusivity in the sense that they strive to accommodate stakeholders within their institute, regardless of the quality of the content being proposed to the festival, but that is where the inclusivity ends. Earlier, this thesis discussed the instrumental objectives of a public engagement with research festival. Ultimately, festivals within this realm of science festival use the festival to meet objectives internal to the organisation, so the inclusion of external content is not always a priority, and indeed, the festival may practice exclusivity with regards to those external to the institute proposing content for inclusion at the festival.

We're trying to move away from hiring external people, either to show that being here at [name of university] doesn't mean that you can't be creative. You have a creative outlet for being scientists.

Participant 7

The entire festival is to facilitate two-way engagement between researchers and whatever publics is appropriate for that particular offering. So to do this, we actually are a very small team. We are a very small team with a very small budget. But what we do is, it's about building capacity within the university, the researchers within the universities themselves to do public engagements. So we obviously execute a science festival, but we also view around engagement that we run fixed projects with particular focus on underserved areas in [name of city] for community engagement, for example. Yeah, we meet our own needs but we try to do more.

Participant 3

Here, Participants 3 and 7, both figureheads of public engagement with research festivals, support the argument that public engagement with research festivals are fundamentally about meeting internal instrumental needs of various departments within their institute. Indeed, Participant 7 goes so far as to say that they fully exclude those external from the institute from contributing content towards the festival. Participant 3 addresses the fact that many public engagement with research festivals take on elements of community science festivals and go out into local communities to do outreach activities and co-produce events with and for local communities. This further supports the proposed theoretical framework of festivals being predominantly placed in one realm, but developing unique identities by taking on board aspects of science festivals from other realms.

Public engagement with research festivals generally take an inclusive approach to curating content internal to the institute (i.e. not turning down internally proposed content). Mostly, they exclude external content providers. This of course begs the question: what does the internal content look like? Participant 3 discusses how the core team curating the public engagement with research festival work and develop a pool of researchers who they can train and support in public engagement:

> So what we're almost trying to do is ensure we've got a high quality, well developed pool of researchers who are wanting, willing and supported in engagement. And so that's always been a big aim for us. I mean, every year we easily get between five to seven hundred research staff and students volunteering with us, producing content, contributing ideas, and talking about their research.

Participant 3

Interestingly, some universities that deliver science communication courses to undergraduate and postgraduate students require students to design and execute science communication events and activities within their institute's public engagement with research festival:

> We also get a load of exhibitions put on by undergraduates or postgraduate students. Those are very carefully curated, assessed, and we would actually take those students all the way through the process of conceiving of the exhibition, designing it, risk analysing it, doing it, and evaluating it. We make sure it's good.

> Participant 17

Participant 17 uses the phrase "we make sure it's good" when discussing their role as a science festival figurehead in working with students to develop content for the festival, as a pre-emptive way to explain that although the content is produced by students, the festival team work with the students to ensure that what they are producing is of high quality. This proactive approach in working with partners to take existing ideas and develop them into high quality activities is seen in many public engagement with research festivals, where initial internal stakeholders might propose an idea that needs developing especially if creating public engagement and science communication activities is new to that researcher.

> People were asked to submit a risk assessment, and in that risk assessment they basically specified that they were gonna be involved and saying what they were gonna be doing. So if anyone that was gonna do something that sounded either really dangerous or really crap, there was an opportunity to kind of intervene and say, "Maybe can you think about doing this a little bit more interactively?" or guide them along the way.

> Participant 27

7.3.4. A marketplace for science communication content

Discussions on a marketplace for content that could be commercially bought-in for a science festival came up in several interviews with science festival directors - predominantly from the corporate and community science festivals realms.

I'm not that keen on paid content generally. Which is miserable of me, because lots of people need to make a living from paid content. I don't feel like it's that sustainable funding wise. Constantly reinventing the wheel and paying for new stuff.

Participant 8

Participant 8 discusses their reservations about buying in content for their community science festival, highlighting the cost involved in commissioning new installations, performances, shows and workshops. Participant 22 takes this idea further, and discusses these in relation to a "marketplace" of science communication content available for festivals to purchase:

There is an underlying, I think, mechanistic problem with science festivals, and that's one of marketplace. There is an absence of a marketplace for good events, which is frustrating the development of content.

Participant 22

This "mechanistic problem" that Participant 22 refers to can be unpicked by exploring science festivals further - particularly in the three realms of corporate, community and music/art festivals with science. Commissioning new work at science festivals - as with art festivals - is costly, but the development of a marketplace could be beneficial to science festivals across all four realms, as discussed by Participant 5:

It shouldn't take that long to set up, so if there were a marketplace where the people who created this stuff or wanted to create this stuff could say, "I will create this if I get booking from six festivals," it will make life a lot easier. And if that were done on a European basis, I think it would help things develop. This happens in TV, happens in the arts, the theatre, but doesn't happen in science festivals.

Participant 5

Development of a marketplace for science festival content could be established by the UKSFN in order to help further the development of not only science festivals themselves, but of the freelance science communicators and organisations who rely on being commissioned by science festivals for their business. Participant 22 discusses their vision for a marketplace for science communication content:

> A proper marketplace would be good. If you go to most science festivals, almost all the content is made up of one or two ways. It's one man or two people bands who make their living out of performing at science festivals. Not only performers. People like [male freelance science communicator] or [female freelance science communicator]. They've basically committed their life to making a living out of this. And then there is the ad hoc content that comes normally from a university or college. So that's normally how it's put together, but if you, and the bit that's missing, I think, is a proper marketplace for the [male freelance science communicator] and the [female freelance science communicator] and so forth, and those that want to be in this game, to actually sell their wares and for the science festival organisers to buy them.

Participant 22

The development of a marketplace for science festivals is a novel insight raised by several figureheads interviewed as part of this research, and is a recommendation of this thesis, which is discussed in greater detail in the next chapter.

7.3.5. Theming of science festival content

A theme for a festival or event is an idea or concept that either gives meaning or is the "object of celebration or commemoration" (Getz & Page, 2016, p.223). Bryman (2004) presents a typology of themes based on both cultural domains and prominent themes of built environments. The typology of themes comprise place (nations, cities or even planets); time (past, present, future); sport (generally or a particular sport); music (various genres); cinema (generally, or particular genres or influential figures); fashion (clothes or models); commodities (cars, food, drink, technology etc.); architecture; natural world (earth, water, sciences); literature (fiction and non-fiction); morality and

philosophy (ethics, conversation, commemoration); and commercial (e.g. a company and its brand) (Bryman, 2004).

The theme of the festival or event should be visible in all staging elements of the festival or event Bowdin, 2011). Staging, is a term that originates from the arts and theatre world, but is an important element of science festivals too. Indeed, staging is about how all the elements of a production are brought together for its presentation on stage (Bowdin, 2011). Once a theme has been decided, then the elements of staging an experience can be built around the theme. Elements of staging which should revolve around a particular theme include the catering (food, drink, menu); programme and events within the festival; decoration, props, scenery; sound and lighting effects; audiovisuals and special effects; and venue and setting (Bowdin, 2011).

When discussing theming of science festivals, it became apparent that theming was seen as a major part of programming in corporate science festivals, a minor part of programming in community science festivals, and almost non-existent in public engagement with research festivals. Music and art festivals (with science) may have their own theme, but the added value that science content brings to these festivals is generally not themed in any particular way. Participant 22 - figurehead of a corporate science festival - spoke of theming as a way to bind various of strands of the festival together using a theme that is not constraining:

> We provide an overarching but not constraining theme for a year, which people get, which is fine, because you have a story to tell the world.

> Participant 22

This notion that a theme can unify various aspects of festival programming was consistent amongst corporate science festival figureheads, as also discussed by Participant 5 - also a figurehead of a corporate science festival:

> If you've got a theme, you can bunch things together and say this is what we are talking about. Kind of lead people around a hook. That's the idea of taking things and trying to bring people in under things.

> Participant 5

Utilisation of themes as a hook for capturing audiences is generally not a priority for community science festivals when programming and curating their festival, but they may group things together - perhaps as an afterthought when programming, as discussed by Participant 2:

> So, there isn't a specific theme to the festival but we do link to relevant things at the time I guess. But, I suppose the bigger intention is just to have a broad remit of activities with something for everyone.

> Participant 2

As previously noted, public engagement with research festivals generally do not theme their festival, perhaps due to trying to be inclusive of as many different branches of science within their institute. Participant 16 - figurehead of a public engagement with research festival - explains why they do not view theming of the festival as a priority for programming and curating their festival:

> It's very personality driven. It's very role model driven. So, basically, that we don't sit down and say this year is going to be an engineering theme or this year is going to be a marine theme. What I do is, I go around, I meet lots of researchers, and if I meet people who are interested and engaged, and would be willing to do public engagement, and I think they would be great people for kids to meet, I ask them if they would like to come and get involved.

> Participant 16

For public engagement with research festivals, theming is very much not a consideration for programming as the priority for programming and curation of content is to achieve the instrumental objectives of the university, research institute or learned society delivering the festival.

7.3.6. Programming model: open-access or curated

An important point that arose during data collection was the difference between curated festivals, open-access festivals and festivals with elements of both. Curated festivals are generally more exclusive than inclusive. Take the Edinburgh International Festival for example - artist and performer participation in this festival is by invite only (Frew & Ali-Knight, 2010). The Edinburgh International Festival is curated in order to bring leading and emerging international talent from across the world to showcase and perform during the festival. Conversely, the Edinburgh Festival Fringe - which runs at the same time as the Edinburgh International Festival, is an open-access festival where participation is open to anyone and everyone (Frew & Ali-Knight, 2010). There is no quality control process at the Edinburgh Festival Fringe, and so long as artists and performers can find a suitable venue and pay fees for their event to be included within the Fringe programme, then they can perform. There was a notable difference in how science festivals viewed themselves in regards to being open-access or curated festivals. This research has identified that many community science festivals view themselves predominantly as open-access festivals, and as such seem to think that this excludes them from being a festival. Participant 21 took particular offence during the research interview when the phrase 'science festival' was used by the researcher to refer to their festival:

> We're not a fucking science festival. In some ways, it has characteristics of a festival. It's weekend, very clearly. Time stamps, I suppose. But it's different from festival in that it's not curated.

> Participant 21

This raises a very interesting point about community science festivals setting themselves apart from corporate science festivals. Corporate science festivals are very much curated festivals, as Participant 22 has stated:

> But one of the main things was we recognised we needed to go from being an inclusive festival to an exclusive festival. By that I mean a curated festival.
>
> Participant 22

Corporate science festivals are curated festivals because they need to guarantee high quality events within their festival for key stakeholders such as corporate sponsors. This curated - or exclusive - programming model is something that community science festivals try to shift away from and a key characteristic of community science festivals is that they generally opt for a more open-access festival, as discussed by Participant 8:

> So, that's the reason why, perhaps, people are more reticent about saying it's not a science festival, it's not ... there's no curation, there's no top down, really, and that might be, have its own problems and limitations. But I think it has its own strengths as well.
>
> Participant 8

Both Participant 8 and 21 are of the opinion that because their festival is open-access - and thus potentially more democratic - than curated festivals such as those within the realm of corporate science festival, then this excludes them from being a science festival - or indeed a festival at all in the case of Participant 8. This thesis argues that they are indeed festivals - and science festivals - that fall into the realm of community science festivals. After all, the largest arts festival in the world - The Edinburgh Festival Fringe - is an open-access festival. There are of course festivals that sit neatly within neither the curated nor open-access fields. Science festivals, like many other types of festival, are a combination of curated programme strands and open-access calls for

inclusion of content. Participant 4 – a figurehead of a community science festival - discusses how they combine these two elements within their festival:

> I should say the basis of the festival is we run an open programming model. In a sense, we provide an umbrella for individuals, companies or whoever it is who wants to put on an event, and can do so under that umbrella. We do have a submissions process where we redact anything that's particularly egregious. I think we've only done that once. Alongside that, we've had a curator of arts and education strand. Those are the two kind of elements of the festival, really.

> Participant 4

The theoretical model of the realms of science festivals proposed in this thesis argue that there are four broad realms in which all science festivals sit; although it is proposed that there is some degree of overlap involved. With regards to programming models, I can broadly say that corporate science festivals and music and art festivals (with science) adopt a curated approach to programming content. Conversely, community science festivals adopt an open-access approach. The approach taken may not be directly due to a conscious choice by science festival figureheads to adopt one approach over the other. Indeed, community science festivals may be limited by resources on offer and may not have the privilege to practice exclusivity, particularly where the community science festival occurs in a remote geographical location.

Public engagement with research festivals are generally curated by universities, research institutes and learned societies themselves. Indeed, they may have an open-call for content but that open-call is generally limited to those who work within (or indeed have close relationships with) the organisation itself. They may also curate some additional content from outside the organisation. Ultimately, public engagement with research festivals practice exclusivity - in so far as being curated festivals.

The tension between curated festivals and open-access festivals is not limited to science festivals. Indeed, there are parallels between arts festivals and science festivals

that can be identified. From the world of the arts, curated festivals can sometimes see open-access festivals as the simplification of culture, (Frew & Ali-Knight, 2010) where audiences are at the festival to be entertained, rather than challenged: "People want to be sure they're going to have a good time. Butlins, rather than Brecht, is the order of the day" (Cavendish, 2008, p.8). In 1991, the Festival Director of the curated Edinburgh International Festival described the open-access Edinburgh Festival Fringe as a "third-rate circus" (De Jongh, 1991, p.20). The tensions between programming models in the arts world does help us understand and unpick how corporate science festivals and community science festivals can be at odds with each other.

The analogy given of corporate science festivals being like five-star hotels resonates with curated arts festivals being like "Brecht" providing high-quality science engagement events, whereas community science festivals, like open-access arts festivals can be seen as the "Butlins" of the science festival world. Of course, Brecht and Butlins will have two very different audiences. One imagines the Brecht audience to have what may be regarded as a sophisticated or complex form of social and cultural capital, certainly in comparison to the Butlins audience; and this view - rightly or wrongly - is seen in the world of science festivals where those attending corporate science festivals are more likely to have higher science capital than those attending community science festivals.

7.4. The UK science festivals network (UKSFN)

Application of the four realms of science festival helps us understand the role of the UK Science Festival Network (UKSFN) in providing a formal network of science festivals across the UK. Understanding that science festivals can be categorised into four realms helps understand views of science festival figureheads who were interviewed as part of this study.

The UKSFN, managed by the British Science Association, sets out to "unite, celebrate and develop" science festivals across the UK (UKSFN, 2020). They aim to build

relationships with other sectors in order to increase attendance at science festivals and improve innovation and creativity within the science festival sector (UKSFN, 2020). In order to achieve its objectives, the UKSFN members meet several times a year to discuss their work and the future of science festivals, whilst developing and distributing funded projects amongst members (UKSFN, 2020). In addition, they advocate for the importance of science festivals in conversation with funding bodies and decision makers (UKSFN, 2020). It is important to note that not all science festivals across the UK are members of UKSFN, and indeed one realm of science festival that is very much under-represented within the network are music and art festivals (with science). This may be because festivals in this realm are fundamentally not about science; rather, they include science content as added value within their programme.

Although UKSFN is a formal network of science festivals across the UK, its roots are in being an informal network, as highlighted by Participant 14:

> The science festival network was really, I think it was just a group of people that were at a conference and just sitting out and talking about some of the issues that they were encountering in science festivals. And they were like, "Why haven't we set up some kind of informal network group or something?" And that's really where it was born. So people that have the same challenges, frustrations, successes, learning that they can share. And then it grew out of that need, from the community.

> Participant 14

The UKSFN grew organically from the science festival community, providing an opportunity for science festival figureheads to get together and discuss their challenges, frustrations and successes, and provided an opportunity for festival figureheads to learn from each other. The shift from being an informal to a formal network provided opportunity for festivals to work together and collaborate on pitching for funding, as highlighted by Participant 22:

> Basically, people want to find ways of raising money and pitching collectively for money or doing things together that make life easier for them, like develop tools they can share.

<div align="right">Participant 22</div>

Evidence was provided for the financial benefit to member organisations of UKSFN membership in terms of receiving funding for projects:

> I think if you ask anyone about benefits, one of the things I didn't say is that we, so they got a pot of money by the research council for projects that engage young people with research so they just kind of sent it out to everyone that put in an expression of interest for this, which I did and we got some money out of that so, that's a benefit of being part of that network.

<div align="right">Participant 4</div>

Collaboration between science festivals within UKSFN extends beyond collaborating for funding opportunities, and includes collaborating on content design and sharing content produced by festivals themselves:

> But I think networks, in general, and festivals working together and collaborating, in terms of sharing content, I think is invaluable for... You get out of it what you put in.

<div align="right">Participant 20</div>

Membership of the network provides reassurance to festival figureheads that other science festivals have the same challenges and that they are working innovatively to achieve their objectives. Indeed, Participant 15 spoke of the inspiration of meeting with other science festival figureheads:

I think the main thing is, when I attended, it was really quite inspiring, because you see what other people do. You realise that some of them have the same battles as you do, and there is a comfort that you're doing it probably not completely wrong, and some of the things you do are quite innovative, and you get different ideas of best practice.

Participant 15

Meeting figureheads from various festivals across the different realms of science festival was viewed as a positive aspect of UKSFN membership by many, including corporate science festival figureheads who found it useful to have discussions with community science festival figureheads about how they achieve so much with so little resources:

And yes, the reason why I quite like the UK science festival network. There are people from different festivals, different sized festivals. I think that there is a lot that we can learn from each other, because sometimes I find it very useful to talk to a smallish festival, to see how creative they are in terms of using their resources. So sometimes, you know, when I go they are, people are like "wow the big science festivals are here". It's, like, at the end of the day, it doesn't matter how big and how small you are, it's about what you do that matters.

Participant 25

The benefit of UKSFN growing from an informal network to a formal network has been highlighted as a good initiative by science festival figureheads, as UKSFN curate a list of member festivals that allows people to go to the website and see where science festivals are taking place across the UK:

But it's a good initiative. I mean, they've now got a nice public presence, so, I mean, even something as simple as being able to click on a link and seeing where all the festivals in the UK are.

Participant 3

Membership of UKSFN has been highlighted as a great opportunity for networking with other festival figureheads and providing opportunities for close relationships to be built between figureheads of different festivals. Participant 14 discusses how membership of UKSFN allowed them to pick up the phone and speak to someone running a similar festival, whilst also highlighting informality of interactions between member festivals:

> And actually running a science festival can be quite lonely sometimes because you're dealing with quite specific things. And you're like, "Uh, okay, how did you deal with this thing?" And it's just quite nice to know there's someone that you can pick up the phone to. And that's one of the things that, having taken it one, it's great it's maintained some element of informality. So someone, and people do still pick up the phone, and go, "This has happened." and ask for solutions.

> Participant 14

Although retaining some level of informality is seen as a positive for some members (e.g. Participant 14, above), this has been highlighted as a potential barrier to engagement for other festivals who are members of the network:

> How do we grow the network into something that's more than just a couple of mates calling each other up into something that's actually for everyone? And we want to be as inclusive as possible but we're not there.

> Participant 24

This theme can be further unpicked by dissecting comments from Participant 12, who noted that new members felt somewhat unwelcome within the network:

> I have attended one or two of their meetings but there is a bit of arrogance as it were with the old established people, that they are not welcoming to new members. So I got the distinct impression that I was not particularly welcome.

> Participant 12

To understand the dynamics of inclusivity within the network, I can apply the theoretical framework of the four realms of science festival being proposed in this thesis. Participant 12 is figurehead of a community science festival and felt unwelcome in a space which they felt was dominated by figureheads of corporate science festivals, and more well established science festivals within other realms. This view was not unique to Participant 12, and indeed did appear in several interviews, with Participant 2 noting that longer-serving members of the network were not keen on new science festivals:

> There was a very strong feeling from some of the longer serving members that they weren't very keen on upstarts.

Participant 1

This research has identified that new, start-up science festivals, particularly those within the community science festival realm, have had difficulties in engaging with UKSFN, which is "dominated by big players" (quote from Participant 1). We can take "big players" to refer to figureheads of corporate science festivals, and festivals in other realms that are well established with excellent reputations for providing high-quality content within their festival. Participant 11, a figurehead of a community science festival, also contributed to the theme of feeling unwelcome as a member of UKSFN, and highlighted concern amongst UKSFN members about the growing number of science festivals, particularly in Scotland:

> They were concerned about the number of science festivals that there were across the country and already alluded to the fact that there are quite a few in Scotland. But then I believe that because of the geography of Scotland that it is essential... I'll try not be too political.

Participant 12

The location of UKSFN meetings was highlighted as being slightly problematic for some science festival figureheads, although I do note that meetings have taken place across Scotland, Wales and England. Participant 8 noted that UKSFN meetings taking place

too far from their festival meant that although they are a member organisation, they have not been able to realise the full benefits of membership of the network:

> That's mostly the events mostly seem to happen in Middle England, Middle Earth and I don't think we've managed to attend a single meeting for that reason. So none of them are local enough for our manager to justify taking probably more than a whole day to get there in time, attend a meeting, maybe stay the night, come back. I'm not sure what the benefits are. I think one of the benefits, sometimes we get some interesting data. We're not realising the benefits because we're not attending the meetings because, geographically, we can't make that work.
>
> Participant 8

The location of meetings being highlighted as a barrier for participation within the UKSFN was particularly prominent amongst figureheads of community science festivals as denoted by Participant 8 (above) and Participant 18 (below):

> I guess if there was a meeting slightly closer than [UK city], that would be great. It's just too far for it to work for us. I know that sounds lame. Even with the last one, our manager wanted to go, but she's got young kids. A trip away. Even leaving before 8:00 am, where are you going to get childcare?
>
> Participant 18

Attendance at UKSFN meetings poses a challenge for some science festival figureheads, particularly community science festivals that solely rely on the use of volunteers to produce and deliver the festival, as Participant's 1 and 6 discuss:

> Ours is entirely volunteer run and virtually all of the team work full time, things like there's meetings and stuff, we struggle to get to those because, obviously, we're not doing the science festival as part of our day job. So you can't just sort of somehow go along to a [UKSFN] meeting as part of your day job. It would mean taking leave to go to things. So that's challenging for us.
>
> Participant 1

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Remember, although I run the festival, my day job isn't the science festival. I'm really a busy person. This is extra-curricular.

<div align="right">Participant 6</div>

The establishment of an informal network of Scottish science festivals within UKSFN to serve the twenty or so science festivals taking place across Scotland each year was highlighted as something that was beneficial to members whose festival is based in Scotland. This informal network within the formal UKSFN network is taking place and developing organically:

So I'm part of a group of the Scottish science festivals that meets intermittently as a sort of, you know, sub-network of the UK festival network thingy.

<div align="right">Participant 2</div>

The geographical differences between members of UKSFN was highlighted as a concern by numerous participants, but another theme that arose was the confusion over different types of science festivals and how they can communicate from each other in a practical way, as discussed by Participant 22:

I don't know what benefits it brings us. I think there's a difficulty with these organisations, and there's a sort of theme in that there are a small number of really big players and a lot of small players, and it's very hard for them to have a practical conversation with each other.

<div align="right">Participant 22</div>

Application of the theoretical model proposed here - the four realms of science festival - will help UKSFN and member organisations articulate and understand the differences between festivals within different realms, thus Participant 22 in the quote above

highlights the vital significance of this theoretical model in a practical sense. It is the application of this theoretical model that could help UKSFN adapt its network and make meetings relevant for festivals within particular realms, thus not only making the network more inclusive, but will allow science festival figureheads to realise that they are not all the same and that some festivals are more suited to having practical conversations with than others. This was also highlighted by Participant 15, who uses the term "they" to discuss what I can now say are corporate science festivals:

> And they, of course, dominate at these things, because they have the funding to go there. They are really keen on professionalising further. So, I sometimes think it might be a little bit... to bring people from all over the country, and all scales together, it's probably not that useful then for smaller festivals like us, in some ways. You know?

> Participant 15

This research has identified that science festivals can be categorised into four realms, and if UKSFN were to create networking events specifically tailored for festivals in each of these four realms, then this would be of practical benefit to members who want to learn from similar festivals and collaborate with festivals from within the same realm as them. Notwithstanding, it is important to note that there is a spirit of collaboration amongst science festivals, regardless of the realm. Science festivals want to engage people with science and celebrate science in both society and as culture. There are always ways to improve the sector, and the practical application of this theoretical model will do so. In the spirit of developing the sector and collaboration, it is appropriate to end this discussion with quotes from Participant 11 (figurehead of a community science festival) and Participant 14 (figurehead of a corporate science festival):

> I think generally speaking, science festivals get on well with each other and I would say that any time that I've ever done something for another festival, it's a situation where if you give, you always get more back.

> Participant 11

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There's an element of trust and openness within the community because we're all trying to achieve the same thing. We're doing it with very different means, perhaps with different audience approaches and budgets and experiences, but we're all trying, I think anyways, we're all excited about science and want to share that. We're all trying to do the same thing here.

Participant 14

7.4.1. Local informal science festival networks

Many science festivals - particularly community science festivals - have created informal networks with other science festivals that are in close geographic proximity to each other. This festival network is not exclusive to a network of community science festivals working together, but also provides a platform for other genres of festival to work together and collaborate. Participant 1 – a figurehead of a community science festival - discusses their motivation for collaborating with other local festivals to secure funding from the local government to support the festival sector. The irony is that the local authority agreed to set up a festival fund, but excluded science festivals from this fund in the first year:

We've worked hard with them and we're trying to see where we can support each other. [Geographic area] set up a year after we did so we did a lot of talks with them as they were setting up. They really picked our brains, they did. But one of the other things that we did do was recognising that there are lots of festivals in [geographic area], so we initiated linking up and creating a festival group in [geographic area]. We also then lobbied with the council because they didn't have any funding for festivals. They didn't see festivals as being important. So we lobbied them really, really hard and they eventually, after two years of lobbying, set up a signature event fund specifically for us. Although in the first year they refused to fund us because they couldn't see how science fit.

Participant 1

Another figurehead of a community science festival within the informal network discussed by Participant 1 highlights the benefit of the informal network and how the local authority is supportive of the festival sector, particularly in areas of supporting independent evaluations of the festivals:

> Actually it's been quite good because part of their funding pays for an independent event evaluation and economic assessment. The same company is used for all the festivals, so all the research is directly comparable, which is brilliant. So now the council is on board and now very supportive. But it was interesting that they didn't see that science festivals would be of tourism or economic value. It took a long time for them. We had to present a lot of data. So things like the reports of the festival impact on [geographical area] and stuff. We had to roll it out to really demonstrate that there is value on lots of different levels, as well as the making people more science literate and driving STEM recruitment for university-level and careers and stuff. There's all of the other spin-off stuff in terms of sectory spend, tourism drivers, blah, blah, blah. So they've now embraced that, but it continues to be challenging. They always need steering, but we're ... Yeah, It's good.
>
> Participant 8

Participant 8 discusses how the local authority was reluctant to see science festivals as drivers of tourism, and thus were disinclined to see how science festivals had any tourism-related economic impact, thus refusing to fund them in the first year of their festivals funding, as Participant 1 pointed out. It is only through external evaluation of the festival that the economic impact has been measured, in addition to other benefits including engaging young people with STEM subjects and promoting STEM careers.

7.5. Staffing of science festivals

Many festivals, regardless of their genre, rely on the goodwill of volunteers in order to staff the festival. A study by the British Arts Festivals Association found that 60% of the workforce across 200 festivals involved in the research study was made up of

volunteers (SAM and the University of Brighton, 2008). Festival volunteers are people who "choose to contribute their time, skills, effort and experience, without pay, to benefit a cause, or the community in which they live" (Shone & Parry, 2013, p.195). Volunteering at festivals is normally on an "episodic" basis, but volunteers do bounce back, and indeed volunteer at future deliveries of festivals (Holmes & Smith, 2016). The research presented in this thesis has identified the use of volunteers is prominent across all four realms of science festival. There is an exception in some corporate science festivals that as a matter of principle do not use volunteers within their workforce, although this seems to be the exception rather than the norm. Participant 22, a figurehead of a corporate science festival, spoke of their rationale for not utilising the goodwill of potential volunteers:

> One of the reasons I think we are good is because we pay people and train them and expect them to do a professional job, so there's not a lot of volunteering going on around here. There's not a lot of relying on people to show up for a day or two. I think you see that in the customer feedback we get.
>
> Participant 22

Conversely, community science festivals almost exclusively pride themselves on their volunteers who help deliver the festival:

> I try not to be the face of the festival and staff. I have a festival coordinator who doesn't want to be the face of the festival. I think the face of the festival, for us, is our volunteers that we hire. They are the best.
>
> Participant 20

Public engagement with research festivals almost exclusively rely on a volunteer workforce, or indeed, students and academic staff contributing their time out of their goodwill, as discussed by Participant 16:

> I think it's the general public engagement event, in a way. All the reasons they [academic staff and students] get involved in public engagement as

well. But it is something I've often thought about doing stuff is like, you can't be paying one person and not paying another. You're not paying for them. It's up to them if they want to volunteer.

<div align="right">Participant 16</div>

Public engagement with research festivals frame their festival as an opportunity for researchers to get involved to enhance their career. During interviews with figureheads of public engagement with research festivals, it became clear that in framing researcher involvement with the festival in this way, they were able to satisfy themselves that they did not need to provide any payment for researchers:

> The academics that have come forward and said, "hey can I talk about that or can I do this demo": they see it as part of their job or because increasingly that is sort of something that they have as a condition of their funding or something that there is increasing pressure on them to do. If I could, I would pay everybody, but I don't actually need to pay academics. I make it out like they need us more than we need them. I can only pay those that need to be paid cos it's their job, you know, it's their work and they're self-employed.

<div align="right">Participant 13</div>

Some figureheads of public engagement festivals do view researcher involvement in their festival as a mutually beneficial opportunity. Whilst researchers invest their time in the festival, they also gain from the experience by receiving in-house training on public engagement and science communication. Participant 16 spoke of trying to make researcher involvement in the festival more rewarding for researchers:

> I'm also hoping to offer in the future free public engagement training to anybody who wants it. So, say if there's some new post-grads who are coming in to join the University in September, who might want to do just a little tabletop activity [at the festival], I think it will quite a nice benefit for them to get kind of, you know, industry standards, public engagements, science communication training for free. In return, they are providing an

activity at the festival. That, in a way, is kind of mutually beneficial and that's the aim.

Participant 16

Participant 16 discusses training postgraduate students in order for them to gain skills development out of their involvement with the festival. Indeed, young people in particular make up a large proportion of the workforce at music and arts festivals, and this translates through to music and arts festivals (with science). Young people volunteer at festivals in order to gain work experience and to develop employability skills (Barron & Rihova, 2011).

Understanding why people volunteer at festivals is of interest to science festival figureheads interviewed as part of this study. There are of course both altruistic and utilitarian motives for people volunteering at festivals (Cnaan & Goldberg-Glen, 1991). The functionalist perspective on volunteer motivations posits that people volunteer in order to fulfil psychological functions, and volunteer satisfaction can be achieved only if volunteer roles and activities are in line with their personal motivations (Cnaan & Goldberg-Glen, 1991). Altruistic, or value-based, motivations include helping others in the local community, helping to better society, charitable giving, religious motivations, enjoyment and leisure (Cnaan & Goldberg-Glen, 1991). Utilitarian, egotistic, or material motivations are based on the prospect of getting something out of the volunteering experience, perhaps career enhancement or developing skills, knowledge and making new connections (Cnaan & Goldberg-Glen, 1991).

For many corporate and community science festivals, external specialists are brought in on a paid capacity to help deliver the festival. Paid staff are generally used for specialist roles including event management and technical roles e.g. lighting technician, sound technician etc. Participant 6 spoke of the need to bring in paid staff during the live phase of the festival on top of volunteers:

> Depending on the programme and the scale of the programme, obviously we need freelance support, because we have to deliver, I mean a massive

programme, and it's not doable, just for the core people within the team. We don't have the in-house expertise that techies or project managers have.

<div align="right">Participant 6</div>

Notwithstanding, the specialist skills of technicians was still sought on a volunteer basis by some science festival figureheads, as discussed by Participant 2, figurehead of a public engagement with research festival:

> So, we don't charge the public, we don't charge the presenters. So, no money changes hands. We do, and I've been able to afford it every year up til now, provide a lunch voucher for everybody, so at least they get something, and for undergraduate students we provide transport expenses. For anyone else like technicians and such, we'll also cover transport and provide lunch so they volunteer their time.

<div align="right">Participant 2</div>

In bringing in temporary staff to help manage and deliver events, coordinating front of house, logistics and even volunteer management, many corporate and community science festivals hire event management specialists to help deliver the festival. Participant 25 explains their rationale for this:

> For me as the director, I think that I don't really, if I have to, I don't mind, it's not that I don't want to do that. I see my role, you know, during the festival as being something different, about really being looking after some important stakeholders that we have during the festival. So my role changes during the festival. We need, last year for example, I think we used three freelancers. These are people who will start a few weeks before the festival, and they really help us with the delivery and take on some of what would have been my role.

<div align="right">Participant 25</div>

The role of the festival figurehead during the live delivery of corporate science festivals tends to be developing relationships with existing partners and potential new partners, whereas in community science festivals and public engagement with research festivals the role of the figurehead is more operational and logistical rather than strategic in terms of developing the festival.

7.6. Sponsorship and funding

Corporate science festivals, community science festivals, and public engagement with research festivals take different approaches to sponsorship of their festival, and indeed sponsors have different expectations of festivals within each of these realms of science festival. Sponsorship is defined as "the purchase (either with cash or in-kind support) of exploitable rights and marketing benefits (tangible and intangible) that arise from direct involvement with a personality, player, special event, programme, club or agency" (Bowdin, 2011, p. 441). This definition is useful for understanding various types of sponsors for science festivals, from corporate sponsors providing financial support to universities providing venues free-of-charge as a form of in-kind support. From the perspective of sponsors, sponsorship is a strategic marketing investment where a direct impact on brand awareness, equity and potential for increased sales is sought (Allen, 2011).

Corporate science festival figureheads spoke of their relationship with sponsors as a mutually beneficial arrangement. Participant 9, a figurehead of a corporate science festival, spoke of expectations of corporate sponsors:

> What do they expect from us? They expect something incredibly well-run. They expect things to be open when they're meant to be open. They expect an audience. They expect a good layout that sort of respects the content. What they're looking for is a level of professionalism in

presentation. Fundamentally, they expect us to deliver an audience to them.

<div align="right">Participant 9</div>

These comments expressed by Participant 9 are consistent with Allen (2011) who discusses what businesses are seeking when sponsoring festivals. Businesses seek increased brand awareness, brand image enhancement, product or service exposure and market interactivity (Allen, 2011). Whilst discussing these motivations of businesses seeking to sponsor science festivals, Participant 22 notes that selling a product or service tends to be the weakest motivation for sponsors:

> Commercial sponsors, they've got a group of motivations for being involved. Some of the motivations include, "I simply want my name out there in front of your audience." And we've got two or three audiences, so they pick which one they want. Some of them have a genuine commitment to funding activity that inspires young people, funding the next generation. Some of them are about recruitment. Some of them are about the schools agenda. Some of them think they want to sell a product to our customers. That's normally the weakest reason for being involved with us.

<div align="right">Participant 22</div>

Indeed, corporate sponsors may provide sponsorship for other reasons such as staff development or to use their investment in a science festival to demonstrate their own corporate social responsibility values to their own stakeholders:

> Many of them [corporate sponsors] want to reward their own staff, so it's a time in the year where technology companies are the story. So you might be a technology company, and you might slap some money on an opera and take your guests to an opera or an art show. Great entertainment, but it's not about you, it's about the opera. A science festival is about you. It's a chance to say, "We are a technology company, and we're all going to celebrate technology and what our company does, so that's good.

<div align="right">Participant 5</div>

Relationships with corporate sponsors should be mutually beneficial to the sponsor and the science festival. Festivals themselves are seeking benefits not limited to financial investment, but also seek in-kind support, marketing and media expertise, festival brand enhancement and product/service offers for the festival attendees (Allen, 2011). Participant 9, a figurehead of a corporate science festival, discusses their expectations from a sponsor:

> Expectation from them, you know we're running this in the third sector. We can only do this if we can raise money to do it. But we do put our own money in as well. So what we expect from them is to take, obviously doing a financial contribution, but to take seriously the content. We expect them to respect equal opportunities. We want them all to have an impact so that you know we've got a great sum of all those parts. We want them to reflect the future of STEM rather than just looking at the past.
>
> Participant 9

Such expectations from the sponsor to not only financially contribute to the festival but to achieve more than this are consistent with the trinity model of sponsor, event and audience (Bowdin, 2011). The trinity model proposes that a reciprocal relationship between the organisation sponsoring the event and the event itself is necessary to maximise the commercial potential associated with the event (Bowdin, 2011).

Corporate science festival figureheads spoke of their festival as being classic stakeholder companies with multiple stakeholders, including various types of sponsors:

> I'm absolutely convinced that this science festival, and probably some of the more professional or bigger ones, are absolutely classic stakeholder companies, and we face them in multiple directions. I regard sponsors as one of our stakeholders, but there are many, so working around stakeholders and figuring out their motives for being involved.
>
> Participant 22

Participant 22 talks about "the more professional or bigger ones" and in light of the theoretical framework produced in this thesis, we now understand this to be their interpretation of corporate science festivals. Participant 25, also a figurehead of a corporate science festival, spoke of the challenge of "sponsor overload" and how they need to remind themselves which sponsor they are dealing with at any given time:

> So there's basically, if you've got our science festival in the middle, there are six, seven, eight, ten different stakeholder types of engagements that the festival can respond to, and when you're dealing with one of them, you've got to know which is the dominant one. But the nice thing is you can work with all of them which many of the small festivals envy. You've just got to remind yourself which one you're dealing with on that particular moment.
>
> Participant 25

Participant 25 talks of being the envy of "smaller festivals" which we now propose are community science festivals, who as discussed below, take a different viewpoint with regards to sponsorship.

Corporate science festivals figureheads were very well aware of the role of the public sector in supporting festival and events and were keen to demonstrate how financial support from the public sector is mutually beneficial to both the sponsors and the festival:

> Governments want to promote what they're doing. Government agencies are a key one as well, like [government agency] wants to achieve behavioural change, and they don't always have the right means for doing it, so that's where we say "we can help you achieve that but it will cost."
>
> Participant 22

Corporate science festivals in particular spoke of their relationship with local governments and demonstrated strong levels of understanding, which was not identified

in discussions with figureheads of science festivals in other realms, of why local authorities might be keen to financially support science festivals:

> Let's start with Council, our funder. It still puts a lot of money into us. Why does it fund us? It funds us for a list of reasons. It funds us to enrich the city culturally. It funds us to support education, although the proportion of their money that goes on that is really very small. They value the reputation we build for the region in terms of developing the profile of science and technology here. There's a bunch of reasons why they like us. We know these reasons. We know how to tick their boxes.

<p align="right">Participant 22</p>

Participant 22 talks about how they "tick their boxes" in relation to meeting the local authority objectives. If the festival itself was to simply follow its own agenda and not meet the strategic objectives of the elected officials and the local authority, then any support offered to a festival would be questionable (Richards & Palmer, 2010). Local authorities have many motivations for supporting festivals and events of all sizes and genres, particularly if developing an eventful city. Indeed, the role of local authorities can go beyond financial support alone, but can include providing expertise and facilitation in marketing; technical aspects of festival production; regulatory roles; developing infrastructure; and providing venue support (Getz & Frisby, 1991). Participant 22, above, spoke of "tick their boxes" and demonstrated that corporate science festivals have a strong understanding of performance and quality management measures in place by local authorities. They understood that designing effective performance measures requires a number of indicators related to the aims of the local authority. These include: the input indicators (effort and resources invested by the local authority); the output indicators (whatever the festival achieves); and wider impact indicators (e.g. effects of the festival) (Richards & Palmer, 2010).

Corporate science festivals have relationships with universities in terms of providing venue and content support for the festival, but some public engagement with research

festivals can be embedded within corporate science festivals. This collaboration provides a joint opportunity for working together, developing new working relationships, enhanced marketing, and audience development. Notwithstanding, such approaches can lead to compromises over quality of content. Whereas corporate science festivals take great care to carefully curate their programmes and take exclusive approaches to programming, public engagement with research festivals take a more inclusive approach. Corporate science festivals balance the advantages such partnerships bring with disadvantages including giving up control over aspects of the quality of content and programming of events produced by the university, research centre or learned society. Here, Participant 22, figurehead of a corporate science festival, discusses their relationship with local universities:

> Take the universities. They are benign landlords normally. You've normally got to give them some money, but they're good partners and important stakeholders when it comes to venues. They provide a lot of hmmm. Universities in this city, of course, they provide a lot of content. They provide a small amount of cash, so are important sponsors. So why are the universities involved? They're involved because they're a highly professional organisation that gets an audience, and they have a reputation, so when they bid for money and they say, "If we get this research grant and when we complete the research, we will communicate this to the general public through [name of corporate science festival]. Everyone knows who that is, and they do a professional job. So the funders say: "We believe you. We believe that will be successful." The universities also value their students. It's a great communication opportunity to train some of them, to develop transferable skills. So there are benefits there.

> Participant 22

In addition to developing relationships with universities, corporate science festivals develop relationships with research institutes and learned societies. Participant 25, figurehead of a corporate science festival spoke of their relationship with research institutes:

They [research institutes] have a similar agenda. They want to get their research out and about. They want to justify the core grant they get from the government and demonstrate its value. Then you may include in that venues, publicly-funded venues like the museum. There are multiple agendas, but they're basically willing partners because we're helping them achieve what they want to achieve anyway. We have the engagement expertise and they have the science.

Participant 25

Corporate science festivals take strategic approaches to structuring sponsorship, with tiered sponsorship structures appearing to be the most common within this realm of science festival. Within a tiered structure, there is a hierarchy of status of sponsors with each level higher than the one below (Masterman & Wood, 2006). Solus structures are where there is one festival sponsor, and this structure is represented as a single and exclusive unit and flat structures are whereby all sponsors have the same status, but may or may not have the same rights or be on the same payment terms (Masterman & Wood, 2006). Participant 5 spoke of one of their sponsors having their title reflected in the name of the venue:

The big corporates, it's quite an exchange, I suppose, in terms of what they want to focus on and how we can help them to do that. They will sometimes want to just help us or they pay us money but they have naming rights on the venue but what is in fact in that venue has nothing to do with them.

Participant 5

Naming rights are generally associated with physical structures (e.g. O2 Arena in London) but naming rights can also apply to arenas, stadia, museums and galleries (Getz, 2010). Naming rights are also applicable to festivals and events who may apply naming rights to a venue or tent within the festival, although the sponsor has no control over the content within the venue. Some corporate science festivals have given

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presentership rights to sponsors whereby the presenting sponsor is acknowledged alongside the title of the festival but not incorporated into the title itself. Discussions with sponsors about where in the tier they will sit and various rights that can be offered to them is a time consuming task and requires time to be invested in partner relationship development, as discussed by Participant 5:

> We're technically a charity, yeah. So we are not for profit. Every single money that we get is from tickets and from our sponsors. It's really tough actually because every year you start from zero. Some of our sponsors stay with us but it's quite tricky, as it is for a lot of festivals I imagine. That's the hard thing. You are very vulnerable to your sponsors. Luckily we have people whose full time job is to chase the sponsors and go for the money. And this sets us apart from most of the other science festivals.
>
> Participant 5

Here, Participant 5 acknowledges that their festival, a corporate science festival, is in a unique position to build relationships with sponsors due to having staff whose job is to do so. This does set corporate science festivals apart from science festivals in other realms - particularly community science festivals and public engagement with research festivals - as these festivals do not have dedicated festival sponsorship and fundraising teams.

During semi-structured interviews with festival figureheads, the role of the sponsor in contributing to the festival programme was discussed in detail. Some corporate science festival figureheads were adamant that no sponsor would have any input over the content of the festival. When asked about whether sponsors could contribute or have a say over festival content, one corporate science festival figurehead responded:

> They have no input, they have no input in the content at all. I would be really resistant to anybody who'd want to do that. Nope. Never.
>
> Participant 9

This viewpoint was consistent with another corporate science festival figurehead who spoke of the role of sponsors:

> With our primary sponsors; you know, the huge commercial companies, and stuff, they're fantastically flexible. [Organisation] basically sponsors the education programme, not fully, but a significant portion of it, and they are obviously branded accordingly. That's all they're interested in. Content… No.
>
> Participant 5

Other corporate science festival figureheads were happy to engage and discuss sponsor views on programming, but still maintain that all content within the programme must fit in with the strategic vision of their festival:

> Sometimes, they have their own priorities in terms of very specific audiences that they want to reach, or they feel very strongly about a topic that they feel that they should really cover for the festival. So, I think that in the past we have been in that situation that a sponsor might have tried to really shape the content or even maybe the strategic direction of the festival in terms of audiences. I think that that is about being confident to say: "Do you know, we have a very clear mission, we have a very clear mission and vision, we know what the target audience is. We know what we are here to do. We are very happy to work with you, as long as that strategic direction, as long as that vision for the programme, it really sits with the festival."
>
> Participant 25

This viewpoint of taking on board ideas from sponsors but ensuring that any programming or content ideas from the sponsor must meet the objectives of the festival is a consistent viewpoint amongst other corporate science festival figureheads. Participant 22 goes further than this and says that not only must the ideas from the sponsor align with the objectives of the festival, but the programming criteria and quality measures must also be met:

For me, I think that the festival sponsors, obviously, they make that mainly financial contribution to the festival. They get something in return, that it could be about, it's what we call activation. That could be from branding associated with the science festival; sponsoring, like, some of the events within the festival, some of them, they are invited to use the festival as a platform to really engage our visitors. For me, what I feel very strongly, is that I am very keen in working closely with the sponsors, however, I don't think that they can really shape the content of the festival. I think that even when they propose an event, they are still expected to really be working to the same standards that we expect from our partners. So, the programme really needs to reflect not only the vision for the festival, but it still needs to meet that programming criteria. So, I think that that is always the tricky bit, having those conversations with partners.

Participant 22

Whereas corporate science festivals are keen to engage with sponsors and build relationships with them, some community science festivals avoid all forms of sponsorship. Participant 15, a figurehead of a community science festival, spoke of trying to avoid needing any form of sponsorship:

I think I love doing things, and I'm not the greatest manager and accountant. So, I've tried to do things as cheaply as possible, with as little funding as possible. I'll avoid needing sponsorship as much as I can.

Participant 15

This view was prominent amongst community science festival figureheads. Participant 1, a figurehead of a community science festival, explains that one of the reasons for being reluctant to have sponsors is that the festival is run on a volunteer basis and they do not have the time to commit to building relationships with sponsors:

Most of our funding does come from grants, and because we're such a small team, one thing I don't actually have a lot of is sponsorship, because that is a very dedicated relationship that you have to build and nurture, and we just don't have the time for that. So definitely something that I

could do with more of but we currently don't. And I mean, it would be great to have the money and it would be great to work with some people from the industry. But that requires having staff to do so, and we don't have staff. We're volunteers.

<div align="right">Participant 1</div>

This viewpoint that engaging with sponsors is time consuming and to some extent incompatible with a community science festival run by volunteers came up as a theme on a number of occasions. Participant 26 spoke of the "problem" of working with sponsors:

The biggest problem is that every sponsor has its own set of criteria. So every time you get the offer of some money you've got to sit down and make sure you fit another set so you're forever re-evaluating what the terms and conditions are, because if you don't satisfy every single criteria then they don't give you money. So you spend a lot of time doing stuff that isn't exactly motivating.

<div align="right">Participant 26</div>

Participant 26 outlines here that their motivation in setting up a festival is not to spend time as a volunteer applying for corporate sponsorship, and indeed this highlights a stark difference between what makes a person a figurehead of a community science festival compared to a corporate science festival. Whereas a figurehead of a corporate science festival is a strategic leader operating at the level of a Chief Executive Officer of a social enterprise or Director within a visitor attraction or cultural organisation, a figurehead of a community science festival might be a local person with no experience in strategic or operational management of an organisation, but is motivated to set up a science festival to achieve a social good. Participant 8 cites their reluctance to engage with sponsors as a financial reason:

The problem with a lot of sponsors is that you have got to spend the money before they will give it to you so you're out of pocket. Being an individual, this sounds very negative, but being an individual, it's out of my pocket. I don't have a company that is giving me ten thousand pounds to play with, if I've got to lay out ten thousand pounds it comes from my bank account which is not the best sort of situation. I don't want to do evaluations, impact assessments, write bids and have to go to endless meetings. This is my evening and weekend job.

Participant 10

Notwithstanding, some community science festival figureheads have very different views to sponsorship, and some see financial support from sponsors as a necessity for the survival and growth of their festival:

I don't have a pool of people producing things free of charge, I do get quite a lot free, but to fill the program I need to look at commercial and buy-in and that's the bottom line as to whether I continue with the festival or not. There is the financial aspect of it. Can I raise enough money to make next year's program as good as this year's?

Participant 12

Indeed, some community science festival figureheads enjoy the opportunity to work with sponsors and some do find this a rewarding aspect of their role:

Our main funding comes through sponsorship, and in [geographic location] we have strong relationships with our sponsors. In [geographic location], you have to work very hard to retain and to build your sponsorship. That's something I enjoy doing and I've become good at.

Participant 20

The main supporter of public engagement with research festivals is the university, research institute or learned society themselves, who invest large sums of money in the

festival in order to achieve their instrumental objectives. Some public engagement with research festivals are completely funded by their organisation:

> So at the moment, the festival is purely paid for by the college. It's completely funded by the college.
>
> Participant 7

> We've actually managed to run without getting a huge amount of external sponsorship, or actually any external sponsorship, and not having to rely on that, so our funding comes centrally from the university.
>
> Participant 10

As public engagement with research festivals enter their growth phase, some festival figureheads spoke of an increased investment from the organisation producing the festival when they realised the extent to which the festival was achieving instrumental objectives of the organisation:

> Then the university started much more heavily investing when they saw the real value of it and the investment comes through widening participation. They see the festival as a really good way of encouraging young people to come to university, which it is very powerful. It [the festival] does a good job. They give us two types of investments, raw cash and they also allocate one of our people to basically manage the show, which is worth more than cash as far as I'm concerned. But yeah, more cash almost every year.
>
> Participant 17

All of the public engagement with research festival figureheads interviewed as part of this study did not see the need to gain external commercial sponsorship. As Participant 16 says:

> It's not about them [corporate sponsors]. It's about us and what we do.
>
> Participant 16

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7.7. Science festival audiences

During the research interviews, participants were asked to discuss their audiences and specifically, who their target audiences are. Some festival figureheads were quite vague in this area, and some had very clear views on who their target audiences are. One figurehead of a community science festival commented that they do not have a target audience *per se*, but their aim is to maximise the number of people attending the festival, regardless of audience segment:

> I mean, we just go for everybody. Our aim is to get the absolutely maximum number of people. We're just continually interested in maximising the audience.

> Participant 11

Other festival figureheads also alluded to having a "broad range of people" attending their festival but did not provide further details on various audience segments:

> So I guess the festival, from a target audience point of view, it kind of depends on who you speak to. We're quite keen for it to be as diverse and as broad a range of people as possible. Because it's seen as being able to meet various different requirements on needs. So yeah, diverse audiences.

> Participant 7

One phrase that came up in several interviews was "hard to reach" audiences. These audiences are hard to reach partly because of lack of engagement with science and possibly low levels of science capital. However, there is an argument that they are only hard to reach due to the way the science festival has been set up and its method of operation, whereas the reality is that they are readily available for engagement with the science festival. Participant 2, figurehead of a community science festival, spoke of teenagers being a "hard to reach" audience:

> The hard to reach group is always the teenagers. We get a few, because they get dragged out by the family on a Sunday to go for a walk, so we do capture some.
>
> Participant 2

Science festival figureheads across all four realms of science festival spoke of families being a key target audience for their festival. Participant 6 spoke about how their festival moved away from being targeted solely towards children and how family audiences are now "key":

> When we started out our target of our audience was children and we've moved on from that now. We actually have events for families and they're key. We put on things now that are targeting the family fun day takes some of our presenters but also local businesses and we've started putting careers in as well.
>
> Participant 6

The point of view expressed by Participant 6 came up in a number of interviews, with Participant 12 noting that only involving children in the science festival, and not families is "an absolute waste of time":

> I have a deep belief that if you only promote, for example in school if you promote school science to kids you will get nowhere. If you promote school science to parents and get parents involved and get them to understand the values of STEM, then they will encourage their kids to. So going to kids and only going to kids is an absolute waste of time. You've got to involve the whole family. You have to involve the whole community.
>
> Participant 12

The role of science festivals in developing supportive parents came up in a number of interviews with science festival figureheads. Participant 2 spoke about their festivals role in "switching on parents" as in important role of their festival:

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One of the things we recognised very early on was that it doesn't matter what we do in terms of switching kids on to science, if the parents aren't supportive of them studying it and considering it as a career option at whatever level; whether it's at an apprentice level, whether it's at a technician level, right way up to, you know, the parents have to support it, buy into it and you know, not say to their kids: "Oh, you're not bright enough. You can't do that." So it's empowering the kids by switching on the parents. It's a big part of what we do.

Participant 2

Families with "younger children" are a key audience of science festivals across all four realms of science festival, and this is consistent with previous comments about teenagers being "hard to reach":

So I think the majority of people who attend [the festival] are families. The biggest component is families. And the families will be of younger children, I would say, probably.

Participant 7

Notwithstanding, science festival figureheads did express concern that the families attending their science festival are those from middle class backgrounds who already have high aspirations for their children:

We are to a certain extent preaching to the converted. So we are attracting families where you've got educated parents, they have high aspirations for their kids. It is a concern but I'm not sure how to engage, you know, those more working class families.

Participant 1

One science festival figurehead spoke about how specific events in their festival are targeted towards families from lower socioeconomic backgrounds:

They [events within the festival] were targeted at families from lower socio-economic backgrounds. They were from the evaluation that we did from festivals, there were a couple of things that came up. The first one is about how important it was to engage family groups and not just engaging the individuals or children themselves.

Participant 25

This viewpoint that places emphasis on engaging families rather than individual children is shared amongst many science festival figureheads, and Participant 25 spoke of how this was verified through evaluation of their festival. Participant 25 went on to explain why engagement with families must be meaningful:

If we really want to maximise the impact of a festival, it's about building that meaningful, that sustained engagement. So what those families, they were trying to say is that: "Well, you know, great you've got my interest. You have engaged me. Now, I'm here for the festival. How are you going to sustain that engagement?" I think that what I'm aiming to do for a festival, and you will see that one of my priorities for the festival is about diversifying our audiences. So it's about the festival audience being more representative of the communities that we serve. I think that it will be unrealistic for me to really develop a different model, a festival that is based on a community engagement model, because if we decided to do that, I'd need three times the budget that I have.

Participant 25

Despite engagement with family audiences being a key priority for all science festival figureheads taking part in this study, it was only figureheads of corporate science festivals who spoke of adult audiences at their festival. Although adults may be a target audience for community science festivals and public engagement with research festivals, such audiences were only at the forefront of discussions with figureheads of corporate science festivals. Participant 25, a figurehead of a corporate science festival, spoke of two audiences: one being families and the other being young adults:

> For us, we have, like, two key target audiences. One, they are about families and the second one is what we call, well, not what we call, it's about young adults.
>
> <div align="right">Participant 25</div>

Participant 22, a figurehead of another corporate science festival, spoke of adult audiences - specifically middle-class adults - as an audience segment that they "want to take money off":

> There are some people who we want to take money off. They are generally middle-class adults. There's one part of our marketing that is directed at festival types, people that go to festivals, because we think they're receptive to what we do and they can afford to pay for ticket prices. So there's a bit of content that's aimed in that direction: the content that makes box office money.
>
> <div align="right">Participant 22</div>

This view is consistent with that of Participant 5, a figurehead of another corporate science festival:

> I always try and have, like, grey hair. Right? Adults. Rather than everyone else who thinks their science festivals are for children, whereas I'm like science festivals are for adults too.
>
> <div align="right">Participant 5</div>

Participant 22 had further segmented their adult audiences and spoke of "non-science adults". Participant 22 spoke of programming free events within their festival to target the "non-science adults":

> There's that bit, then there's the free bit, a lot of the content that is completely free. That is aimed at everybody, including people who wouldn't naturally want to pay for going to stuff but especially the non-science adults.
>
> <div align="right">Participant 22</div>

In addition to corporate science festival figureheads discussing their "non-science adult" strand of their festival, a figurehead of a public engagement with research festival also spoke of an ambition to develop the "non-science adult" audience segment within their festival:

> The other side is like non-science adults, I've got some experience in targeting that and that is going to be online advertising very much Facebook, Twitter, Instagram, you know. "Why don't you come along and do this, see this, listen to this?" Again, because it's free, and it is in the centre, it's a pretty low pressure scenario. People can come along for a couple of hours, listen to some talks, try some hands-on activities, and that's how I'm gonna market it, I'm gonna be very sort of like blonde and non flashy and just be like: "Why don't you come along to this?" You might like it. Shit, who knows?"

> Participant 13

Interestingly, Participant 13 also has experience of working within a corporate science festival, so elements of corporate science festival approaches took place within the public engagement with research festival, with events for "non-science adults" being one example.

Many science festival figureheads spoke of clear ambitions to target the most deprived children and families to attend their festival. Indeed, Participant 13, a figurehead of a public engagement with research festival, spoke of their target audience being from the most deprived geographical areas, as identified by the Scottish Index of Multiple Deprivation (SIMD):

> It's the fact that the venue of the festival this year is in a grand building. I think it's gonna be really off putting for the kind of people that I want to attract. My target audience is children and families from areas that score in the lowest 20 percent of the SIMD, which is the Scottish Index of

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Multiple Deprivation, and this quintile I've been doing some work with [organisation] and they are really open to having this content come to the festival, but I think because of the multiple barriers they have, including a kind of psychological thinking of like: "Oh that's not the kind of thing that do. It's not the kind of thing that my kids will enjoy. They'll probably find it boring." So yeah that's challenging.

Participant 13

Targeting science festivals towards people from lower socioeconomic backgrounds was a prominent theme within the data, which came through particularly from community science festivals, particularly from more rural community science festivals which function within geographically isolated locations:

My target audience is children that aren't going to be able to access anything out of the norm, if that makes sense. Like, their parents can't afford or don't want to take them to [city] for this learning festival.

Participant 18

This viewpoint was seen in a number of rural community science festivals. Participant 26 discusses how geographical isolation combined with financial reasons and lack of confidence creates a barrier to engagement with science, and positions their rural community science festival as a means to break these barriers:

Our main focus for our audiences are our hard to reach audiences, so people that don't visit science centres and that could be because of financial reasons, living outside of the city, or just because of lack confidence or feeling like: "Science centres are not for me. Science festivals are not for me." That type of thing. So, we target all of our events in areas of high deprivation and within community centres so that people don't even have to travel on a bus.

Participant 26

The point made by Participant 26 about producing events within community centres "so that people don't even have to travel on a bus" is a theme that came up on several occasions. Participant 4 speaks about this in greater detail, and explains why their festival actively engages communities "around the outside [of the city centre] that are some of the poorest in the country" to come to the centre for the festival:

> You've got communities around the outside that are some of the poorest in the country. We say: "You should come to this it's really cool" and people are in the outskirts of the city: "Fuck off, why should I?" So, that's something to really think about. That's about working with people that are in those communities, so it's working with youth groups or BME [Black and minority ethnic] groups, that kind of thing. Sort of going to them and saying: "This is what we're doing. This is how you can get involved. This is how I would like you to get involved. What do we need to do to make sure that happens?" So there's a little bit of that I think. I mean there's no point in us dunking loads of flyers around the city. We're done some of that obviously, street banners on street light things. But you only see those if you come to [the city centre] anyway. People who live in most outlying areas, they don't come to the centre. People that live in those outside communities just don't see the central city as a place for them to be so they don't see any of that stuff and there's no point is us just dumping stuff like posters and flyers around in pubs and wherever, it's about working with people to engage people I think.
>
> Participant 4

Participant 4, above, discusses their approach in working alongside Black and minority ethnic communities to engage them with the festival. Not all science festival figureheads participating in this study took the same view, with Participant 13 stating that they are not specifically targeting BME groups:

> As for Black and minority ethnic communities, no I'm not doing anything to target them, but not out of badness but just because I think that's a whole different thing, you know.
>
> Participant 13

Conversely, Participant 25 viewed their festival as being diverse and doing "quite well" in terms of working with BME communities. Participant 25 did, however, express caution about "parachuting" community groups into science festivals:

> If you really want to invest in developing meaningful and long-lasting relationships, what I don't want is parachuting community groups into the festival for a few days. Quite a few science festivals are doing this and then not doing anything else. I think it needs to be much more. Really, I want to take a much more holistic approach to it, and that is when I think that this is really positive. What we do is to make sure the visitors, they really represent, their ethnic diversity, the socio-economic background. I think that in terms of ethnic diversity I think that we do quite well. In terms of socioeconomic backgrounds, I think there is still a while to go.
>
> Participant 25

Not all science festival figureheads set out to engage people from lower socioeconomic backgrounds. Participant 20, a figurehead of a community science festival, spoke of their geographical location as having no deprived communities:

> Personally, the opinion of the organisation here in [city] is we don't have deprived communities, as such. Everyone benefits from coming [to the festival]. I think you can't judge a book by its cover, and I think in [city], people can spend a lot of time saying: "Well, that's a deprived area," when in fact, that area's got some of the best and brightest, or, in terms of disposable income, you can't make any assumptions, but high incomes. [City] is not, and doesn't have deprivation.
>
> Participant 20

This point of view did appear to be a one-off, and is inconsistent with the experiences of the researcher undertaking research in that geographical location.

Community engagement was an important theme for all science festivals with Participant 21, a figurehead of a community science festival noting that their ambition to make "community science a thing":

The purpose of [the festival] for me is to, from the science angle, is to make things more community led. I want to make community science a thing. In a way that community arts is a thing. Alright? And I don't think that, I don't think science communication is community of science. I'm not sure it's even a community.

<div align="right">Participant 21</div>

Here, Participant 21 makes an important point about the science communication community and the role of science festivals in supporting and developing that community. Participant 25, a figurehead of a corporate science festival, spoke of the role of their festival in developing and shaping the science communication community within their geographical location:

Well I think I could go back to that idea that I mentioned when we started doing community, it's about being part of that ecosystem of science communication within [geographical location], and I think that is probably where we play an important part, we are an important partner. However I am not coming here to say we are the only or the most important partner within that science communication environment exactly. I think that for me the value is about being a really good platform to do public engagement with science. It's [the festival] a really good platform for scientists to really disseminate their research. It's a really good opportunity for hooking new audiences in terms of engaging them with science. So I think that, you know, that is the way that I see, I think that we are an important part of that ecosystem.

<div align="right">Participant 25</div>

Science festival figureheads had mixed views about whether their festival attracted tourists. Indeed, some festivals (in both the corporate and community science festival realms) include the word "international" in their title. One festival figurehead spoke of having an international audience:

The vast majority of the intentional audience are families with primary school age children.

<div align="right">Participant 2</div>

Other festival figureheads were very clear that the festival is for the local geographic community and not for tourists:

> It is not for tourists. So, there is, though, of course, in order for making it really attractive to everybody in the business community, they want us to do this for tourists, so that tourists will additionally come here. So, there is an interest from the business community for this to have wider applications. But they're of secondary interest to me. This is about us and our community.

> Participant 15

Nonetheless, other community science festival figureheads were more open to developing tourists as an audience segment:

> My obvious target audience is local community but broadening it out to make it more of a visitor attraction and bringing in tourists would certainly be a very definite objective.

> Participant 12

Public engagement with research festival figureheads spoke of various audiences for their festivals which touched on many of the themes identified above. Participant 16, a figurehead of a public engagement with research festival, spoke of the widening participation agenda and fulfilling the university's instrumental objectives around widening participation as a key driver for audience development:

> In keep with our widening participation agenda, which targets the sort of first generations, you know, although those people who haven't gone to universities; the person's family haven't gone to universities. The gender balancing things as well. So that whilst even though the universities may be seeing the gender balance shift towards, you know, the female. You see a lot of the science and engineering are still very male dominated. So those groups are our target.

> Participant 16

Some public engagement with research festivals view children visiting the festival via school trips as the most essential audience. Participant 17 spoke of school children (coming to the festival via school trips) and their own students as their target audience for their festival:

> Ultimately, we want to make people feel that science is something they can all engage with. I would say we try to make it fun and interesting and non-threatening. We also want to very much encourage young people to get interested in science over a period of time. Schools come to [the festival] year after year after year, so it's a long-term thing. Clearly, we want to educate, teach them some science. We also want to have a forum for particularly the university research staff to show off what they're doing and achieve some degree of impact on society through what they're doing. That's an important value. The final one, which is almost the most important, is that we use it to enhance the student experience and train our students. So students coming along to the festival is key. They are our target.
>
> Participant 17

Public engagement with research festivals produced by universities identifying their own students as a target audience was a prominent theme in interviews. Participant 27 spoke of their approach to trying to engage students on campus to come into the building in which the festival was taking place:

> So we tried to make it a little more approachable, so we kind of put music instruments outside, we had marquees outside to make it very clear you were allowed to come in. The volunteers who were based outside were encouraged to really go out there and invite people. "Come one, go into this. It's great. Go on, it's free, there's cake, there's stuff." And to try and encourage students passing by. We didn't get too many people to come in.
>
> Participant 27

Encouraging people to cross the physical barrier to enter a university, research institute or learned society buildings and take part in a science festival that is occurring within their venue was noted to be a problem for science festivals within the public engagement with research realm. Participant 27, above, noted the difficulty in engaging university students already on campus, and Participant 7, below, discusses the difficulty in bringing people from outside the campus onto the university grounds for the festival:

> I think a key value is around the barriers that people put between the academic, the research world, and the public. And some of those are physical barriers, stuff is stuck in labs or facilities or behind security closed doors. And some of it is mental barriers, people have put up walls as to what, again, from both sides, researchers put up walls as to what they think the public think, and the public put up walls as to what researchers are, and what the academic world looks like, and what they think.
>
> Participant 7

Participant 7 articulates the physical and social barriers associated with bringing people external to universities, research institutes and learned societies into a public engagement with research festival. Alternatively, Participant 27 highlights that their public engagement with research festival needs to develop a strategy to engage with the public:

> I think we need to think of strategy to get more members of the public in. It still seems to be this barrier about coming into the university, but to be fair, I don't think that the venue was particularly accessible. I think if we could do it elsewhere.
>
> Participant 27

However, Participant 27 goes on to say that taking the festival out of the their institute to more accessible locations is problematic for them in terms of their funding and sustainability:

Part of the funding part is to bring people into the uni. And it's difficult to do that when you're not right in the city centre, and people are just passing by thinking if you're in a location where people are just around anyway doing their shopping, they might just pop in. So we can't really change venue or that. This is us. This is where we are.

<div align="right">Participant 27</div>

7.8. What makes a science festival unique?

During research interviews with science festival figureheads, participants were asked about whether their festival is unique and if so, what it is that made their festival unique. This question drew out some very mixed responses, ranging from a few festivals seeing themselves as very unique, some festivals seeing themselves as not unique at all, and most festivals viewing themselves as being somewhere in the middle ground between such responses. Participant 14 took particular exception to this question:

I don't really like being divisive like that. Of course I think we're creative, whether we're more creative than other festivals, I don't think that's either an appropriate or relevant question because every festival is programming for their audience. So as I said at the beginning, I'm not really into the biggest, the largest, the longest, you know. It's whatever. We're all programming for different people and so yeah. We're all just as creative for the people we're serving.

<div align="right">Participant 14</div>

Participant 14 makes valid comments about every festival being different in terms of each festival undertaking its own approach to programming for their own audiences but this response in itself contradicts the viewpoint that festivals are not unique; rather this response can be interpreted to say that every festival in itself is unique. Notwithstanding, some science festivals did not view themselves as unique at all:

I'm not entirely sure I would make some grand claims to uniqueness because I think there's some incredible stuff being done.

<div align="right">Participant 3</div>

So I really couldn't say that there is anything that makes me stand out from the crowd.

<div align="right">Participant 12</div>

From the viewpoint of the researcher, asking participants about what makes their science festival unique was not an inappropriate question, and indeed provided an opportunity for research participants to open up about all of the positive work their festival does, and indeed most participants viewed this question as an opportunity to discuss their community engagement work and working with different audiences, as highlighted by Participant 10:

I feel that we are very unique and original in the way that we reach out to different audiences.

<div align="right">Participant 10</div>

The major themes that came out of responses to this question can be broken down into two: firstly, that community science festivals view much of their community engagement as unique; and secondly, that public engagement with research festivals view their audiences speaking directly with researchers as unique. Importantly, festivals within both the realms of community science festivals and public engagement with research festivals discuss their uniqueness by comparing them to corporate science festivals, or indeed "bigger" science festivals as they refer to them as. Participant 4 discusses community engagement as "a principal tenent" of their science festival:

I mean, we've got some really nice community engagement projects that we do, and again a principal tenet of that has always been to start off by speaking to people and the local community. And I do think that's actually

something which is horribly missed by a lot of people, especially the bigger ones [festivals].

The viewpoint amongst figureheads of community science festivals was fairly consistent that their festival was unique as they really understood and engaged with their audiences, again as highlighted by Participant 15, who refers to what I now present as community science festivals as being "small festivals":

> The other thing I think is a bit unique here, or unique, you'll find, in the small festivals, is that you really know your audiences. The post code doesn't tell me whether I've got somebody of high education interests or not, but I know my audiences here. I know the people, the communities unlike these big other ones [corporate science] who don't know or care about that.

Participant 15

Community science festivals that take place in remote geographical locations viewed themselves as being unique in the sense that they are bringing science to a community that would otherwise not be engaged in science. Participant 18 - a figurehead of a community science festival - discusses how the community their festival serves is in the "dark ages" with regards to their engagement with science:

> It's [the science festival] unique because [geographic location] don't do science. It's the truth. You mentioned science to anyone in [geographic location], they just don't get it. I don't know whether that's because we're still kind of in the dark ages, it is a rural agricultural area. Or the other extreme, it's really arty. That's the two extremes, agriculture or art. You're looking at creative people or farmers. When you ask people to be scientific or slightly academic its terrifying concept to them. Our aim is to show people that science doesn't have to be academic, it's really fun and it's

really worthwhile. And, it's not hard at all if you put your mind to it, but these huge festivals with huge audiences don't do this.

<div align="right">Participant 18</div>

Participant 18 again highlights how community science festivals view themselves as unique to corporate science festivals (or indeed as "huge festivals") because of their work in engaging audiences who are not traditionally engaged with sciences.

On discussing similarities between smaller science festivals or more rural science festivals (that I can now refer to as community science festivals), Participant 20 highlights the similarities between these festivals:

> There's a lot of similarities [between community science festivals], but we are all different, and we're different because our communities are different, and our local businesses are different, and the way in which the schools work are different, and the geographic reach that we have is different. But I think what we all have in common is we do it for the audiences. Every festival is run by passionate people who do it not just because it's a job, but they do it because they're driven to do it. It's something we do on the side because we genuinely care and are passionate about it.

<div align="right">Participant 20</div>

Here, Participant 20 reinforces that community science festivals generally operate a different business model from corporate science festivals, in that the festival team may be exclusively volunteers working at the science festival as a volunteer rather than as a paid employee. This is a point picked up in an interview with Participant 12 who goes on to discuss how unique community science festivals are compared to corporate science festivals:

> This is not a 9-to-5 job. And I think it's difficult to look at the skill set of what's required to put it together because it's so different from [names of

corporate science festivals]. Just because you've worked on one big fuck-off festival doesn't mean you're going to necessarily enjoy working on another festival - or be any good at it - because they're completely different. But everybody is 100% unique in that respect. They're doing it for themselves, we're doing it for our audiences.

Participant 8

Indeed, Participant 8 sees community science festivals as being so different from corporate science festivals, that staff from corporate science festivals may not enjoy, or indeed "be any good at it" when working at a community science festival.

Public engagement with research festivals position themselves as being unique in that they provide opportunities for members of the public to have conversations with research scientists, as discussed by Participant 23:

Like, people this year can talk to the guys that made the [name of major scientific] discovery, and you know, you're talking to some of the leading principal investigators. So, I don't know how to phrase that, but I feel like it's something that is fairly unique to us.

Participant 23

On engaging with audiences, some public engagement with research festival figureheads spoke of being unique in that researchers are making themselves as accessible as possible and moving away from educating people about science, but using the festival as an opportunity to talk about what it is like being a scientist:

We try and get our researchers to move away from teaching kids about general principles of science. Talk about the stuff you're doing right now, but find a way of making that engaging, explainable to a family. You're not giving a science lesson, you're giving a "this is what we do, this is what actually a scientist does, or an engineer does on a daily basis". And here's why we think it will have implications in ten years time or whatever.

Participant 7

This approach of moving away from researchers educating the public, to opening doors of the university, research centre, or learned society to talk about what it is like working as a researcher is an emerging theme for public engagement with research festivals. Participant 15 discusses their approach to bringing people inside to their institute during the science festival:

> And I actually can see whether people come, whether old folk come, or whether it's just my own undergraduate students who come to events. But they're not the ones I need to get. They get lectures all the time. And I think that's something that we do, that's good, in the small festivals like ours. And I think we're more approachable, as such. But we are not here to say our science is dazzling, because we're not set there to show people just wang-bang how amazing we are. That's not the purpose of it. It's about showing what it's like to work here.
>
> Participant 15

The opportunity of opening up a laboratory and having guided tours and the opportunity to speak with researchers - in the researcher's space - is a key advantage of public engagement with research festivals and it is something that such festivals are capitalising on. Many public engagement with research festivals are using their festival as an opportunity to move away from their instrumental objectives to try and achieve something greater - indeed, have conversations with people about what it is like being a scientist rather than having a discussion about science. Participant 7 said about this approach: "we think it will have implications in ten years time or whatever" although how this implication will be measured remains yet to be seen.

7.9. Aspirations for the future

Science festival figureheads interviewed as part of this research were asked about their aspirations for their festival in the future. Responses to this question were varied, but

inevitably, figureheads of community science festivals spoke about retaining and developing engagement with communities. Participant 1, a figurehead of a community science festival, spoke of the need to retain community roots, but also used their answer to this question as a further opportunity to discuss how such an approach makes them unique:

> I think it's keeping the community roots really strong, not just become the same as somebody else. We are unique. We want to retain that unique quality.

> Participant 1

Some figureheads of community science festivals spoke about expanding - but not in terms of size of their current festival. Indeed, growth within community science festivals is about taking the festival to a wider range of geographical areas, rather than growing a festival within one geographical location:

> We'll just keep on doing what we do. We'll go to more and different rural areas. Because we work mostly in this little, big, actually, pocket in [geographic location] we don't want to tread on the toes of other people who run festivals. So, we're quite careful in choosing where we'll go. We have talked about going to [geographic locations] as well, which are quite a lot of areas of social deprivation that we haven't been to and would like to do more there. But, that needs money, because you've got to get people and kit quite a long way. And to get a free venue isn't that easy.

> Participant 2

Here, Participant 2 discusses their ambition to tour their festival to go to more areas, particularly where there is social deprivation, but highlights costs involved with touring their festival and finding free venues to support the festival. This viewpoint was consistently raised by figureheads of community science festivals. Participant 26 spoke of achieving this by taking the festival to public venues which are not associated with culture:

If we're looking at a science festival as a way of kind of driving meaningful engagement from people that weren't engaged before and driving behaviour change, if that's what's desired. Then I think we have to do better in making ourselves appealing to those people, however that is, and I think it is about getting to people where they're at. So, in five years I would like the festival to be taking place in what I'd call a public venue, you know, like a, somewhere that can be hired out and somewhere that doesn't have any cultural ties to it.

Participant 26

Corporate science festivals also spoke of similar funding issues and an aspiration to engage new audiences in the future, but with a notable difference that instead of touring the festival or having a new location for the festival, corporate science festivals discussed bringing those communities that Participant 2 spoke about to their existing festival venue, rather than taking the festival to such audiences. Participant 5, a figurehead of a corporate science festival, spoke of their ambition to "crack the future":

We really have to crack the future. I think we do, at all the festivals, whatever the genre is, do a good job going to the audience that are open to you. The audience that already know that are comfortable looking at this kind of subject, what we've got to crack is getting people to the festival who are absolutely interested in this stuff but don't know that they are. They watch all this on the tele but they don't come to a festival about it because they don't understand what it is. I would really like us to go a bit further with the non-science kind of audience and do more with schools. I think we do need to find another way, on another specific programme for schools. We do need to have a more secure funding, I think, for science as well. I think we would really like to attract people from a wider audience. From a wider geography. People coming from outside [geographic location] as well. How do we get them here? We've got quite a lot to do. You've always got quite a lot to do.

Participant 5

This highlights an important difference between corporate and community science festivals. Whereas community science festivals will go to their audiences location and venues, corporate science festivals will create programmes and initiatives in order to get those audiences to come to them.

On having aspirations for the future, some science festival figureheads spoke of collaboration with other festivals. One figurehead joked about an alternative to collaboration:

> There won't be any other festivals, so it'll just be this one. It will take over all science festivals. Everyone will have to go to it for at least half the year.

> Participant 13

Joking aside, there is an appetite for collaboration amongst science festivals from all four realms, but this appetite for collaboration is for other genres of festivals outside science festivals, as articulated by Participant 10:

> Yeah it would be nice to I think work more collaboratively, it's just we've had this question over control and quality and how we maintain that. So I'd like to see more collaboration, not necessarily with other science festivals, but with other cultural organisations and festivals.

> Participant 10

One aspiration for many science festivals is to have the festival - and thus science itself - seen as a cultural offering in the same light as festivals in other genres - such as music, art or film festivals. This ambition for the future provides justification for science festivals now to view themselves as organisations that provide an intangible social good:

> And so, in terms of my aspirations, I really want it to be seen as somewhere that people go, either to learn something, or not necessarily, or just have a nice social interaction. And it's seen alongside a music festival and an arts festival and a film festival. And maybe it is impossible

to imagine, but I think there are people out there that would say, "Yeah, I like science and I want to come to this." And it's not just retired scientists. It's actually the young people that have the choice of things they can do to fill their spare time with. And it's bringing them in and effectively, when they become parents, maybe their confidence is raised and we're fixing the cycle. So maybe there is a social good in there somewhere. We certainly hope so.

Participant 14

This viewpoint that somehow science festivals currently offer a "social good" is an important point as it helps us understand why science festivals do what they do - particularly those community science festivals run on a voluntary basis - but it is something that requires further clarification and research into what exactly this social good is and how it can be measured.

One final important aspiration for many science festivals in the future was that of survival, as articulated by Participant 3 who gave the following response when asked about their aspirations for the future:

Surviving. The funding landscape is just very challenging for science festivals and public engagement in general. So the fact that we are in our [n]th year and critical funded. We really are. So I think being able to keep doing what we're doing, as a baseline, would be a very nice thing. To still be able to be here in five years time to do that.

Participant 3

This aspiration just to survive as an organisation was apparent and plays to the political nature of science festivals: the reliance on public funding and the public need to develop a future STEM workforce. Festival survival can only be achieved by developing and strengthening business models and ways of working. Ultimately, one way to survive is to avoid "burnout", something discussed in greater detail below.

7.10. Burnout and the festival life cycle

An important theme that arose during interviews with research participants was around poor mental health of festival figureheads, caused by their commitments to the festival. This was a particularly prominent theme that arose during interviews with figureheads of community science festivals in particular. It is important to note here that there was no question within the semi-structured interview where research participants were asked to discuss mental health. Indeed, there was no ethical approval to do so and thus to ask such a question would have been unethical. The discussion around mental health was, on all occasions, brought up by the participants themselves. The role of the researcher here was to lend a sympathetic ear and to give the research participant time to talk about their mental health and how their involvement within science festivals have led to poor mental health. Participant 24 discusses how their community science festival in the early years nearly killed them:

> First few years, I did everything. It nearly killed me.
>
> Participant 24

Participant 15 discusses how their festival led to them losing the will to live:

> It's [producing a community science festival] quite a stressful thing to do, so I lost a little bit, the will to live.
>
> Participant 15

Upon further discussion around their science festival, Participant 15 explains in more detail about the impact of the science festival on their own mental health, and how the stress of producing a community science festival contributed to cases of serious poor mental health:

I'm very sad to talk about this, in some ways, because it's your own initiative. But as I said, I've not completely given up, but I cannot do this anymore. I think the two times that I got really seriously ill, I don't think it was just caused by that [the festival], but I certainly think it made it worse, the stress associated with that. Maybe it was all 'cos of it.

Participant 15

Discussions around mental health arose on multiple occasions and one festival figurehead spoke of having to take time off their regular job to recover from the delivery of the community science festival:

I think the challenge of the festival is it does only happen once a year, so you burn yourself and I had to take time off work until [month] to recover mentally. We're trying to create more of a marathon environment than a sprint so that the festival is put together over the course of the year. But it is exhausting.

Participant 20

Developing mental illness from producing and delivering a science festival is problematic, yet appears to be a widespread problem. Participant 11, a figurehead of a community science festival, spoke of the underlying reason as to why they get "burned out" after the delivery of their festival:

I could sometimes get burned out after them [the community science festival]. The thing about burn out is of course it's happening when you're a volunteer, because you've got your day job and then you've got this on top of it.

Participant 11

It is evident that being the figurehead of a science festival is in itself a huge task, but to do so on top of a full time job is such a mammoth task. On discussion about the use of

volunteers to help take on some of the workload thus reducing the workload of the festival figurehead, Participant 12 spoke about the difficulty in engaging the local community where they are producing their festival:

> When it comes to running the actual day-to-day programme during the festival week, again it's me. I'm out visiting schools. I'm at all the evening events but I do manage usually to get quite a lot of volunteers to come out and help for the science festival, because registration and that sort of thing. A lot of it is family but there are a few people that will come out for an hour or two but getting the commitment for a few days or about a week or something like that is very difficult. Again, I think it reflects on communities generally but I think rural communities, they are always shouting out for things to do, but not necessarily queuing up to do things.
>
> Participant 12

Many community science festival figureheads spoke about an ambition for the future being for their festival to become less reliant on them as the figurehead, and ultimately to develop into a sustainable business. Participant 8 spoke of the desire for the festival to keep on doing what it does, but for it to be less reliant on them:

> My ambitions are that I am less involved and it doesn't collapse. Because it's much too, and always has been much too dependent on me. And I won't be here forever, not if the festival has anything to do with it. It has to become more independent and less reliant. Other than that, it could keep doing, more or less, the same things it's doing. If it could just do it on its own, that would be great.
>
> Participant 8

Burnout is not a phenomenon unique to community science festivals, but is also prominent amongst figureheads of public engagement with research festivals. Participant 19, a figurehead of a public engagement with research festival, spoke of the stresses involved in producing such a festival:

Personally it's stressful in the sense that I ended up signing off the whole event. The risk assessment, health and safety and everything, not something I ever want to do again. I was sick at the thought of coming to work in the morning.

Participant 19

This viewpoint from a figurehead of a public engagement with research festival is consistent with that of a community science festival figurehead. It is important to note, however, that the figurehead of the public engagement with research festival is generally in full-time paid employment with the university, research centre or learned society that is producing the festival, so although their involvement with the science festival may constitute extra work, it is generally within the scope of their paid employment. Participant 7, a figurehead of a public engagement with research festival, speaks of how they have been able to share out the workload involved in producing and delivering the festival, resulting in better mental wellbeing:

This year it was much better because we were able to put a team together and we were paying a few external people to do things. Next year will be even better because we've actually got staff who's dedicated to that role. So you can see it's shifting. You asked, basically it's been a complete nightmare around this and it's shifted over time. What's happened is people have burnt out. Someone in another role has been cast to lead it, has taken it on and it's been far too big and they'll never do it again. It's too stressful. That's why we're trying to embed some stuff trying to make it proper and make it not like that. So someone sees it as a task and it doesn't stress them out.

Participant 7

It is also apparent that after a few years of public engagement with research festivals having a figurehead who does most of the work is a way to gain institutional buy-in, but in order to develop the festival and avoid burnout of that figurehead, bringing more

people onto the leadership or coordination team is important for developing the festival, as highlighted by Participant 16:

> You know, the whole thing's been steered very much by me. And I'm sure other people have been great, and I know there are other people around who've got great ideas and were interested in about how to do things and get involved. And I think it's approaching that time where it needs more input from other people. That I'm showing that it can be done, there's an appetite for it. It's time to drive this thing forward and bring in fresh coordinators.
>
> Participant 16

In addition to the mental health of festival figureheads being identified as a reason for festival decline, a surprising number of community science festival figureheads spoke of growing bored of their festival, resulting in decline of their festival. Despite the enthusiasm for setting up their community science festival, Participant 8 spoke of the boredom of continually delivering the festival:

> I'm brilliant at setting things up. That's a really egotistical thing to say. But let's just say that's my strength. I can set things up. I can innovate. I'm really creative. I can motivate a team of people to do a thing. I am not the best person to then run it for twenty years. Because, I, forget burnout, I get bored. I don't have the attention span required to run something I started five years ago for another ten years. I'm a serial entrepreneur, not an event monogamist.
>
> Participant 8

This viewpoint expressed by Participant 8 that after 5 years of running a science festival, considering a new figurehead taking over, is consistent with the viewpoint expressed by Participant 16, above, albeit for different reasons. Being aware of "festival

fatigue" and trying to avoid becoming bored of the festival was discussed by Participant 15, who discussed various ways of trying to avoid "festival fatigue":

> And there is probably some of that festival fatigue, you know? I have tried to do it differently year on year, and I do not have one formula. We've changed, quite fundamentally, what we've done, all the time. But I have fatigue. So, I'm not carrying on with it, myself, in the future.

> Participant 15

Combined, boredom (or "festival fatigue"), stress, and associated mental health issues can lead to festival decline. Participant 6 speaks of all of these factors, but also adds in "criticism" from others as a factor that leads to the fatigue and growing disinterest in the festival they set up:

> I think people stop because they get bored or it's hard and they're giving a lot of their time, and I'm the same. It's an intense week for me, it's usually a pretty intense three months. You need change or it gets boring so there probably have been years where I'm just going on with the momentum of other years. Oh, and there's a report to do. Nobody pays for the report but that report probably takes 80-100 hours of my time and it's always criticised by the Government and the festivals network who say we don't calculate things right.

> Participant 6

Festivals, as businesses, can take various pathways or trajectories (Davies, 2011) and science festivals are no exception to this. Festival trajectories include simply surviving whilst not growing; growth phases; and also sudden and unexpected cancellation (Holmes & Ali-Knight, 2017). Butler (1980) theorises that there are 5 stages of festival and event life cycle with regards to destination (Figure 7.3).
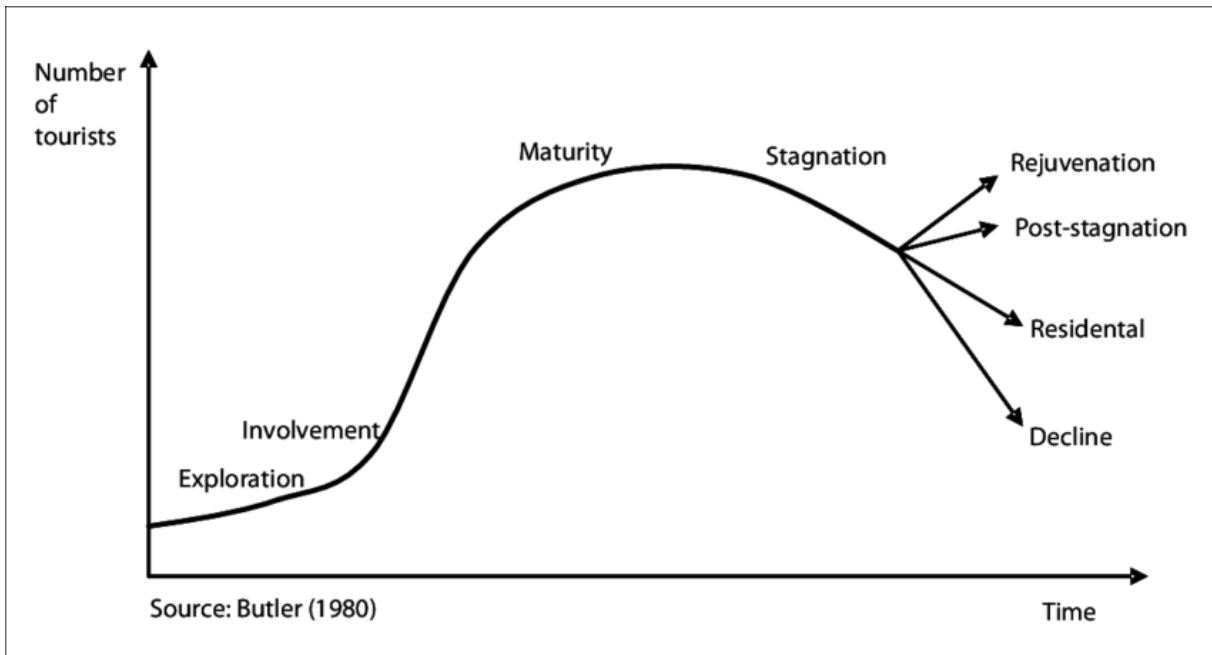
Figure 7.3: Event life cycle and destination (Butler, 1980).

Beverland et al. (2001) propose that there are actually 5 different key stages of festival and events comprising establishment, recognition, regional prominence, maturity, and regional decline. It is of interest to festival managers to understand what are the factors that lead to success and failure for events (Getz, 2002). Gibson & Connell (2012) define festival success as the ability to continually grow whereas failure would be cancellation of the festival. However, the decline and cancellation of a festival might not necessarily be a negative outcome and can be viewed as a natural conclusion to the festival, having already achieved some positive outcomes (Davies, 2011). Whichever trajectory a festival takes, factors that affect the trajectory taken include a combination of internal and external factors such as governance models, budget, finances, sponsorship from business and government, box office sales, media coverage, and buy-in from local communities (Getz & Frisby, 1991; Lade & Jackson, 2004). Holmes & Ali-Knight (2017) propose that festivals can take alternative trajectories including cancellation, hiatus, and redevelopment. A festival can be cancelled due to burn out of the organisers, whereas a hiatus may take place when a temporary major problem has halted further development of the festival resulting in one or two deliveries of the festival being skipped (Holmes &

Ali-Knight, 2017). A festival can be redeveloped if it goes through substantial change such as new ownership, theme, or destination, but still operates successfully (Holmes & Ali-Knight, 2017). Science festivals taking various trajectories were apparent in interviews with science festival figureheads. Participant 6 spoke of festival finances, lack of funding, and not being able to recruit a new volunteer figurehead as reasons which may lead to the cancellation of their community science festival:

> So, I think when I stop, it might go on a year if there's money in the bank or it will stop.

<div align="right">Participant 6</div>

Community science festivals not being able to make the break-event point and actually lose money is a concern for many, with Participant 12 themselves covering the financial deficit incurred as a result of delivering their festival:

> Talking about sustainability after the festival this year, I'm still not convinced that it's going to continue because I actually personally lost a thousand pounds this year. That's too much.

<div align="right">Participant 12</div>

Taking a hiatus was viewed amongst community science festival figureheads to not only try to find funding and develop the festival as a business, but also to recover from burnout, as discussed by Participant 2:

> Ultimately we'd quite like to find additional funding that will pay for an administrator or some sort of coordinating role because with all of us working full time it's a lot to ask of everybody to take on the scale of this event. And that was really one of the real motives to break this year. Everybody's kind of burnt out. It's just to give us a chance to stop, reflect, review, see what works well, what we could do differently, see how we can do something which is maybe, maybe look at how we manage the scale of it so it has maximum impact but with slightly less effort, and also have more impact in terms of things like economic and stuff like that. So it gives

us an opportunity to do that and get the right business model approach that will make a huge difference in terms of our ability to get additional funding.

<div align="right">Participant 2</div>

Community science festivals considering cancellation or taking a hiatus have reached out to corporate science festivals for guidance on development of business models. Participant 25, a figurehead of a corporate science festival, spoke about a conversation with a community science festival figurehead who was considering a hiatus:

> Do you know what is really interesting, because I was having this conversation with someone who is absolutely in the same position. [They] came to talk to me, because [they] wanted some, I don't know, guidance or advice. I just said don't take it [a hiatus] as a bad thing. Sometimes just taking time to sit back and to really reflect about what you have been doing, the direction that you really want to take on the festival is great. You might see that maybe an item of that is that you were doing amazing things and you just really want to take time to recover. Or you might review your whole festival and then start doing something that is absolutely different. Sometimes having time, having space to reflect is not a bad thing. I wish that I could have that time.

<div align="right">Participant 25</div>

Developing a business model that secures funding for an administrator or for a paid team member does appear to be an ambition of many community science festivals; indeed, some festival figureheads spoke of this as being essential to survival of the festival once the volunteer figureheads or coordinating teams experience burnout:

> The next one's the last one. I'm at the point that if the funding case means that I've got to do more myself and more risk, why should I? I'm already giving my time and my volunteers' time for free. We're exhausted. We

need to find a way to pay someone to work for us, or that's it, the festival is over.

<div align="right">Participant 17</div>

On finding a new figurehead to take over community science festivals to develop the business and grow them, this prove challenging with Participant 6 discussing how difficult it is to step back from the role without an enthusiastic and experienced replacement ready to take over:

It's [the festival's] not sustainable. No one else would do what I do. I've stayed in different lands and I've lived with totally different people, so I've always tried to do the best for my community. Do you find people like me in general? No. Will I find a replacement like me? No.

<div align="right">Participant 6</div>

7.11. What is a science festival?

As discussed in Chapter 4, there is no single agreed definition on what constitutes a science festival, leaving the term itself open to interpretation. Research participants were asked during their interview with the researcher their interpretation of what a science festival is, and their interpretations are discussed below. Participant 3 responded to this question by speaking about "grumblings around what a science festival wasn't":

We go round the houses and argue this all the time. I mean, as I say, there was some definite grumblings around what a science festival wasn't. And I've sat in [UKSFN] festival network meetings where people have been very vocal about, that so-and-so shouldn't be part of the network because they're not a science festival. It's a very basic term to me. It's a

showcase or a celebration or a short series, or you have an extensive programme that pops up, does its thing and then goes away again.

<div align="right">Participant 3</div>

Participant 10 explained that a science festival is "whatever you want it to be" and "whatever people perceive it to be" and in doing so, highlighted the importance of effective festival marketing:

> It's whatever you want it to be, but on the other hand it's whatever people perceive it to be and so marketing is, effective marketing of what you're trying to achieve, is key.

<div align="right">Participant 10</div>

Participant 1 took the view that as science festivals were "all so different" then providing a definition of a science festival in itself would be problematic:

> Each festival is, you know, they're all quirky, and they're all so different. That's, I think, a great thing. So any definition might cause a problem.

<div align="right">Participant 1</div>

This viewpoint was consistent with that of Participant 3 who also thought that a definition of a science festival should be flexible if one was offered:

> I'm not a big one for having a really strictly defined definition, because I think that, okay, a one-day cheese toastie event is starting to push it a little bit, as far as festivals are concerned. But I do think that you should have the flexibility and ability to evolve to meet the needs for your locale, but also to deliver in a way that you can feasibly achieve, you know.

<div align="right">Participant 3</div>

This requirement for flexibility with regards to any definition for a science festival came through quite strongly particularly from community science festivals, many of which shape their festival to meet the needs of the local communities they serve:

> So yeah, I think that flexibility within people's remits to be able to shape what they call a festival to meet their needs and that of their communities is quite important.
>
> Participant 21

Bultitute et al. (2011) define science festivals by saying that the main focus is on 'celebration' of STEM, and the 'celebration' aspect of a definition of a science festival is heavily supported by this research. Discussions around what is meant by 'celebration' came up in multiple interviews. Participant 2 interpreted science festivals to be "anything that celebrates science":

> I think it can be anything that celebrates science. So, it doesn't necessarily have to be time or place, it's anything at all. So, anything. I don't think there's a definition. I don't think the label can be defined particularly.
>
> Participant 2

Whilst Participant 2 agrees that celebration is an important aspect of a science festival, they disagree that it needs to be at a particular time and place, and perhaps this is at odds with Bultitute et al.s' (2011) characteristic of a science festival that the event is time-limited and recurring, usually on an annual or biannual basis. Nonetheless, the celebration theme came through strongly. Participant 15 unpicks what is meant by 'celebration' of STEM:

> I think a science festival should be what it says. A celebration. A festival celebrates science. And humanises science. And brings the scientist out, rather than the science. Brings the people out. And it's a place where you create friendships and trust and enjoyment.
>
> Participant 15

Participant 12 understood the term celebration to be about fun, but one aspect of celebration is that it must somehow be engaging with young people:

> I expect them [festival attendees] to have fun. I expect them to have a better understanding of what science does for the community, does for us. That they are better informed, but most of all they are better informed in a good engaging way. I think that is what all science festivals are about. I've always been accused of being an idealist and that's it. That's what I want to do. We need young people to be taking up STEM subjects. We need to have them involved. But they need to be involved in an engaging way and that is what a celebration of science is. One of the things I get angry about is schools are not engaging kids. There are opportunities to but the schools are not engaging children.
>
> Participant 12

The celebration aspect of a science festival was further unpicked by Participant 25, who saw the celebration not of science, nor of scientists themselves, but interprets celebration as an atmospheric element of the festival, and further states that the celebration is about and for the audience:

> I think that for me there is something about a festival that is, it needs to be a celebration. I think that it's about the atmosphere. It's about the experience. It's about bringing people together, that idea of bringing people together to celebrate. I feel that on this instance I feel that, you know, that is bringing people together to do a celebration. And that celebration might not be about science. What that celebration looks like, I think that it can look very different from [city] to [city] to [city] because that celebration really needs to be shaped by the needs of the audiences. So you may invite me to a party that you might think it's the most exciting party ever, and I can be very bored, or it could be the opposite. I think that is the thing that, that is something that I think that is so exciting about science festivals is that there is not a right or wrong way to do it. What it's about it will always depend on your audiences. For me it is a celebration. Yes, a celebration of and for the audience. And about making sure that you make that celebration as inclusive, as exciting as possible.
>
> Participant 25

The celebration aspect of a science festival was indeed interpreted on numerous occasions by science festival figureheads not to be about science, but to be about audiences and the communities that the science festival serves. Participant 8 spoke of science festivals as a celebration of shared experiences:

> To me, it should be celebratory. It should be fun. And it should be sharing in the proper sense of sharing, I mean that's what a celebration is. Like, this is something we celebrate together. Me and everybody, let's all come together and celebrate this thing that's happening here. And just feel good about it. But that's what happens in celebration.

> Participant 8

It was proposed by Participant 8 that the celebration is of the science festival and of its audiences, not a celebration of STEM in its broader sense. This viewpoint was further supported by Participant 24:

> Hopefully, it's a celebration. For me, it's in a localised way, a celebration of our community. But that's because we're a community festival. So it's a celebration that we share with the people around us. That's kind of it, I think. I don't know that it's anything more than that.

> Participant 24

Burns et al. (2003, p.190) propose that science communication events produce "one or more personal responses" and that those personal responses fit into the AEIOU analogy, as discussed in Chapter 3. These are the promotion of awareness of science (A); providing entertainment and enjoyment through science (E); sparking and developing an interest in science (I); shaping opinions in science (O); and developing public understanding of science (U; Burns et al., 2003). Participant 15 spoke of the celebratory aspects of what a science festival is, indeed arguing that a science festival is "a party" and "a barbecue". However, they also spoke of science festivals as

phenomena in which the get people become intrigued about the natural world around them:

> I don't think it should be a hardcore education kind of thing, because you get that in many other avenues. It is something that should make people curious, that they want to go and pick up a book, or go and register and do an evening course in something. Or yeah, anything. Anything that they do, that they wouldn't have done beforehand. Or any bit of awareness that would have come. But it has to be really positive, and party. For me, a festival, it's a party. It's a barbecue. It's all of these things. It's got to have music, and it's got to be quite broad. And yeah, that's what a science festival, to me, is.

> Participant 15

This sparking of curiosity ties in with Burns et al.'s (2003) thesis that science festivals can spark an interest in science. Participant 12 spoke of science festivals as an opportunity to raise awareness of the place of science in society:

> So the science festival is an opportunity to focus on science activities for a short period of time to highlight the essential place of science in our society. It's not purchasing scientists, it's not telling kids to become brain surgeons, it's getting the population to be aware of what science is about and just to keep that thing going on throughout life rather than just a one-off.

> Participant 12

The role of science festivals in educating their audiences was raised by some science festival figureheads, with some figureheads viewing education as a fundamental part of their festival. Participant 5 spoke of the role of science festivals in making scientific knowledge understandable:

> I think it is about finding more easy ways, easy pathways, into helping people find out about the world we live in and to share that knowledge.

> Participant 5

The educational element of a science festival was highlighted as something that set science festivals apart from other festivals such as music or arts festivals:

> I'm looking at like, the thing about a music festival or an arts festival, it's a lot of people who do the same kind of thing coming together to show the public what it is that they do. With the intention, the primary intention, with a science festival, I think, is to educate and entertain. So that is different from arts and music festivals. I think that goes for all science festivals. It can be an opportunity to showcase research, it can be an opportunity to try new things, and collaborations. As for, yeah, I just keep thinking about like what it visually looks like as well, which is quite different across different venues. Often it is a mixture of different types of content, it might be an exhibition, workshop, show, talk. So, yeah that kind of probably runs from most science festivals that I've ever seen. There's a mix of content, certainly a mixture of ages, and yeah that's kind of it. But those science festivals folk who say it isn't about education, they're not being fully honest with themselves.

> Participant 13

This notion that due to an educational element of science festivals, they are set apart from music and art festivals came through on several occasions in interviews, with Participant 18 commenting:

> For a science festival it's still creative, it's still an event, it's still a festival. But, its outcomes are that you're going to, you want people to have learned science or be inspired to do something in science. Arts festival are different. The intention isn't to make you an artist.

> Participant 18

Science festivals as platforms for ideas, debate and robust discussion was highlighted by some science festival figureheads as key to their definition. Participant 22 noted that a science festival "doesn't have to be about science only":

It doesn't have to be about science only. Probably it shouldn't be. I think a science festival can be an ideas festival pretty much. It can include economics, philosophy. As far as I'm concerned, it can have a pretty broad spectrum or range of subject matters.

Participant 22

The notion that science festivals are festivals of ideas first and foremost came up on more than one occasion, with Participant 11 saying that science festivals are like a kaleidoscope:

A science festival, it's like a kaleidoscope. It's a festival of ideas. It has to sparkle. It has to be first and foremost a true festival. It means that the criterion for events is the audience.

Participant 11

Bryant (2003, p.7) propose that science communication is "the process by which the culture and knowledge of science are absorbed into the culture of the wider community." When asked about a definition of a science festival, Participant 16 spoke of the purpose of a science festival being to show that science is as much a part of culture as any other area of interest:

It's to show that it [science] is as much a part of culture as any other area of interest. With its own flaws, it's own clique-i-ness, in the past anyway, it's own rules. I want people to be able to feel more confident in thinking about science, talking about it, discussing it. To feel like they have a right to do it, you know, nobody tells anyone that they can't have an opinion on a film because they didn't study film. Nobody thinks they're not allowed so, they didn't like books, they didn't study literature. But you will get that belief system accruing around science if you go: "Oh I don't understand it." And especially in the kind of age that we're in, in the world, we need a scientific or literate population and that's not just about good teaching, it's more about getting people to feel positive about science and that it is for them. That's what the point is.

Participant 16

Festivals have the potential to positively impact the quality of life of people who live in the geographical location of where the festival takes place (Fredline et al., 2003). Indeed, festivals themselves can have positive sociocultural impacts as discussed extensively in Chapter 2. Participant 14 discussed the "social good" that science festivals do and proposed that any definition of a science festival should refer to the social good that they set out to do:

> I think science festivals provide social good in terms of bringing people together, giving people opportunities to speak, meet different people, developing that side of themselves. Whether it's the research or the person in the audience. But I'm not claiming my festival is a social justice charity. It's not, of course we're not, that would be ridiculous. For me to sit here and say that, even though I believe in social justice and we do it through our festival, but it's not a social justice charity.

> Participant 14

Science festivals achieving a "social good" further came up in discussion with Participant 26 who understood science festivals to be about achieving "social good":

> I really believe science festivals are about social good. I really believe they can deliver social good. And because there are no barriers and walls, you can bring more people into the conversation.

> Participant 26

Public engagement with research festivals also interpreted science festivals very much within the definition provided by Bultitude et al. (2011). Participant 7, a figurehead of a public engagement with research festival defined science festivals as a platform which allows people to engage with researchers in an informal way whilst simultaneously raising the profile of science:

But I suppose really they're just allowing people to engage with research and researchers in an informal and exciting way. And you know, it raises the profile of science in its broader sense. How you do it depends on your locality, your audience, your participants, your event providers. So each one [science festival] is unique and that will colour it accordingly.

Participant 1

Participant 27, a figurehead of another public engagement with research festival, reflected on what science festivals achieve for their own organisation as a means to define what a definition of a science festival is:

Science festivals are good for reputation enhancing, because people start to know what we're doing. Recruiting more people to come to the institute has value. More people hear about, there's a lot of people engaged with the facilities and that helps with funding. Being just a general value, it would be just education, because it increases people's awareness. So it's kind of shown people opportunities for collaboration, so within the institute, the students for collaboration and development of these kind of bigger research projects that are very cross-disciplinary.

Participant 27

In the quote above, Participant 27 clearly reinforces the theoretical framework that science festivals within the public engagement with research realm set out to achieve instrumental objectives of the organisation in which they are produced. This is further supported by Participant 19 who discusses training opportunities for researchers when asked about a definition of a science festival:

Dialogue with our community about what we do and what most science festivals are about. And that works two ways. That's about our researchers having a chance to talk to the world about what they're up to because most of them are publicly funded. And they provide opportunities to train and develop our researchers' public engagement skills. Also just for people to have that opportunity to come and find out what we're doing. We know that really works. People are just fascinated by what's going on in

the research world, but they need an invitation; some way of being invited to have that conversation. That's what a science festival does.

Participant 19

Indeed, further supporting the theoretical framework proposed in this thesis, Participant 27 explained why they opt to use the term science festival rather than public engagement event:

> When I hear "science festival", I hear it and in my head it's a celebration. And I hear "public engagement event" and it seems a bit more structured than a festival. Kind of just the terminology of it sounds, the language is more informal and fun, and accessible. "Public engagement event" is academic terminology, which I think is off putting. Whereas a festival is something that if I might say to my kids: "Do you want to go to a science festival?" Or: "Do you want to go to a public engagement event?" "I want to go to the festival." I could go to the kids: "Would you like to go to a biology public engagement event or do you want to go to a poo festival?" And they'll go: "Poo festival." Because it's a festival. And it's a more accessible word. And I think it's about celebration. It sounds a bit mad and chaotic and fun. Whereas a public engagement event sounds like you would have to be very strict, structured, and rigid. So yeah, a science festival.

Participant 27

Whereas public engagement with research festival figureheads define science festivals as a means to achieve instrumental objectives of their organisation, corporate science festival figureheads took a more strategic approach to defining a science festival. Participant 5, a figurehead of a corporate science festival, spoke of partnership working when asked to define a science festival:

> Science festivals are collaboration, excellence, innovation and inspiration. Certainly for us anyway. We have to work to have really good partnerships. That's really important to us.

Participant 5

Participant 5 using the terms "excellence" and "innovation" when defining a science festival reinforces the theoretical framework proposed in this thesis, in particular the analogy proposed by Participant 8 that such festivals are like five-star hotels. In further support of the theoretical framework, Participant 25 – a figurehead of a corporate science festival - spoke of the need to take a strategic approach to the management of science festivals when asked about defining the term science festival:

> A science festival is an opportunity to engage, inform, educate, inspire, and to do it without any walls, any barriers. It can be an event in a shopping centre. I think it has to last for a certain number of days. That's across the board for festivals. I think it needs to be something that the public can put in their diary. Something that they can get excited about. But I think you have to be driven by a mission. I think you've got to have a core set of aims and objectives, and at the end of it, to critically evaluate whether or not you've met your success. You know, have you been successful? What does success look like at the beginning? What do you think it's going to look like, and when have we achieved it? So I think a festival has got to be evaluated. I think a science festival is also whatever its local community needs it to be. If they need to be more about what's happening within the community, or whether they need it to be the top, top, top research that's happening across the UK, where you bring your IQ and you come with your notebook, it's whatever the community needs it to be. As long as you stay in touch with your audience, you can do great things.
>
> Participant 25

The focus of Participant 25's answer on taking a strategic approach to having clear aims and objectives of the festival, and a strategy in place for evaluation of the festival is in line with the answer provided by corporate science festival figureheads to the question asking them to define science festivals. The focus on excellence, innovation, evaluation further supports the theoretical construct proposed in this thesis.

Of course, not all science festival figureheads gave as clearly articulated interpretations like the one provided above by Participant 25. There were naturally some colourful

responses to the question asking science festival figureheads what a science festival is. Participant 6 spoke of science festivals being "anything that makes you think I'm going to do that":

> It's personalities. It's smells. It's smoke. It's a character that you haven't seen before. It could be a lawyer. It could be a juggler. It could be a puzzler. It could be somebody who speaks too loud. It could be anything that makes you think I'm going to do that.
>
> <div align="right">Participant 6</div>

Participant 24 decided to answer this question by describing the science festival as a person:

> It's a person. Slightly differently dressed. Very articulate. Very self confident. I think that science festivals are not actually about science. It's an opportunity. It's a wildcard to get people in our community involved and having fun and we'll make a science theme to anything.
>
> <div align="right">Participant 24</div>

Here, Participant 24 embodies the science festival as a person and, in so doing, invokes ideas that are found in the work of Latour (1991). Thus, Latour (1991) discusses the Parliament of Things, a parliament whereby non-human actants and quasi-objects are brought together to be given voice and agency as equals with human counterparts. Embodying science festivals and giving them agency enabled Participant 26 to describe a science festival as "a perfectionist":

> It's about a little bit about empowerment. You've seen something a lot of politicians for instance use facts that they don't actually understand the facts that they're talking about so I think that if you do science or mathematics you go: "No, I don't think so." I think it's a critical analysis to get out of home for young people and so that might be about exposing them to perfectionists. And a science festival is a perfectionist.
>
> <div align="right">Participant 6</div>

In addition to the thought-provoking discussions on what constitutes a science festival, there was one whimsical response that was made in jest about what defines a science festival. Indeed, it is deemed appropriate to end this chapter with the definition of science festivals provided by Participant 13:

Bloody waste of time is what they are.

Participant 13

Chapter 8: Conclusions and Recommendations

8.1. Significant original contribution to knowledge

Chapter 7 presents several original contributions to knowledge. The most important contribution to knowledge created by this thesis is the creation of the theoretical model: the four realms of science festival. The four realms are: corporate science festivals; community science festivals; public engagement with research festivals; and music or art festivals (with science) (Figure 7.1).

This model helps us understand that science festivals can be understood by breaking them down into four major categories. The production of this theoretical model is important in helping science festival practitioners and researchers understand the diversity of the science festival industry and the four broad categories of science festival that exist. This thesis demonstrates that, as there is no single approach to devising and delivering science festivals, then there is a reduced need for competition between science festivals. It is anticipated that the creation of the theoretical model of realms of science festival will help science festivals develop and grow by being able to recognise that it is perfectly acceptable to have their own unique aim and objectives and meet the needs of their audiences and communities they serve, without having to compete with other science festivals. This theoretical framework may also lead to increased levels of cooperation between science festivals in different realms.

Although many science festivals fall clearly into their respective realm, this model does not conclude that there are only four types of science festival: in the sense that they must fit neatly and wholly into one of these four realms. Instead, it evidences how science festivals may transcend realms and evolve over time, and may move from one realm to another. Furthermore, it shows how some festivals may contain elements of

two or more realms of science festivals. This does not disprove the theoretical model; rather, it demonstrates that science festivals are unique and indeed utilise elements of each of the realms and adapt to their own audiences (Figure 7.2).

The unique characteristics of each of the four realms of science festival are presented in Table 8.1. This is a guideline for helping understand the differences and similarities between science festivals across all four realms, but is not intended to be interpreted as a model to be emulated. The nature of an interpretivist epistemology, whereby knowledge is co-constructed by research participants and the researcher, does allow for some degree of subjectivity and interpretation (Kozinets, 2015). As this thesis has employed an interpretivist philosophical stance, it is possible that those data and conclusions drawn remain at an impressionistic level (Chesebro & Borisoff, 2007). It is further important to note that within interpretative research, the world and knowledge does not exist in some external and readily discoverable form, and is open to interpretation (Chesbro & Borisoff, 2007). Thus, this thesis describes the four realms of science festival as 'broad categories' in the sense that some festivals may contain elements of one or more realms of science festival, and this diversity of science festival makes each and every science festival unique.

Table 8.1: The four realms of science festival

	Corporate science festivals	Community science festivals	Public engagement with research festivals	Music and art festivals (with science)
Description	If science festivals were hotels, then corporate science festivals are "five-star" hotels e.g. prestige; high quality expected. However, not everyone feels welcome in a five-star hotel and there is the perception of it being expensive	These are grassroots, community initiatives that are generally concerned with philanthropy rather than entrepreneurial motivations. They are concerned with giving back to the community and creating a sense of belonging within a geographic community	University 'open day' serves as a platform for researcher engagement with publics. Substantive rationale for public engagement with research (i.e. the festival serves as an opportunity to enhance scientific outputs)	These festivals are first and foremost not what one might imagine a science festival to be, as the focus is on music, arts and/or literature. However, there is science content at the festival such as science tents and talks from researchers.
Time length	The longest of science festivals that spans 7-10 days	Usually takes place across 2-3 days	The shortest of science festivals. Can take place over 1-2 days (e.g. Doors Open Day at a university)	As per music festivals, normally a long weekend. Art festivals and carnivals take place on a sliding scale e.g. 1 day to 1 month
Geographic location	Usually in cities and major towns. Festival takes place in areas of dense population with easy travel access	Usually in rural and suburban communities i.e. outside of major cities and towns (but not always the case). Serve communities whereby it might be difficult to travel to big towns and cities	Takes place within the walls of universities, research institutes and learned societies but may go out to local communities to deliver outreach activities and co-produce events with various local community groups	Areas of open land such as fields (music festival) or cultural venues (arts and literature venues)
Festival figurehead	Festivals are led by strategic leaders such as CEO of a small-to-medium size charitable organisation or CEO/Director of a visitor attraction or trade body. At this strategic level, the figurehead has an overview, but not directly involved in day-to-day operational aspects of festival curation/production	Festivals are created and managed by enthusiastic community volunteer(s) who may not have any management/business training (although not always the case), but is likely to have some experience of science and/or science communication	Festivals are embedded within universities, research centres or learned societies. The festival figurehead is usually a university academic e.g. Professor of Science Communication or from professional services e.g. Public Engagement Manager. Within a learned society or research centre the role could fall upon an Events Manager	These festivals are led by a director of a music, art or literature festival
Content	These are curated festivals that practice an exclusive approach to programming/curation with a 'gatekeeper' responsible for ensuring quality of content (e.g. Curator, Head of Programming, Creative Director). Strong quality control processes around the creation and production of festival content. An exception to the 'quality control' is that these festivals may commission local universities to provide content free-of-charge to be included in the programme,	These are open-access festivals that take an inclusive approach whereby local businesses and community members are encouraged to contribute ideas for events and content. Festival team will work with local businesses, community groups and community members to develop and strengthen ideas. Where possible, these festivals might work with universities and research institutes to provide content free-of-charge	These festivals take an inclusive approach to curation of content in the sense that all departments (academic or otherwise) are encouraged to contribute ideas for events and activities within the festival. The festival figurehead will work with those proposing content to develop ideas. They are exclusive in the sense that content generally only comes from within the organisation producing the festival, with a few exceptions e.g. the inclusion of well-known scientists and science communicators as headline contributors.	The music or arts festival carefully curates science content but does not produce its own science content. Science content provides added value to the festival programme, but is not a primary focus of the festival. Public engagement with research festivals and community science festivals may be keen to provide content and deliver activities at these festivals. Such activities should accommodate large numbers of people (e.g.

	with a caveat that the content for university events and activities is a matter for the university and will bypass the 'gatekeeper'			soapbox talks and interactive activities that can accommodate large volume of people)
Theming	Theming is a major aspect of programming and staging of a corporate science festival. Each year the festival will focus on a new theme that all content centres around. This keeps the festival fresh and vibrant (but is also a way to 'rebrand' old content and most themes are not constraining in the sense that any content could be creatively framed to fit the theme)	Theming of the festival may play a minor role or no role at all	Theming almost non-existent in this realm of science festivals, with the exception of such festivals produced by learned societies who may focus on one particular area of STEM	Science content is separate from the music or art theme.
Speakers	Events have high-profile speakers who are easily recognisable to lay audiences. Event hosts and chairs of panel discussions may be well known TV/radio personalities who may not necessarily be associated with STEM but will attract large audiences and help maximise ticket sales	The festival prides itself on being a local festival and will strive to use community members to be speakers and provide content. Nonetheless, the festival does try to bring in a few TV/radio personalities to create a local buzz around the festival and provide the community with the opportunity to see someone off TV. Tendency for these festivals to avoid public lectures and panel discussions and to encourage active rather than passive participation	The festival may include some talks from high-profile members of staff (internal to the organisation) but the focus of the festival is on interactive table-top activities and immersive experiences rather than panel discussion events	Speakers for science tents are high-profile scientists and science communicators who are also TV personalities
Tickets	Comprises a combination of ticketed events (e.g. panel discussions, public lectures, special events) with free-of-charge drop-in activities at the festival and other free-of-charge drop-in activities around the city/town in which the festival takes place. May also have an educational strand to the festival providing special events for school groups which may be sponsored, ticketed, or offered free-of-charge	Endeavour to deliver the festival free of charge to the audiences (particularly family audiences) but may have some ticketed events aimed at adults with small fee. May introduce a small entry fee to try and recover costs, but generally keep this as minimal as possible	Free entry to all audiences	Tiered levels of ticketing available e.g. day-pass, weekend pass, VIP pass, overnight camping.
Key driver	Revenue-driven A high proportion of events within the festival must be	Value-driven The festival is driven by the same values as the festival	Objectives-driven Driven by the need to achieve instrumental objectives internal	Revenue driven The festival is ticketed at an appropriate price with

	of high quality, bold, creative and/or have prominent speakers in order to attract audiences and maximise ticket sales. Other events may be free of charge. Sponsorship professionals within the organisation seek to maximise income from a high number of sponsors.	figurehead and key organisers: driving social change, raising aspirations and improving quality of life. This focus on being value-driven means there is less of a focus on being revenue-driven, and as such the festival may run without any corporate sponsorship and with free (or minimal) entry fee in order to make the festival accessible for everyone regardless of socioeconomic status.	to the organisation e.g. objectives around widening participation; marketing; admissions; public and community engagement; equality (e.g. Athena Swan strategy); researcher development; science communication training; research funding; and alumni engagement	various tiers of ticketing (music festival) in order to maximise revenue. May programme events free of charge for school and community groups (especially arts festivals) but will seek to generate income via ticket sales, sponsorship and other means
Local community as stakeholders	Secondary stakeholder Primary stakeholders are sponsors, partners, co-producers (e.g. local university that may contribute content), ticket-paying audience members. Local communities secondary to the above	Primary stakeholder Strong focus on taking festival events to community spaces and venues and delivering events free of charge	Strong ambition for the local community to be a primary stakeholder but the reality may be somewhat different. May, however, include some local community groups and organisations in the endeavour to engage with local communities	Secondary stakeholders (music festivals). Art festivals have strong ambition for local community to be a primary stakeholder but reality may be somewhat different
Key target audiences	Producing events for adult audiences (particularly non-science young adults and working professionals) are an important aspect of festival programming. Events for families (particularly those with small children) is an equally important aspect of programming	Children, families, and community groups living within the geographical area in which the festival is taking place. Those from low socio-economic backgrounds who would otherwise have no access to science events	Those who fall within the university, research institute or learned society 'widening participation' agenda. Local schools are a key target, as are students, staff and families of staff of the organisation producing the festival	Typically those interested in the bands, artists, performers who are headlining the festival. Traditionally, young people and those looking for a liminal experience
Sponsorship	Corporate sponsorship; stakeholder-centric. Dedicated sponsorship professionals and/or development teams bid for commercial and public sector investment, and are dedicated to building new and existing relationships with sponsors. Sponsors seek brand awareness, image enhancement and/or product/service awareness (noting that 'selling' a product or service is the weakest motivation). Sponsors seek to use science festivals to treat their own staff and demonstrate socially responsible credentials	Attendee and community-centric Notwithstanding, involvement of local businesses contributes to placemaking. Tendency to avoid corporate sponsorship as applying for sponsorship and building up relationships with sponsors and reporting back to sponsors on festival evaluation/impact is time-consuming for a volunteer or part-time staff structure. Notwithstanding, some community science festival figureheads enjoy working with sponsors and find this a rewarding aspect of their role	The festival is almost (if not fully) entirely funded by the university, research institute and/or learned society producing the festival. Funding is proportionate to the quantity of internal objectives being met by the festival	Corporate sponsorship; stakeholder-centric. Dedicated sponsorship professionals and/or development teams bid for commercial and public sector investment, and are dedicated to building new and existing relationships with sponsors.
Volunteerism	Such festivals hold mixed views on volunteerism.	Almost entirely run by volunteers from figurehead	Festival figurehead and other senior festival figures are	Volunteerism by and large encouraged, with

	May not use volunteers at all as a business value, arguing that all those contributing to the operational delivery of the festival should be paid. Alternatively, may use volunteers during live delivery of the festival to help with front of house and other logistical roles	down. May have some part-time administrator/festival manager roles, usually on a temporary or part-time basis	allocated time to produce and curate the festival (i.e. it is within their workload). Academics, researchers and students volunteer their own time to develop and deliver their activities. Students generally responsible for front of house roles. Students studying science communication courses may develop content as part of course requirement and/or undertake marketing, social media and evaluation roles	volunteers rewarded with free entry to the festival when not working and/over free overnight camping (e.g. music festival). Festival volunteers may receive free tickets to festival events if seats are available

8.2. Evaluation of aim and objectives

This thesis set out to investigate science festivals in order to understand the various forms that they take and to make a valuable contribution to the science festival sector about the diversity of the sector and on the value and contribution of science festivals to wider civil society. Despite their 30-year history, science festivals are still largely unresearched and, as such, it is unclear how they are organised; what impact they have on society; and what their ambitions for the future are. This research is the first of its kind to explore science festivals from both critical event studies and science communication perspectives and as such, this study has been able to meet the aim and objectives set out in Chapter 1. The extent to which the objectives were achieved are discussed below.

Objective 1: To evaluate academic literature within the fields of critical event studies and science communication in order to identify gaps within current academic literature pertaining to our understanding of science festivals.

This objective has been met in full, with a comprehensive literature review produced that spans three chapters of this thesis. Chapter 2 explores literature pertaining to festivals within critical events research. This chapter explores academic literature around social, cultural, political, economic and environmental impacts of festivals. The

role of the public sector in supporting, developing, and regulating festivals is also discussed, as are other festival stakeholders and the importance of festival organisers taking strategic approaches to event creation. Chapter 3 provides a broad critical overview of science communication research, and covers definitions and practical applications of public engagement with research, public understanding of science and outreach, whilst also exploring various motivations and rationales for conducting science communication. Chapter 4 explores current literature surrounding science festivals and identifies the gaps within the literature on science festivals. An important notable gap within the literature is the lack of research on science festivals from a critical events perspective i.e. exploring science festivals from business and management dimensions. It is from completing the literature review and identifying such gaps that the following objectives have been able to be drawn up (and achieved) in this thesis.

Objective 2: To conduct semi-structured interviews - until the theoretical saturation point is reached - with science festival figureheads in order to generate data on their experiences and perspectives on leading a science festival and to create a theoretical model that helps categorise the diversity of science festivals that exist based upon the festival values, strategic objectives, operational management and business models.

This objective was met in full. Chapter 6 outlines the methodological approach taken in this study. In sum, 27 semi-structured interviews with science festival figureheads were conducted, at which point the theoretical saturation point had been reached. Interviews were audio recorded and manually transcribed, culminating in excess of 250,000 words of transcripts. These interview data were then coded using thematic analysis, and the codes were the basis for the findings discussed in Chapter 7.

This thesis has produced a theoretical model: the four realms of science festival, and as such this objective has been fully achieved. The four realms of science festival is a new theoretical model that can be used by academic researchers on science festivals and by

practitioners themselves to help understand the diversity of the sector. Table 8.1 summarises leadership, sponsorship and other such management perspectives of science festivals across all four realms.

Through the production of the four realms of science festival model, this thesis has been able to dissect different approaches taken by the four broad categories of science festivals. Table 8.1 summarises the various open-access and curated approaches taken by festivals and how this links to inclusivity and/or exclusivity of content. This newly created knowledge is discussed extensively in Chapter 7.

Objective 3: To analyse interview data in order to: understand what makes a science festival unique in comparison to other genres of festival; analyse whether current definitions of a science festival are accurate and appropriate; and to understand both the future aspirations for science festivals and the barriers for achieving those aspirations.

This objective is met in full. Chapter 7 provides an analysis of the uniqueness of science festivals from the perspective of science festival figureheads, and those data on uniqueness supports the theoretical model of the four realms of science festival. Each festival is unique in that they cater to their unique audiences, but there are so many similarities that they can broadly fit into one of the four realms of science festival. Chapter 7 also discusses those data pertaining to the interview question "what is a science festival?" These data support current broad definitions as outlined in Chapter 4, but this thesis has advanced our understanding in the sense that there are four broad categories of science festival, and ultimately there is no one-size-fits-all definition, so there is a need for flexibility and to allow for self-identification on behalf of the festival producers, stakeholders, and attendees.

Aspirations for science festivals are explored in detail in this thesis. One prominent theme that arose during this thesis is the burnout and poor mental health of science festival figureheads, particularly those leading community science festivals and public

engagement with research festivals. Developing mental illness from producing a science festival is problematic and appeared to be a widespread problem. Thus, a recommendation of this thesis is for future in-depth academic research exploring mental health issues within the science festival sector and exploring this from a critical events perspective i.e. in relation to linkages between mental health of figureheads and development of sustainable business models.

Objective 4: To create recommendations for science festival practitioners on how to develop and enhance the sector. In addition, the researcher will create recommendations for future researchers on research avenues to explore.

This objective is met in full with recommendations for practitioners and for future research discussed later in this chapter.

8.3. Recommendations for practitioners

The major recommendation of this thesis is for science festival practitioners to adopt the findings of this study. The key finding is that there four realms of science festival. This provides clarity for practitioners on the four broad categories of science festival. It is anticipated that this will help build consensus amongst science festival figureheads and reduce any unnecessary competition or ill-feeling between various festivals. In doing so, festival figureheads will be able to identify similar festivals and it is anticipated that this will lead to enhanced collaboration and sharing of learning between festivals.

The findings of this study have provided useful insights for UKSFN. By adopting the new knowledge created in this thesis - the four realms of science festival - UKSFN should now produce events for figureheads from different realms of science festival to come together to share their approaches and discuss their concerns and matters relevant to their specific realm. By adopting the theoretical framework, festival figureheads will be

able to identify that practical conversations on the management and production of their festival are better suited with festivals in the same realm, although we still propose continuation of annual meet-ups in addition to smaller realm-specific meetings. Such smaller realm-specific events would be of practical benefit to festival figureheads who want to learn from similar festivals and collaborate with festivals within their realm.

It is also a recommendation of this thesis that the science festival sector in the UK set up a marketplace for science communication events. It is noted that Science Live - which the British Science Association manages in addition to UKSFN - provides a platform that enables people who are interested in science festivals and events (whether as organisers, speakers, volunteers or attendees) connect with each other (Science Live, 2020). Science Live provides an online platform that allows people to engage with each other and discover new events across the UK (Science Live, 2020). It is a recommendation that UKSFN and Science Live further develop the science festival sector by developing a marketplace for content. Such new content could be discussed at UKSFN meetings and collectively commissioned by science festival figureheads which would lead to a strengthening of the freelance science festival community, particularly the freelancers who could develop content for shows, workshops and performances in the knowledge that they are being commissioned by several science festivals and not just one festival. This new marketplace should be developed by, and for, freelance science communicators and organisations who produce content commercially for science festivals.

It is also a recommendation of this thesis for formal business and management training of science festival figureheads. This research has identified that many science festival figureheads have no formal training in management, and indeed come from science and/or science communication backgrounds. By developing skills in business and management areas such as marketing, audience development, audience segmentation, finance, sponsorship, human resources, strategic leadership, and governance, festival

figureheads will be in a stronger position to drive the growth development of the festivals and develop more sustainable organisations. Training in festival management and strategic leadership will provide festival managers with the skills to be able to take a more strategic response to leadership of their festival and help prevent business decline and reduce burnout. This training could be provided by festival management professional trainers sector-wide via UKSFN or through other commercial means. Development of business and management skills by science festival figureheads could help reduce high levels of burnout and poor mental health associated with many figureheads participating in this study.

8.4. Recommendations for further research

There are a number of avenues to explore for future academic research on science festivals. This research is focused on the UK, and thus research is needed on international science festivals in order to investigate whether the four realms of science festival can be applied on a global scale.

Further detailed research is needed on the value of the UKSFN and of other informal networks in order to gain a better understanding of the role and value of such networks within the science festival industry. Such research is needed in order to provide practical recommendations to promote inter-festival collaboration and thus enhance the sector.

Understanding more about volunteerism within the science festival sector is an important avenue for future research. This research has highlighted that there are both altruistic and utilitarian motivations for people volunteering at science festivals, as with

other types of festivals (Cnaan & Goldberg-Glen, 1991). Exploring the motivations for volunteering across all four realms of science festival will help provide practitioners with practical insights on how to recruit and retain volunteers, whilst providing insights on how to enhance the volunteer experience.

Further research is needed on the science festival life cycle in order to develop an understanding of various phases in which science festivals go through. Holmes & Ali-Knight (2017) explore various stages of festival life cycles in relation to arts festivals, but there is a research gap on how this applies to science festivals, in particular, exploring whether science festivals take different trajectories depending upon the realm in which they are broadly based. Further research is also needed on burnout and mental wellbeing of science festival figureheads, as burnout caused by stress and anxiety has been highlighted as an issue in this study by science festival figureheads.

Taking a critical event studies approach to science communication research is also a recommendation of this thesis. Further research is needed to explore the various social, cultural, political, economic and environmental impacts - both positive and negative - of science festivals. Such research will require an in-depth mixed methods approach. Rigorous qualitative research is required to understand more about the social, cultural and political impacts of science festivals and quantitative research is needed in order to further our understanding of the economic impacts of science festivals.

8.5. Limitations of study

There are a number of limitations to this study that must be duly considered. This thesis sought to explore the diverse range of science festivals within the UK, and therefore, the conclusions drawn are based upon research from the UK. This means that a limitation of the study is that there is no data from international science festivals. This limitation

was a choice of the researcher who wanted to narrow the focus of the study on the UK, where the research plan was to conduct as many face-to-face interviews as possible. As noted above, a recommendation of this thesis is to test the validity of the theoretical framework on international science festivals.

A further limitation on this study is that it was particularly difficult to conduct interviews with music and art festival (with science) figureheads, due partly to their disinterest in participating in this research study, and partly due to the researcher not being particularly well connected with festivals in this realm. Therefore, future studies are needed to understand more about the business and management dimensions of science content at music and art festivals.

8.6. Closing remarks

Ideology is the body of doctrine that guides individuals, social movements, class and society at large. Political ideologies (e.g. communism, fascism, socialism, conservatism) exist alongside religious ideologies (e.g. Christianity, Islam, Judaism), legal ideologies, economic ideologies and ethical ideologies. There are ideological underpinnings in the relationship between science and society. Science is practiced within the boundaries of institutions (universities and research centres) that are inaccessible to the general public. Access to the space where scientific knowledge is created – the laboratory, field sites, observatories – is restricted to scientists and those working within the academy. Laboratory scientists spend their time conducting research within the confines of these physical barriers and publish their findings behind the physical barriers of journal paywalls. Even when the journals are publicly available, language may be inaccessible for non-scientific audiences, thus reinforcing social barriers, in addition to the physical barriers, between scientists and wider society.

Science communication events, such as science festivals, exist to break down barriers between science and the wider society. This research study has found that many science festivals, particularly community science festivals, aim to bring scientists out of the laboratory and into spaces inhabited by wider society, such as arts and cultural venues. In doing so, they remove the physical barriers between science and wider society, contributing towards a democratisation of science.

Notwithstanding, what may be the tragedy of science festivals is that, whilst they challenge the ideology of the separation of science and society, they may remove physical barriers, but many science festivals reinforce social barriers. In other words, whilst they endeavour to democratise science, what they actually do is reinforce the social separation between science and society. To their credit, science festivals bring scientists out of the laboratory and into the places inhabited by the publics.

Nevertheless, many science festivals fall into the trap of reinforcing the ideology that scientists have a higher social authority than the audience. An example of this are panel-discussion events - which play a prominent role at corporate science festivals. From a critical perspective, panel discussions at science festivals reinforce the authoritarian ideology of science and society: scientists are there to have conversations with each other, whilst the public pay to listen to these conversations. The layout of the science festival venue is meticulously prepared to reinforce this ideology: sofas on a stage for those with the authority (scientists) and rows of chairs facing the stage for those without the authority (the public). The physical barrier of the laboratory is removed, but the social barriers are reinforced: scientists have the knowledge, which gives them a greater status in society, so they are to be obeyed.

To conclude, it is appropriate to look beyond the theoretical model of the four realms of science festival proposed in this thesis and consider what science festivals of the future may look like. Science festivals of the future must be designed in a way that enhances

the democratisation of science and go further to remove the physical and social barriers between science and society. Many existing science festivals employ some form of deficit model to programming whereby there is a one-way flow of information from scientist to the audience, with public lectures and panel discussion events being ripe for reinforcing this deficit model.

This thesis proposes that future science festivals must also move beyond dialogue models of public engagement - moving beyond an even flow of information between scientists and the public. Indeed, to truly democratise science, science festivals of the future must adopt a participatory model of public engagement, whereby the audience no longer are passive recipients of the knowledge being imparted by scientists, or indeed passive consumers of the science festival. After all, the largest arts festival in the world - the Edinburgh Festival Fringe - has no gatekeepers. There are no curators, creative producers, or teams of festival volunteers putting content together for this festival. The content of the festival is fully open-access and anyone can programme an event at the Edinburgh Festival Fringe, meaning that the festival is entirely produced by those attending the festival. Science festivals of the future must adopt a citizen science approach, whereby citizens are not only essential for data collection within scientific research, but that they are also essential in programming science festivals. In order for science festivals to realise their full democratic potential, there must be an uprising from a new generation of scientists and that those who are marginalised by science, and their allies, to overthrow the dictatorship of science and achieve this revolutionary change.

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Appendix 1: Participant Information Sheet

University of
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MANCHESTER

Research Participant Information Sheet

Doctoral Research on Science Festivals

A research study by Dr Gary Kerr & Professor Andy Miah

> *You are invited to take part in research that investigates a number of dimensions about UK Science Festivals. Before you decide, please ensure you understand why the research is being done and what your commitment would involve. Please read the following information carefully and ask questions if anything you read is not clear, or if you would like more information. Take time to decide whether or not to take part.*

What is the purpose of the study?
This study investigates the social and political dimensions of UK Science Festivals. Its primary data is generated through discussions with science festival figureheads across the UK to address the following areas of interest:

- The history and development of your science festival;
- How you position your festival within the broader festivals networks locally and nationally;
- Your approach to curating content within your festival;
- The investment infrastructure around your science festival (sponsors, co-producers, partners);
- Your Festival's marketing and communication priorities;
- How you perceive the value of your science festival for your community;
- Your aspirations for your science festival.

Why have I been invited to take part?
You have been invited to take part as you are a key leader of a science festival, or a festival that contains an element of science. We would like to interview you to learn more about your festival, your experiences, and your views on science festivals.

Do I have to take part?
You do not have to take part in this study, as taking part is voluntary. If you don't want to take part, you do not have to give a reason and no pressure will be out on you to try and change your mind.

Has this project received ethics approval?
Yes, this project has received full ethical approval from the University of Salford and the research study has been deemed to be consistent with the principles of research ethics.

What are the benefits of taking part?
This research is likely to provide key insights on UK science festivals that have not yet been realised or articulated. We believe that this research study will help to generate some unique insights that can inform future science policy and science communication strategies nationwide.

What are the disadvantages and risks of taking part?
No disadvantages or risks have been identified for research participants in this study.

What will I have to do if I take part?
If you agree to take part, the research team will contact you to arrange an interview. The interview will take place on a date, time and at a location that is convenient for you. During the interview, we will ask you questions about your festival. There aren't any right or wrong answers – we just want to hear about your experiences, values, opinions and visions. The discussion should last around 1-1.5 hours. The interview will be recorded using a digital recorder.

Will my taking part in this study be confidential?
Yes, your participation in this study will be kept confidential. The named researchers will not discuss your involvement with anyone.

What will happen to the information (data) I provide after taking part in this study?
All the information (data) you give us will be confidential and used only for the purposes of this study. The audio file (tape recording) of the interview will be transferred into an anonymised text file. The data will then be stored securely on a University of Salford local disk drive and can only be accessed by the named researchers during the course of this research. Upon completion of the research study, anonymised raw data will be located in a digital repository.

What will happen to the results of the research study?
We aim to share the findings of this research in the academic literature and with the wider science communication community. The information you give will be anonymised and you will not be identified as a participant in the research. Any quotations attributed to you will be anonymised within publication and any data repository.

What will happen if I don't want to carry on with the study?

You are free to withdraw from the research study at any stage without giving reason, up to the point of data analysis (1 Sept 2018).

Who is conducting this research?
This research is being conducted by Dr Gary Kerr (Researcher in Science Communication) and Professor Andy Miah (Chair in Science Communication & Future Media), School of Life Sciences, University of Salford.

Who is funding this research?
This research study is being funded by the University of Salford, Manchester.

What do I do now?
Think about the information on this sheet, and ask us if you are not sure about anything. If you agree to take part, you will be asked to sign a participant consent form. The consent form will not be used to identify you. It will be filed separately from all other information, in a locked filing cabinet. Only the named researchers have access to the filing cabinet.

Who should I contact for further information about this research?
For further information about this study, please contact the named researchers Dr Gary Kerr and/or Professor Andy Miah (contact details below) who will be more than happy to provide further information and/or address any questions you may have about the study.

Dr Gary Kerr
Researcher in Science Communication
School of Environment & Life Sciences
University of Salford, Manchester
Peel Building
The Crescent
Salford, Greater Manchester
M5 4WT
Email: G.Kerr@edu.salford.ac.uk

Professor Andy Miah, Ph.D.
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Appendix 2: Participant Consent Form

University of
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Research Interview: Participant Consent Form
Doctoral Research on Science Festivals
A research study by Dr Gary Kerr & Professor Andy Miah

☐ I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.

☐ I understand the purpose of the research project and my involvement in it.

☐ I understand that this project has received full ethical approval from the University of Salford's Research Ethics Committee (Ethics Reference Number STR1617-02).

☐ I have been given the opportunity to ask any questions (face-to-face, via telephone and/or email)

☐ I understand that while information gained during the study may be published, I will not be identified and the information provided today will be anonymised in publications.

☐ I understand and agree that I will be audio recorded during the interview and that this audio data file will be transferred into an anonymised text file.

☐ I understand that all interview data will be stored securely on a University of Salford local disk drive and will only be accessed by the named researchers during the course of the research.

☐ I understand that, upon completion of the project, anonymised raw data will be located in a digital repository.

☐ I understand that I may withdraw from the research project at any stage without giving reason, up to the point of data analysis (1 Sept 2018) .

☐ **I understand that I may contact the researchers if I require further information about the research, and that I may contact Professor Andy Miah at the University of Salford, if I wish to make a complaint relating to my involvement in the research.**

Signed …………………………………………………………………… Research Participant

Print name …………………………………………………………………..Research Participant

Date…………………………………………………………………..

Appendix 3: Statement of Ethics Approval

University of Salford
MANCHESTER

Research, Innovation and Academic Engagement Ethical Approval Panel

Research Centres Support Team
G0.3 Joule House
University of Salford
M5 4WT

T +44(0)161 295 5278

www.salford.ac.uk/

18 October 2016

Dear Gary,

RE: ETHICS APPLICATION STR1617/02 – The role of science festivals in society

Based on the information you provided, I am pleased to inform you that your application STR1617-02 has been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible by contacting S&T-ResearchEthics@salford.ac.uk

Yours sincerely,

Prof Mohammed Arif
Chair of the Science & Technology Research Ethics Panel
Professor of Sustainability and Process Management,
School of Built Environment
University of Salford
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