CLASH OF THE LIFEWORLDS:

HOW SCIENTIFIC ORGANISATIONS ENGAGE WITH THE PUBLIC ON CONTROVERSIAL SCIENCE

A study based upon the theories of Jürgen Habermas

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Table of Contents

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Abstract

Communicating and engaging effectively with the public during a public health crisis can save lives, prevent harm and reduce the impact in terms of social and economic costs, as exemplified during the ongoing COVID19 pandemic. This qualitative research focuses upon the approach of UK scientific organisations to communications and engagement with the public about controversial issues of science, using vaccine safety as a case study. Despite widespread public education and engagement policies adopted by scientific organisations in the UK since 1985, academics in science and technology studies (STS) allege that the scientific community does not meaningfully engage with the public and has failed to incorporate social and value concerns into discussions about new science and technologies (Trench, 2006; Wynne, 2014).

Using critical theory, I set out to better understand the disconnect identified in the STS literature between policy and practice through interviews with senior communications and engagement professionals and an analysis of science communications materials, including websites, job descriptions and other public documents. Using an analytical framework based upon Jürgen Habermas's theory of communicative action, I identified key themes within five diverse aspects of communications and engagement practice: **context**; **conduct**; **content**; **construction** of knowledge; and **competence** of the participants (the '5Cs').

Based upon this analysis, I argue that the ideal conditions for rational discourse around science are far more difficult to achieve than academic commentators have previously acknowledged, for a variety of cultural, political and organisational reasons. Whilst individuals working in scientific organisations are motivated to engage with the public, they face internal barriers to action as well as a hostile and difficult external environment. A variety of factors are inhibiting co-ordination across scientific institutions and reducing the effectiveness of engagement and communication to the public from reliable and authoritative sources during a scientific controversy.

This research provides insight into the underlying and perhaps unacknowledged cultural and social influences that place constraints on the ability of scientific organisations and scientists to engage in meaningful scientific discourse with the public. These observations could inform professional practice as well as provide avenues for further research.

List of abbreviations

BAME	Black, Asian and minority ethnic
BLM	Black Lives Matter
BSE	bovine spongiform encephalopathy
CCDH	Center for Countering Digital Hate
CDC	Centers for Disease Control (in the US)
COBRA	Cabinet Office Briefing Rooms
DoHSC	Department of Health and Social Care
GMOs	genetically modified organisms
ISS	ideal speech situation
MMR	measles, mumps and rubella
NCCPE	National Coordinating Centre for Public Engagement
NGO	non-governmental organisation
NHS	National Health Service
PES	public engagement in science
PPE	personal protective equipment
PUoS	public understanding of science
R&D	research and development
SAGE	Scientific Advisory Group for Emergencies
STEM	science, technology, engineering and mathematics
STFC	Science and Technology Facilities Council
STS	science and technology studies
UKRI	UK Research and Innovation
WHO	World Health Organisation

Introduction

The World Health Organisation has described misinformation on social media as one of the top 10 threats to global health (WHO, 2019; Larson, 2018a). Subjects such as vaccine safety and climate change have been described as 'artificially' controversial in the sense that the scientific evidence is conclusive, yet constantly disputed (Carrion, 2018; Irwin, 2008). My thesis is concerned with the challenges faced by scientific organisations when they communicate and engage with the public about controversial science. Scientific organisations are not responsible for conspiracy theories and the tide of misinformation and disinformation. However, they *are* responsible for the effectiveness of how they respond proactively to the public's need for reliable information, and how they choose to communicate and engage with the public. I have identified several barriers, arising both from the contemporary socio-political context in which they operate and from the culture and ways of working within the scientific institutions themselves.

To some extent, public controversy is a sign of a healthy democracy as issues are raised for public discussion, people are motivated to join in debates, and ultimately they bring about a resolution to the problem or issue that was raised (if necessary, using political and legal systems). However, both collective and individual decision-making are undermined by misinformation, conspiracy theories and misrepresentation (Kata, 2012; Garrett & Weeks, 2017; Borman, 2011).The willingness of large minorities to embrace falsehoods and conspiracy theories constitutes a threat to society's ability to make decisions about pressing challenges such as COVID19 and climate change.

Scepticism, debate and challenge are integral parts of the scientific method, but the debate needs to involve a willingness among participants to listen, explain, justify claims to 'truth', and ultimately to change their minds. Unfortunately, this is not always the case. The political and social upheaval of the past 20 years has changed the nature of public discourse. Social inequality has been exploited by populist governments who have constructed narratives of past national triumph and contemporary decline. Populism has fuelled a suspicion of 'the establishment', including scientific institutions, and undermined the credibility and authority of

experts. In addition, the very nature of knowledge itself is being challenged, with a widespread disregard for facts in the public and political domains.

Government policy relating to health or technology is often based upon scientific data and evidence; however, the process by which scientific evidence becomes part of a policy is complicated and messy. There is a serious disconnect between public opinion and scientific evidence in some areas, such as vaccine safety and genetically modified organisms (GMOs) (Scheufele & Krause, 2019). One key issue is disputes over what constitutes valid evidence, where there are arguments about relative validity of qualitative and quantitative evidence (Horton & Brown, 2018).

Collective decision-making is dependent upon a common understanding of a shared reality; it is undermined by the rejection of reliable evidence. To give an example from the US, in mid-2020, a survey indicated that nearly a third of Americans (44% of Republican voters) believed the COVID19 vaccine would implant a microchip in their body so that their movements could be tracked by the billionaire businessman and philanthropist Bill Gates (Goodman & Carmichael, 2020). Such beliefs have created a complex and difficult environment for scientists and scientific institutions to engage with the public.

The issue of how these institutions approach communications merits study, not only because of the substantial investment of public and private funds in initiatives to engage the public in science, but also because a balanced and rational discourse around science is important to public health, policy-making and democracy. The coronavirus pandemic has starkly illustrated some of the problems resulting from unproductive discourse. People have set fire to 5G phone masts, believing that they cause virus transmission (Ofcom, 2020; Jolley & Paterson, 2020). People died or were harmed after drinking methanol and bleach or overdosing on hydroxychloroquine after claims from former US President Donald Trump that they were ‘cures’ (Durkee, 2020). There is evidence from the 2019 coronavirus pandemic that misinformation is a major threat to public health. Roozenbeek and Van der Linden (2019) found that susceptibility to misinformation reduced people’s willingness to be vaccinated themselves, to recommend the vaccine to vulnerable friends and family, and also their compliance with other infection control measures.

This introductory chapter intends to help the reader navigate their journey through this thesis. Having described the field of study, I set the scene by elaborating upon what is meant in this research by the term 'public engagement in science'. Then I outline the aims of my research and describe the gap in the literature that I have addressed along with a summary of the main findings. A summary of the thesis structure follows, and this chapter concludes with a summary of the contribution to knowledge made and the anticipated impact of my research findings.

i What is public engagement in science and why is it done?

Controversy about the ethical and practical impact of new scientific knowledge within society is not a new phenomenon, and the literature relating to this is reviewed in section 1.2. In recent decades, there have been many crises in relation to science and the public in the UK, related to possible risks to the public, moral questions or due to political disputes. Since 2000, policy changes have been adopted by UK scientific institutions to address the perceived issue, which is lack of public trust in science and the unwillingness of the scientific community to meaningfully engage with the public (Science and Technology Committee, 2000; Wynne, 2006). Prior to this, policy was based upon the mistaken assumption that public concern was based upon lack of understanding of science and that the public will support science if they are educated about it (Royal Society, 1985; Wynne, 1989).

The discourses around controversial subjects such as vaccine safety are often characterised by an almost complete disconnect in communications between the opposing parties; with little common ground, disputes about evidence, refusals to concede a position or compromise, and a tendency to demonise or 'other' those in opposition (Burchell, 2007a; *Nature* Editorial, 2017). This can create the impression among the public that there is no scientific consensus on the safety of vaccines, undermining public health (Dixon & Clarke, 2013). The separate discourses make it difficult to openly acknowledge, discuss and resolve differences based on knowledge, values or interests. The theoretical intent of public engagement activities is to achieve this dialogue (Bauer et al., 2007).

The term ‘public engagement’ covers many different types of activities with varied objectives (Davies, 2020). These may include direct involvement of laypeople in science policy formation, participation in public consultations, inviting people to make their views known by completing surveys, signing petitions, attending dialogue events, science festivals, visiting science museums, listening to podcasts, seeking and consuming information about science online and many more.

The objectives of these activities are equally broad. Some scientists are seeking to co-create research programmes together with patients or communities, to ensure that the studies reflect real-world conditions (Maguire & Britten, 2018). Governments may be seeking input from the public about any moral or social dilemmas that may be raised by new technologies, such as GMOs. Other organisations wish to educate the public about how a new technology can be used or to conduct commercial marketing for institutions or products. The lack of clarity and understanding of public engagement objectives and activities (VanDyke & Lee, 2020) means that engagement, transparency, educational and commercial objectives frequently become conflated, with ‘engagement’ activities being used to gain public acceptance for pre-conceived policies and decisions, or simply one-way information provision or education rather than true engagement.

Publishing a policy on public engagement in science is politically expedient, but the implementation is more difficult. There is a conceptual issue because the terms ‘science’, ‘public’ and ‘engagement’ are subject to widely differing interpretations. The major stumbling block to the evaluation of many a public engagement activity is that the reason for doing it in the first place is not always clear (Jensen, 2014). It also results in a lot of activities targeting those who are already interested in science, rather than to systemically tackle public concerns about seemingly intractable issues, such as opposition to GMOs and vaccines. The most recent UK government select committee report on public engagement in science (Science and Technology Committee, 2017) strikes a complacent tone, celebrating a competition to involve the public in the naming of a polar exploration boat as a wonderful example of science engagement, despite the fact that the subject was not controversial and the name the public voted for (‘Boaty McBoat Face’) was deemed unsuitable and not even used.

There are multiple benefits to public engagement in science. The involvement of laypeople or non-experts can bring valuable insights or identify areas where the subject under investigation might be broadened. For example, people living with a medical condition may be able to identify more meaningful treatment outcomes for studies of medicines than scientists working in the laboratory. When new technologies are being introduced, members of the public can advise on the possible social or moral issues that they may create. Experiential experts can augment scientific information with local or practical knowledge, for example farmers collaborating with ecology experts. The highly technical nature of scientific disciplines means that scientific expertise should be weighted more heavily than lay knowledge *in questions of science*, as scientists who have spent decades working on a specific subject will always have more expertise. Similarly, non-specialist representatives of communities are better placed than technical experts to ask or answer questions about how a technology might impact their lives and their community.

Some academics have expressed concern that in engaging with the public, it is important not to lose sight of the value of scientific expertise and knowledge to interpret scientific evidence and formulate research to answer scientific questions. Many questions of controversial science have little to do with the science; they relate to values, beliefs and societal norms. A science controversy with multiple dimensions requires diverse input and respect for relevant expertise in the different dimensions. Gathering this input is often the aim of public engagement activities, which seek to gauge ‘public opinion’. To some extent the promise inherent in a widespread policy to engage ‘the public’ in ‘the science’ is fraught with difficulty, and in practice must be carefully managed so as not to stifle scientific advances or to allow special interest groups to dominate the policy agenda. The first challenge is that ‘the public’ is not usually of the same opinion on anything, and nor is ‘the science’.

ii Who is ‘the public’ and do they have one opinion?

‘The public’ is not one uniform block of people with the same ‘public opinion’. Their interests are generally diverse and contradictory and made up of multiple lifeworlds. This can be somewhat problematic when considering the subject of public engagement in science and consultations about the social implications of new

technology. Such activities are often considered to be in the public interest or to make science more ‘democratic’ by increasing access to decision-making processes and information. However, it can be difficult to identify the key audiences for engagement activities. A large proportion of the public is not interested in science or motivated to participate; some disadvantaged and marginalised communities may be difficult to engage; it may be practically impossible to canvas the opinion of a large section of the population about a new technology due to resource constraints. As a result, ‘the public interest’ is usually defined by politicians, public bodies or activist groups in the name of the public. Some of these claims to represent the public’s interests are more valid than others.

Elected governments are given a mandate to represent the interests of voters, based on their manifestos and party politics, but scientific policies may not be included in manifestos and science issues often transcend traditional party politics. Politicians are most likely to portray public opinion to support their own political interests, regardless of whether they coincide with the interests of the public (Mudde & Kaltwasser, 2017). For example, populist governments claim they are defending the public interests against ‘elite’ institutions, which include scientific institutions and experts in general. These parties have sought to undermine established scientific knowledge and opposed measures recommended to address climate change and control infectious disease (Mudde & Kaltwasser, 2017).

Those who proactively engage in a ‘stakeholder dialogue’ or consultation exercise are likely to be those individuals and groups who have a strong interest in the subject matter, or who express a particular opinion. Special interest groups or individuals usually advocate for a specific cause or goal that is important to their lifeworld. Their stance may (or may not) be representative of the population, or in the interests of those individuals or society as a whole. For example: those who support a total ban on the use of animals in medical research, even though such a step could disrupt medical progress; or those who campaign against wearing a face covering or taking a vaccine to protect them against COVID19, even though they would put themselves (and others) at higher risk of infection.

Those organising public engagement have to balance the interests of the various opposing groups. A consultation of the whole public, such as a referendum, would be impractical and probably undesirable in scope and scale for science policy-making. So, for practical reasons, during consultations and public engagement, scientific organisations tend to engage with the bodies that make up civil society, such as non-governmental organisations (NGOs), charities, community groups, professional organisations and foundations, who advocate for and support people outside the state systems and the family unit, in the public sphere. As a result, the key relationship developed by organisations during a public engagement exercise is actually to civil society not 'the public', and there should be a recognition that these groups may not be fully representative of the majority.

iii Who represents 'the science'?

The same complexity that is evident in the multiple versions of the lifeworld that constitute 'the public' in the previous section are also evident in the scientific establishment. There is a diversity of opinion and practice over knowledge and ideology which leads to animated disagreements between groups of scientists. For example, scientism is an ideology of extreme logical positivism or reductionism that does not value other methods of knowledge generation, and the majority of natural scientists disagree with it (Sorell, 2013; Pigliucci, 2018).

Despite this heterogeneity it is common for groups to claim they represent 'the science': this is founded on the incorrect cultural perceptions that science will offer definitive answers and 'truth' to any particular problem, and that scientific knowledge is completely objective and neutral. In summary, there is no one scientist or organisation that can claim to represent 'the science', in the same way that claims made to represent 'the public' are unsound.

These conceptual difficulties relating to the term 'public engagement in science' provide important context for this study.

vi Aim of this PhD

This research critically examines the social and cultural influences upon the approach of scientific organisations to communications and engagement during public scientific controversies. Recognising the poor standard of public discussion about controversial science, my interest was focused on how organisations can create the discursive conditions in which to have *better* arguments. A framework for the 'ideal' conditions was provided by the work of Jürgen Habermas, a leading critical theorist who is committed to rational and open discourse about science through his theory of *communicative action* (these theories and concepts are discussed in Chapter 2) and other writings.

The study uses concepts from Habermas's theoretical framework of communicative action as an 'ideal' benchmark against which to compare real-world practices. This enables an examination of how engagement between the public and scientific institutions may be inhibited by different cultures, norms and beliefs, which subconsciously (or consciously) result in forms of pseudo-communication that serve to manipulate the opinions and beliefs of others, rather than engage in genuine debate. I also analysed the extent to which the discourse is distorted by contextual social and environmental influences in real-world practice.

The research question underpinning this study is:

> **How can we explain and understand the dissonance between competing and conflicting voices in areas of controversial science?**

There are two sub-questions:

> **Q1:** How are policies and strategies for engagement and communications activities during public scientific controversies influenced by the culture and interests of the organisation that they represent?
>
> **Q2:** To what extent is the deliberative ideal behind programmes of scientific engagement distorted in practice, and why?

These questions are answered in the concluding chapter, drawing upon insights from the research findings and analysis in Chapter 4.

The responsibility for leading public engagement and communications activities largely sits within the scientific 'system', so this research deliberately focused on the role played by scientific organisations rather than that played by activists (which is, in any case, more widely studied). I examine three different types of scientific organisations (public sector, private sector and NGOs) because different sectors have distinctive roles in the instigation and organisation of public engagement and communications.

Public sector and governmental scientific organisations usually have a statutory role in formal public communication and engagement relating to policy. University scientists are obliged to conduct public engagement as part of responsible research and innovation and the UK's Research Excellence Framework (UK Research and Innovation, 2021). In private sector organisations the drive towards public engagement is usually commercial or reputational. Science NGOs and campaigners are diverse – they may be professional bodies or campaign for single issues – so their rationale for public engagement varies accordingly. This research provides insight about the underlying and perhaps unacknowledged cultural and social influences on scientific discourse.

v Thesis structure

Chapter 1 | Science and society: A literature review

The first chapter presents a critical summary of the literature relating to this research. The literature review aims to do three things:

- to examine trends in UK policy-making related to communications and engagement with the public about science
- to outline the contextual challenges arising from the social, political and cultural influences upon the discourse environment in 2021
- to analyse the long history of people's concerns relating to science and technology through the prism of vaccines.

The literature review for this study identified a lack of open-ended engagement activities that enable laypeople to meaningfully contribute to scientific discussions, despite the stated policy intention of UK scientific organisations to engage with the

public (Wynne, 2006). I have identified three main barriers to effective engagement which are further explored in the empirical part of my research.

The first difficulty is that of conducing any rational discourse in a hostile and, at times, irrational public sphere, which acts as a deterrent to scientific organisations and scientists because the consequences can be reputationally negative, both for organisations and individuals.

The second barrier is that there is a general lack of clarity around what 'public engagement' means in terms of objectives and desired outcomes. This leads to a wide variety of activities targeting the public, which are of variable value. Such ambiguity can also lead to a mismatch of expectations between those organising engagement and those participating, causing frustration for lay participants when they feel their concerns are not addressed and for scientists when robust scientific evidence is incorrectly challenged by non-experts.

The third obstacle is that the policy for engaging with the public has largely been delegated to individual scientists, without supporting them with the skills or resources to implement it properly. This raises the question of whether the observed communications default to a technical-rational approach is simply because scientists, whilst being highly skilled in conducing scientific research and teaching, should not also be expected to be experts in public engagement, particularly in areas of controversy and those that attract hostility.

This chapter also outlines the gap in the literature that I identified, which is that there is little research published into the views of policy-makers and communications and engagement professionals working within scientific organisations. Most studies have been conducted among activists, scientists or the public (or in a medical context, healthcare professionals and patients). Communications and engagement professionals are extremely influential in communications policy development and implementation and could be expected to provide valuable insights.

Chapter 2 | A communicative ideal: The theories of Jürgen Habermas

To better understand the gap between policy and implementation, this research examines the views and experiences of those who act as intermediaries between the scientific organisations and civil society. In Chapter 2, I outline a theoretical framework which uses concepts from Jürgen Habermas's *The theory of communicative action* (Habermas, 1984; 1987) as an 'ideal' benchmark against which to compare real-world practices. Habermas describes a communicative ideal which draws attention to how democratic discourse has been transformed by a variety of societal factors. Examination of how and why the conditions for an idealised form of communication are not met during prolonged public controversies provides insights into how rational discourse can be undermined and why attempts to create understanding and consensus may fail.

The purpose of Chapter 2 is to explain my choice of critical theory and how Habermasian theoretical concepts are used to structure my research. Starting with the societal context in which the communication takes place, I draw upon Habermas's theories of knowledge interests and communicative action to outline the 'ideal' conduct he described for democratic discourse. *The theory of communicative action* describes an ideal of rational communication, elements of which are evident in the policy aspirations of scientific organisations in the UK (Science and Technology Committee, 2000) including meaningful involvement of the public in decision-making and equal consideration of all perspectives in a debate.

This section is followed by a discussion about how statements might be assessed for their validity and the conditions and skills needed for effective democratic discourse. Having outlined a number of concepts, I then show how they were used to create a simplified conceptual framework (the 5Cs) to be used as an artificial construct against which to examine real-world practice of engagement between the public and scientific institutions. The 5Cs of the framework are:

- the **context** of the discourse in the public sphere
- the **conduct** of communications activity and debates
- the **content** of the arguments
- the epistemological **construction** of knowledge
- the communicative **competence** of those participating in the discourse.

This framework provided a comprehensive and well-structured analytical tool through which to seek better understanding of the complex terrain in which scientific organisations engage with the public. Finally, I outline the major criticisms of Habermas's research and explain how these have been accounted for in my research.

Chapter 3 | Research design

In the third chapter, I explain the thought process behind key decisions in my research design. I initially share the choices made in relation to methodology and theory. I then outline the research questions, describe the process for data generation and the strategy for analysis. Finally, I examine the ethical and political issues arising in the study, describe my use of reflexivity in this research and highlight any limitations identified. I have used the case study of vaccine safety as an illustrative example through which to study a wider phenomenon (Simons, 2009; Crowe et al., 2011); in this case, to try and explain the dynamics within public discourse around controversial science (Schwandt & Gates, 2018). Vaccination was chosen as a good example of a public science controversy because it is long-running, well established and well documented in the literature (Porter & Porter, 1988).

Chapter 4 | Clash of the lifeworlds: Findings and discussion

In this chapter I present my research findings and highlight areas of consistency and divergence with the literature in Chapter 1. The chapter is structured around the 5Cs that were derived from the writings of Habermas and laid out in Chapter 2. I share the major findings from my analysis of the data in these five categories:

- the **context** of the discourse in the public sphere
- the **conduct** of communications activity and debates
- the **content** of the arguments
- the epistemological **construction** of knowledge
- the communicative **competence** of those participating in the discourse

Each section in the 5Cs includes a brief reflection and discussion section where I draw upon my own experience as a communicator to discuss the significance of these findings for the practice of science communications and engagement. Finally, I

explore how the findings in each category combine to influence how scientific organisations approach public engagement and communications on controversial science in the UK in the present day.

The major findings confirm the continued default to the 'deficit model' of science communications observed by STS scholars. My research explores the underlying reasons why this happens. I found that organisations are fully committed to communications and engagement but find themselves unable to overcome barriers posed by the degeneration of discourse standards. There are also internal obstacles to engagement such as a lack of clarity in the policies of public engagement and a consequent lack of investment in resources or skills to do it properly. As a result, a variety of internal and external factors have combined to mean that there is a lack of reliable authoritative sources of information for the public during a science crisis. The gap is being filled by unreliable information from various actors, including anti-science organisations.

Conclusion chapter

In the concluding chapter, I revisit the research questions posed at the start of this PhD and present my conclusions. I explain the dissonance between competing and conflicting voices in areas of controversial science in Habermasian terms of a 'clash of the lifeworlds'. I summarise the insights gained into how policies and strategies for engagement and communications activities during public scientific controversies are influenced by the culture and interests of the organisation that they represent. Also, I discuss the extent to which the deliberative ideal behind programmes of scientific engagement is distorted in practice, and why.

Despite the internal and external pressures upon scientific organisations and the general degeneration in the public sphere as a place for rational debate, there are grounds for optimism. This research demonstrates that scientific organisations are clearly committed to engage with the public about science. Recent polls show that the public continues to trust scientists, far more than politicians, social media or corporations (Edelman, 2021). Post-COVID19 may be the opportunity for scientists and the public to reject post-truth, politicisation of science and disinformation and collaborate to conduct a more rational and inclusive debate in the public sphere.

vi Thesis contribution and impact

My research has made an original contribution to academic knowledge and has the potential to impact practice in the communications profession in science-based organisations and industries.

Firstly, I created and tested a novel analytical framework based on Habermasian theory that enables a thorough examination of communications and engagement practice relating to the 5Cs: **context**; **conduct**; **content**; **construction** of knowledge; and **competence** of the participants. This Habermasian framework may be of use to other researchers and practitioners, so I intend to share it via workshops and publication in peer review journals to make it more widely available to practitioners.

Secondly, my use of this analytical model highlighted and explained a number of barriers to public engagement that go some way to explain the observed continued adherence to the 'deficit model' previously observed by STS scholars. Some of these observations are related to the culture and ways of working, many of which are already documented in the STS literature. However, in using this wider theoretical approach, I have signposted *why* these barriers appear to be insurmountable. I have found that, despite a wish to do so, organisations find it difficult to engage, either because of their own processes, or because the external environment is so hostile that it is not worth the risk to personnel or to reputation.

This study is also novel as it drew insight from an under-researched group of senior professionals who are responsible for creating programmes of engagement and communication within scientific organisations. These individuals provide a unique insight into the tensions and constraints in these organisations. For example, scientific organisations are obliged to communicate but are also attacked for doing so. Also, they are subject to national policies, but provided with little support to implement them. I also draw out the conflicting organisational priorities that may unintentionally distort communications by disincentivising organisations to get involved in controversy.

The potential reach of this research goes beyond academia to professionals working in science communications and engagement. The research findings are practically

useful as they confirm some areas that scientific organisations *cannot* change directly as they are beyond their influence, such as the politicisation of science and lack of action from social media companies on disinformation. But there were other findings that can be practically addressed – such as poor evaluation – by more focus on setting objectives and measurable outcomes. Lack of resources is identified as a key issue, but this might be overcome by pooling resources and increased co-operation between institutions on intractable issues, or ensuring the right level of skills and resources are focused on key objectives.

These research findings will be shared through professional bodies, science communications networks, publications, conferences and seminars with both academic researchers and science communications professionals. I also identify any areas where there is insufficient evidence to support practice and suggest further research. Drawing attention to the underlying and perhaps unacknowledged cultural and social influences on scientific discourse is the first step to improving practice. In this way, I hope to contribute to improving the quality of the public debate in this area, supporting evidence-based policy implementation.

Chapter 1 | Science and society: A literature review

1.1 Introduction

Communication does not occur in a vacuum. In order to really understand the approach of scientific organisations to communications and engagement about controversial science, it is important to situate them in their societal context. This chapter considers the published literature about the opposing actors in the discourse, the influence of their shared history and the environment in which it takes place. This literature review aims to do three things:

- to examine trends in UK policy-making related to communications and engagement with the general public about science
- to outline the contextual challenges arising from the social, political and cultural influences upon the discourse environment in 2021
- to analyse the long history of people's concerns relating to science and technology through the prism of vaccines.

This literature review led me to the title of my thesis – 'clash of the lifeworlds' – which draws attention to the incommensurability of the opposing use of knowledge claims, language and narratives within the scientific lifeworld and the multiple lifeworlds which make up different social groups in 'the general public'. The expression 'lifeworld' (or lebenswelt) was first described by Husserl (1970 [1936]) and, drawing on the tradition of phenomenology, was further developed by Habermas in *Legitimation crisis* (2015 [1975]). Observing scientific discourse in the present day, it would be easy to conclude that rational debate about science is difficult – if not impossible – but Habermas's conception of 'lifeworld' emphasises the competence of ordinary people to communicate and establish social relationships. This thesis builds upon this observation to construct the argument that more faith in the competence of the general public may well provide the basis for increased mutual understanding.

1.2 How scientific organisations engage with society

Addressing the ethical and practical impact of new scientific knowledge within society is not a new phenomenon. It has been faced by politicians, scientists and philosophers since the time of ancient Greece. In recent decades, there have been many controversies and crises in relation to science and the public in the UK. Many of these crises concerned human safety and risk, such as:

- the Chernobyl nuclear disaster in 1986
- the 'mad cow disease' (bovine spongiform encephalitis (BSE)) outbreak in the UK in 1986
- the disputed link between the measles, mumps and rubella (MMR) vaccine and autism from 1998 onwards.

Other cases raised difficult moral questions, such as advances in reproductive technologies, genetic modification that allowed gene therapy and the safety of genetically modified (GM) crops. Still further scientific subjects provoked bitter and partisan political disputes, such as the anthropogenic basis of climate change (Royal Society, 1985; Science and Technology Committee, 2000; 2017).

In many of these cases, crises were exacerbated by inept paternalistic attempts to reassure the public about there being no risk, often against the scientific evidence or when considerable uncertainty still existed. These events provided me with a substantial amount of material for a PhD about how scientific organisations communicate about controversial science. Then in 2019 the most devastating global health crisis for 100 years began to unfold, and scientific controversy over the coronavirus pandemic became the dominant issue in the public sphere. This not only made my research incredibly topical, but also served to demonstrate the life and death stakes involved in communication to the public about science during a global pandemic.

Perhaps unsurprisingly, the policy approach of scientific organisations to society during a controversy is *also in itself* controversial and the following section traces recent policy discussions about science in society, which revealed several cultural influences and assumptions that prevail to this day.

1985: Public understanding of science

In the 1980s, officers at the Royal Society, a UK independent scientific academy, became concerned that increasingly negative public attitudes towards science could make funding for research politically vulnerable. So they convened a panel of senior scientists and released a report that encouraged actions which would lead to improved 'public understanding of science' (PUoS) (Royal Society, 1985). This understanding included the facts of science, the scientific method and its limitations, and the nature of risk. The intent was to improve public decision-making and protect members of the public:

> An uninformed public is very vulnerable to misleading ideas on, for example, diet or alternative medicine. An enhanced ability to sift the plausible from the implausible should be one of the benefits from better public understanding of science. (Royal Society, 1985, p.10)

Reading the 1985 report, one can observe that the scientists involved sincerely wished to address a problem that they define as the poor public reception towards science. Unfortunately, the scientists characterised the problem and came to a solution based on their own culture, norms and values.

There were two problems with the approach laid out by the scientists:

- the assumption that the blame for falling public trust in science lay with the public, not the scientists or the government
- the normative assumption that scientific knowledge should be prioritised over other types of cultural or experiential knowledge that the public might possess, or public objections to science that were based on beliefs and values (Wynne, 1995).

As a result, the Royal Society report was extensively criticised by academics in the science and technology studies (STS) community. Wynne memorably described the PUoS activities as adhering to a 'deficit model' to characterise what he saw as a paternalistic belief held by members of the scientific community that the public did not support science because they had a knowledge deficit which led to them not understanding and appreciating the achievements of science (Wynne, 1995). Wynne complained that:

> This model has emphasised the public's inability to understand and appreciate the achievements of science – owing to prejudicial public hostility as well as to misrepresentation by the mass media – and adopted a linear, pedagogical and paternalistic view of communication to argue that the quantity and quality of the public communication of science should be improved. (Hackett et al., 2008, p.450)

Although Wynne's deficit model terminology was never defined by the scientists, the criticism of PUoS coalesced around it as a political and ideological stance within science in the years to follow (McNeil, 2013).

2000: Public engagement in science (PES)

By 2000, in the wake of further crises over the MMR vaccine and BSE, the criticism of PUoS was well acknowledged, and led the House of Lords to establish an inquiry and publish a report entitled *Science and society* (Science and Technology Committee, 2000). On this occasion input was sought from the critical social scientists and the recommendations were much changed, with an acknowledgement that the basis for public concern was not related to ignorance of science:

> Some issues currently treated by decision-makers as scientific issues in fact involve many other factors besides science. Framing the problem wrongly by excluding moral, social, ethical and other concerns invites hostility. (Science and Technology Committee, 2000; summary)

The Lords' report demonstrated a clearer understanding of the social issues alongside the scientific ones, and acknowledged the contribution of the academics working in STS. The report recommended a move towards a more participatory model; a two-way, consultative, discursive engagement of the public in science, to build trust between the public and the scientific community, 'changing the culture of policy-making so that it becomes normal to bring science and the public into dialogue about new developments at an early stage' (Science and Technology Committee, 2000, section 1.19).

The term public understanding of science (PUoS) evolved to public engagement or involvement in science (PES). The practice of PES encouraged scientists to transparently explain the uncertainty and risk associated with new scientific knowledge, as well as the potential benefits. Scientists were also instructed to seek

and gain valuable input from laypeople and special interest groups on the potential benefits and drawbacks of new science and technologies. This recommendation served to meet the increasing demand for involvement from citizens that was emerging, at the time, in a number of areas. These included patient groups who wanted to help design clinical studies of new medicines, and people concerned about the exclusivity of expert groups formed to advise on nuclear power (Epstein, 1996; Topçu, 2008).

After 2001, significant resource investments were made in engaging the public in science, by organisations such as Wellcome[1] and the UK government via the National Coordinating Centre for Public Engagement (NCCPE) and Sciencewise (Boaz et al., 2016), which offer training and guidance and expert implementation respectively. Charities such as Sense about Science and the Science Media Centre were also set up to improve engagement on science and balance the media coverage respectively.

Today, almost all scientific and health organisations in the UK employ teams of communications and public engagement professionals, and all UK Government departments have been directed to routinely conduct public engagement activities and formal consultations using the NCCPE framework (Science and Technology Committee, 2017). Public engagement was also built into research grant conditions in academia, which now require an element of public engagement as part of the Research Excellence Framework (UK Research and Innovation, 2021). These actions demonstrated widespread acceptance that effective communication requires initiatives that sponsor ‘dialogue, trust, relationships and public participation’ (Nisbet & Scheufele, 2009, p.1767). The solution had been identified and was to be implemented by a policy that had broad support from representatives from the natural sciences and the social sciences.

[1] Wellcome is also known as the Wellcome Trust.

2020s: The deficit model continues to dominate – why?

Despite this, an ongoing disconnect prevailed between the intent to engage with the public on science (as expressed in the various policy initiatives on public engagement in science) and the implementation in everyday practice or attitudes of scientists or institutions. In the years that followed the 2000 report, STS scholars observed that the move from 'deficit to dialogue' was not entirely successful (Smallman, 2020; Smallman, Lock & Miller, 2020). Trench (2006, p.1) stated that:

> the deficit model remains the default position of scientists in their public activities and underpins much of what is proposed by public officials in their promotion of science.

It was also noted that where engagement did happen it involved a small number of people, and many of them were already supportive of the science or socially and educationally privileged (Dawson, 2018; Jensen et al., 2014). This is puzzling, given the widespread acceptance of the need to engage more meaningfully with the public, and suggests that the intended switch from 'deficit' to engagement and involvement is much more difficult to achieve in practice than it might appear to researchers in STS and other observers.

It is important to note that nearly all science communication and engagement is designed, conducted and controlled by scientific and research institutions themselves. Therefore, it is almost certain that the norms, culture and bureaucratic processes of those organisations will have a significant impact upon the conduct and content of the dialogue and deliberations. STS research has often focused upon these cultural barriers, suggesting an intransigence in the scientific community. There is no doubt that culture is influential, and I examine the issue of cultural influence later in this section, but I also argue that there are several other more mundane and bureaucratic barriers. The section below outlines a number of these possible reasons, such as lack of skills or resources, that may explain why the deficit model prevails despite the best intentions of all those involved.

Resource constraints

Meaningful engagement and dialogue generally require an open-ended investment in time and human resources over many years. The hierarchy of knowledge and the annual business planning cycle in any science-based organisation will almost

inevitably prioritise activities with an evidence base with short-term deliverables. In addition, when funding is constrained, budget allocation to conduct communications and engagement ultimately can mean reallocating funds from science. These factors combine to make it difficult for engagement activities to compete against scientific research activities because the evidence base on the effectiveness of these education and engagement campaigns is poor and the outcomes are long term. Without enlightened leadership, this can lead to a tactical scientist-led unsupported approach a more strategic professional-led co-ordinated organisational approach, embedded in policy and organisational governance (Wellcome, 2015, Chapter 5).

Both approaches have inherent problems for any activities that are intended to be meaningful, open ended and based on dialogue. I was unable to find any academic literature on this. However, there were a number of surveys from the University of Reading (2018), the NCCPE (2015), Wellcome (2015) and the Science and Technology Facilities Council (STFC) in UK Research and Innovation (Grand & STFC, 2016), all of which found funding mechanisms and institutional support to be a significant challenge to public engagement activity.

The UK's Research Excellence Framework was designed to build resources into research programmes for individual scientists to demonstrate the *impact* of their research on the world outside academia. One of the ways in which they can satisfy grant application conditions or impact requirements is through generating quantitative evidence of engagement with the public (Parks et al., 2018). However, Boaz et al. (2016) argued that this led to a tick box mentality, whereby scientists do not see the value in the activity and therefore do the minimum necessary to meet the requirements, possibly in a way which does little to meet the original goal of the exercise to demonstrate *impact*. This observation was supported by a review of public engagement submissions made by universities in the Research Excellence Framework in 2014, which showed that 47% of organisations made a reference to engaging with the public, but the extent varied significantly and how the activities were described differed significantly (Duncan & Manners, 2017). The report concluded that evidence to demonstrate impact was weak and focused on numerical outputs as opposed to increased understanding, involvement or awareness (Duncan & Manners, 2017).

None of these reports detail exactly what benefit the public will gain from this enforced engagement, as it is unlikely that all research will be of interest to the public, yet the funding is diluted across all subjects, when it may be better concentrated in subject areas where there is a demand from the public. A contributory factor to the budget constraints described above is the increasing 'corporatisation' of science, whereby research institutions become more strategic and professionalised.

Corporatisation of science

The corporatisation of science is reflected in the shift in funding of science away from unrestricted grants towards defined programmes with economic impact from commercial organisations funded by industry, venture capital firms or private donors such as the Gates Foundation, or research charities such as Wellcome. Many scientific organisations are reliant on their reputation to secure this external funding, and this has a profound effect on how they communicate about science (Weingart & Joubert, 2019).

Davies (2020) argued that institutions such as universities view science communications as a tool for reputation-building and prioritise this over education and engagement activities which would typically be seen as integral to science communications. Reflecting the timing of the House of Lords' report, the overall volume of science communication activities in state funded research institutes since 2000 has also increased significantly (Carver, 2014). However, these science communication activities are almost always a form of commercial marketing or public relations intended to attract funding and students (Weingart & Joubert, 2019). This diversification of science communications into marketing and reputation-building means that communications and PR teams have had to develop an array of new skills, and that science communications now covers a range of activities.

Lack of skills and competence

There is more than one type of science communications. The term covers many different types of activities, and the differences between them – and their intended outcomes – may not be well understood (Davies, 2020). There is a lack of clarity and understanding of public engagement objectives and activities (VanDyke, 2020) so engagement, educational and commercial objectives become conflated, with

'engagement' activities being used to gain public acceptance for pre-conceived policies and decisions. The departments responsible for delivering engagement activities are also often responsible for a variety of very different activities, which include technical education about science, science festivals and schools' activities, policy consultation exercises, public involvement in research and also more marketing and public relations activities which aim to promote a technology or boost the reputation of a scientific institution (Wellcome, 2015). Each different activity is entirely legitimate, but some academics have criticised activities that are essentially 'cheerleading for science' or 'science propaganda', which is seen as problematic as it does not contribute to wider public value or reflect the moral duty of science to communicate through dialogue and discussion. Universities have been singled out as 'especially egregious offenders' (Davies, 2020, p.10). The differing activities and their sometimes-conflicting objectives highlight another gap, which also influences funding and prioritisation, measurement and evaluation.

Ineffective evaluation

As noted in the Introduction, the major stumbling block to the evaluation of many public engagement activities is that the reason for doing them in the first place is not always clear. The objectives of such activities may need to be better explicated in order to evaluate the activity and also to clarify the expectations of the participants. For example, a scientist may approach an activity in order to inform or educate the lay public. A member of the public may attend with an expectation of a reciprocal dialogue that may change the practice of the research.

Where public engagement *is* evaluated, the activities are not measured for outcomes that benefit the public, but for more instrumental objectives such as success in mobilising stakeholders with funding (Weingart & Joubert, 2019). Alternatively, the evaluations may be passive numerical outputs such as the number of participants and their satisfaction with their experience of an event, rather than more active engagement outcomes such as enabling them to usefully influence science policy or develop critical thinking skills related to science. When public consultation activities were evaluated in more depth, it was shown that they had little impact on policy (Wynne, 2006; Smallman, 2018).

It is possible that evaluation is poor because it is difficult to do well and is subject to the same resource constraints as the programmes themselves. The focus on numbers and outputs rather than meaningful outcomes suggests that the scope of consultations may not be clear with relation to intended outcomes. For example, will the engagement have an influence upon *how the research programme is conducted* itself, as well as considering the implications of the findings? It may also reflect the hesitancy of the scientific community to modify the design of specific research projects, based on insights gained from laypeople with experience of a subject, such as a health condition, as is discussed next.

Risk and unpredictability leading to instrumental engagement

Public engagement is intended to allow the public to discuss science with the experts and legitimately raise any concerns they may have about the impact that specific developments in science and technology may have on their lifeworld (Burchell, 2007a; Gildiner, 2004).

A key feature of dialogue is unpredictability (Theunissen et al., 2012) and the outcome may not be favourable for some participants (Heath, 2006). Dialogue can expose differences as well as similarities; there may be disagreement, conflict and damaged relationships. Faced with hostile activist groups, this puts off many organisations from engaging in dialogue completely or leads them to use it instrumentally. Attempts are made to minimise uncertainty by overengineering dialogue or framing it to favour a preferred outcome (Leitch & Neilson, 2001, p.135).

A number of researchers have described how organisations can either frame engagement activities for persuasion, i.e. act instrumentally, or else frame them for dialogue and democratic engagement with science (Gieryn, 1983; Burchell, 2007b; Sprain, 2018; Nerlich, 2018). In this way the organisers have the power not only to make the decisions, but also to decide which decisions can be made, with no requirement to justify the decision-making processes when challenged (Bachrach & Baratz, 1963; Gieryn, 1983). The previously described tendency of policy-making bodies to preferentially rely on scientific and technical information can force value concerns to be played out in technical debates, where they can be easily dismissed as not relevant (Jasanoff & Simmet, 2017). Alternatively, citizens may be physically

excluded from discussions because they take place within specialist institutions and because participation is limited (Gieryn, 1983).

In theory PES is a democratic process which involves the public, but in practice participants in PES are either selected by the organiser or self-selecting because they already have an interest in the subject (Kennedy et al., 2018; Cooter & Pumfrey, 1994; Stilgoe et al., 2014; Jensen & Holliman, 2016). Finally, when they are invited, they may not be able to fully participate because they are excluded by the technical nature of the debate and discussions (Gieryn, 1983). The issue is not the use of technical language per se, which is necessary for precise and accurate communication between scientists in particular specialties. The problem of exclusion arises when the content presented at a public engagement meeting about the *social* impacts of science or technology is so technical that it excludes laypeople from making a meaningful contribution as intended (Scrimshaw, 2019). This can lead to misunderstandings, due to language being either incomprehensible or else oversimplified to the point of technical inaccuracy (Boaz et al., 2016). Alternatively, it is often expected that laypeople adopt the expert language or scientists adopt the layperson's language (Hodge, 2005). It is not unusual for lay members of a group to undergo training and to develop technical competencies to fit into the system processes and knowledge. They thus become part of the system and are quasi-professional, which may defeat the purpose of their inclusion (Hodge, 2005; Bissell, Thompson & Gibson, 2018).

These forms of instrumental engagement backfire against organisations and stimulate opposition from groups who believe that scientific institutions physically exclude them, disregard their worries about values and societal impacts of science, or frame discussions in a way which avoids their key concerns (Gieryn, 1983; Burchell, 2007b). Those who set up such engagements or consultations may be doing this unintentionally because they genuinely believe the intent of such interactions with the public is to share science and technical information (as per the deficit model). Alternatively, they may lack the expertise required to design an interaction that enables laypeople to add the most value to the process.

The first part of this section outlines what I would characterise as the pragmatic and bureaucratic influences upon scientific communications and engagement, such as lack of funding and increased corporate interests in science. I will now examine the arguments made by STS scholars about the cultural assumptions and influences that provide justification for the continued adherence to the deficit model of public engagement. The first area I will explore is the justification used for framing and exclusion, which is founded upon institutions believing that public engagement in science is 'problematic'.

Problematising public engagement and involvement

Essentially, this means that the public can be problematised by scientists as an obstacle to achieving technological policy objectives (Welsh & Wynne, 2013). Calls for greater public participation are often met with the response that they are unrealistic, idealistic or unhelpful. Institutions fear that all their decisions would be open to contestation by people who they perceive to be ill-informed or unqualified. Activists who campaign on scientific issues are also often misrepresented as 'anti-science' or 'science denialists', although they may be primarily motivated by social or political beliefs, rather than an opposition to science itself (*Nature* Editorial, 2017). Similarly, the public can be characterised as ignorant, irrational, emotional, sceptical and easily influenced by NGOs and the media (Burchell, 2007a).

Maintaining the trope of an 'ignorant public' and misrepresenting legitimate scepticism as denialism is used to support the status quo of the 'system' and disenfranchises the public further. For example, there is no evidence that people who oppose vaccination are less educated (Larson et al., 2014), politically influenced (Baumgaertner et al., 2018) or that they are lacking in information, as many spend a great deal of time researching vaccines online (Jones et al., 2012). The issue is more that they are unwittingly consuming misinformation which leads them to draw reasoned – but incorrect – conclusions. This undermines the assumption that people who are anti-vaccine or vaccine hesitant are 'stupid'. They are just basing their decisions upon very different information than those who support vaccines. There is also some evidence from cognitive psychology that people who are sceptical about vaccines tend to process information about risk quickly and in a less deliberative manner, which leads them to overestimate the likelihood of a rare vaccine reaction or

death (LaCour & Davis, 2020). This tendency is exacerbated by the media's tendency to give prominent coverage to rare reactions to vaccines.

A number of commentators have claimed that politicians, scientific organisations and scientists harbour prejudices about an 'ignorant' public: Welsh and Wynne (2013) wrote that members of the public who are 'unable or unwilling to comply with the escalating need for science-led commercial innovation for global competitiveness' (p.541) are seen as a political threat requiring state control, surveillance and criminal legislation. Such accounts do not always acknowledge that many people are disillusioned with science because it has become dominated by the system in the form of commercial interests or the government (Lyotard, 1984). Bauer et al. (2007) noted a conflation of value and emotion and an association made between emotion and irrationality; similarly, Burchell (2007a) described how the public is characterised as ignorant, irrational, emotional, sceptical and easily influenced by NGOs and the media.

These assumptions and prejudices ignore the possibility that the public can evaluate certain types of technologies in the context of their experiential knowledge (perhaps reflecting the epistemological biases outlined earlier in this chapter) or because there is a conflict with their beliefs, values or culture. By portraying reasoned disagreement as ignorance, the pro-science groups may be denying the intellectual capabilities and the political awareness of many members of the public.

The assumption of an ignorant public can also be reinforced by the framing of interactions between scientists and the public. Laypeople are not experts in science and should not be expected to be. In the context of public engagement in science, the role of the layperson is to raise questions about what should be done *in the light of* the scientific findings rather than engage in a highly technical discussion about scientific evidence. It is usual that laypeople involved in discussions about the social impact of science are expected to learn about the science under discussion, even if this is not necessary for them to knowledgeably discuss the moral or ethical implications of a new technology. However, there is less expectation that scientists reciprocate. It has been suggested that there may not be as much interest among the professionals in understanding the public's life experiences as there is in the laypeople to understand the system (Hodge, 2005; Bissell, Thompson & Gibson,

2018). The presumption that the public need to be educated about the technicalities of science to have an opinion on its social implications was described as 'beside the point' by Gregory (2005, p.1) who commented:

> One does not need to know how many legs insects have in order to contribute to a democratic decision about research on embryos, for example. Indeed, if one's position on such an issue is primarily a moral one, then even knowing about embryology is likely to be beside the point.

A lack of direct knowledge of science does not mean that people are unable to critically assess specific pieces of scientific information when they need to in the context of their individual life experience, beliefs and values (Layton et al., 1993). The epistemic and normative assumptions of scientists during crises means that people's legitimate contributions are ignored during scientific controversies. This not only alienates the public, but also eliminates potential solutions based on traditional or local knowledge (Gregory & Miller, 2000; Miller, 2001). This problematisation of the public is taken a step further in the case of anti-vaccine groups who are frequently portrayed in pejorative terms in narratives from scientists, politicians and the media in order to create a 'moral panic' (Chone, 2002 [1972]).

A 'moral panic' about anti-vaccine sentiment

Anti-vaccine groups and those who do not vaccinate are portrayed as a threat to societal order and a 'moral panic' is caused by heightening anxiety in the general public about their influence (Rimmer, 2019). For example, when he was UK health secretary, Matt Hancock said that those who have 'promoted the anti-vaccination myth are morally reprehensible, deeply irresponsible and have blood on their hands' (Sky News, 2019). The term 'moral panics' was coined by Cohen (2002 [1972]) to describe how those in a position of power define a group as a threat to societal interests. This 'moral panic' coverage in the media amplifies the malevolent threat of the anti-vaccine groups and the irrationality of those who believe their claims about the safety of vaccines. Those who do not vaccinate are made into an acceptable target for hostility from the elites and the public (Capurro et al., 2018). Amplifying the perceived threat to society enables governments to introduce enforcement measures, such as making vaccination compulsory.

Blaming anti-vaccine groups appeals to health professionals' sense of rationality and their culture of paternalism, and helps to justify the contradiction in National Health Service (NHS) policy that emphasises the patient's rights to informed consent to every medical procedure, *except* vaccination (Carrion, 2018). In addition the marginalisation of anti-vaccine groups means that solutions to the issues they raise are never discussed. Blume (2006) argues that if anti-vaccine groups were taken more seriously, it would be necessary for healthcare providers to engage with their concerns about choice, informed consent and dissatisfaction with the vaccination schedule.

Many people object to the bureaucratic approach to healthcare and demands to make vaccination mandatory and enforce compliance; they may feel that their healthcare providers are condescending and dismissive of their concerns about vaccines (Brown et al., 2010). Shifting the focus on to anti-vaccine groups also serves to distracts attention from the failures of the healthcare services and the government in terms of scheduling, health literacy and socio-economic disadvantage. Capurro et al., 2018, p.42) argued:

> Health officials may be blaming a group that does not actually exist, and in doing so oversimplify the complex causes of declining vaccination rates. These causes include not just attitudes and beliefs about vaccine safety, but also vaccine scheduling, province-specific recommendations about types of immunisation, low levels of health literacy relating to socioeconomic disadvantage, and so on.

There is evidence that a lack of availability of appointments is a far greater problem than anti-vaccine propaganda in terms of influencing people's vaccination behaviour (National Audit Office, 2019). However, when vaccine hesitancy is discussed, the state will often invoke what Capurro et al. (2018, p.25) describe as a form of 'moral regulation', enabling them to exercise power over the public using norms and moral persuasion as a means of enforcement.

The belief that activist groups or members of the public are ill-equipped to advise or challenge scientists on the social or political implications of their work has its roots in an assumption of the inherent superiority of scientific understanding (Gregory & Miller, 2000; Gregory, 2005) which is discussed in the next section.

Privileging scientific knowledge over other forms of knowledge

Typically, it is argued that the culture of scientific institutions leads them to privilege scientific knowledge that is generated by formal assessments of technological efficacy and risk, and to ignore public understandings, knowledge, concerns and questions as irrational or irrelevant (Wynne, 1989, 2008; Michael & Brown, 2000; Michael, 2001). However, it is important to note that the weighting given to different types of knowledge is context-dependent and there are occasions where scientific knowledge *should* be privileged as it is the best way to answer the question.

For example, to answer questions such as:

- 'does the COVID19 vaccination cause people to develop protective levels of immunity against the coronavirus (as measured by antibody levels)?' or
- 'is there a causative link between the MMR vaccination and autism in children?'

it is entirely appropriate to prioritise data from carefully designed clinical and epidemiological studies over other forms of knowledge.

However, if the question is 'should people be compulsorily vaccinated against coronavirus?' a conclusion cannot be reached solely on the basis of scientific evidence which demonstrates that the vaccine gives protective immunity alone, as there are other legal, social and values-based issues that must be considered alongside scientific evidence.

This is often the point of friction between the lifeworlds of the scientists and the lifeworlds of the general public, because the way in which people create meaning and make sense of their lives can vary significantly; some people will follow scientific logic based on evidence or facts that they believe to be objective, whilst others will prefer to base decisions on their experiences or their religious and ideological beliefs. A clash will arise when one set of people with particular knowledge interests, values and beliefs make decisions that directly affect how other people lead their lives. For example, those who are anti-vaccine would argue that vaccine policies based on epidemiological evidence do not consider their individual experiences of vaccines or their right to choose not to consent to a medical procedure. Those who are pro-vaccine would argue that the same epidemiological evidence justifies universal vaccination in order to protect the whole community.

STS researchers argue that the privileging of scientific knowledge over other forms of knowledge becomes an issue when scientific forms of explanation are employed and privileged in contexts where the question is not a scientific one but one of values. The invalid belief that scientific knowledge is the *only* source of legitimate knowledge is scientism, an ideology of extreme logical positivism or reductionism that does not value other methods of knowledge generation (Sorell, 2013). Scientism holds a mistaken idea of objectivity and considers values and beliefs to be subjective preferences that cannot be debated. Therefore, the only evidence that this ideology holds worthy of discussion is scientific. As scientific evidence is physically and intellectually monopolised by trained scientists, this places them in the position of authority and power in policy formation because they are 'allowed to declare which information is salient and which is not' (Welsh & Wynne, 2013, p.544). As a result, scientific institutions have a vested interest in preserving the perceived epistemological superiority of science, as this provides intellectual authority, political influence and funding; it also protects from political interference (Gieryn, 1983).

Scientism also describes a situation when the logic and methodology of natural science is applied inappropriately to other areas – such as the humanities and social sciences – or when the scientists from one discipline, for example physics, attempt to answer questions about an area in which they have no expertise, such as climate science (Oreskes & Conway, 2012). Similarly, the authority of science can be misused to make claims that are not necessarily supported by current evidence, for example explaining the workings of the human brain and consciousness only in terms of biochemical and neuroscientific parameters, discounting philosophy, human experience and culture. Habermas described scientism as resulting in 'the pseudo-scientific propagation of the cognitive monopoly of science' according to which 'legitimate knowledge is possible only in the system of the empirical sciences' (Habermas, 1972, p.71).

Scientism should not be confused with science itself. Science and the scientific method have demonstrable value as a way in which to produce knowledge in a rigorous way in relevant areas of study. Scientism is actually harmful to science because it results in bad science when the scientific method is inappropriately applied to human and normative matters to which it can provide no insight. It is also provocative to other academic and intellectual communities, diminishing their value

and importance (Mercer, 1999). The overclaiming of scientism ruins the reputation of the vast majority of scientists who practise a more epistemologically inclusive and generous appreciation of the arts and humanities (Pigliucci, 2018).

Attempts to draw attention to the dangers of scientism and the limits of science by philosophers and sociologists have often been ignored, dismissed out of hand or seen as a political threat to the authority of science or the social order, rather than acknowledged as legitimate. In the mid-20th century, a number of theorists demanded more scrutiny and justification of scientific methods and claims to knowledge, and the key focus of their criticism was the assumed objectivity that was inherent in the claims of positivism that science was independent of social, historical or political context. Whilst most critics accepted that natural science generates vital knowledge about how the world works, they also argued that the aims and methods of science are shaped by its social and historical context.

The issue of the inappropriate application of scientific methods was addressed by Popper (1959) who was critical of the scientific basis being claimed for some areas of study and introduced the term ‘pseudoscience’. Popper challenged the accepted view that a theory could always be proven by empirical observation and confirmation, illustrating his work by showing how Freud’s psychoanalysis theory was impossible to prove or disprove, so therefore was not a scientific theory at all. The work of Kuhn (2012 [1962]) suggested that science was not completely rational and objective but much more politically and sociologically determined. Kuhn argued that accepted scientific paradigms were often the product of consensus or politics rather than objective scientific criteria. Kuhn did not believe claims of the objectivity of scientific evidence itself, noting that data is ‘contaminated’ by the theoretical assumptions of whichever theory it proves or disproves and how it is produced.

The assumed authority of scientific knowledge was the subject of a substantial philosophical critique between 1970 and 1990. Post-modernists asserted that the scientific method and scientific knowledge are no more objective and rational than other forms of knowledge (Lyotard, 1984 [1979]; Foucault, 2002 [1969]). The critical theorists Adorno and Horkheimer made the case that modernity had failed to deliver its promise of emancipation and equality. The promise to dispel superstition and myth with reason, evidence and critical thinking was unrealised because new myths

had been created about the infallibility of science. They argued that by the mid-20th century, the scientific establishment was behaving as dogmatically and irrationally as the pre-modernists had, and that the enlightenment project should be abandoned (Adorno & Horkheimer, 1979). Concerns about how this dogma and the power of science was leading to excessive risk being exerted by science were raised by Beck (1992, p.70):

> Science has become the protector of a global contamination of people and nature … it is no exaggeration to say that in the way they deal with risk in many areas, the sciences have squandered until further notice their historic reputation for rationality.

For example, nuclear weapons research in the 1950s created nuclear waste with no consideration for its safe disposal, and the long-term solution to the safe storage of this legacy waste still remains unresolved (Nuclear Decommissioning Authority, 2016; 2017). The medicine thalidomide was introduced for treatment of morning sickness in pregnant women without rigorous testing and caused devastating developmental injuries to their babies (Porter, 2004, p.107). The discipline of STS built on these arguments, drawing from many academic fields including sociology, anthropology, philosophy and gender studies (Okasha, 2016). STS scholars such as Latour argued that questions of science in society are not just epistemological (fact and knowledge based) but also ontological (the social construction of what constitutes facts and knowledge), and recognition of wider societal concerns would be an important way to create a constructive dialogue about science (Woolgar & Latour, 1979; Latour, 1987; 1999).

Having highlighted that science was a social process, some members of the STS community adopted the post-modern argument that scientific ‘facts’ were therefore simply beliefs that held no more authority than experiences. A protracted and bitter argument (the ‘Science Wars’) subsequently took place between natural scientists and STS scholars based on this extreme interpretation of the work of Latour and others (Gross & Levitt, 1994; Koertge, 1998; Sokal & Bricmont, 2014; Zaleha, 2015).

Scientists responded that the post-modern critique of science was political radicalism and did not address societal issues (Gross & Levitt, 1994; Calhoun, 2012). More to the point, they expressed concern that post-structuralists and post-modernists

appeared to wish to undermine science without suggesting any viable alternative. Latour later accepted that although science is a social process, it still produces knowledge (Latour, 2005). Reflecting on the Science Wars, Latour expressed the opinion that his social explanation of science had not been successful (Latour & Noor, 2002; Latour, 2005). However, his work did draw attention to the unjustified certainty and objectivity claims that are often made for scientific knowledge, which are explored in the next section.

Issues of 'truth' and objectivity

There is a proverb 'with great power comes great responsibility' (origin unknown); specifically for the scientific community this should involve a duty to acknowledge the limitations of scientific knowledge; science is only one way of understanding the world and it entails much epistemic uncertainty. There are two incorrect cultural perceptions of scientific knowledge that provide science with enormous credibility but also serve to hinder the discourse:

- that science will offer definitive answers and 'truth' to any particular problem; and
- that scientific knowledge is completely objective and neutral (as previously noted).

Generating definitive scientific knowledge may take many years and whilst this process is ongoing there is a period of uncertainty. The facts of a scientific matter can remain tentative or change dramatically as scientists challenge and criticise ideas and theories to further develop them. A body of knowledge becomes stable over time as theoretical and experimental evidence accumulates and is challenged by peer review, collaboration and ongoing debate. There is an assumption (encouraged by the media) that the public expect scientists (and politicians) to provide definitive answers to every question, even when the situation is unprecedented, nuanced or there is a disagreement on what data really means. There is a reluctance among some scientists and politicians to admit to uncertainty; Van der Bles et al. (2019, p.1) argued:

> Uncertainty is an inherent part of knowledge, and yet in an era of contested expertise, many shy away from openly communicating their uncertainty about what they know, fearful of their audience's reaction.

Failure to acknowledge uncertainty can have disastrous consequences. Demands for definitive positions on all matters lead to public figures making incorrect statements or policy decisions that they later have to reverse. The BSE Inquiry criticised ministers, chief medical officers and scientific advisers, after a 'campaign of reassurance' misled the public about the potential risk of contracting Creutzfeldt-Jakob disease from ingesting British beef (BSE Inquiry, 2006). During the COVID19 pandemic, Professor Chris Higgins, who chaired the Spongiform Encephalopathy Advisory Committee after the BSE Inquiry, said ministers would do well to re-read the report. He said:

> The government has not learned the lessons outlined in the Phillips review of BSE. There should, as Phillips recommended, be a clear-cut separation between those analysing data and assessing risk and those making decisions. This distinction has been lost in the COVID crisis. (Sample, 2020)

Failure to acknowledge uncertainty is also a missed opportunity to build trust (O'Neill, 2002). During the early stages of the coronavirus pandemic, the public did not expect the experts to know everything, but the government experts were sometimes unwilling to say what they did not know; this simply further undermined trust particularly among the more sceptical groups (Rosenbaum, 2020). Scientific uncertainty is also exploited by science denialists to undermine trust in science (Hansson, 2017). The process of knowledge generation and the lack of scientific certainty is used to artificially maintain controversies such as climate change (Latour, 2004) and vaccine safety, long after a consensus has been reached.

The second misunderstanding of science is that it is completely neutral or objective. Science is a cultural activity, not the realisation of a universal method of inquiry. The pragmatist Peirce (1982 [1897]) studied scientific inquiry and he argued that whilst scientists claim to objectively and collectively formulate hypotheses and theories, the reality is that some information may be missing, and hierarchies can interfere. Some aspects of scientific inquiry are dependent on political and social circumstances, which influence funding. There are examples where politically sensitive areas of medical or scientific research have been curtailed by governments on ideological grounds, for example in the US the Trump presidency cut funding for research into climate change (Dennis, 2018; Gibbens, 2019).

One of the reasons that science is held up as objective, is that it is a communal activity which involves claims made by individuals being scrutinised by others and required to demonstrate their objectivity and robustness. Scientists continually challenge and correct each other, through peer review, publishing, forming alliances, collaborating and discussing competing views with rivals. Experiments are repeated in different laboratories by different scientists to verify that the same results can be obtained. There are many social influences upon scientific research and knowledge but there is also an understanding that 'Science … is the sustained social effort to create something from which, eventually, the social will be eradicated' (Rutten et al., 2018, p.256).

This system is not infallible, and the verification process can take some time to complete. It is not unusual for unsound or biased science to be withdrawn after publication when independent experts are unable to reproduce or corroborate the findings or when conflicts of interests have not been declared transparently. An example of this self-correction was the study that triggered the MMR crisis by Andrew Wakefield et al. (1998), which was found to be unverifiable, as well as scientifically and ethically unsound. It was eventually retracted but by this time much damage to the reputation of the vaccine had already been done (Murch et al., 2004; Horton, 2004a). This is discussed further in section 2.3.

Summary: How scientific organisations engage with society

The approach of the scientific community towards communicating (and engaging) with the public since the 1960s has been driven by a number of assumptions explored in this chapter, which place the blame for controversies in science upon the public, activist groups or the media. Bauer et al. describe this as an 'institutional neuroticism' and along with other STS researchers point to a failure to recognise the role played by the behaviour of scientists themselves in the creation of public controversies (Bauer et al., 2007 p.84; Wynne, 2006). Rather than improving the public's understanding of science the STS community diagnosed the issue as 'scientific misunderstanding of typical publics' and called for institutional reflexivity and learning (Wynne, 2006, p.216). However, this harsh assessment of scientific organisations does not always take into account the practical difficulties faced by scientific organisations caused by the way engagement activities are funded and

organised, and the reality of commercial pressures upon science to protect institutional reputations. Neither does it consider the hostile and difficult discourse environment that has evolved in the last 20 years, which is explored in the second section of this chapter.

1.3 Discourse in the 2020s: Science in society

Scientific discourse differs from social discourse: it has more explicit rules by which it is governed and conducted. Scrutiny, debates and disagreements between rival groups of scientists are commonplace, but they take place in designated spaces such as peer-reviewed journals or conferences, and those participating understand the accepted behaviours, the governance and explicit processes for debate and argumentation. Scientists who are steeped in this discourse environment are bewildered by the conduct of discourse about scientific subjects in the public sphere in 2021 where there are more diffuse rules of conduct, diverse fora for debate and variable criteria for claims of knowledge.

An ‘epistemic crisis’ that is undermining democracy was described by Dalhgren (2018). He warned of the dangers posed by new forms of ‘knowledge’, whereby accuracy and transparency are ignored in favour of ‘algorithmic analyses of what people prefer to hear’ and where ‘emotion prevails over factual evidence and reasoned analysis’ (Dahlgren, 2018, p.26). A widespread disregard for facts and evidence is favourable to the anti-vaccination movement and those who would use vaccines as a political tool (Kata, 2010; 2012). Discourses about vaccinations take place in the context of the contemporary global political and social environment. This section will explore the context in which scientific organisations are engaging and communicating – and the challenges therein.

Post-truth

Since 2016, the term ‘post-truth’ has entered the lexicon to describe what is widely seen as a significant disintegration of the quality of public discourse (D’Ancona, 2017; Ball, 2017). Post-truth refers to a situation whereby objective facts are less influential in changing public opinion than appeals to emotion and personal belief. The deficit model assumes that people will objectively review information, but this is not the case with science denialists, who use motivated reasoning to selectively

interpret evidence to reinforce their preferred position (Merkley, 2020). The reasons for this may be ideology, vested interests, conspiracist worldviews, fears and phobias, personal identity expression and social identity needs (Hornsey, 2018).

Science denialism has flourished in the post-truth environment where there is more than one truth ('alternative facts'); all accounts of reality have equal validity (Davis, 2017; D'Ancona, 2017; Ball, 2017). Post-truth could be seen as a reinvention of the post-modern challenge to modernity's assertion that scientific knowledge and methods were the only legitimate way to produce knowledge and truth (Calcutt, 2016). Science denialists have misappropriated many of the arguments put forward by the post-modern sceptics of science who argued that scientific knowledge was socially constructed and unrepresentative of any form of fundamental truth (Latour, 2004).

Outrageous and false claims are also used as a smokescreen to divert attention from strategic political actions or challenges (Farkas & Schou, 2018). Previously, the system used to self-correct when people deliberately altered or misrepresented facts, but standards in public life have disintegrated to the point where public figures have no shame and are no longer held to account (Davis, 2017; D'Ancona, 2017; Sismondo, 2017; Seaton et al., 2020). This is facilitated by the availability of diversified information channels allowing political actors to produce and spread misinformation easily and bypass the gatekeeping processes applied by editorial codes in the mainstream media (Jang et al., 2019). For example, a study found that former US President Donald Trump was the world's biggest driver of COVID19 misinformation during the 2020 pandemic, accounting for 40% of the misinformation in an analysis of 48 million articles (Evanega et al., 2020 (pre-print)). Trump had counterclaimed that public health warnings about COVID19 were a conspiracy against *him* (Dyer, 2020).

Politicisation of science

Many aspects of science are political because they have legal, social, ethical and economic implications (Scheufele, 2014). Nevertheless, political decision-making on matters of science is often portrayed as rational, and science led. This is problematic because although science can be used to inform a political decision, there is rarely a direct scientific answer to a problem; nor does scientific knowledge always lead

directly to a specified policy decision (Grundmann, 2020). STS researchers argue that science and politics are inseparable (Jasanoff, 2005) and that scientific knowledge embodies the interests of social actors and institutions including scientists themselves, professional organisations, universities, funding agencies, government regulators and legislators (Gieryn, 1983; Jasanoff, 2012).

Whilst this is true in principle, it offers no alternative source of knowledge generation in a specific scenario such as a pandemic. It is inappropriate to dismiss all scientific knowledge for fear of it being 'politicised'. A more pragmatic response is that scientific researchers must declare their interests, independent experts must assess all scientific evidence for its reliability and robustness, and the public must critically assess the evidence in the light of assessments of third-party experts, the source of the evidence and potential influences (funding, ideology).

There are many examples of the politicisation of science, but the ongoing coronavirus pandemic has illustrated the difficult trade-offs that must be made, particularly between measures to protect public health and those required to safeguard the economy. It should be noted that academic literature on the COVID19 crisis is still emerging, so this section draws heavily upon my observations, media reports and commentary articles in journals.

Early on in the COVID19 pandemic, the UK government turned to its scientific and medical advisers. Scientific advice and evidence-based policy-making for disease outbreaks have been institutionalised in the UK through the establishment of advisory groups such as the joint committee on vaccines and immunisation (JCVI), which created the vaccination policy for the UK, or the science advisory group for emergencies (SAGE), which has advised the UK government during the coronavirus pandemic. Throughout the pandemic, the government has sought to reassure the public and claimed to be 'following the science' when it was in fact making political judgements in an unclear and complex situation in the absence of consensus around the scientific evidence, as it was an unprecedented situation (Ramakrishnan, 2020). For example, critics have alleged that decisions on 'social distancing' measures in the UK were delayed by political concerns about the economy and a desire to reassure the public rather than acknowledge the gravity and scientific uncertainty in the situation (Grundmann, 2020). This was also the case in a previous UK public

health crisis (BSE in the 1980s), where the danger to the public was initially downplayed when the evidence was still uncertain (BSE Inquiry, 2006).

This temptation to misrepresent the scientific basis for decision-making by politicians was recognised by the government's science and technology select committee in 2017, when it called for a separation of the debates on matters of scientific knowledge from political discussions of science to make it more transparent when the government decided not to follow scientific advice. Retaining this distinction between scientific advice and policy decisions is important because transparency is needed about the multitude of social and political considerations that influence policy alongside any scientific evidence. This recommendation, however, does not appear to have been implemented, and during the pandemic, the Chief Medical Officer, Professor Chris Whitty, and the Chief Scientific Adviser, Sir Patrick Vallance, were made highly visible in daily press briefings alongside politicians (Government Office for Science, 2020). As a result of creating the misperception that scientific guidance was deciding policy, when poor political decisions were made the politicians were able to deflect the blame on to the scientific advisers and 'the science'.

This political use of the authority of science and scientific institutions was a source of concern in the scientific community, who felt that scientists would be blamed for poor decision-making early in the pandemic relating to the supply of personal protective equipment (PPE), use of face coverings and timing of infection containment measures, such as the timing of lockdowns and guidance on social distancing. As a result of presenting science as having the 'answers', changes in policy were interpreted as the scientists being 'wrong' or the science being inaccurate (Grey & MacAskill, 2020). Scientists felt that the authority of science could be undermined by politicisation (Jones-Jang & Noland, 2020, p.8):

> Considering that politicisation may produce irreversible, devastating consequences in science communication, extra caution should be exercised in the case of politicians' involvement in science or health issues.

Politicisation was also impacting the timing and content of information and guidance to the public. Scientists have voiced concern about secrecy (Sample, 2020), the 'gagging' of NHS staff who spoke out on social or mainstream media (Oliver, 2020) and the poor flow of authoritative information to the public. Seaton et al. claimed that

the initial spread of COVID19 might have been contained with better communication (Seaton et al., 2020). Brennen et al. (2020, p.6) concluded that:

> governments have not always succeeded in providing clear, useful and trusted information to address pressing public questions. In the absence of sufficient information, misinformation about these topics may fill the gaps in public understanding, and those distrustful of their government or political elites may be disinclined to trust official communications on these matters.

This attempt to control the scientific debate for political gain has had mixed success, as individual scientists have bypassed control mechanisms to communicate directly to the public; the most notable example being the setting up of the confusingly named 'Independent SAGE' by a former UK Chief Scientific Adviser, Sir David King.

The understandable attempts by the government to simplify public health messaging by controlling information flow led to accusations of lack of transparency and brought the highly technical scientific debate that often occurs in scientific discourse into the public domain. As a result, the public was left to critically evaluate the motivation and credentials of those claiming to be 'experts' and the validity of the evidence presented to them. For example, the 'Great Barrington Declaration' was released with much fanfare and a veneer of scientific respectability by a libertarian think tank to oppose lockdown measures. Jeremy Farrah, Director of Wellcome, later described it as 'ideology masquerading as science and the science was still nonsense' (Farrah & Ahuja, 2021, p.182). The 'Declaration' suggested that there was a scientific 'divide' over herd immunity, which did not exist in reality, and was widely used politically to support opposition to public health measures such as lockdowns (Reynolds, 2020).

This highly partisan debate, accompanied by a communication gap during the coronavirus pandemic, only served to exacerbate the existing crisis of health misinformation identified by the WHO in 2018 (WHO, 2018). Unsurprisingly, research indicates that anti-vaccine groups see the COVID19 pandemic as an opportunity to drive vaccine hesitancy (Center for Countering Digital Hate (CCDH), 2020a).

However, what was less anticipated was the impact of BREXIT upon vaccine confidence. Prior to COVID19, there was not a great deal of evidence to suggest that vaccination was as politicised in the UK as it is in the US, because in the UK the main political parties all support vaccination. However, the sharp political and

ideological divides that have emerged since BREXIT have led to various groups using vaccine policy as a way to further their goals or cause division.

The COVID19 vaccine was a victim of this in 2021. The UK COVID19 vaccination programme was inaccurately described in nationalistic terms by the UK government as an example of the benefits of leaving the EU (Full Fact, 2020). Matt Hancock, the then health secretary, claimed that the UK was 'the first to approve the vaccine because of BREXIT' and the Education Secretary said that the approval of the vaccine showed that the UK was a 'much better country' than France, Belgium and the US (Halliday, 2020). Furthermore, the vaccine developed by the global pharmaceutical company AstraZeneca with scientists at Oxford University was described by politicians in nationalistic terms as a 'UK vaccine'. It was even revealed that politicians had unsuccessfully tried to have the national flag stamped on the vaccine vials (Wearmouth, 2020).

As soon as COVID19 vaccines were given regulatory approval, the vaccination programme quickly became embroiled in BREXIT politics. Vaccine procurement was probably the only area where the UK *was* more successful than other countries. The UK secured supply of very large quantities of vaccines earlier than other countries. Due to the high demand as well as the complexity of manufacturing vaccines, AstraZeneca was forced to delay vaccine shipments to the EU. This delay, combined with the positioning of the AstraZeneca vaccine by politicians as a singularly UK achievement, may have been counterproductive for the company. Leading politicians in France, Germany and Italy publicly undermined the vaccine, repeating unsubstantiated claims that the AstraZeneca vaccine was ineffective in older people and also overstating the risk of a rare blood clotting side effect. Having damaged the reputation of the vaccine, the EU then negotiated a price cut despite the fact the company was already making it available at cost of production (Appleyard, 2021). President Macron was described as 'reckless and ignorant' in the media (Appleyard, 2021) and his undermining of the vaccine enraged physicians in France (Samuel, 2021).

The danger in this politicisation is that the same powerful authorities who are complaining about lack of vaccine supply and criticising the Oxford-AstraZeneca vaccine, are undermining public confidence in the vaccines which are vital in their

efforts to contain the virus until the end of the pandemic. It appears that national governments are doing the work of anti-vaccine groups for them in a collective act of self-sabotage. It leads to the question of how much blame should be attributed to the anti-vaccine groups when evidence suggests that when political leaders publicly undermine a vaccine, their followers may blindly adopt the view of their political leaders (Jones-Jang & Noland, 2020).

Politicisation of science is an enormous issue for scientific organisations, as it can make science communications efforts inefficient or even make them backfire (Hart & Nisbet, 2012; Kahan et al., 2012). It can also undermine trust in science and scientists and invite hostility to scientific organisations and experts.

Populism and rejection of expertise

Populist politics – which reject expertise and question the epistemic foundations of rational democracy – are enjoying a resurgence globally (observed in the US and parts of Europe – the UK, Italy, Austria, Poland and Hungary). Democratic and rational debate has been stifled and, to some extent, replaced by identity politics, sloganism (for example, 'BREXIT means BREXIT' and 'Make America great again'), appeals to history and national identities (Canovan, 1999; Davis, 2017). A contemporary culture of anti-intellectualism has been described, whereby people are proud of ignorance and reject evidence and the advice of experts on principle (Nichols, 2016, Wright, 2016). Merkley (2020) found that anti-intellectualism is connected to populism, a worldview that sees political conflict as primarily between ordinary citizens and a privileged elite. Scientific experts are resented because they occupy positions of power and are perceived to decide how other people should run their lives.

The populist rejection of expertise risks an undermining of the institutions, professions and experts plus a dismantling of social norms in the system (Kelly & McGoey, 2018). Nichols likens current day discourse to that of the Middle Ages and writes that people resist further learning rather than give up their beliefs, noting a 'self-righteousness and fury to this new rejection of expertise' that suggests a narcissistic 'distain for expertise as an exercise in self-actualisation' (Nichols, 2016, p.xii). Anti-intellectualism is impervious to evidence because beliefs are fused to

personal identity, and indeed providing evidence may lead to people holding their beliefs even more strongly (Nichols, 2016).

Assaults upon expertise are also used by politicians in order to undermine their opposition; for example, Michael Gove, a UK politician, claimed that 'the people of this country have had enough of experts' during the BREXIT referendum, as economists were predicting that BREXIT would be negative for the UK (Mance, 2016). He implied that the public was rejecting a form of elitism whereby the opinions of experts were more valid than those of non-experts.

The reality of what 'the public' thinks about experts is more complex and nuanced. Opinion polls (Ipsos MORI, 2019) show over time that natural scientists are highly trusted by the public. In the 2019 poll, 84% of the public trust scientists to tell the truth. Politicians are the least trusted profession, with only 14% trusting them to tell the truth (Ipsos MORI, 2019). A separate MORI poll on public attitudes to science (Ipsos MORI, 2014) showed that trust in scientists is linked to the organisations they work for, and that public concern lies more with how science is used commercially and politically. John and Lewens (2001, p.2) state that:

> What appears at first sight to be a crisis of trust in 'science' per se might be better analysed as a crisis of trust in industry or government sponsored science, or in the ways in which government and industry institutions make use of scientific advice.

Indeed, rather than having had enough of experts (as was claimed) people are actually aware that science is being used instrumentally by powerful individuals and organisations – and object to it. This is mirrored by survey data from Edelman's annual Trust Barometer (2021) which show that trust in the 'establishment' institutions of government, business, media and NGOs is at an all-time low.

This lack of trust in institutions is highly relevant in vaccine discourse. There is a general public mistrust of pharmaceutical companies because of past safety scares and also due to their commercial interest in healthcare (Attwell et al., 2018). Anti-vaccine groups believe that the pharmaceutical companies that discover and manufacture the vaccines cannot be trusted because they profit from immunisation (Larson et al., 2011; 2014). Anti-vaccine activists also routinely suggest a financial conflict of interest between government and experts that recommend vaccines, and

healthcare professionals who administer them (Kata, 2012). These alleged conflicts provide fertile ground for conspiracy theorists.

Conspiracy theories

In the epistemological anarchy created by post-truth and populism, blatantly untrue conspiracy theories thrive. Conspiratorial thinking is the attempt to explain real events as secret acts exerted by powerful, omnipotent forces (Sunstein, 2014). The idea that a group of elites are misleading the public has clear links to populism, as noted previously, and conspiracy theories are more prevalent at the extremes of ideology and politics (Cassam, 2019). Conspiracy theories are different to real conspiracies (such as Watergate) because they are speculative and based on conjecture rather than knowledge or evidence. Anti-vaccine groups have proposed various conspiracy theories: for example, that vaccine side effects are hidden by government, healthcare systems and the pharmaceutical industry in order to protect profits or payments; that pharmaceutical companies have never conducted safety studies on their products; or that researchers are bribed to produce positive results (Jolley & Douglas, 2014; Kata, 2012; Grimes, 2016).

Conspiracy theories are used by the powerful as a form of propaganda. When people in power promote conspiracy theories their aim is to delegitimise their opposition, influence public opinion or cause confusion (Cassam, 2019). They can also distract the public's attention from real-world social issues such as injustice and inequality. Another group who publicise conspiracy theories are described by Sunstein (2014) as 'conspiracy entrepreneurs' because they use them as a marketing opportunity and profit from them.

Conspiracy theories are very appealing because they tell compelling stories that people want to hear; they are morality tales confirming people's existing beliefs about who is good and who is evil. Cassam (2019) noted that conspiracy-mindedness is correlated with negative events and people's life circumstances. For example, some individuals who are anti-vaccine have an autistic child and are seeking an explanation for their condition, as well as bringing attention to the lack of social care and support for their family from the authorities. People are seeking an explanation, an apportionment of blame and a way to make sense of events that are incomprehensible to them.

A number of common features are found among those who subscribe to conspiracy theories. These include a fear or perception of danger, feelings of powerlessness, disillusionment or disappointment in a situation or a lack of trust in the government or system (Diethelm & McKee, 2008). It is unsurprising that some people might be pre-disposed to believe these theories, given their lack of trust in experts and the system.

Conspiracy theories are not necessarily the result of bad thinking or intellectual character traits. People may believe them because they do not have access to reliable information or reliable experts. Alternatively, belief in a conspiracy provides a mechanism for intelligent people to 'logically' reject an overwhelming scientific consensus, alleviates the cognitive dissonance caused by evidence that disproves your position, and avoids people having to accept that evidence and so change opinions or behaviour (Festinger, 1962; Lewandowsky et al., 2013).

The manner in which the authorities respond to people subscribing to conspiracy theories is important, because belief in such theories is often a way for people to express their concerns about how the world works. Coady (2019) describes how conspiracy theorists are belittled and ignored; they are often ridiculed on social media fora by scientists, an approach which is likely to alienate and prevent constructive dialogue (Anderson et al., 2014). Scientists also criticise those who propagate 'myths' about science rather than engage with their concerns. Dudo and Besley (2016) showed that scientists will prioritise communication designed to defend science from misinformation and educate the public about science, over communication that seeks to build trust and establish resonance with the public.

Desire to correct: Myth busting and education

This is evident in the number of pro-science groups and activists who publish books, newspaper articles and blogs, countering what they see as the worst pseudoscience in their areas of expertise (Pigliucci, 2014). These people tend to operate in an unofficial capacity outside their institutions, and usually their communications include a note that their views are personal and do not reflect those of their institutions.

Occasionally they are confrontational. Examples are Dr Jennifer Gunter[2] ('wields the lasso of truth') and David Gorski[3] ('Surgeon, scientist, skeptic promoting science and exposing quackery'). Others are scientists, communicators and writers such as Anthony Warner (Warner, 2017),[4] the 'Angry Chef' ('Angry about lies, pretensions and stupidity in the world of food').

These pro-science activists point out when scientific evidence is being swept away in favour of poorly evidenced, ill-informed viewpoints, or draw attention to evidence being manipulated or misrepresented to make it appear to be in support of something entirely different. These individuals have a large (generally pro-science) following and are likely to be influential upon the general public. However, the literature indicates that their focus on contested facts is likely to be just as unsuccessful as the education and fact-checking activities of the major science organisations. The public's fears about science are driven by social norms and beliefs rather than irrationality and lack of understanding of science (Douglas & Wildavsky, 1982; Slovic & Peters, 1998; Gauchat, 2008; Sturgis & Allum, 2004). Studies have shown that education does not increase acceptance and it may even lead to those who have a negative view becoming more entrenched in those beliefs (Sadaf et al., 2013).

There is also evidence that publishing 'debunks' can cause more harm than good, especially as agents behind disinformation campaigns see media amplification as a key technique for success (Wardle & Derakhshan, 2017). Finally, research shows that a confrontational approach is likely to be counterproductive in convincing non-experts, as it further polarises opinions where people have concerns about a technology (Anderson et al., 2014). It also serves to alienate:

> … insofar as people who distrust science are motivated by the perception that experts view them as idiotic, pointing out the idiocy of their behaviour may simply reinforce their alienation. (Rosenbaum, 2020)

[2] https://linktr.ee/DrJenGunter

[3] https://sciencebasedmedicine.org/editorial-staff/david-h-gorski-md-phd-managing-editor/

[4] https://angry-chef.com

Aggression and incivility in public discourse

Not only is the discourse about vaccines on social media often not constructive, at times it can be uncivil and aggressive. Sobieraj and Berry (2011) have described the 'discourse of outrage': the psychological distance and anonymity of social media makes it easier to behave badly (by trolling and bullying), and a discourse of outrage appeals to righteous anger, emotion and moral indignation. This leads to an inverse relationship between the controversy of a subject and the willingness of scientists to communicate and engage in a hostile environment, because scientists whose work and motives are continually attacked become resistant to ideas of openness and transparency on public fora such as social media (Holliman, 2011).

As a result, activists can dominate the discourse in politicised scientific fields. In such contexts, Holliman (2011) found that scientists are less willing to share raw data and information for fear of how it may be used. It is proposed that the hostile discourse environment causes scientists to communicate in a way that is 'politically robust' rather than 'socially robust', which means that they may not directly or fully answer questions, avoid confrontation or admit to mistakes or uncertainties in knowledge (Tøsse, 2013).

This is a good example of how the discourse environment can act as a barrier to communication and engagement in the public sphere. It also illustrates the disruptive influence of social media on scientific discourse.

Influence of social media

Social media has changed the location and nature of public discourse in a number of ways. The proliferation of non-hierarchical, unregulated networks of communication, completely independent of any establishment hierarchy, allows mass communication initiated by individuals or groups by themselves about subjects they are interested in. This has contributed to a fundamental change in the culture of society and created a new way to influence policy-making (June, 2011). However, users of social media can also manipulate public opinion by acting as an effective vehicle for the mass dissemination of disinformation (Larson, 2018a). Larson is quoted by Horton in his book exploring the MMR crisis (2004b, p.130):

> To achieve, maintain and sustain successful immunisation programmes it is necessary to win and keep the trust of the public. This is more difficult to do than previously because there are more sources of information, they are more decentralised (the internet) and less well scrutinised. The result is that small groups with high motivation and commitment can deliver their message easier, even if the message has no merit. Marginalised anti-immunisation groups have taken advantage of that.

In *The rise of the networked society* Castells discusses new media and communication technologies based around networks, arguing that they are contributing to a fundamental change in the culture of information sharing and community building (Castells, 2010; 2015). An information 'democracy' has bypassed the information gatekeepers of government and the mainstream media. For example, social media has unified what would previously have been disparate voices in online communities to mobilise effectively around topics of special interest such as vaccines and climate change (Kata, 2012). The entangled nature of the anti-vaccine groups was illustrated by Johnson et al. (2020) who found that anti-vaccination groups were better networked online, with large numbers of small clusters of 'undecided' members of the public, where they blend their anti-vaccine information with other subjects such as safety of medicines, alternative healthcare, conspiracy theories, and now the COVID19 virus. In comparison, pro-vaccination clusters are more peripheral, and monothematic. As a result, anti-vaccine groups are able to attract more undecided individuals by offering a broad type of narrative that appeals to different people for different reasons.

The opening up of communications channels enabled by digital media has had a number of amplifying effects on some of the factors already discussed in this chapter. More information than ever is accessible to the public via the internet, but the removal of any checks and balances means that much of it is unreliable (Davis, 2017; D'Ancona, 2017; Ball, 2017) and this facilitates the activities of self-appointed 'expert' activists who do their own 'research' on a subject, while lacking the knowledge to distinguish between reliable and unreliable sources (Carrion, 2018). These spokespeople are then provided with a platform due to the proliferation of the number of outlets (in mainstream media, social media and other channels).

Digital media also enables ideology-led groups to establish independent looking (and sounding) ‘think tanks’: organisations that compete with official bodies in public debate (Gildiner, 2004; Oreskes & Conway, 2012). These are usually politically influenced and funded by those with a vested interest to produce arguments and data to influence specific areas of public policy. It is claimed that think tanks concerned with science are campaigning organisations rather than independent groups providing a rigorous analysis of a subject (Gildiner, 2004). Their appearance as independent expert bodies manipulates discourse in the public sphere to create the impression of a highly polarised debate among experts. This has had an enormous impact on the nature of ‘news’ whereby content is published regardless of its provenance, or veracity. These artificial debates can serve to make news more appealing and entertaining.

Polarised debates: News as entertainment

The boundaries between news and entertainment appear to have blurred. Much of the political debate and media discussion in 2021 is set up to be highly polarised, and participants are often selected on the basis that they have diametrically opposing views. In new areas of science, emerging hypotheses are usually more nuanced, with many grey areas and caveats, which does not lend itself to the adversarial set up of many media discussions. This is also exacerbated by the phenomenon of ‘fair balance’ in the mainstream media (Dixon & Clarke, 2013). The BBC has been criticised on many occasions for ensuring that both ‘sides’ of a debate are given similar airtime (Horton, 2004b). Whilst this is laudable in cases where there is no scientific consensus, it could also be seen as giving legitimacy to obscure or unproven opinions where the scientific evidence is clearly supporting one side in the debate, as was the case with the suggested link between the MMR vaccine and autism (Science and Technology Committee, 2000). Although this gives the appearance of a rational debate, it is in effect a parody because the opponents are aiming to ‘win’ the argument, by appealing to the public’s beliefs and ideology, rather than explore the relative validity of the two sides of the argument.

Ideology and attitudes to science

It has been argued by Grimes (2016) that the major challenge in communicating about science is not information deficit but rather ideological or moral convictions which may distort how evidence and information is evaluated and received. Individuals who do not accept the validity of scientific information, such as anti-vaccine activists, frequently make claims that are motivated by an ideology; be that naturalist, neo-liberal or post-modern in influence. This contrasts with the pro-science organisations' modernist attitude to evidence, data and the benefits of science.

There is a tension between the 'facts' of science and the beliefs and 'values' of individuals or organisations. This is not limited to citizens; ideological bias in government can guide how evidence is received and impact upon science policy. Oreskes and Conway (2012) detailed the impact of a small number of scientists who successfully undermined climate change science in the US in order to protect the interests of the fossil fuel industry, leading to increased scepticism or rejection.

The freedom of choice and primacy of the individual that is inherent in neo-liberalism influences attitudes to science. The concept of individuals doing something they do not wish to do (whether that be reducing their carbon footprint or being vaccinated) for the benefit of the whole of society finds resistance among many right-wing groups, who view this as a politically inappropriate form of socialism or communism (Cheek, 2008; Oreskes & Conway, 2012).

Summary: Discourse in the 2020s

The discourse environment in 2021 is extremely difficult for scientific organisations to navigate. The arguments that scientists are accustomed to constructing are often based on expertise, evidence and objective facts. However, in recent years the influence of politicians and media companies has eroded the power of such arguments. The public sphere has become polarised and simplistic, and science is complex and uncertain. Finally, the hostility and aggression seen in public and political discourse is a deterrent to many organisations and individuals to lend their expertise and opinions to inform public debates.

1.4 Vaccines

Unless we take time in this thesis to consider the position of those who oppose vaccines or who are hesitant to be vaccinated, it is difficult to draw any conclusions about the approach of the scientific organisations to public engagement and communications to address the issues they raise. As far as the scientific establishment is concerned, vaccination should be uncontroversial; it is one of the major achievements of modern medicine, an evidence-supported narrative that appears at the start of almost every article, book and commentary on vaccine hesitancy (including this PhD thesis). Yet, it is disputed by anti-vaccine groups.

Vaccination is of particular interest in a societal context because successful programmes require nearly all individuals in a society to take an action. For highly infectious diseases such as measles or COVID19, immunisation campaigns aim for high levels of coverage (95% for measles and 80% for COVID19) to provide 'herd' immunity, which is the point at which the circulating levels of virus are reduced to zero and disease transmission is stopped. Herd immunity is desirable in order to protect individuals who are unable to be vaccinated (due to age or a medical condition) or those in whom the vaccine does not work as well (due to a compromised immune system).

Whatever the decision (to vaccinate or not) there are implications beyond the immediate family and for the community locally and more widely; people can be altruistic and motivated to vaccinate to protect everybody; others may be tempted to take advantage of the protection provided by others.

In this final section of the chapter, I will explore the basis of objections made to vaccines and consider how this debate has evolved over time.

Historical opposition to vaccination

Opposition to vaccines has been resilient since the introduction of immunisation in the 17th century. It is striking that the concerns of those who formed the Anti-Compulsory Vaccination League and rioted in Ipswich and Henley in the 1800s are almost exactly the same as those who protest on social media today (Scarpelli, 1992; Millward, 2017). Over the years, a vocal minority of the public has disputed the evidence of safety and efficacy of vaccines and felt that their beliefs, values and

individual rights were being ignored by the powerful institutions of the state. These commonalities are discussed below.

Safety of vaccines and risk perception

Vaccine hesitancy in the 1700s was far more understandable than it is in the present day; the first immunisations against smallpox used dried fluids from scabs and pustules of infected individuals, which were scratched on to the skin of the healthy. Smallpox was a highly contagious disease with a 30% mortality rate, and although the vaccine had a lower death rate it was not risk free. People of all social classes were hesitant to have their children vaccinated; Benjamin Franklin, founding father of the US, wrote in his autobiography:

> In 1736 I lost one of my sons, a fine boy of four years old, by the small-pox. I long regretted bitterly, and still regret that I had not given it to him by inoculation. (Franklin, 1950)

Widespread vaccination did not begin until the early 1800s when Edward Jenner created a safer vaccine from cowpox.

The safety of vaccines has gradually improved over time to the point where modern vaccines are now only licensed by government regulators after demonstrating high levels of both safety and efficacy. However, a series of safety scares have impacted confidence in vaccines, most notably the MMR vaccine, which has been the subject of a protracted crisis that has been used by anti-vaccine groups to shake confidence in all vaccines. This is discussed later in this chapter.

Ironically, the success of vaccination programmes in eliminating infectious diseases has altered the risk-benefit perceptions of the public towards vaccines. Many people under 40 years old have never observed people infected with measles, mumps, rubella, whooping cough, tetanus, polio or diphtheria. Having never witnessed the severity of these infections and their complications, people find it easier to be complacent of the risks they pose. Whatever the reality of the risk profiles of the disease compared to the vaccine, where people have no fear of the disease but are worried about the safety of the vaccine, they are more likely to refuse the vaccine. Conversely, when there are outbreaks of disease and it is highly visible in the news,

as is the case with recent measles outbreaks or COVID19, people are more likely to accept the vaccine.

Compulsion to vaccinate vs individual rights

People have objected to the imposition of vaccination as a threat to their human rights since the beginning of public health interventions being made by the state. In 1853, the Compulsory Vaccination Act in England sparked immediate resistance. People saw its imposition as a threat to individual freedom (Blume, 2006; Durbach, 2004). The compulsory nature of vaccination was dropped around the time of the formation of the National Health Service in the mid-20th century. Smallpox was largely eradicated by the 1930s and vaccination was discontinued in 1971 (Millward, 2019). The benefits of vaccination were more widely accepted.

The current UK national vaccination programme is comprehensive, with children being protected against 14 diseases with 16 vaccines given before the age of five years (NHS England, 2018). Susceptible adults are offered additional vaccines such as the annual flu vaccine, and now the COVID19 vaccine. Vaccines are provided free at point of care in the UK by the NHS and funded by central government. The vaccination schedule is based on evidence of clinical and cost effectiveness (as judged by the National Institute for Health and Care Excellence (NICE)) and on the evidence-based recommendations of groups of appointed experts such as the Joint Committee for Vaccines and Immunisation (JCVI). Both of these organisations are government-funded ‘arms-length’ bodies that provide scientific advice and justification for the state vaccination programme. Vaccines are provided to the NHS by pharmaceutical companies under contracts.

Today, compliance with the vaccination schedule in the UK is voluntary but strongly encouraged, and non-vaccinated children may find themselves excluded from nursery schools. Discussions are currently ongoing about the ethics of a COVID19 vaccine ‘passport’ for adults with immunity against the virus that allow travel whilst the pandemic is ongoing (Brown et al., 2020). This indirect pressure to vaccinate is objected to by a sizable minority who view it as an unacceptable state intervention and discriminatory against non-vaccinated people. The anti-vaccine campaigns have further evolved this argument to suggest that mandated vaccinations are a form of human rights violation (Crick & Gabriel, 2010).

Mistrust in science and technology

The Anti-Compulsory Vaccination League of the 1800s was also sceptical over the truth of claims of the emerging fields of epidemiology and public health, and retained a belief in natural healing, spiritualism and religion (Porter & Porter, 1988). In the 21st century, many of those who oppose vaccination espouse naturalistic ideas, and characterise vaccines as man-made chemicals and toxins that cause harm, believing that it is better for a child to build immunity naturally by becoming infected with the disease itself. This view is exploited by the 'wellness' industry, which commercialises various 'natural' products, treatments or diets in place of evidence-based medicines (Gunter, 2018).

Mistrust of the authorities

The 1853 Compulsory Vaccination Act was introduced as part of the poor laws, and it penalised parents who failed to vaccinate their children against smallpox. It was perceived to stigmatise the poor, who were no less likely to be infected than the rich and powerful, while the selectively applied nature of the intervention served to protect the interests of the rich by ensuring a healthy workforce. It also lowered the rates of infection in the community generally, from which the rich would benefit at no risk to themselves through vaccination, and 'tested' the vaccine in general use.

Extension of these laws to the entire population was not enacted in legislation until 1867 (Millward, 2017; Wolfe & Sharp, 2002). Although such selective legislation would never be tolerated today, mistrust in vaccination programmes does exist in specific communities in the UK (Razai et al., 2021a). This was evident in the lower levels of COVID19 vaccination uptake in Black, Asian and minority ethnic (BAME) and deprived communities in 2021 (Ethnicity sub-group of SAGE, 2020; Martin et al., 2021 [pre-print]). Researchers have found that trust has been undermined in Black communities by systemic racism and discrimination, previous unethical healthcare research in Black populations, cultural insensitivity in healthcare and under-representation of minorities in vaccine trials (Razai et al., 2021b; Gamble, 1997; Ethnicity sub-group of SAGE, 2020). This is represented in the historical trend (cumulative data for 2000–2020) of lower vaccine uptake in areas with a high proportion of ethnic minority groups in England (Public Health England, 2020).

Benefits to the state vs benefits to the individual

When trust in the authorities is low, state-initiated public health campaigns can suffer. This is often because they are positioned in terms of benefits to society. For example, the predominant narrative in favour of vaccines is that they are a wonder of medicine and science. This is undoubtedly true when vaccination is considered on an epidemiological level. Millions of deaths from infectious diseases have been prevented by vaccines, which are effective and generally safe.

However, this does not mean that there are no side effects at all. Mild side effects are common, although serious adverse reactions are very rare and idiosyncratic. But following the thalidomide crisis in the 1960s – which had made the public mistrustful of healthcare professionals and new drugs – an acknowledgement of vaccine damage was secured by the Association of Vaccine Damaged Children in the 1970s. The Association's campaign for compensation was high profile and effective, and resulted in the establishment of the Vaccine Damage Payment Scheme in 1979 to compensate cases of disability proven to be caused by any vaccine that is part of the UK government's immunisation programme.

The Vaccine Damage Payment Scheme was intended to demonstrate confidence in the immunisation programme and reassure parents that, if their child did suffer a rare reaction, they would be supported by the state; but the Scheme is publicised widely in contemporary anti-vaccination literature as proof that vaccines cause harm. The Scheme made awards to 936 children between 1978 and 2017, although between 2017 and 2019 there were only five successful claims (Full Fact, 2019).

This balance between population risk and individual risk remains one of the key elements within the ongoing dispute about the safety of vaccines. The way in which these risks are contextualised for the public in scientific or epidemiological terms provided little reassurance in the face of individual cases of severely disabled or sick children or bereaved families. The battle between the scientific 'facts and data' approach to vaccine risk, and the experiences of individuals and how they were treated by the medical establishment and supported by the state, has continued to prove irresolvable. In the 1990s a series of events triggered the MMR crisis, a seminal event that was to affect public confidence not just in the MMR vaccine, but in all vaccines.

MMR vaccine controversy

This section discusses the MMR vaccine crisis in some detail because it illustrates many of the issues highlighted earlier in this chapter and also sets the scene for more generalised concerns about vaccines to multiply. The MMR crisis matters because it highlights important themes about science in society that extend to other controversial subjects. It illustrates that scientific controversies are often based on:

- unproven hypotheses
- mistrust of experts, politicians and pharmaceutical companies
- disputes over the truth of different types of evidence
- differing perceptions of risk between laypeople and scientists
- how institutions behave, engage and communicate during a crisis.

It also illustrates how scientific issues can be used instrumentally by the media to criticise government (Horton, 2004b). The MMR crisis is important in the overall story of controversial science in society because the actions of those involved on both sides contributed to an overall undermining of trust in the entire vaccination programme and the institutions involved in delivering it.

In 1988, a combined vaccine that protected against measles, mumps and rubella was incorporated into the paediatric vaccination schedule in the UK, which replaced separate vaccines for each disease. The introduction of the combined MMR vaccine achieved a rapid drop in all three diseases because it reduced the number of clinic visits needed. Over the next 10 years, tens of millions of children were vaccinated globally, which allowed safety surveillance mechanisms to identify patterns of side effects, most of which were mild to moderate reactions at the injection site (Horton, 2004b, p.21). However, a number of parents claimed that their children had developed autism soon after vaccination. The specific causes of autism are not known, and the first symptoms manifest at around 12–18 months, which coincides with the administration of the first dose of MMR vaccine. A number of families sought compensation through the UK government's Vaccine Damage Payment Scheme and the courts.

Ten years later, a paper was published in the prestigious *The Lancet* medical journal by a gastroenterologist, Dr Andrew Wakefield, and colleagues describing eight children who reported developing autism within a month of being immunised with the

MMR vaccine. The researchers postulated that the MMR vaccine caused intestinal inflammation which affected brain development (Wakefield et al., 1998) but did not prove an association between the MMR vaccine and autism. The editors of *The Lancet* published the paper alongside a highly critical commentary pointing out the limitations of the study (Chen & DeStefano, 1998).

However, separately, Wakefield convened a press conference at the respected Royal Free Hospital and discussed the possible link between the MMR vaccine and autism in stronger terms than in *The Lancet* paper; and suggested that giving the three vaccines spaced by at least 12 months would be safer than the combination MMR vaccine. The recommendation about single vaccines was not supported by any evidence, and single vaccines were not available, so Wakefield was effectively urging parents not to have their infants vaccinated.

In the months that followed, a number of much more authoritative and very large epidemiological studies were published that showed no link between autism and the vaccine, including a 14-year study from Finland of thousands of children (Peltola et al., 1998; Fombonne, 1998). Other scientists failed to reproduce or confirm the Wakefield hypothesis of a link between the measles virus and autism, weakening further what had always been a speculative link.

However, as is usual practice in science, experts conceded that the possibility remained that there might be an extremely rare syndrome of measles infection causing autism (Horton, 2004b, p.27). Effectively, the scientific establishment considered the evidence to be clearly in favour of the vaccine and that the matter was closed. Single vaccines were not made available by the manufacturers and parents were strongly advised to continue vaccinating their infants with the recommended two-dose schedule of the MMR vaccine.

However, the campaigners and parents of children with autism were angered by the attitude of health professionals. They strongly believed that autism was linked to the MMR vaccine as the condition became apparent at around the same time as the first dose. Convinced that the vaccine was to blame, they wanted recognition of a link and they needed financial and practical support. They felt marginalised or belittled by the authorities and healthcare professionals who did not accept that their child's condition was caused by the MMR vaccine. They believed the conspiracy theories of

the anti-vaccine groups that there had been a ‘cover up’ about the link between the MMR vaccine and autism to deny them help.

Wakefield made sense of their experiences and positioned himself as a courageous physician who listened to parents, uncovered the conspiracy and stood up to the authorities. Together they campaigned hard via the media to put their case. The media published hundreds of articles giving equal weight to both sides of the argument in the interest of ‘balance’ that led the public to believe there was an equal and substantial weight of evidence on both sides of the argument (Mayes, Snyder & Spencer, 2009). The activist-led discourse distorted the perception of the evidence base by presenting ‘both sides’ of an argument as if they had equivalent epistemological authority (Crick & Gabriel, 2010).

Journalists wrote human-interest stories to question the character and vested interests of the parties involved, particularly the government (Mayes, Snyder & Spencer, 2009). Collins described it as a ‘counterfeit scientific controversy’ in which prominence was given by the media to Wakefield and his colleagues, anti-vaccine campaigners and parents of autistic children who all claimed the vaccine caused autism, over the entire medical establishment and expert epidemiologists who had facts and data in tens of thousands of children that showed no link (Collins, 2014, p.108). The controversy was later described by the former editor of *The Lancet* as ‘one of the most sectarian debates in modern scientific history’ (Horton, 2004b, Author’s note xiii). The immunisation rate dropped sharply, falling well below the threshold needed for herd immunity, and resulted in outbreaks of measles; in 2002 there was a measles outbreak in London in middle class areas, and vaccination rates reached a low of 81% by 2004.

The basis of Wakefield’s campaign against the MMR vaccine was completely undermined in 2004. An investigative reporter revealed that Wakefield was being paid by solicitors who were preparing a case against the manufacturers of the MMR vaccine, and that the children in *The Lancet* study were part of that legal action. Evidence was also presented that Wakefield had filed a patent on single vaccines in 1997 and potentially stood to benefit financially should the combination vaccine be replaced by single vaccines. Finally, it was alleged that the study had seriously violated ethical approval protocols.

By the end of 2004 the initial research had been withdrawn (Murch et al., 2004; Horton, 2004a). Subsequently, the General Medical Council investigated Wakefield for serious misconduct and in 2010 withdrew his licence to practise medicine – and subsequently *The Lancet* fully retracted the paper (Boseley, 2010; Editors of *The Lancet*, 2010).

Despite the evidence, the anti-MMR campaigners still firmly believed that the vaccine had caused autism in their children, and a series of alternative hypotheses (Gerber & Offitt, 2009) emerged relating to vaccines and autism, and the debate about vaccine safety and risk to individuals continued for another 20 years. During 2018 a series of measles outbreaks occurred across the UK (and in Europe and the US) after several years of falling disease levels (Smyth, 2018). The outbreaks were attributed by public health officials to falling vaccination rates.

With respect to the MMR vaccine, there were two main reasons the public had become vaccine hesitant:

- The cause of autism remained unclear, and families wanted to know what caused their child's condition (autism is now considered to have a largely genetic cause). This, together with the recall bias in parents who pinpointed the onset of their child's autism to the time they were vaccinated makes a compelling case to many people, despite the weight of scientific evidence against it.
- The attitude of the medical establishment to the concerns raised was unhelpful and 'contributed heavily to the problem they were trying to fix by trivialising vaccine hesitancy and framing the debate as science vs. ignorance' (Goldenberg, 2016).

Those who remained opposed to MMR vaccination were portrayed as ignorant or ill-educated and the focus shifted to educating hesitant parents with the facts. This allowed Wakefield and the anti-vaccine movement to position themselves as moral champions for families, and to dismiss the allegations against him and the removal of his medical licence as evidence that he was being 'silenced'. Wakefield claimed in media interviews that he had been the target of 'a ruthless, pragmatic attempt to crush any attempt to investigate valid vaccine safety concerns' (Russell, 2011).

Labelling the opposing voices as irrational enabled the establishment to dismiss the concerns of parents about vaccination and medicine as a whole. This allowed them to avoid any need to scrutinise how medicine is practised in this area and unilaterally define the problem (ignorance) and the solution (education) to the issue of vaccine scepticism. However, this approach was mistaken in the eyes of many, who believed that concerns about vaccine safety were better defined in sociological terms rather than educational ones. Goldenberg suggested that those who refuse vaccinations are rejecting the values underlying the scientific consensus rather than the science itself (Goldenberg, 2016).

Why the MMR crisis matters

The MMR vaccine crisis matters for many reasons.

Firstly, I would argue that the prolonged discourse about the safety of the MMR vaccine has come to impact confidence in all vaccines. This was exacerbated by the tendency of the authorities to downplay the side effects that did exist. All vaccines have side effects, mostly mild and transient, but also – and very rarely – very serious adverse events. Denying them simply undermines trust and plays into the hands of the anti-vaccine groups claiming a conspiracy. The unpredictability of idiosyncratic reactions – such as the incidence of blood clots with the Oxford-AstraZeneca COVID19 vaccine (Public Health England, 2021) – is exaggerated to create fear far in excess of the likelihood of harm compared to catching the disease. In addition, the existence of one form of serious adverse event is then used to suggest that there are other side effects which do not exist. The sensationalist publicity given to real rare events gives credibility to a host of invented ones.

In the years since 2004, all new vaccines have been targeted with unproven hypotheses in the same way that the MMR vaccine was linked with autism. For example, the cervical cancer vaccine was claimed to cause a variety of neurological disorders (Kitano, 2020). More recently, it has been claimed that the COVID19 vaccine causes sterility and is harmful to pregnant women and their babies (Kelen & Maragakis, 2021).

Secondly, the MMR crisis saw anti-vaccine sentiment move from the fringes into the mainstream: as a lifestyle choice, a reflection of your values, and a way of belonging to a social group (Downs et al., 2008). Campaigners successfully aligned concerns

about vaccines with people's wider social concerns, such as the involvement of the pharmaceutical industry and financial incentives for GPs to vaccinate. The rigid NHS immunisation programme was challenged by those concerned about freedom and choice. The anti-vaccine movement also very successfully aligned with lifestyle choices such as an interest in alternative medicine, vegetarianism or 'natural' child rearing (Browne et al., 2015).

By 2018 vaccine hesitancy became a major public health concern, and the World Health Organisation has described misinformation on social media as one of the top 10 threats to global health (WHO, 2019; Larson, 2018a). The COVID19 pandemic has provided a significant boost for the anti-vaccine industry (CCDH, 2021b). It is estimated that the major anti-vaccine groups now enjoy a following of 58 million people, having gained almost eight million followers since 2019.

This misinformation emerges from a number of different players who all have different motives. This is explored in the next section.

Who opposes vaccination?

The anti-vaccine movement represents a broad and diverse set of groups and individuals (Poland & Jacobson, 2001). At its core are networks run by parents who believe their child has been harmed by vaccination, or who mistrust industry and the medical profession for ideological reasons. These people are small in number but are super-influencers with policy-makers, social networks, the media and individuals (Stahl et al., 2016). The movement has also attracted opportunistic groups who seek to further their interests, be they political, commercial or religious. The literature in this area demonstrates a clear influence of ideology: from the neo-liberal ethic of individual autonomy and responsibility, through the post-modern medical paradigm that emphasises patient empowerment and shared decision making (Reich, 2014, Kata, 2012), to the pre-modern or naturalistic rejection of medicine as 'unnatural' (Attwell et al., 2018).

Naturalism

There has been a resurgence in pre-modernism or 'naturalism', which equates what is natural with what is good and advocates for a simple and unspoiled way of living. According to Larson:

> the human race seems to go through waves of moving forward with scientific advances and then coming back to more primal instincts which can include rejecting science and medicine and preferring nature and religion. (Larson, 2018b, p.1)

Naturalism could be seen as a form of reductionism (reducing all problems to a simple, natural solution) that enables an escape from the complexity of modern society. Parents who refuse vaccines engage in lifestyle behaviours that they believe negate the need for vaccines, such as eating organic food and using alternative medicine (homeopathy, herbal remedies). Reich attributes this to a confluence of healthism with parenting philosophies that hold parents accountable for the well-being of their child (Reich, 2014).

Healthism

Neo-liberal health pedagogy focuses on the individual more than the community, and related to this is the concept of 'healthism' – first described by Crawford (1980) – whereby health is described as a goal that can be reached primarily through lifestyle modifications. Healthism ranks the pursuit of health above everything else and makes individuals responsible for their health and disease status, ignoring factors such as poverty, poor access to healthcare, accidents, genetics or sheer bad luck (Weeks, 2019). This healthistic discourse has been appropriated by anti-vaccine groups in support of their mistaken belief that they can exert control over vaccine-preventable diseases by adopting lifestyle changes which they perceive to be protective. These interventions include organic food, exercise, breastfeeding, taking supplements and limiting contact with other children (Dubé, 2016; Kata, 2012). This behaviour is understandable in a contradictory healthcare system, which encourages autonomy of decision-making in many domains of health but then expects unquestioning compliance with vaccine schedules. Paediatric vaccinations are imposed on a population basis using a set schedule, which some object to as state control over their children's bodies and an infringement of their human rights (Crick & Gabriel, 2010).

Anti-vaccine information as a destabilising political influence

A more recent phenomenon is the use of anti-vaccine disinformation by people with no interest in science or vaccines to cause disruption and dissent, for example a

Russian company specialising in online influencing that disseminated disinformation about vaccines during the 2016 US presidential election campaign (Broniatowski et al., 2018). Fake social media accounts flooded the debate to give the appearance of a dispute between scientists, but also stoked socioeconomic tensions related to ethnic or religious divisions, for example claims that the elite received 'clean' vaccines that are not available to others (Broniatowski et al., 2018; Dredze et al., 2017).

Frankfurt (2005) has argued that the purveyors of disinformation have no particular attachment to the position they are arguing; their intent is to disrupt and subvert, to create confusion, use controversy to distract people from more important events, exhaust the electorate and upset the political world order. Much of this type of disinformation directly or indirectly questions the actions, competence or legitimacy of public authorities such as governments, health authorities and organisations such as the World Health Organisation. This form of information is difficult for those organisations to address because 'they would say that, wouldn't they?'

Anti-vaccine information as a commercial opportunity

The Center for Countering Digital Hate (CCDH) reports that there is a highly organised anti-vaccine industry in the US. Large anti-vaccine groups are commercial businesses selling anti-vaccine content such as videos and books, vitamin supplements and other merchandise (CCDH, 2020a). Anti-vaccine groups represent an industry with annual revenues of at least US$36 million and an estimated English-language social media following of 62 million (CCDH, 2021b). This following on social media could be worth up to US$1.1 billion to social media platforms (CCDH, 2021b).

Characteristics of non-vaccinators

There are other social factors of contextual interest related to the characteristics of those who choose not to vaccinate. Contemporary culture is a consumer culture and acts of consumption, lifestyle and image have become the method through which individuals express their identity. Studies indicate that children who are unvaccinated because of parental choice are more likely to be white, educated, affluent and live in geographical clusters (Omer et al., 2008).

Belonging to a social group appears to have a particular impact upon vaccination choice (Sobo, 2016; Poltorak et al., 2005). Refusing vaccination may be a way of joining a particular social group (Sobo, 2015). Kahan termed this 'cultural cognition', defined as when people match their ideas to those of in-group members, which provides group solidarity, and that this is intensified when people are challenged by 'other' groups (Kahan et al., 2011; Nyhan, 2014). They conclude that:

> scientific opinion fails to quiet societal dispute ... not because members of the public are unwilling to defer to experts but because culturally diverse persons tend to form opposing perceptions of what experts believe. Individuals systematically overestimate the degree of scientific support for positions they are culturally predisposed to accept. (Kahan et al., 2011, p.167)

In this environment, attempts to convince parents of the benefits of vaccination using epidemiological facts and data is not only likely to be ineffective, but it will also further bond the social group that shares anti-vaccination views, and potentially strengthen their resolve.

The reaction of healthcare professionals to non-vaccinating parents is often negative, with doctors expressing 'frustration' and finding parents 'exasperating' (Swaney & Burns, 2018, p.147). Vaccine-unfavourable mothers in a study by Dubé et al. (2016) reported that they did not want to discuss their vaccine choices with physicians, out of fear that they would be judged.

Summary: Vaccines

In 2021 the anti-vaccine movement is thriving, with themes in the public discourse not dissimilar to those in the 1700s. The anti-vaccine movement has been extremely successful in falsely prolonging the perception of a scientific controversy. Years of intense education and communication of facts to correct public misperceptions have been ineffective in reassuring many parents, and vaccine sceptics are abused as ignorant and unscientific (Goldenberg, 2016). The anti-vaccine movement has been extremely clever at widening its appeal by aligning with different concerns the public may have over human rights, freedoms, the pharmaceutical industry, governments and others. Re-energised by social media, the anti-vaccine industry has found new audiences, created networks and cleverly exploited the fears of the public over risk and safety. This has now been weaponised by opportunistic politicians and

governments who have seized upon vaccines as a tool by which to create dissent and disruption. These combine to create the perfect environment for controversy over science.

1.5 Conclusion

The literature review for this study identified a lack of open-ended engagement activities that enable laypeople to meaningfully contribute to scientific discussions, despite the stated policy intention of UK scientific organisations to engage with the public (Wynne, 2006). I have identified three main barriers to effective engagement, which is further explored in this research.

Hostile discourse environment

This study was born out of concern about the culture clash between the way in which science works and the nature of public rhetoric. The adversarial 'Punch-and-Judy' nature of public discourse on controversial science, whereby opposing sides publicly attack each other's credibility, motivation and 'facts' (Attwell et al., 2018) does not lend itself to rational discussions of uncertainty, the testing of hypotheses and peer review. The debates over vital subjects such as climate change and the safety of vaccines have become so politicised and polarised that there is no longer a sense of a rational debate, where arguments are tested, evidence examined, opinions expressed, uncertainty acknowledged, and judgements made of overall benefits of new technology to society. The approach traditionally favoured by scientific institutions is being overwhelmed by the deployment of post-truth and fake news to create a discourse environment where appeals to emotion, celebrity and rhetoric are favoured over evidence, experts and analysis. Participation in discourse and argumentation are at the core of a democratic society. However, if the participants choose different epistemologies and employ different 'rules' of engagement, it is a challenge for the democratic process.

The effect of this hostile environment upon those working in communications and those interacting with the public is important, as it can lead organisations and individuals to avoid controversy or refuse to engage for fear of damage to their reputations, their scientific work or their personal safety. The question this raises is

whether engagement on controversial science can ever be effective in a discourse environment in which many of the conditions for rational debate have been removed.

Lack of clarity around the intent of public engagement in science

The evolution of the way in which scientific organisations engage with society appears to have started in the wake of a number of public controversies, with an aim of protecting funding for science by educating the public to understand its value. This subsequently evolved – from educating, to engaging, to involving the public in science – with input from a variety of actors with different views about science's interactions with society, and different agendas and motivations. Public engagement does not appear to have been extremely well defined – both in terms of its objectives and also *what the benefit for the public is*. A diffuse set of activities has resulted that are difficult to evaluate, and it is not altogether clear what the widespread engagement of scientists with a largely uninterested public is achieving. The broad nature of the term 'public engagement in science' is leading to mismatched expectations and therefore continued dissatisfaction from scientists, the public, activist groups and the STS community with what public engagement achieves.

There are many excellent examples of science engagement and public consultation and involvement, particularly the involvement of patients in the design of clinical studies of treatments (Holmes et al., 2019). These successful interactions usually feature a rational discourse where people collaborate, listen to each other, respect each other's expertise and all parties understand the reasons why conclusions are drawn, or the decisions are made.

However, much discourse related to controversial science is not conducted in this way. People may seek a specific outcome based on their beliefs and values, the parties may not listen to each other or be prepared to change their minds in the light of new information, the conditions for a debate may be tightly controlled and people may feel frustrated that they are unable to table their concerns because they have been designated as not relevant. This leads to frustration for all parties involved:

- Scientists complain that activists disrupt the introduction of new technology and incorrectly dispute scientific knowledge.
- STS academics criticise how consultations are organised and how debates are framed by scientists.

- Activist groups complain that their views are not listened to when they do participate.

A clearer policy on what public engagement in science is intended to achieve for all parties may go some way to managing expectations and demonstrating the value of these activities. There are a great many calls for scientific organisations to be accountable to society and more democratic, but it is clear that those who engage with science must also be similarly accountable and democratic.

Delegation of engagement activities to scientists

Based on an assumption that engagement with the public about science is a universally accepted good thing, the subsequent policy implementation was enacted through the Research Excellence Framework (UK Research and Innovation, 2021). This delegated engagement with the public to individual teams of scientists, in many cases without supporting them with the skills or resources to design and implement it properly. Many have embraced this to great effect, but others see little or no benefit in doing it except for satisfying grant requirements (King et al., 2015).

Others who work in controversial science (such as climate science, animal research and vaccines) have found themselves attacked physically, verbally or virtually, because of the hostile discourse environment for their subject. This raises the question of whether specialist skills in public engagement are needed, and whether they are provided. The technical-rational 'deficit' approach taken by scientific organisations to engaging with the public about vaccines (or any other subject of controversy such as climate change or genetically modified crops) may simply be a result of the fact that they are scientists, not engagement professionals.

To better understand the gap between policy and implementation, this research examined the views and experiences of those who act as intermediaries between the scientific organisations and civil society. In the next chapter, I outline a theoretical framework that uses concepts from Jürgen Habermas's theoretical framework of communicative action as an 'ideal' benchmark against which to compare real-world practices.

Chapter 2 | A communicative ideal: The theories of Jürgen Habermas

2.1 Introduction

For the purposes of this research project, Habermas describes a communicative ideal that draws attention to how democratic discourse has been transformed by a variety of societal factors. Examination of how and why the conditions for an idealised form of communication are not met during prolonged public controversies provides insights into how rational discourse can be undermined and why attempts to create understanding and consensus may fail.

Therefore, the writings of Habermas provided me with an 'ideal' communications framework against which to compare, contrast and analyse the approach of scientific organisations to communications and engagement with the public on controversial science. Habermas was one of the later members of the Frankfurt School of critical theorists and is best known for his work on communicative rationality and the public sphere (Habermas 1984; 1987; 1989 [1962]). Habermas's consideration of how communication and discourse is influenced by types of knowledge, behaviour, competence, ethics and the political and social context encouraged a more deeply rooted theoretical approach and provided a robust structure to this research project.

The purpose of this chapter is to explain my choice of critical theory and how I will use Habermasian theoretical concepts to structure my research. Starting with the societal context in which the communication takes place I will then draw upon Habermas's theories of knowledge interests and communicative action to outline the 'ideal' conduct he described for democratic discourse. This is followed by a discussion about how statements might be assessed for their validity, and the conditions and skills needed for effective democratic discourse.

Having outlined a number of concepts, I will then share how they were used to create a simplified conceptual framework to be used as an artificial construct against which to examine real-world practice of engagement between the public and scientific institutions. Finally, I will outline the major criticisms of Habermas's research and explain how these have been accounted for in my research.

It is important to note that this PhD is not intended to be a theoretical development of Habermas's body of work, but a more practical application of his concepts to attempt to understand and explain the area more fully in order to effect change and improvement.

2.2 Theory choice

In this research, Habermasian critical social theory is used to deepen our understanding of issues of trust, legitimacy and discourse in the public sphere. Critical theory was chosen firstly because it is concerned with the improvement and change of society and the institutions within it. Secondly, it was selected because of its interdisciplinarity, combining philosophy, history and the investigation of the wider social context (Horkheimer, 1993). Within the field of public relations, the use of Habermas has grown significantly in the last 10 years (Buhmann et al., 2019). One appealing aspect of his concepts to researchers into communications is their application to understanding how communications works in society and how it is influenced by social structures and culture. By providing a wider context for scientific discourse, Habermas offers me an opportunity to highlight interactions between the lifeworld with the system, inside and outside of the public sphere, in a frame that encourages wider and more detailed consideration of the influences upon science. Eley (2002, p.231) explained 'what I have always liked about "public sphere" is that it provides a way of conceptualising an expanded notion of the political. It forces us to look for politics in other social places'. He went on to note that Habermas's theories draw attention to the role of individuals and citizens as political influencers in society, restoring and reclaiming politics.

As well as his focus upon communications, I was drawn to Habermas because of his mission to 'rehabilitate' modernity. His work began at a time when other members of the Frankfurt School were expressing concern about the enlightenment project and modernity. Adorno and Horkheimer (1979 [1947]) described how the promise of science and technology to bring rationality, emancipation and equality had instead led to new forms of social domination and irrationality, such as the rise of fascism and the atrocities of the Second World War. Whilst Adorno and Horkheimer recognised that developments in science and technology could bring social improvement, they brought attention to how modernity was being used in a

destructive, instrumental and ideological way. They were not alone; Heidegger (1977) postulated that technology undermined religious and moral principles and that modernism led to a sense that nature was simply a reserve to be exploited for human use. In today's highly technological society the science 'genie' is well and truly out of the bottle, so perhaps the question we can ask most constructively is: 'How can scientific institutions best contribute to society?'

In an attempt to reorient modernity, Habermas proposed an acknowledgement of the issues inherent in positivism and scientism in order to analyse and account for problems of science in society (Habermas, 1990). Although he was a champion of modernity, Habermas was not blind to its limitations. He understood that scientific knowledge was socially influenced, and that the credibility of scientific truth claims had been undermined by scientistic hubris. But instead of the abandonment of modernity suggested by his Frankfurt School colleagues, Habermas suggested a more pragmatic approach (Habermas, 1990; 1999). His solution was rooted firmly in communication and democracy (Habermas, 1984; 1987). Recognising the political nature of science and its influence upon the state, Habermas described communication (spoken and written) as a social act and argued that it can be a source of social power and an instrument of democracy. He argued that communication can stand and prevail against bureaucracy and economic rationality to generate mutual understanding. Setting out an ideal approach to how deliberations should be conducted in a democracy, Habermas also provided theoretical concepts that described how rational discourse could and should work, which could be put to practical use in this research (1990; 1999).

Scientific discourse was thereby placed firmly in the political and social domain as part of a deliberative democracy. This enabled Habermas to highlight the lack of public involvement in discourse about matters that impact them and the dangers of technocratic authority (Habermas, 1992). The impact of technological risks being imposed upon the public without their involvement or consent was also highlighted by Beck (1992) who further argued that the cultural authority of science had been undermined by its inability to defend itself against its own standards (Gauchat, 2012). By the late 20th century, there was a backlash against the authority of the scientific community from the public who held them responsible for risks posed by industrialisation and nuclear waste (Beck, 1992; Sunstein, 2002). The same

concerns about risk and lack of participation of layperson representatives in important science policy decisions remain pertinent, particularly during a crisis such as the coronavirus pandemic (Richards et al., 2020), despite a number of policy measures implemented to require public consultations and to ensure the transparency and disclosure of data (Science and Technology Committee, 2000).

The desire of the public to understand scientific decisions made on their behalf has been particularly apparent during the COVID19 pandemic, where there has been great scrutiny of decisions made on the basis of epidemiological models. In order to realise this goal of bringing the public more fully into the democratic process, Habermas set out an outline based upon inclusive public debates that take place to rationally evaluate knowledge claims, and come to an agreement whereby the most reasonable argument wins (Habermas, 1984; 1987).

Whilst the ideal discourse conditions outlined by Habermas are rarely met, they do serve an important purpose by defending the need for public discourse before decisions are made, and providing guidance on the procedures and skills needed to communicate rationally and democratically in society (Habermas, 1984; 1987). Importantly in this time of ‘post-truth’ and conspiracy theories, his theories also provide standards for the conduct of debate and scrutiny of knowledge claims (Habermas, 1972; 1989; 1992).

Although Habermas’s work on rational discourse was written in the 1970s and 1980s, it is just as relevant in 2021. Controversy around the scientific advice that informed decisions made by the UK government over the 2020/21 COVID19 pandemic raised many of the issues highlighted by Habermas around use of evidence and transparency in political decision-making (Cairney, 2021). For example, early in the pandemic, the identity of scientists advising the government on the COVID19 crisis was not disclosed; nor were the meeting minutes or evidence published. This was reversed in the face of intense criticism from the scientific community and the media (Alwan et al., 2020; Sample, 2020; UK Government Press Release, 2020).

Over many decades Habermas refined and developed his philosophy and created an extensive body of work. It is not my intention to review Habermas’s theory in detail in this chapter; rather I will focus on the Habermasian theoretical concepts that are

used in the analytical framework and will explain their applicability to this research. This selective approach to Habermasian theory has been applied previously in healthcare/science communications research (Barry et al., 2001; Gross, 2005; Koerber et al., 2008; Brown, 2011; Buhmann et al., 2019). I will start with the societal context in which the communication takes place, then draw upon Habermas's theories of knowledge interests (1972) and communicative action (1984, 1987) to outline the 'ideal' conduct he described for democratic discourse; how statements might be assessed for their validity, and the skills needed for effective democratic discourse.

2.3 Societal context: System, lifeworld and public sphere

As previously noted, discourse on science does not happen in a vacuum; it has a context within society. This context is provided by the situation within which the discussion occurs (e.g. in formal consultations or on social media), the societal organisations and administrations who organise communications and engagement (universities, governmental and commercial) and the public (the communities, families and individuals) who participate and may be directly or broadly affected by policy decisions (positively or negatively).

The participants will differ widely depending upon who has an interest in the subject under consideration. For example, a consultation about the location of a nuclear waste disposal site is likely to involve local residents living close to the proposed site, businesses and politicians as well as environmental and conservation groups, representatives of government and the nuclear industry. Whereas a consultation about genetic screening of embryos to diagnose medical conditions before birth may include religious groups, relevant patient groups, people with genetic diseases in their families and healthcare providers. As well as being influenced by the specific topic under consideration, such discourse is also influenced by wider trends in society including economic, social and political trends that influence how different subjects are perceived. This context is constantly evolving, so it is important to understand the nature of public discourse on science in 2021.

When setting out his theories of communication in society, Habermas divided society into two interrelated realms; the **lifeworld** and the **world of systems** (Habermas 1987). Between the two, he defined a **public sphere** (Habermas, 1987). The concepts of systems, lifeworld and public sphere are a helpful device to identify and explain some of the tensions that can arise between different stakeholder groups in the scientific community and wider society. In this research, these concepts are used to facilitate an exploration of the macro and micro influences at play in any discussion about science, upon individuals, communities, organisations and bureaucracies. In this section I will discuss how Habermas described these concepts and outline their relevance to this research.

Lifeworld

The lifeworld is the set of intuitive skills, competencies and background knowledge that individuals use to make sense and meaning of their personal, familial and cultural world – and without it, taken for granted actions are impossible. The lifeworld is dominated by an individual's experiences, intentions, beliefs and value orientations. People who share a lifeworld understand each other and use their common knowledge to maintain and create social relationships and operate effectively within their personal sphere. People who inhabit different lifeworlds – such as scientists, academics and laypeople – constitute their worlds differently, which may lead to difficulties in communication and mutual understanding. This was described by Husserl (1970 [1936]), who termed it the 'scientific attitude' and the 'natural attitude' and also by Bourdieu (2008 [1988]; 2013 [1977]) who described how scientists are socialised over many years to adopt a scientific 'habitus' of deeply ingrained rationality and intuition that influences how they think, work and operate. The scientific habitus bonds scientists together as a community but it also sets them apart from the rest of society in an elite group.

In this research the lifeworld concept is used in two ways:

- Firstly, as a device to explain the influence of laypeople's background consciousness, experiences and personal networks upon how they interpret scientific knowledge and their choices relating to technologies such as vaccines. For example, they may be strongly pro- or anti-vaccination as a result of their lifeworld influences.

- Secondly, it is used as a device to explain the culture among scientists, where there are accepted customs, norms of behaviours and beliefs about knowledge and rationality, all of which influence their approach to communications and engagement with the variety of lifeworlds that constitute the public. For example, scientists may dismiss legitimate public concerns over vaccination as irrational because they reason and assess evidence in a completely different way to laypeople.

World of systems

The Habermasian system is an abstract concept that describes the set of rules and behaviours that all individuals recognise and follow within a society. Systems sustain the lifeworld through the simplification of interactions. One of the key systems is the market, whereby services and goods are provided in exchange for money. Another is administration, which takes on the burden of organising the social world and negotiates more efficiently and effectively than individuals would be able to, using their lifeworld competencies. Systems divide up the multitude of tasks and roles needed to support the lifeworld, for example ensuring enough food is grown by farmers, sold to shops and then supplied to customers in shops in exchange for money. The system also enforces laws and policies according to rules (Weber, 1922).

In small, simple societies there was little requirement for systems because people knew each other and who to ask for all the things they needed. However, with modernity, the co-ordination of activity in systems (such as banking, healthcare and global supply chains) enabled the development and support of a higher degree of societal complexity.

Much of the behaviour within systems and the competencies needed to navigate them is taken for granted. For example, people know how to buy food in exchange for the correct amount of money in a shop. They also know how administrations work so they can access healthcare providers, medicines and welfare services. In any society, an individual can reasonably expect other people they encounter to follow the same rules, regardless of their particular culture or lifeworld. The benefits for citizens can be profound; for example the provision of education, healthcare and welfare services as well as the availability of affordable mass-produced goods,

housing and utilities. This beneficial impact of the system is termed *rationalisation of the lifeworld*. The systems serve the interests of the lifeworld and in return, the lifeworld confers legitimacy on the actions of the systems.

In my research the concept of the system is used to describe and explain the operation of scientific and medical organisations. Using the Habermasian concept, healthcare can be considered a 'system', and hospitals, GPs and primary healthcare providers are different parts of this system. The healthcare system is controlled by money (funding) and administrative power (the government and the NHS). However, because the institutions that make up the healthcare system operate relatively autonomously, there is potential for them to pursue their own goals and operate using their own inherent logic rather than serve the interests of the lifeworld. I explore the influence of 'system' logic and goals upon how organisations engage and communicate with the public during scientific controversies such as the COVID19 pandemic.

Public sphere

The public sphere is a shared place where social issues are discussed, and where public opinion is formed. This may be in the news media, social media or public meetings. Public opinion gives legitimacy to social institutions, which is then transformed into the administrative power of the system where decisions are made. According to Habermas a healthy public sphere is inclusive, representative and characterised by respect for rational argument (Habermas, 1989 [1962]). The public sphere is viewed by Habermas as an integral part of democracy, a social space in which activities of the state might be confronted and subject to critique by citizens in open discussions. The public sphere is where citizens exert their influence through expressing an *opinion*, as individuals and in aggregate (as noted in the introductory chapter, section ii).

Having described the social structures of lifeworld, system and public sphere, Habermas invoked an 'ideal' scenario of a deliberative democracy. The ideal is unrealistic in real life but is valuable as a frame of reference to understand the way things actually are and how they might be improved. In this ideal, decisions are made after rational debates and the system, lifeworld and public sphere co-exist in a dynamic way with moving boundaries as society changes and evolves.

Of course, the real world is far from what Habermas has described. Public opinion is highly prized because of its links to power in society, so it is vulnerable to manipulation or misrepresented to obtain legitimacy. People are not always rational or fair, so having conceptualised how an ideal society would work, Habermas then went on to describe two scenarios whereby pathologies develop in the interactions between different groups in society. The first is 'degradation of the public sphere', where the public sphere becomes corrupted by vested interests. The second is the 'colonisation' of the lifeworld, whereby the system starts to take on a life of its own and starts to impinge negatively on people's lives and choices. These are discussed below.

i Degradation of the public sphere

Habermas described a process he termed 're-feudalisation' of the public sphere in modernity, where elite groups asserted power over the population, as had been the case in pre-enlightenment times (Habermas, 1989 [1962], p.200). He described examples of political inequality and social systems, such as denying women the vote, and how they can distort and inhibit the possibility of communication and the ability to challenge power through rational arguments about the social and moral implications of science. He noted that marginalised citizens in a representative democracy have little opportunity to publicly challenge system decisions because they are excluded from participating directly by voting or involvement. This 'degradation' meant that the public sphere did not provide the necessary environment for democratic debates and discussions to be possible.

In my research the concept of degradation of the public sphere is used in a number of ways to investigate whether it is possible for the public to engage in the meaningful and nuanced discussions about science advocated for by Habermas (Habermas, 1989 [1962], p.221). I look at the influence of elite groups such as the professions, scientific bodies and the media, and the way in which public participation is conducted, to assess whether it is framed in a way that is designed to be meaningful and gain public input. In addition, this concept is used to examine the impact of social media, especially its role in facilitating the spread of misinformation on controversial scientific issues such as vaccine safety. Finally, the post-truth environment is analysed as an example of the degradation of the public sphere to

describe how the context for discourse can be manipulated by power, influence and systemically distorted communication that violates the conditions for communicative action (Habermas, 1987, pp.307–08).

In contemporary society, the growing influence of scientific and technological corporations is of concern to many, as they are politically influential, but are unaccountable to the electorate. This echoes Habermas's concerns (1989 [1962]) about the role of science and technology in capitalism because it had significant potential to change the activities of society. The commercial role of the pharmaceutical industry in healthcare and vaccination has long been a source of concern and suspicion due to influence upon vaccination policies and scandals over safety and pricing (Brown & Calnan, 2012). Similarly, the fossil fuel industry has disputed and undermined science which shows that climate change is anthropogenic, undermining policies to reduce fossil fuel emissions (Oreskes & Conway, 2012). In more recent years, corporations such as Facebook, Google and Amazon have grown to become both economically and politically powerful (Clement, 2021).

This research examines the role of such corporations in the discourse on science and their unique status in the 'system' as organisations that largely sit outside of national legal and regulatory frameworks (Wu, 2015). Habermas linked re-feudalisation to the institutionalisation of scientific and technological development, and described 'scientisation of politics' as a form of depoliticisation (Habermas, 2015). Crouch (2016) labels this as 'post-democracy', whereby politics is overtly influenced by a small circle of business lobbyists and political and economic elite. He describes how economic globalisation – and the interests of global shareholders and business executives – has become a bigger influence on politicians than voters.

This leads to a situation in politics and in science where citizens are relegated to the position of bystander or spectator and become increasingly disenfranchised and disengaged with the processes intended to gather public opinion or input. This description from Habermas of exclusion and disengagement is relevant to my research because I will use it to consider how the way in which scientific organisations engage and communicate influences how people react to controversy. In the dispute about vaccines, for example, some people who have concerns about

safety express themselves through consumer activity, such as alternative therapies, organic food or vitamin supplements. A minority engage in activism and political action through 'the voluntary associations of civil society' (Habermas, 1996) or anti-vaccine groups. In this way, I will use Habermas's characterisation of the public sphere as a tool to investigate the extent to which the behaviour of the scientific community is excluding the concerned public from a meaningful discussion, thereby inadvertently driving them straight in to the arms of the alternative health industry or the anti-vaccine groups.

Whilst the vast majority of vaccine-hesitant people are not intractably opposed to vaccination, they are influenced by the ongoing discourse in the public sphere (Leask, 2011). For example, uptake of the AstraZeneca COVID19 vaccine has been impacted severely by publicity around rare but serious blood clotting side effects (Samuel, 2021). The media portrayal of a protracted dispute about scientific evidence can influence observers, who conclude that there must be some merit to both sides of the argument, or it would not be in the media. In this way, the media's role in scientific discourse is influenced by what Habermas described as the 'commodification' of the culture industry, changing the 'ideal' role of the media from informing citizens and facilitating rational debate to managing public opinion by distraction and propaganda (Habermas, 1992). The media's commercial imperative may lead it to boost controversy and hype disagreements between politicians and scientists. A study of US media coverage of the COVID19 pandemic showed that it was highly polarised and politicised, and that this contributed to polarised public attitudes towards governments, confidence in scientists and support for public health measures (Hart et al., 2020).

Since Habermas warned of the changing role of the media in the 1970s, there have been significant further developments in the media, social and digital technology which – it could be argued – further degrade the public sphere. Of relevance to this study, there is some evidence that vaccination is starting to be absorbed into the 'culture wars', in that vaccines have become politicised and are being used to create division (May, 2020). The politicisation of science is symptomatic of a resurgence of populist politics, which encourages an undermining of elite institutions, professions and experts (Mudde & Kaltwasser, 2017). Populism was also evident in the US

elections of 2016 when Republican politicians repeatedly questioned the safety of vaccines in order to appeal to their right-wing supporter base (Dredze et al., 2017).

Since Habermas wrote in 1971, new fora for debate have been created by digital technology in the form of social media sites such as Twitter and Facebook, which create new challenges – and opportunities – for scientific organisations. These new communications channels are owned by a small number of powerful technology companies who will act in their own political and financial interests (Media Reform Coalition, 2019). They are also unregulated, or 'unregulatable' by national governments (Wu, 2015). The extent to which social media has enhanced or eroded democracy is unclear:

- On the one hand, social media has been used malevolently by anti-vaccine groups to amplify misinformation and subvert democracy, bypassing the checks and balances of the mainstream media (Mortimer, 2017; Lewandowsky et al., 2016; Broniatowski et al., 2018).
- On the other hand, channels such as Twitter and Facebook provide a free, easily accessed platform for any individual (or organisation) to share user-generated content in networks. Social media has increased the ability and agency of citizen groups to co-ordinate, communicate, protest and influence policy (Park et al., 2011; Yeung, 2018).

This research uses Habermas's characterisation of the degraded public sphere to describe the challenges encountered by scientific organisations in communicating with the public, and to investigate how they are navigating this new contextual terrain.

Habermas argued that the degradation of the public sphere opens the way for an intrusion of the organisations that are conceptualised in Habermas's 'system' into the lifeworld. This is described in the next section.

ii Colonisation of the lifeworld

Systems in modern society are incredibly complex, interconnected and relatively autonomous (Heyman & Pierson, 2015). The interplay between system and lifeworld in a democracy is a delicate balance, whereby the lifeworld confers legitimacy on the actions of the system, when it acts in the interests of the lifeworld (Habermas, 1984;

1987). This balance is disturbed when the system, acting autonomously, operates to its own inherent logic and unintentionally or unconsciously exceeds its boundaries or goals, resulting in pathologies in society. Habermas termed this **colonisation of the lifeworld**, a situation that arises when the system's advantages of convenience, elimination of individual negotiation and assumed mutual understanding between system and lifeworld become a liability. This may lead to the system encouraging people to do things that are not in their interests. For example, the rules set for a financial system that are intended to provide credit to people on low incomes, may automatically encourage some people to take out loans they cannot afford, if the system goal of profit dominates. Alternatively, the market may restrict what citizens are able to do and the choices they can make. For example, by making essential products available for sale, but not always *accessible* to those who may need them. Other infringements may take the form of bureaucratic rules that must be obeyed, such as a requirement for photo identification to reduce voter fraud, which disenfranchises people without a passport or drivers' licence.

The concept of the colonisation of the lifeworld is used in this research to describe the tension in science and healthcare between the systems operated by the state and commercial organisations and the needs of the individual and the lifeworld. Heyman and Pierson (2015) described how social media has interfered with the balance between the public, commercial and private spheres. Companies such as Facebook follow their own imperatives and the way they work for users is intended to increase advertising revenues. This leads to problems in the lifeworld when the algorithms that drive these commercial goals interfere with people's ability to make sense of their lifeworld. For example, people who may be seeking information on vaccines are led into 'echo chambers' that may confirm their existing beliefs, or else fed compelling but misleading information which reduces their ability to effectively participate in democracy.

As noted in the Introduction to this thesis, here is a tension between the public interest and the interest of individuals. Decisions for the good of society are made based on what is best for the majority, so one person's rationalisation of the lifeworld may be another person's colonisation. In the case of vaccination, many people see this as a rational measure to protect public health and so co-operate, but anti-vaccine groups perceive it as an unacceptable infringement upon their personal

freedom (Leask, 2011). Colonisation of the lifeworld can cause citizens to publicly challenge the authority of the systems and the state, leading to what Habermas termed a 'legitimation crisis' (Habermas, 2015 [1975]; Reich, 2014). This is particularly pertinent in modern societies where systems that are intended to serve the lifeworld are provided by governments and private companies whose objectives may not always be aligned with the interests of the lifeworld.

The legitimation crisis described by Habermas (2015 [1975]) was largely related to inequality and injustice within capitalist societies, leading to public outcry. The legitimation crisis I am researching relates to the challenge being made to scientific and medical systems over imposed risk, choice and evidence. Habermas described how the crises in society were communicative at their core; triggered when the instrumental reasoning of the system dominates the communicative reason of the lifeworld. My research explores how the scientific institutions contribute to the problem through the medical–paternalistic style of discourse where the patient was passive and directed by the experts. The concept of a legitimation crisis is used to characterise the public crisis of confidence science and vaccines, signified by a lack of trust in the government and experts.

Another important area of interest is how scientific organisations are responding, knowing that they are open to challenge in a healthy democracy, how they listen and what responses they make in the face of public opinion. Habermas noted that authoritarian or populist governments take steps to avoid a legitimation crisis by deploying propaganda, disinformation and rhetoric to confuse and distract the citizens from the reality of the situation; thereby subverting democracy to continue acting on their own terms.

Having outlined how I will use the concepts of lifeworld, system and public sphere to draw out observations about science communications and engagement in my research, I now describe how I will use Habermas's more philosophical exploration of the way in which communication and language could be used to further democracy. The next sections will draw upon key concepts from this work, starting with knowledge.

2.4 Knowledge, knowledge interests and 'truth'

One of the major issues in societal discussions about science is the privileged position afforded to scientific knowledge over other forms of knowledge, such as experiential knowledge. There is also a complexity to science that goes beyond the broad categories of the scientific attitude and the natural attitude described by Husserl (1970 [1936]) and outlined in section 2.2. As noted in section iii of the introductory chapter to this thesis, the same multiplicity that is evident in the multiple versions of lifeworlds that constitute the 'public' is also evident in the scientific establishment. For example, scientism is an inappropriate extension of natural science. The resulting diversity of opinion and practice in scientific systems leads to animated disagreements between scientists over knowledge and ideology. These arguments can lead to several issues in public discourse and undermine trust in science, for example when discussion of moral, ethical or societal issues of science are discounted in decision-making, or when scientific evidence is incomplete or uncertain but still used to justify a decision. All of these instances occurred during the 2020–21 COVID19 pandemic, for example the UK government justified political decisions by claiming it was 'following the science' (Ramakrishnan, 2020).

When conducting research upon how scientific organisations communicate and engage with the public on controversial science, it is important to analyse how different types of knowledge are understood by different stakeholders. Habermas offers a tool to classify different types of knowledge: the concept of 'knowledge interests'. Many controversies in science have contested knowledge at their core and often different types of incomparable evidence are used in the discourse. For example, scientists will use a randomised controlled clinical study of thousands of patients to argue that a vaccine is safe, and that serious side effects are extremely rare (Peltola et al., 1998; Taylor et al., 2014). Anti-vaccine groups will report anecdotal cases of children who became ill after vaccination (for example, the website www.vaccineriskawareness.com has 12 pages of unverified 'vaccine deaths') out of context to imply that deaths are frequent. In this case it appears that the opposing sides are engaged in separate discourses and a rational discussion and agreement is not possible, or indeed desirable for some who wish to perpetuate the dispute.

In outlining different types of knowledge, Habermas also offers a pragmatic account of the strengths and limitations of natural science recognising that science is socially and culturally embedded and influenced, building on the work of Peirce (1982 [1897]). Knowledge interests thereby provide a helpful mechanism to characterise the pathologies in public discourse based on contested knowledge, misuse of knowledge and disputes about 'truth'.

There are three different categories of 'knowledge interests' defined by Habermas to describe how people perceive different types of knowledge and differentiate between them.

Purposive-technological interest

The first interest is a *purposive-technological interest* in the control and manipulation of the physical world through technology, for example medicines and vaccines that prevent infectious disease. Natural scientific methods of inquiry involve experimentation by scientists in the real world that exists independently of the research. Science tries to model that world as precisely as possible in descriptions and explanations of nature expressed in technical or numerical terms.

The knowledge produced in pursuit of the purposive-technological interest is often considered to be objective and purged of outside value interests. An example of knowledge generated to meet the technological-purposive interest is a quantitative epidemiological meta-analysis of medical data from 1.2 million children that found no statistical evidence of a link between the MMR vaccine and autism (Taylor et al., 2014).

Communication and the ability to use language

The second interest is in *communication and the ability to use language*, which leads to better understanding of human beings and their actions. This is the interpretive domain of the social sciences and humanities. Knowledge emerges through people communicating, interacting and understanding. The research methods are hermeneutic and reflexive, gathering meanings, experiences and interpretations. The researcher uses evaluative standards and makes judgements that are influenced by societal norms, beliefs and individual experiences. The intersubjective knowledge generated is expressed in everyday language. An example of interpretive knowledge

generated to meet the communicative interest is a qualitative social science analysis of data generated through interviews with new parents to identify the most common reasons for refusing vaccination for their children (Reich, 2014).

Being conscious of hidden influences upon our actions

The third knowledge interest is in being conscious of hidden influences upon our actions and recognising social and political problems which cause injustice or inequality so that we can challenge and control them. This is the ideological domain of the emancipatory sciences and generates knowledge that can create change in society and avoid social conflict. Emancipatory knowledge can expose **colonisation of the lifeworld** where the system works outside the conscious intentions of social actors. For example, social media can corrupt our knowledge of the physical and social world through algorithms that expose us to misinformation and create 'echo chambers' where our world view is never challenged. It can also identify **systemically distorted communication** in which some or all of the participants may not recognise the power differentials that are in play (explored further in the next section). For example, women may assume (unconsciously) that they should not challenge male speakers or raise issues in a male dominated workplace, or be unaware that they have less opportunity to do so.

All three different knowledge interests are necessary within society to meet material needs, to avoid social conflict and organise society. Habermas advocated that all three types of knowledge should be weighted equally when they are considered as part of a democratic discourse. By elevating all types of knowledge to the same level of importance Habermas addressed the problem whereby natural scientific knowledge was considered to be the most important. Commentators on science in society such as Wynne (1989) and Jasanoff (1996) have also warned that it is not possible to consider the public issues when all three types of knowledge are not considered together. For example, during the coronavirus pandemic of 2020, emerging scientific knowledge about how to minimise transmission needed to be balanced with knowledge about human behaviour, social issues and political (or economic) factors. This research will explore how a lack of appreciation of the different knowledge interests of organisations that make up the system can lead to a dislocated discourse with the lifeworld in the public domain.

An understanding of the concept of Habermas's knowledge interests is useful when considering acts of communication and the ways in which people engage with others. The next section will critically discuss Habermas's theory of communicative action and explain how it is used in this research.

2.5 Communicative action

Communicative action is at the core of all of Habermas's work. Its importance within the present research project lies in understanding the theory of communicative action as a tool through which a researcher can identify people's underlying motives for the way they engage in discourse, by outlining how to evaluate the behaviour and actions of those participating in public discussions. Habermas set this out as a potential solution to the previously described legitimation crisis caused by the colonisation of the lifeworld (Habermas, 2015 [1975]). Recognising that people usually do not agree about everything all the time, communicative action proposes a co-operative and democratic endeavour to attain consensus based upon rationality, where all participants are free to contribute, are competent to speak and have equal opportunity to do so (Habermas, 1984; 1987). All participants understand the language used and the context and assumptions made are meaningful and acceptable. Each participant must be prepared to justify their claims and also be prepared to change their minds. Consequently, Habermas argued that communication is important to democracy because it enables people to understand the point of view of one another, resist what they disagree with, have an argument and reach a consensus.

Undistorted communicative action is very much an aspirational ideal rather than an achievable standard, as people participating in such arguments rarely achieve such magnanimity. So, having established that communication is fundamental to social interactions and democracy, Habermas raises the importance of the conduct of public discourse. As noted in the previous section, **systemically distorted communication** is a pathology of society that occurs unconsciously when the normative discourse conditions do not enable mutual understanding, for example if discussions are dominated by the powerful in a way that makes it difficult or even impossible for other groups to express their opinions and assert their rights. A historical example of a systemic distortion is withholding the vote from women, which

many women accepted as the norm until they became conscious of the inequality and injustice of it, after this was highlighted by those with an emancipatory knowledge interest (see section 2.4).

The hidden or unconscious nature of systemically distorted communication differentiates it from **strategic communication**, which is an intentional manipulation when one person treats another as something to be controlled, coerced or manipulated, possibly against their will or without their knowledge. Strategic action is not always simply an act of communication: it can be accompanied by threats or bribes; it may exclude people with an opposing view from participating in discourse. Strategic action or communication is aimed at achieving a particular outcome, regardless of whether people have a shared understanding of the objective, for example public relations or rhetorical persuasion that aims to minimise opposition to a new technology by not exploring its limitations. Strategic action is common in disputes when each side wishes to win people over to their position and they may be selective with the information they share, mislead or attempt to undermine their opponent, displacing rational debate about facts and failing to acknowledge or recognise the different knowledge interests. To some extent, Habermas's definition of 'strategic communication' is an oxymoron, it can be understood as an action (verbal, written or behavioural) that deliberately seeks to *inhibit* the usual openness of communication.

In defining the ways in which communications can be manipulated or distorted, Habermas made it easier to describe the ways in which contemporary discourse conditions are far removed from the free exchange of knowledge, argumentation and interaction that he advocates for in communicative action. The concepts of communicative and strategic action are very valuable in this research as they provide a device to allow me to characterise the motives of organisations when they engage and communicate, and how they may disrupt society's means of reaching an understanding through discourse by a strategic use of language. For example, initiatives from the scientific establishment in the 1980s to improve the 'public understanding for science' could be described as strategic, because their main intent was to build public support for science rather than listen to the concerns of the public (Royal Society, 1985).

In its purest form, public engagement in science could be characterised as communicative action. Science denialism can also be strategic or instrumental; climate change deniers cast doubt on climate science in order to meet political goals and prevent regulatory curbs on fossil fuel use (Oreskes & Conway, 2012). Strategic action may not necessarily be malevolent, for example the use of behavioural 'nudges' to encourage people to get their children vaccinated bypasses the discussion about safety concerns and prompts people to vaccinate without discussing their concerns (Levy, 2017; Dubov & Phung, 2015). Instrumental action can also marginalise goals that cannot be measured or which society values less. For example, universities are partly evaluated by the government's Teaching Excellence and Student Outcomes Framework (UK Department for Education, 2016) on the size of earnings for recent graduates, which directly correlates earnings to the value of the degree. This may devalue degrees that lead to jobs with lower salaries, but which provide value to society or graduates in other ways.

Strategic communication is probably the most common form of public communication in modern society. Most large organisations are set up to act rationally and instrumentally, for example pharmaceutical companies exist to create and supply medicines and vaccines to generate value for their shareholders. Media companies communicate to sell newspapers and support the interests of their owners. Governments communicate to get elected, gain power to implement their policies and get re-elected. Despite the often-used phrase 'public opinion', the public is heterogeneous, individuals think differently and have different views on what would be best for them or best for society depending on their individual circumstances. In short, everyone has an 'axe to grind'. However, in order to recognise strategic communication, people need a way to evaluate the evidence they are being given, or to assess what they are told by other parties. One way in which to assesses a communication and determine its status as communicative, distorted or strategic (instrumental), is to examine the content of what that person says and assess its 'validity'. The next section discusses the 'validity criteria' concept created by Habermas through which communicative acts can be assessed and claims can be tested for 'truth, truthfulness and rightness' (Habermas, 1988, p.24).

2.6 Validity criteria and 'truth'

Habermas was a pragmatic realist and he argued that scientific knowledge should be recognised as having a special epistemological status, rejecting the relativist idea that there was no such thing as 'truth'. Whilst Habermas accepted that there is a social influence upon science he did not accept the post-structuralist and constructionist arguments that knowledge is wholly a social construction. Accepting the notions of justification, rational acceptability and warranted assertibility (Dewey, 2013 [1938]), Habermas refers to a normative 'reality' reflecting Peirce's argument that there is a real world against which scientific knowledge can be tested (Peirce, 1982 [1897]). For example, it is truthful to claim that a vaccine is effective; not because results are constructed within the paradigm of modern medicine, but because the vaccine is tested against reality and found to prevent a disease. However, this was tempered by Habermas's insistence that other forms of knowledge should also be considered on an equal basis in democratic discourse.

To get away from scientism and the positivist approach to evidence, and in a manner consistent with the three knowledge interests (section 2.4), Habermas defined three criteria (explicated below) to determine validity against which the claims that people make can be tested. The concept of validity criteria and the associated expectation that claims are scrutinised by others is pertinent in the so-called post-truth environment. Whilst everyone is entitled to speak during communicative action and other participants must listen, they are not obliged to accept what is said. In communicative action all parties are entitled to question the assertions of others for their validity, emphasising that 'truth' cannot be accepted without scrutiny. The denial of objective reality and a lack of concern about either telling the truth or being found to be misleading people would be characterised in *The theory of communicative action* as invalid claims that undermine confidence in objective inquiry and democracy (Borman, 2011; Frankfurt, 2005).

During discussions of controversial science, the willingness of all parties to listen and evaluate other views is important because it creates an environment in which the disputant's expressed opinions can be heard, and this constructive dialogue may reveal associated concerns which are unrelated to the science (lack of trust in authority, moral objections, previous bad experiences). Validity criteria encourage a

critical evaluation and discussion about the evidence being used to justify claims. It also places a responsibility on individuals to be accountable for what they say, be prepared to justify their claims when challenged and provide reasons for their opinions or claims. Their assertion of validity can be accepted, rejected or interrogated, depending on the extent to which the person they are talking to is convinced of its validity. Testing the validity of an assertion is particularly important in science, where knowledge accumulates over time and an accepted position may be overturned at any time by new and contradictory evidence (Ramakrishnan, 2020). Discourse is where Habermas believes that competing assertions of the reality of a situation are sorted out by discussion and argumentation to reach understanding and agreement.

Habermas argued that a claim is deemed unacceptable and irrational if it cannot meet three equally valuable dimensions of validity:

- **Truth (objective): the claim concerns a true situation (the sharing of knowledge of the objective world)**. Objective claims can be validated by checking them against a number of different sources, for example ‘Measles is a highly infectious virus’.
- **Truthfulness (subjective sincerity): the claim made is an honest one and made sincerely (the establishment of trust)**. Subjective claims can be validated by comparing what people do with what they say. e.g. if a politician encourages people to be vaccinated against COVID19 and are also vaccinated they are being sincere; if they refuse the vaccine for themselves they are being insincere.
- **Rightness (normative): the request is socially acceptable (the social lifeworld).** Normative-evaluative claims are checked by assessing whether people collectively accept that a person has the right to make a claim due to their expertise or credentials. For example, an immunologist has a right to pronounce on the safety of a vaccine and their claim will carry more authority and credibility than that of a layperson with no medical training. The statement is validated if the normative assumptions it makes correspond to the way the world is understood by the majority. Those participating collectively accept its validity, for example ‘We accept that vaccination protects against disease, because immunologists assert that it does’.

Communicative action's validity criteria is used in my research to consider the extent to which competing claims can be evaluated. For example, the accuracy of **objective truth** claims can be validated by the emergence of fact-checking services (as noted in section 1.3). The criteria will also be used to characterise the behaviours inherent in post-truth standards of public discourse which illustrate how claims are made that would not meet Habermas's validity criteria, such as the increase in people who misrepresent their expertise or credentials as experts to make claims about health that are not normatively *right.*

This chapter has so far outlined aspects of the ideal approach to discourse, in terms of how the discourse is conducted, types of knowledge and how claims can be evaluated. Habermas also set out a set of conditions that govern the conduct of debates and how people behave during discourse, and this is discussed in the next section.

2.7 Ideal speech situation: The 'ideal' conditions for communicative action

The ideal speech situation (ISS) is a set of conditions for free and transparent communications. The ISS is construed by Habermas as a set of counterfactual assumptions that ordinary people make when they join a conversation. That is, we assume when we are invited to join in discourse that it is constructed in an open and fair manner, until we have evidence to the contrary. Applying these conditions is intended to ensure that the lifeworld voice is heard; that the debate is rational but also considers underlying morals, values and principles. The concept of ISS is broadly concerned with the ethics of discourse, the morals of those participating and how power imbalances can distort dialogue. Habermas believed that those participating in discourse should be concerned with what is best for *everyone* and that the outcome should transcend the interest of any one particular group. He argues:

> We should not expect a generally valid answer when we ask what is good for me, or good for us, or good for them; we must rather ask: what is equally good for all? (Habermas, 1992, p.248)

The ideal speech situation forms part of a wider ‘discourse ethics’ that described two principles for discourse and communication: the first is universalisation (people consent to the conclusion); and the second is discourse (agreement is reached by an open discourse). Once again, Habermas describes an aspirational ideal, and in reality, there is usually a designated decision-maker with legitimate authority, such as an elected politician or a CEO, but, in describing an ideal against which to compare reality, he brings attention to distortions brought about by the conduct of public discourse.

The ISS brings together many of the concepts already discussed in this chapter; during the discourse everyone is allowed to question any claim or assertion made by anyone else (using validity criteria); they can also introduce their own claims or assertions (expressing all categories of knowledge interests); and people can express their own attitudes, desires or needs. This allows people to develop an understanding of the extent and quality of the knowledge available and how that can be reasonably interpreted in context. This involves engaging in critical reflection, so that people not only understand their own interests but also those of others in order to make progress. The conditions also assume that a diverse group of potential speakers are allowed equal participation and that no one’s speech is inhibited by overt or covert coercion.

As is suggested by its name, the ISS is the description of a perfect interaction in which everybody freely expresses themselves and the decision is unanimous and based on the strength of the arguments. This does not mean that all arguments are taken at face value and have equal weight; the validity of claims to knowledge are assessed against the validity criteria described in the previous section. Habermas acknowledged that public discourse was unlikely ever to meet these perfect standards of rationality, co-operation and reflexivity among the participants. However, in documenting what the ideal could be, Habermas makes a moral point about the conduct of politics, and how people behave during public discourse by calling for inclusion, truthfulness, equal representation and consideration of values and social norms on an equal footing with factual or scientific evidence.

In this research the concepts of discourse ethics (including the ISS) offer a way to describe the behaviour and processes that contribute to distortions in communication and discourse. For example, the vaccine safety controversy is prolonged because neither side is engaging in communicative action, which seeks compromise through rational discussion. Habermas's focus on the emancipatory sciences, and the hidden or covert influences on our behaviour and communication, opens up the possibility of not simply taking the utterances and actions of both sides literally or at face value, but also of examining the hidden factors or motivations that might distort their communicative acts. The expert scientists and pro-vaccine groups defend their privileged status, believing their position to be rational and medically, legally and morally justified. They may refuse to engage with laypeople over their doubts. However, the entrenched anti-vaccine groups may protest against vaccination to express their sense of a technological change impinging on their lifestyles. Anti-vaccine groups engage in strategic communications to continue their cause (Crick & Gabriel, 2010). This results in a disconnected discourse, the audience for which are the people who may be undecided or vaccine hesitant (Larson et al., 2014).

So far in this chapter, I have described concepts that relate to the way in which knowledge is constructed and the conduct, content and context of discourse. The final concept upon which this research will draw is that of competence, from Habermas's universal pragmatics (Habermas, 1999). This relates to the skills of participants themselves and their ability to engage in the discourse.

2.8 Universal pragmatics: Skills and behaviours for rational discourse

Universal pragmatics (UP) is the final concept that I will use from Habermas's philosophical study of communication in a democracy. The concept of UP draws attention to the fact that communication can be a difficult and time-consuming activity, and that our ability to communicate is grounded in the capacity to understand each other and make ourselves understood. It is focused on the competence of humans and describes a group of behaviours or skills that people need – not only to make themselves understood but also to understand others – in order to communicate effectively and repair any breakdowns in communication should they occur. This research will investigate the extent to which issues of

competence are considered by scientific organisations, both in terms of the laypeople and the scientists involved.

The challenge of mutual understanding is prominent in science. Scientific knowledge can be so specialised that only a small number of people are qualified to critically appraise the evidence, and so people are reliant upon expert opinion and the validation of scientific knowledge through mechanisms such as peer review. The lay public is not competent or trained to engage in discussions about the technical details of science. However, it is still possible for non-experts to competently engage in a discussion about the *societal* impact of complex science. When scientific organisations arrange discussions between laypeople and scientists, it is important that they consider how technical language and jargon might become a barrier to a mutually beneficial dialogue. Non-experts can provide valuable input that can inform the scientists' subsequent design of research programmes, or they can highlight areas of knowledge in which some communities are under-represented, such as women and ethnic minorities in medical research.

Interestingly, as well as language barriers, Habermas also included a range of more sophisticated engagement skills such as the capacity to connect with and engage others, an awareness of the social and physical environment in which the communication is taking place and the skill of drawing upon common cultural assumptions between people speaking to each other. Competent participants demonstrate an adeptness at recognising and repairing breakdowns in communications and can distinguish between strategic and communicative action. I would argue that by outlining these additional skills, Habermas put a greater responsibility upon the scientific institutions to think beyond transmission of facts and information, towards ensuring a genuine engagement to listen, answer questions and seek a critical understanding of the experiences of laypeople in a way that can improve how scientists conduct, interpret or apply their research.

This concludes the description of the Habermasian concepts that are deployed in this research. The analysis presented does not provide an in-depth analysis of Habermas as it would not add to the aims of this research. What I have intended to provide is an insight into how the comprehensive nature of Habermas's examination of public discourse in modernity has influenced this thematic review and provided a

rich conceptual framework on which to conduct a more deeply rooted theoretical approach to my PhD research project. The next section explains how the concepts were used to create a new analytical framework for this research.

2.9 Applying Habermas to public scientific controversies

For the practical purposes of this research project, I have created a simplified conceptual framework to be used as an artificial construct against which to examine real-world practice of engagement between the public and scientific institutions. The framework draws upon Habermasian theory to categorise different aspects of discourse into five areas. Within each category, the most appropriate Habermasian concepts are deployed to compare real-world practice against the ideal communication he theorises with everyday practice.

These are the '5Cs', which form the basis for my analysis and are summarised in the explanatory text and Figure 1 below.

- **Context** for discourse**:** An analysis of the environment for a communication can highlight any political, social or cultural influences upon discourse. Habermas described the 'public sphere' as the space for mediation, debate and discussion to form public opinion. The concepts of system, lifeworld and public sphere facilitate a research analysis of the contextual impacts within and between these domains in contemporary science communication.
- **Conduct** of the discourse: Applying the ideal speech situation and implementing the principles outlined in discourse ethics is intended to ensure that the lifeworld voice is heard; that the debate is rational but also considers underlying morals, values and principles. These provide a useful benchmark to consider how scientific organisations approach public engagement and communication**.**
- **Content** of communications: The concepts of communicative action and validity criteria enable an assessment of the validity or 'truth' of what people say to assess whether they are engaged in communicative action, which aims to create mutual understanding and facilitate discussions and agreements, or whether the communication is strategic or distorted.

- **Construction** of knowledge: The knowledge descriptors outlined by Habermas facilitate an analysis of the epistemological weight given to different types of knowledge in contemporary scientific discourse.
- **Competence** of those engaged in the discourse: Habermas recognises that communication can be a difficult and time-consuming activity; that people need to be actively engaged and aware of the social and cultural context in which the discussion is taking place. This set of behaviours and skills is enlightening when examining whether the communicative competency of all participants is considered by scientific organisations when engaging with the public.

Figure 1: The 5Cs and their relationship to Habermasian theory and literature

The 5Cs	Key Habermas sources	Habermasian concepts deployed in this research
Context for discourse	Structural Transformation of the Public Sphere (1989) Communicative Action (1984, 1987)	• System; Lifeworld; Public sphere • Colonisation of the lifeworld • Rationalisation of the lifeworld
Conduct of the discourse	Moral Consciousness and Communicative Action (1992) On the Pragmatics of communication(2001)	Discourse Ethics • Universalisation; discourse Ideal Speech Situation • Inclusion, open to challenge , willing to defend, freedom to speak without coercion
Content of communications	Communicative Action (1984, 1987)	Validity claims: • Truth (objective); Truthfulness (subjective sincerity); Rightness (normative) Speech acts: • Communicative action; Strategic action; Instrumental action
Construction of knowledge	Knowledge and Human Interests (1972)	Knowledge interests: • Purposive-technological (natural sciences) • Communication and the ability to use language (Interpretive) • Being conscious of hidden influences upon our actions (emancipatory)
Competence of those engaged in the discourse	Moral Consciousness and Communicative Action (1992) On the Pragmatics of communication(2001)	Universal Pragmatics • Skills needed to be understood and to understand others: Capacity to connect; awareness of environment; drawing upon common cultural assumptions; adeptness at recognising and repairing breakdowns in communications; ability to distinguish between strategic and communicative action

This concludes my description of the 5Cs, which are at the core of the thematic analysis of the data collected for this research. Before moving to the research design chapter, I will summarise the criticisms made of Habermas's research and explain how these have been accounted for in my research.

2.10 Habermas: Limitations, criticisms and responses

Habermas's critical theories became very influential in social research that considered the democratic role of communication (Fang, 1995; Gimmler, 2001; Janssen & Kies, 2005; Goode, 2015) and this influence is demonstrated by the wide uptake of his ideas (Dahlberg, 2014). Habermas's theories have been used extensively in the sociology of medicine and health by Scambler and others (Scambler, 2018). At the same time, his work has been critiqued from a variety of theoretical and political positions, and this section will discuss and critique the main areas of commentary that are relevant to this research and explain how, if necessary, these criticisms were accounted for in this research project. This section is selective due to the sheer volume of original work produced by Habermas, and the extensive philosophical dialogues in which he engaged with his peers.

The central criticism of Habermas's theories relates to the gap between the ideal and reality, whereby good intentions are frustrated by differentials in power that are unaccounted for in Habermasian theory: he describes a utopia but not the practical steps to get there. However, for the purposes of this research these criticisms offer an opportunity. Habermas's work – due to its very idealism – is useful to provide an object of comparison for my research subject which is concerned with the pathologies in real-world communications and engagement practice.

In the next section I will consider the criticisms made of Habermas's work relating to exclusion and elitism, accusations of both idealism and pessimism, whether rationality can attain 'truth' and finally how realistic his conditions for ideal speech and communicative action are in the face of real-life human behaviour.

Is Habermas's public sphere democratic or exclusionary?

Communicative action has been criticised as elitist and paternalist because of the high level of skill, knowledge and reflexivity it demands from an informed and intellectually competent public (Calhoun, 2012). For participative democracy to work

as Habermas describes it, citizens must be informed and able to engage in argument and rational debate. In addition, everybody must understand the criteria for guiding and judging the democratic process. This competence cannot be taken for granted in the entire population because it is developed through education and training in critical thinking and social mobility, which is not freely available to all. As a result, it was argued by post-structuralists that the deliberative public sphere criteria actually support domination by excluding people who are not well educated or able to participate fully in debates (Lyotard, 1984; Dahlberg, 2014). They argued that this exclusion then leaves control of public deliberations in the hands of dominant or powerful groups (Mouffe, 1992; 1996).

Taking this line of criticism further, White (1980) described how a number of German philosophers suggested in the 1970s that Habermas's theoretical approach encouraged and supported authoritarianism, even if it was unintentional (Lubbe, 1978; Maurer, 1977; Spaemann, 1977). They suggested that a 'consensus' decision may legitimise the uncontrolled power of a minority or a majority in the name of 'freedom'. However, White (1980) felt that this was based on a fundamental misunderstanding of Habermas, and Habermas himself responded that his concepts were intended as philosophical principles, not as an organisational blueprint for how to organise democracy (Habermas, 1972), and that his model of discourse does not conflict with the reality that political debates are conducted under many constraints and influences. For the purposes of my research this criticism is helpful because it highlights some of the issues that have been noted to happen in science communications and draws attention to the ways in which the ideal of communication as described by Habermas is unattainable, as it is disrupted by issues of power, human behaviour and competence.

Exaggeration of the passivity of the public in the face of the media

Having pointed out issues of exclusion, critics went on to question Habermas's suggestion that the public was apathetic and passive in the face of low-brow mass media and consumerism. This was a common theme in the Frankfurt School and beyond (Adorno, Horkheimer and Habermas), but historians and feminist scholars contest whether it was exaggerated. Habermas (and first wave critical theorists such as Adorno) described the media as having become instruments of the state and

corporations and implied they were not fulfilling their role in holding power to account in democracy.

Goode notes that Habermas's criticism of the mass media and culture industries is rather sweeping, noting that at that time, the media, state and commercial institutions were still being used to support public deliberation and transform public life for the better (Goode, 2015). Habermas describes new broadcast media as discouraging reflection and discussion, but Goode suggests that Habermas's preference for print over broadcast media may simply reflect his dislike of the new technologies being introduced at the time he was writing. More recent research indicates that social media can support democracy (Loader & Mercea, 2014). The assumption that the public is easily led and lacks reason is one that also interests me as it is still prevalent today to some extent, an attitude that Tracey Brown at Sense about Science has described as 'elitist and obnoxious' (Brown, 2016). Understanding this attitude towards the public and any assumptions made (consciously or unconsciously) is important, as it directly influences how scientific organisations and governments communicate about risk in science.

Idealistic and universalised view of democracy

As well as raising concerns about the way in which the public was portrayed in Habermas's writing, critics went on to discuss how his description of political debates was overly idealised and universalised. The description of the bourgeois public sphere of the 18th century in his early work implied that the public could contest institutional processes and decisions, scrutinise information and hold the powerful to account. However, the power dynamics in society at the time meant that the post-Enlightenment 'bourgeois public sphere' he describes is composed entirely of property-owning males, to the exclusion of women, ethnic minorities and the working classes (Mansbridge, 2012). Habermas was criticised for not accounting for societal power dynamics in his early work, with post-modern philosophers such as Foucault fundamentally questioning the existence of a coercion-free public sphere in his theorisation of power in the modern age (Foucault, 1965; 1988 [1978]; 1994 [1973]).

Historians such as Eley (1992) and Baker (1992) have also criticised Habermas for historical inaccuracy, because when describing the decline in public debate in the 20th century, Habermas's earlier work did not acknowledge the increasing rise of

political activism, possibly because it was outside of the official political and legal systems, a necessity due to exclusion (as noted previously). This neglect of popular forms of public discourse discounts a multitude of co-existing public spheres that could overlap or oppose, inhabited by different social groups. For example, although women are largely missing from Habermas' description of the bourgeoisie, Fraser (1992) wrote that women were active in the promotion of temperance and poverty relief even if they encountered a hostile environment in the institutions of state and commerce. Feminist critics such as Ryan noted the irony of Habermas pinpointing the decline of the public sphere to the precise period in history when women were winning the right to vote and participate more fully in public life (Ryan, 1992).

Habermas's theories of rationality and consensus were also too 'neat' for the post-structuralists who (building upon the philosophical insights of Derrida and Foucault) espoused a messier democracy, characterised by undecidability, impossibility and necessary failure (Dahlberg, 2014). Even in a fully rational and inclusive debate, consensus may not be reachable. Habermas accounted for systemic distortions or strategic action, but his work is less clear in instances where the conclusion may remain provisional as the truth is not clear, there is not enough evidence or political compromise is necessary from some participants rather than true consensus. This criticism can be accounted for in my research, because it draws my attention to the areas where some groups are excluded or where the issues may be intractable.

Rationality

There is an assumption within Habermas's theories that free and uncontrolled discussion will always contribute to clarifying and resolving problematic situations. Commentators including Mouffe and Rorty criticised Habermas's rationalism as unrealistic. Rorty (1991) pointed out that universal rational justification would flounder in a political space which was distorted and influenced by ignorance and emotion, as he believed that sentiment and sympathy drive democratic advances more than rationality (Van Niekerk, 2020; Mouffe, 1996, p.5). The radical post-structuralist Mouffe (1992; 2016) thought that deliberative democracy was a way of avoiding irresolvable conflict between equality and liberty, and claimed that Rorty and Habermas were utopian and simplistic. Rienstra and Hook (2006) argued that Habermas expects too much of people's ability to be rational.

These points are echoed in recent claims that rational discussion is ineffectual in a landscape of identity politics and post-truth. A number of commentators on post-truth contend that argument is not always possible or desirable, and that communication does not always lead to solutions (Geuss, 2019). This is supported by research showing that engaging in argument about 'manufactured' controversies is counterproductive because it suggests to the public that there is a debate still to be had (Ceccarelli, 2011; Pluviano et al., 2017). Whilst Habermas cannot be expected to anticipate the emergence of social media and the post-truth discourse environment, in defining the ideal speech situation and discourse ethics, he did acknowledge that simply engaging in discourse alone will not guarantee democracy. These criticisms support my decision to use Habermas's concepts as an ideal and object of comparison for real-world practice, in order to highlight the pathologies.

No such thing as one 'truth'?

One angle of criticism of Habermas's theories expressed by post-structuralists is more conceptual (as detailed by Dahlberg, 2014), as it related to the post-structural argument that there is no such thing as a universally accepted 'truth'. Paul Feyerabend, Richard Rorty, Chantal Mouffe and John Keane are theorists of democracy, but they all depart from the commitment to the universal truth-claims that underpin other schools of democratic thought. They argued that Habermas's universalist approach considers different types of knowledge and requires that they are given equal weight and their validity scrutinised, but that he does not account for the situation whereby different groups, embedded in different lifeworlds, will have different preconceptions of what a legitimate and convincing response to the challenging of a truth claim looks like. Scientists may not engage with novel non-scientific challenges to their area of expertise because they don't fit with their tacit knowledge (Kim, 2014). The acceptance of claims as valid can differ within a culture (or by groups within society) and at different periods in history, depending on the accepted norms of the group or at that time. Relativist and post-modern commentators on science rejected the idea of unconditional validity of scientific claims because all the truth claims have to fulfil criteria based on scientific practises and 'normal' science (Kuhn, 2012). Feyerabend pointed out the limitations of fixed and universal rules in the scientific method and described science as an ideology, or scientism (Feyerabend, 2010). His work, and that of other post-modern scholars

such as Latour, ignited the Science Wars of the 1990s, previously described in Chapter 1 (Zammito, 2011). Rorty also rejected the suggestion of a universal truth, espousing a more contextualised version (Kim, 2014).

Habermas's realist position relating to the truth of scientific knowledge was built on the work of Peirce (1982 [1897]) who argued that there is a 'real' world and that scientific knowledge is tested against that independently existing reality. Scientific knowledge claims evolve constantly to reflect new evidence and new technologies that enable new research. A definitive grasp of a scientific 'truth' is only possible in the very long term, where the strength of the evidence means that something can be reasonably accepted as being 'true' by most people, but this may never happen as new evidence may emerge.

These debates about 'truth' are very pertinent to my research as they form the basis of many disputes about science and are a major influence upon the approach of scientific bodies to discourse on science. Truth claims are ultimately assessed on the basis of the context in which they are made, the strength of the evidence behind them and societal norms.

Response from Habermas to criticism

One of the unsurprising characteristics of Habermas, a philosopher who advocated for rational discourse, is his willingness to engage in discussion and dialogue with his critics. Over many years he has either acknowledged criticism and evolved his work (Habermas, 1992), or he has explained how his concepts may have been misinterpreted. With regard to the key criticism that he was idealistic and historically inaccurate, Habermas acknowledged the impossibility of fully realising communicative rationality, explaining that he was establishing a theoretical ideal not a normative ideal (Calhoun, 1992). In the late 1990s Habermas argued that the deliberative public sphere is not an end state that can be realised because 'it would make all further communications superfluous' (Habermas, 1996, p.1518) as all the negative influences that necessitate communication (deception, misinformation) would have disappeared.

In acknowledging that no deliberation or agreement is completely rational, Habermas invites continuous public scrutiny of instituted processes, criteria and practices for deliberations and decision-making. On matters of exclusion and power dynamics, he

felt that this criticism of his work was constructive as it highlighted exclusion and motivated people to create a more inclusive space for debate. Much of the critique on exclusion and power in *The structural transformation of the public sphere* (1989) was addressed and accounted for by Habermas in his later theory of communicative action (1992). Academics applying the public sphere concept have used it to focus on reducing exclusion (Fang, 1995; Gimmler, 2001; Janssen & Keis, 2005).

For some critics of Habermas, their objections lay in more fundamental differences in belief, such as his pragmatic stance on a universal 'truth' arrived at by rational discourse. The academic discourse on 'truth' is extensive and contested, and is beyond the scope of this thesis. However, Habermas's contribution to thinking on scientific validity is important for science, as it highlights the dangers of both relativism and scientism. Habermas's reply to the post-structuralists and radical constructionists was that although scientific knowledge *is* influenced by culture and paradigm shifts in ideas, scientific theories are tested against an *independent reality*. Vaccines work, not because study results are constructed within the paradigm of modern medicine, but because the vaccines are tested in people, and they can demonstrably prevent infectious diseases. Conversely, when they do not work, scientists try to find out why they did not, and thereby refine their theories and models of reality.

So, although Habermas was not blind to the limitations of science, he believed that scientific knowledge should be recognised as having a special epistemological status and rejected the idea that there was no such thing as 'truth'. However, this was tempered by his insistence that other forms of knowledge should also be considered on an equal basis in democratic discourse.

Implications for this research

As noted in the introduction, this PhD is not intended to be a theoretical development of Habermas's body of work, but a more practical application of his concepts to attempt to understand and explain the area more fully in order to effect change and improvement. Therefore, for the purposes of this research project, Habermas describes a communicative ideal, thereby providing a conceptual framework by which to analyse communications patterns in system and lifeworld settings.

The criticisms of Habermasian theory (social exclusion, sexism and paternalism) that have been highlighted are still features of real-world public discourse today. However, in documenting what the ideal could be, Habermas makes a moral point about the conduct of politics, and how people behave during public discourse, calling for inclusion, truthfulness, equal representation and consideration of values and social norms on an equal footing with factual or scientific evidence. The strength of Habermas is that he drew attention to the changes in the public sphere and how democratic discourse has been transformed – and is still being transformed.

Habermas's theories describe an ideal discourse environment that is probably impossible; the arguments in *communicative action* are rational, people reciprocate and listen, and conflict is eliminated. In reality, people seem to enjoy controversy and conflict in public discourse and as a result, contemporary discourse can be very polarised and aggressive (Anderson et al., 2014). The concepts described in this chapter provide a way to identify and describe anti-democratic communications and interventions, to look inside organisations and discussion frameworks that claim to be democratic, but underneath may be acting strategically and instrumentally in their own interests. Examination of how and why the conditions for communicative action are *not* met during prolonged public controversies provides insights into how rational discourse in a democracy can be systematically undermined (consciously and unconsciously) by the participants, and why attempts to create understanding and consensus may fail. Prolonged controversy may also be politically motivated; it is a very effective way to delay policy change. This has been seen in the debates about the role of greenhouse gases in climate change (Oreskes & Conway, 2012). It is also used to disrupt the effectiveness of public health measures such as vaccination.

2.11 Conclusion: Why Habermas is important

Viewed through a Habermasian framework, public scientific controversies are a dispute about knowledge or power or ideology. The breadth of Habermas's concepts relating to types of knowledge, societal context, validity of claims and the ethics and conduct of discourse facilitate a comprehensive and well-structured conceptual framework through which to seek better understanding of the complex terrain in which scientific organisations engage with the public. The critical theories of Habermas provide a useful framework to understanding the problems inherent in

public science discourse. Habermas's account of discourse was an ideal, but nevertheless it is worth considering how we might get closer to a version of that interaction in society now.

The case study for my research is a prime example of a conflict between the system and lifeworld; vaccination schedules are created on the basis of large population-wide clinical studies and are then implemented by the state healthcare system. The system emphasises the benefits to the population over potential harm to individuals, and although vaccination is not legally mandated in the UK, there have been calls to make vaccination compulsory in law (Moberly, 2017). Through a Habermasian lens, the anti-vaccine movement may be explained as a reaction to a discourse environment that does not allow the public to meaningfully engage in important matters in public. Alternatively, it may be a sign of a revitalisation of and re-engagement in participatory democracy – where citizens are engaging in resistance to the system and government or corporate interests that dominate the lifeworld of citizens.

This research is a timely opportunity to reflect upon the way in which scientific organisations communicate. A variety of factors have led to vaccine hesitancy and fuelled the influence of anti-vaccine groups (Larson et al., 2011; Larson et al., 2014). Contested science has become a subject of major debate during the COVID19 pandemic, whether it is about the origins of the virus, the effectiveness of face coverings in reducing coronavirus transmission or the safety and efficacy of the vaccines. At the time of writing (September 2021), there is concern that confidence in the vaccine in some communities will make high immunisation rates unachievable. It is not uncommon for the scientific community to blame the anti-vaccine groups for their beliefs, or the public for an inability to critically evaluate information. However, it is less common for scientists to consider their own role in the problems faced by science in society, and I hope to shed some light on this using concepts originally created by Habermas to rehabilitate modernity.

Having justified the choice of theorist and use of concepts to create a framework for approaching this research I now move to the next chapter, which will examine how critical theory drove the methodology and research design.

Chapter 3 | Research design

3.1 Introduction

The selection of research design for this study was not immediately obvious, as Habermas does not define a particular methodological position. The purpose of this chapter is to discuss the methods deployed in this research and share the thought process behind four key decisions in my research design. These are:

- the use of qualitative mixed methods[5]
- the rationale for a case study approach
- the focus on science communications professionals
- the use of a thematic approach to the analysis of the data.

I initially share the underpinning philosophy of the research techniques, i.e. the choices made in relation to methodology and strategy for analysis (Crotty, 2015). I then outline the research puzzle and research questions that form the foundation for this research. This is followed by a section detailing how data was generated and the approach to the analysis. The final section includes an examination of the ethical and political issues arising in the study, describes the use of reflexivity in this research and highlights any limitations identified. Throughout the chapter I justify and critically explore the decisions made and their impact upon the project.

3.2 Research paradigm

As previously noted, research around science in society in the STS literature is often critical of scientists and scientific organisations for lack of reflexivity, positivism and scientism (Jasanoff, 1996; Burchell, 2007a; Irwin, 2008; Wynne, 2006; 2014). Science communication research generally focuses on the motivations of anti-science activists or public opinion on controversial science issues. However, there is less research intended to inform and change practice and a lack of insight into the

[5] The definition of mixed methods I have applied: one which involves a comparison of data derived from different methods relating to a phenomenon (Denzin & Lincoln, 2018; Flick, 2018).

cultural and contextual reasons that shape the day-to-day practicalities of how scientific organisations communicate.

This incoherence between theory and practice is why I chose the paradigm of critical theory. Critical theory ultimately aims to create catalysts for change in thought and practice by gathering and evaluating information, ideas and assumptions from multiple perspectives to produce a well-reasoned analysis and improved understanding (Guba & Lincoln, 1994). Critical theory also highlights the importance of reflecting upon the social and political environment in which science is conducted (Horkheimer, 2002 [1937]).

With this in mind, in the interviews the participants were encouraged to reflect upon their own perspectives and assumptions as well as those of others in order to recognise norms and practices that may interfere with – or create – barriers to effective engagement with the public during crises of confidence in science. My exploration paid attention to organisational policy, intent and language, and considered aspects of the historical, social, cultural and political processes and the context in which they all work together to influence the practice of science communications and engagement. A structured approach was provided by the conceptual framework derived from the work of the critical theorist Habermas.

As a result of this paradigm choice, the ontology informing this critical study was derived from pragmatism. Pragmatism holds that reality is constantly renegotiated, debated and interpreted. This ontology holds that knowledge acquisition is influenced by social factors, but is not wholly a social construction (Peirce, 1982 [1897]). It is thus consistent with my chosen critical theorist Habermas, who refers to a normative 'reality' and accepted Dewey's pragmatic notion of truth, i.e. warranted assertability, rational acceptability, as well as much of Peirce's philosophy of science (Habermas, 1972; Dewey, 2013 [1938]). My research paradigm assumes that scientists provide evidence to support their arguments so that they are accepted as valid at a point in time, but that this validity may change, because of new evidence or a change in normative social beliefs and customs.

In using a pragmatic ontology, I am acknowledging the extensive theoretical discourse about scientific 'truth' in the philosophy of science but also recognising that acceptance of some form of 'reality' is necessary for coherence in social policy. In

other words, there is an acknowledgement of a historical and social perspective to how people make sense of evidence and create norms and generally accepted societal 'truths' (Crotty, 2015, p.42).

Critical theory and pragmatism were selected because they are aligned with my intent to use a dialogic methodology to build an understanding of the various (political, commercial, social and cultural) influences upon the way in which scientific organisations engage and communicate with the public. The epistemology of this paradigm is subjective, as pragmatism recognises the intersubjective quality of knowledge creation, which is to say that knowledge is an intersubjective achievement given the collective nature of scientific research and the influence that non-scientists within the broader social environment will have on the study (Denzin & Lincoln, 2018). A subjectivist epistemology requires the researcher to deploy methods that uncover all the elements which shape knowledge claims (Guba & Lincoln, 1994). This methodology also enables me to subject the different statements to critical scrutiny rather than seeking the 'right' answer, as there is unlikely to be one. Intersubjective research aims to develop understanding and increase sensitisation to moral and ethical issues (Denzin & Lincoln, 2018).

In the next section, I will describe the project design. Critical theory is aligned with qualitative methods and there is a wide range of qualitative approaches including case studies, life stories, interviews or observational methods, all of which aim to define and describe people's experiences and observations. The methods selected are discussed.

3.3 Formulating the research puzzle and questions

The fundamental puzzle underpinning this research is the vocal opposition or scepticism about scientific knowledge from a small minority of the general public (Diethelm & McKee, 2008). The discourses around controversial subjects such as vaccine safety are characterised by a disconnect in communications between the opposing parties; with little common ground, contested evidence, refusals to concede a position or compromise, and a tendency to demonise or 'other' those in opposition (Burchell, 2007a; *Nature* Editorial, 2017). This can create the impression among the general public that there is no scientific consensus on the safety of

vaccines, undermining public health policy. The separate discourses make it difficult to openly acknowledge, discuss and resolve differences based on knowledge, values or interests.

When seeking to explain this puzzle, the role of all the actors must be scrutinised. My review of the literature found very little research into the part played by scientific organisations. I could not find any literature that included interviews with communications leaders in scientific institutions, and few that had interviewed science policy-makers. Given their substantive influence upon how organisations communicate, and professional insight into dealing with controversies in science, this is a significant omission in the research literature, and may explain the disconnect that is often lamented between those who research science communications in academia and practitioners who direct major programmes of communications and engagement (Jensen & Gerber, 2020). For these reasons, I deliberately chose to focus on the role played by communications professionals working within scientific organisations.

A lack of research insight in this area was also reflected in my own experience as a practitioner, which could have been greatly enhanced by a wider evidence-base. The lack of empirical evidence for science communication is confirmed by Jensen and Gerber (2020). It is possible that this reflects the epistemic preferences and culture within scientific institutions, where communications activities are poorly evaluated (Ziegler et al., 2021), or where communications is seen as a tick box exercise to meet funding requirements (Boaz et al., 2016).

Communication about science is not ‘scientific’ or formulaic itself; it is often a matter of professional expertise and judgement based upon circumstances and experience, then refined by evaluation (Jensen & Gerber, 2020). Longer term, lack of evaluation is an inherent problem for communications professionals, as it can be difficult to demonstrate value or impact or justify investment in the absence of empirical data in an evidence-based organisation. To some extent, it also relegates communications to the stereotype of ‘dark art’ or ‘spin’, which is perceived to be necessary but difficult to measure. The dearth of evidence-based practice is surprising given the policy prominence of public engagement in science included in government policy, and the

substantive investment in both personnel and campaigns across the sector (Weingart & Joubert, 2019).

Within this study data were collected from three different types of scientific organisations (non-governmental organisations (NGOs), state sector and private sector) because different sectors have distinctive motivations for the instigation and organisation of public engagement and communications (Weingart & Joubert, 2019). Public sector and governmental scientific organisations usually have a statutory role in formal public communication and engagement relating to policy. Academic scientists are obliged to conduct public engagement as part of responsible research and innovation and the UK's Research Excellence Framework. In private sector organisations the drive towards public engagement is usually commercial or reputational. Science NGOs and campaigners are diverse; they may be professional bodies or campaign for single issues, so their rationale for public engagement varies accordingly.

The research puzzle outlined above is not, in essence, that dissimilar to the one outlined by my chosen theorist Habermas in the 1970s when he set out to rehabilitate modernity, addressing issues caused by the extremes of scientism and relativism that led to a crisis of modernity. Habermas was concerned that post-modernism was undermining the project of the Enlightenment (Habermas, 1990). In the present day, a number of those post-modern and constructivist criticisms of science have been cherry-picked and reassembled into an argument for the dismissal of science (Kata, 2010; Sokal & Bricmont, 2014). What is *very* different in 2021 is the emergence of social media and a general deterioration in standards of evidence in political discourse, which is characterised by the term 'post-truth'. This has been particularly apparent during the coronavirus pandemic where many debates have been highly polarised (for example over lockdown measures, face masks, vaccination, etc) as part of a culture war driven by political extremists provoking controversy online, stoking conflict or clashes over science, as a way to further their ideology or values and personal identity (Perry et al., 2020). How can this polarisation be addressed?

One simplistic solution is for the scientific institutions to communicate and engage with the public to contextualise scientific knowledge, address people's concerns, dispel misperceptions and build trust. This is the policy position across publicly funded scientific organisations in the UK (Science and Technology Committee, 2000). In Chapter 1, the literature review for this study clearly revealed a policy *intent* in UK scientific organisations to engage with the public; but the literature also identified a lack of open-ended engagement activities that enable laypeople to meaningfully contribute to scientific discussions (Wynne, 2006). This indicates that there is a failure of policy implementation which is important to explore.

My research explores the interface between the policy intent of communications policy-makers and the policy implementation, as conducted by science communications professionals and evident in documents in the public domain. Research among these science communications intermediaries (between scientific organisations and the public) merits study because of the substantial investment of public and private funds in initiatives to engage the public in science, and it may serve to inform future activity.

Research questions

The study is based on the overarching research question:

> **How can we explain and understand the dissonance between competing and conflicting voices in areas of controversial science?**

There are two sub-questions:

> **Q1**: How are policies and strategies for engagement and communications activities during public scientific controversies influenced by the culture and interests of the organisation that they represent?
>
> **Q2**: To what extent is the deliberative ideal behind programmes of scientific engagement distorted in practice, and why?

3.3 Choice of vaccine safety as case study

My chosen topic of research, controversial science, is extremely wide. To narrow the field of inquiry, I used the case study of vaccine safety as an illustrative example through which the wider phenomenon of controversial science may be studied. Case studies are described by Simons (2009, p.21) as:

> an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, programme, or system in real-life context. It is research-based, inclusive of different methods, and is evidence-based. The primary purpose is to generate in-depth understanding of a … programme, policy, institution or system to generate knowledge and/or inform policy development, professional practice and several community action.

Case studies are fundamentally a method by which to conduct an analysis of an issue, in context, from the point of view of participants (Merriam, 2009; Stake, 2017; Yin, 2018). This method is useful in the context of my research as a way to explore human behaviour and social interactions in the context of institutional processes and politics (George & Bennett, 2005; Harrison et al., 2017). The importance of real-life context was also emphasised by Crowe et al. (2011) as a strength of case studies in healthcare research. Bearing this in mind, I wanted to anchor this critical study in a topical and well-known example of a science controversy that professionals working in communications and engagement can relate to and understand (in different ways, depending on their experience and beliefs).

Therefore, I purposively selected vaccines for population-wide immunisation campaigns that aim to achieve herd immunity, such as the MMR vaccine for infants or the coronavirus vaccine for adults. These vaccines are most relevant to my study because they are specifically controversial due to the system imperative to achieve herd immunity, where the benefit to society as a whole is considered more important than the individual's right to choose to be vaccinated. These vaccination campaigns also raise ethical issues around informed consent for children or those with lack of capacity due to age (e.g. dementia), learning difficulties or other conditions. As in many areas of controversial science, there are organised anti-vaccine groups, and

the subject has become politicised (Peretti-Watel et al., 2020; Perry et al., 2020; Jones-Jang & Noland, 2020).

Vaccination was also chosen as a good example of a public science controversy because it is long running (formal resistance being triggered in the UK by the Compulsory Vaccination Act of 1853), and well documented in the literature. It is suitable for this study of communication because the balance of scientific evidence has demonstrated that, in general, vaccines are safe and effective; however, significant public concern over safety remains. Vaccine hesitancy and refusal are a result of safety scares relating to unproven links to neurodevelopmental or immunological disorders and the campaigning of anti-vaccine groups (as described in section 1.4). Whilst this particular example is representative of scientific controversies, and the observations made in this research may be useful when considering other subjects, the conclusions drawn are unlikely to be generalisable to other subjects. Making generalisations from a case study must be done with care, as a case study is steeped in a particular place, time and context (Patton, 2013).

3.4 Process/conduct of the research

The choice of methods was very open, as Habermas does not define a particular methodological position. A qualitative mixed methods approach was chosen, the elements of which are described in this section, followed by a justification for the rationale as to why they were combined. Data were generated for analysis from several sources: semi-structured interviews, texts from web pages and documents related to policies and procedures and job roles. Collecting or generating data from multiple sources added multiple layers and perspectives to the analysis. For example, I was able to analyse how closely the practice reflects the policy intention within organisations by comparing data from interviews with data from documents. The participant selection method also enabled me to capture different approaches and insights across three different types of organisation (public sector, private sector and NGO/charity). The final section outlines the limitations of the research design, discusses challenges encountered whilst executing the research and how these were mitigated.

Qualitative interviews with communications professionals: Logic and rationale

The first method used was semi-structured interviews with senior communications professionals within scientific organisations. These interviews were conducted to explore their knowledge, understanding, interpretations and opinions to understand their individual social reality within the organisational culture in which they work. As the theoretical approach for this study is based in critical inquiry, questions required participants to make observations within the specific context being explored, and draw upon their own specific experiences rather than hypothetical ones in order to elicit relevant information. Interviews are long established as a key qualitative method in the social sciences as a valuable way to investigate the attitudes, beliefs and experiences of individuals (Brinkmann & Kvale, 2015).

Semi-structured interviews (as opposed to fully structured or completely unstructured) were chosen. This format attempted to ensure enough consistency between the interviews to enable themes to be identified, but also enough flexibility to pursue interesting and relevant themes within the chosen context to enrich the data collection. As advised by McGrath et al. (2019), the interview guide was first tested with a sample interviewee whose data was not included in the analysis in order to check that the guide elicited useful data, and also to get interviewee feedback on how it felt being asked the questions. Minor adjustments were made to the questions in the light of this testing, to remove questions that elicited less useful or duplicative information or interrupted the flow of the interaction.

Six interview questions were put to each participant, as follows:

1. How did you come to be in this role and how does that journey influence your approach to science communications and engagement?
2. How much of an issue do you believe science controversy is for your organisation/ sector?
3. What are the major challenges or opportunities for scientific organisations when engaging with the public about disputed or controversial science?
4. What do scientific and medical organisations hope to achieve by public engagement?
5. Do you have any examples of good or bad practice? I am less interested in the content than why it went well, or not.

6. Is there anything you would like to mention that I have not asked about?

The dialogue I was aiming to create in the semi-structured interviews was that described by Mason (2018) as interactional and relatively informal in style rather than an interrogative Q&A-style session. This more open form of questioning also served the purpose of allowing the interviewees opportunity to comment more widely on matters they believed to be pertinent to the subject, which I may not have anticipated.

The ambience also made it easier to invite interviewees to reflect on what might prevent genuine critical reflection at an organisational and individual level. Interestingly, a number of the participants expressed that they welcomed the opportunity to reflect in this way. As a former practitioner, I am aware that in these roles, dealing with fast-moving situations, often there is little time for reflection upon decision-making processes unless a formal after-action review process is in place. It is likely that the ongoing coronavirus pandemic would have exacerbated the time pressures upon many of the participants, and this was expressed by some individuals.

Semi-structured interviews have been described as a ‘conversation with a purpose’ (Burgess, 1984, p.102) to stress the importance of meticulous planning with respect to theoretical alignment, methods and ethics to meet the end goal of generating data. In selecting interviews as a method, I was conscious that my ‘insider’ status as a former practitioner and my familiarity with the content (and some of the participants) had potential to both negatively and positively impact my effectiveness as an interviewer (this is explored in more detail in a reflexive exercise in section 3.6). Transparency about my prior experience was intended to create an atmosphere of collegiality with the participants and encouraged a rich two-way conversation. This dynamic reflects the observation that qualitative interviewing is a co-construction of knowledge between the participant and the interviewer, rather than a reporting of objective ‘facts’ (Brinkmann & Kvale, 2015; Harrison, 2017; Mason, 2018). Although it was vital for me to remain in the ‘role’ of interviewer, a number of participants commented that they found it reassuring speaking to someone who understood the technical aspects of the job, as well as the difficulties, and that they had trust that

their observations would be understood in context (and not misinterpreted). I would argue that this brought an increased level of candour to the discussion.

Participant selection and recruitment

There are many actors in the discourse around science. There is a significant body of literature on scientists as communicators, but my research is deliberately focused on the activities of senior communications professionals who work within or with science-based organisations. This choice was made because communicators generally have responsibility for formulating communications policy, deciding strategy related to how organisations present themselves and operationalising this through a communications function. As previously noted, there is little research conducted among these individuals. In part, this may be because science communications is a relatively new, poorly evaluated and heterogeneous profession (Jensen & Gerber, 2020). The influence of this group of professionals on the approach of scientific organisation may also be unrecognised and underestimated. My own experience as a senior science communicator was that individuals can be very influential agents for change within organisations (or not).

My sampling method was chosen to ensure that I could gather the opinions and experiences of experts or people with direct experience of managing communications on controversial science subjects. These individuals can be categorised as ‘elites’ due to their senior positions within their organisations. They are attractive to interview because they have a breadth and depth of knowledge about their organisations, have access to the board and responsibilities for issues of ethics and company policy (Marshall & Rossman, 2015; Bowen, 2002). Targeting experts and leaders in the field provides deeper and wider insight into the issues being researched and facilitated a co-construction of knowledge during interviews (Berner-Rodoreda et al., 2020). This purposive sampling strategy is appropriate when few people have the necessary expertise to contribute to the study aims. This sampling technique produced data that was indicative (but not representative) of broader trends (Bryman, 2016) and the findings may be transferable to different contexts but are not generalisable (Lincoln & Guba, 1985).

Participants were selected for their credibility in the sector, and direct experience or the transferability of their experience to areas of science outside of vaccines. I sought a sufficiently broad sample to ensure that their responses would cover a wide range of relevant issues. Many participants were approached directly as they were former colleagues or acquaintances. I also made use of professional networks (my own and those of contacts and professional groups to which I belong (on LinkedIn and Twitter, for example). These networks all comprise members from three different sectors: private industry, state organisations (including the NHS and universities) and NGOs (including charities). To support recruitment and provide supplementary information about the study, I wrote and published an article about my research on the professional networking site LinkedIn, inviting people to get in touch, and also set up an 'information for participants' website so that people who were interested in participating could find out more about the study before committing. Once initial contact was made with potential interviewees, a formal interview request was sent with participant information and the consent forms for interview participation and data processing. All participants were informed that neither their individual identity nor that of their organisations would be disclosed in the thesis or in publications, but that their comments might be attached to a sector. Identities were withheld because the field of science communication is relatively small. However, participants did not appear to be unduly concerned and many were happy to express opinions, publicly stating that their views were fully in the public domain so there was no sensitivity. The only exception was in a couple of requests for some parts of the interviews to be 'off the record', but they freely shared the information as added background on the understanding that it would not be published. This demonstrated a high level of trust in me as interviewer.

Sixteen interviews were conducted with individuals in organisations across the three sectors:

- five from state organisations (including the NHS and academia)
- six from the private sector (pharmaceuticals)
- five from science-related NGOs.

The three sectors were included in order to capture the diversity of all the major organisations working in the area of science communications. Given the differences in the characteristics of the three categories of organisations, it was anticipated that this diversity would add a richness to the analysis, highlighting contradictions and mutual confirmations of knowledge and practices. All those selected were pro-science organisations and involved in public engagement, or communications activities, about vaccine safety and about other topics of science or medicine.

Additional data relating to the characteristics of the participants is included in appendix 1. All the participants had worked in the UK, and only two were not UK-based. Eight of the 16 had global experience (largely those who had worked in the pharmaceutical industry). Ten of the 16 had worked in more than one of the three sectors. The group of people interviewed was majority female (13 of 16) which is not representative of the industry as a whole, although public relations and communications is a female-dominated industry with around 64% of the profession being female (PRCA, 2016). There is no research to suggest that gender is influential in an individual's approach to science communications, but this may be a limitation, even though the cohort was not selected to be representative of the population at large.

My initial intent was to formally compare responses between the three cohorts of participants in the three different sectors. During the interviews it quickly became apparent that this would not work for a very positive reason; many of the participants had diverse experience working across several sectors. In the interviews I deliberately asked them to comment on their experiences over the whole of their career, not just at their current organisation, and to consider themselves as individuals talking about the issues in the profession rather than as spokespeople for their organisations.

Individuals were able to compare their own experiences in different sectors and to comment upon whether they had different experiences doing the same job in different types of organisations. This comparison was made to highlight any differences in communications strategy related to funding sources, stakeholders or business model: for example, whether vaccine manufacturers are less likely to

engage with the public over fears about vaccine safety than NHS staff; or whether the funding source impacted the approach to public engagement.

A wide range of motivations and objectives have been described in the literature, so I anticipated that there would be differences of approach to communications between the sectors when approaching the same subject. Objectives may vary, from an intention to engage and inform to a desire to promote, persuade and legitimise science (Weingart & Joubert, 2019). Different motivations for communications results in different outcomes, for example a press release about a collaborative study between a pharmaceutical company and a university may be used by the company to meet its legal requirements to inform the stock market and the same information used by the university to attract research collaborations.

The data collection took place over a time period when vaccine safety, and science itself, became prominent and controversial in news and politics because of the ongoing coronavirus pandemic. The timeline of major pandemic events and the interview schedule is shown in appendix 2. The interviews took place in July, August and September 2020. At this time, the UK had been through the first wave of the pandemic and the first national lockdown had ended, although some social distancing measures were still in place. At this point in time, there was still no firm prospect of a COVID19 vaccine, although several were in development. Much was still unknown about COVID19 and the effectiveness of public health measures being enforced to contain it. This series of events served to make the subject of my PhD research very topical, but also sensitive and political. There were positive and negative implications for my research. One of the negative consequences of the pandemic was that the people I wanted to interview were extraordinarily busy working on pandemic-related projects within their organisations. For example, a number of the participants needed to postpone the interview several times over months due to pressure of work or colleague sickness absence related to the coronavirus pandemic. As their time was pressured and limited, all rescheduling requests were received sympathetically and accommodated, so no participants were lost to the study as a result.

A more difficult issue that emerged related to widespread criticism of the government's response to the pandemic (Cowper, 2020; Oliver, 2020). The negativity made state sector communications and policy staff (in central government, arms-length bodies and universities) wary of all approaches for interviews. Overall, I developed a sense, confirmed in the *BMJ* by Oliver (2020), that many organisations had instructed their staff not to grant interviews to the media or other interested parties, and this was impacting my recruitment.

It is not unusual for large organisations to avoid comment in order to avoid being drawn into a controversy. It was clear from some responses that they did not wish to get involved in a discussion about scientific controversy at a time when their institutions were embroiled in a crisis. The interviews I did secure with people working within state organisations (central government, arms-length bodies or NHS) were via personal contacts. This sensitivity also appeared to extend into academia, although there may have been another explanation related to the changing role of communications within universities. Other participants commented upon a change within the university sector to become more 'corporate' and focused on marketing, promotion and branding (Davies, 2020). It is also possibly why, when approached for interview, the people involved did not perceive themselves as 'science communicators' who dealt with controversy and therefore did not wish to participate. Whilst this was a gap, it also became a finding of my research (elaborated upon in Chapter 4).

Crises such as the COVID19 pandemic raise wider moral and ethical issues for researchers, many caused by the pressure to produce research findings quickly to resolve uncertainty (Meagher et al., 2020). Among these is the impact of conducting research among people who are directly impacted by the crisis. I was interested in the phenomenon of 'moral distress', which is when a professional believes they know the right thing to do morally but are unable to do so. Whilst this phenomenon was first described in healthcare professionals in 1984 (Jameson, 1984; Hamric et al., 2012), I argue that it is also applicable to communications staff in the face of demands placed upon them during prolonged crisis situations. Related to this was the high level of general frustration at the UK government's response to the pandemic, and the use of communications as a political or propaganda tool rather than for information provision (Cowper, 2020). For example, claims that the UK was

'world-beating' in various aspects such as vaccine procurement, test and trace and personal protective equipment (PPE) (Rutter, 2020). This use of rhetoric can place communicators in a difficult moral position, and a number of the participants discussed the moral and ethical conflicts raised by their work.

There was also a risk that the unprecedented set of circumstances during which the interviews were conducted could make the research findings unrepresentative. For example, it may be more likely that some participants would be more critical than usual of government communications, and that others would be defensive of those doing a very difficult job under unprecedented circumstances. In order to gain insight for this research, I was careful not to invite participants to judge either way on the events unfolding within the UK pandemic response, in case this influenced their responses to questions. In the event, I was impressed with the clear sightedness of all the communicators in expressing the difficulties faced by all science communicators during the pandemic. They also expressed their frustration but were able to give objective and pragmatic commentary on the reason events were unfolding as they were; and drew parallels with past scientific controversies (this is discussed more in the analysis in Chapter 4).

The logistical arrangements for the interviews were also impacted by UK government lockdown restrictions, which effectively stopped all travel and in-person meetings. This meant that plans for face-to-face interviews were switched to the 'virtual' meetings platform (either Zoom or Teams depending on the preference of the participant). Recognising that a research interview is an unusual interaction, even in non-pandemic times, the dynamics of the interview interaction were considered carefully (Brinkmann & Kvale, 2015). When arranging appointments, I was flexible and sensitive to the needs of the participants in order to maximise the usefulness of the data generated.

Anticipated problems in establishing rapport did not emerge as the visual contact in videoconferencing worked just as well as face to face; interviewees may even have been more relaxed in their home, away from colleagues who might have overheard in an office environment. Only one participant requested not to use the video and this interview was conducted on the phone, which made it a little more difficult to build rapport due to lack of visual feedback, resulting in the shortest interview. One

interview was beset by broadband technical issues, but the interview was simply switched from Zoom to the telephone and continued. Overall use of videoconferencing technology was beneficial to the study as it reduced the time spent travelling and also made it possible to interview two participants in other countries (for which there had been no travel budget).

The interviews were recorded and transcribed by myself, with the participants' permission, which ensured my familiarity with the data for the analysis. All interviews were transcribed as it was not possible to identify in advance which topics would be most pertinent. The transcripts did not include minute linguistic details such as hesitations or false starts. This transcription approach was acceptable as I was not conducting a linguistic analysis, but a thematic one. Instead, transcription included verbatims of what was said plus important context, such as interruptions. Any parts of the interview that were very obviously not relevant or where there was undue repetition were omitted as recommended by Lathlean (2015).

The interview data were supplemented with data from documents related to the practice of science communications and engagement, as described below.

Samples of documents related to the practice of science communications

Samples of descriptors of communications and engagement roles – including job templates, person specifications and departmental descriptors – were acquired from each of the different sectors. A list is shown in appendix 3. These documents were reviewed to identify the characteristics organisations are looking for in a science communications or engagement professional (such as their background and experience), the orientation of the job description (public or organisational) and stated objectives (compared with organisational objectives). I also collected samples of communications from scientific organisations to assess the extent to which they meet the public engagement objectives as expressed in policy documents and by interviewees. These were obtained via the websites of the different types of organisations as they were freely available to the public.

The documents provide real-world examples of organisational approaches to communications and engagement. The review of the materials was carried out to contribute an understanding of how the activities implemented by science communications professionals on a day-to-day basis (survey and job descriptions)

matched the aspirations of the stated policy objectives of their organisation (as expressed in the interview and policy documents). I did not restrict the selection of materials to the organisations from which the interview participants were selected; this widened the pool of materials from which to choose, and also served to further obscure the identity of the participants and organisations.

Selection was purposive and guided by insights and themes emerging from analysis of the interviews. To an extent the materials were used to supplement observations created by the interviews; that is, any interesting patterns in the interviews prompted an investigation into how that was manifested (or not) in public documents. For example, the interviews and recruitment for interviews indicated that universities were now less engaged in science communications and that the focus was more upon the commercial. So, in this instance, I sought out job descriptions for university communications jobs to include in the analysis, which would either confirm or refute the observation or at least elaborate upon it. As the review of documents was not systematic, the findings are illustrative rather than generalisable, but this was acceptable within the parameters of this study, which seeks to broaden understanding.

Rationale for mixed methods

Mixed methods involves a comparison of data derived from different methods relating to a phenomenon (Denzin & Lincoln, 2018; Flick, 2018). Every method gathers evidence about an issue in a specific way, so methods can be chosen that complement each other. Mixed methods can also enable the researcher to use the results from one method to inform another, in this case using insights from the interviews to inform which documents are selected for analysis. If different types of data lead to the same conclusion it improves the rigour of the research; but it does not indicate the reality of a finding as this would imply the existence of a ‘master reality’ or an ‘objective truth’, which is not the case in this research area (Flick, 2018, p.447). Combining approaches gives a fuller picture to elaborate or enhance research findings.

There were two drivers for use of mixed methods in this study, which are reflected in my research questions: the first was the observed gap between desired policy and real-world implementation; and the second was the claim of a lack of reflection within

scientific organisations and consequent lack of self-awareness of their contribution to the issues (Wynne, 1993; Science and Technology Committee, 2000). After the interviews, I wanted to compare the interviewees' observations and practices of science communications and engagement with real-world samples of policy documents or communications to understand the level of alignment and identify any disconnects.

Approach to the analysis

This research used a thematic content analysis. The analysis is the process by which the researcher makes sense of the data to provide explanations for the phenomena under study (Pope et al., 2006). This analytical approach is a very common method of data analysis in qualitative work (Braun & Clarke, 2006; Pope et al., 2006; Ritchie et al., 2003). The choice of analytical approach was very wide because there is no single way of doing a qualitative analysis. My choice changed halfway through the research, and the literature confirms that this experience is not unusual; as Lathlean advises: 'for the qualitative researcher, the process of analysing qualitative data is not necessarily linear or even predictable' (2015, p.471). The next section will justify that choice and explain the process of analysis.

From CDA to thematic analysis

Initially the intent was to complete a social construction-based critical discourse analysis (CDA) of the data to gain insights into how discourses can create acceptance for institutionalised 'normal' forms of power that many would see as legitimate and acceptable, such as the enforcement of programmes to improve public health through vaccination. However, this changed as I became more focused upon wider cultural questions of institutional approaches to communications and how these organisations have taken account of changes in the public sphere, such as the ubiquity of social media and the explosion of disinformation. The eventual creation of my Habermasian 5Cs framework led me to conclude that a thematic review would be more suitable to gain insight using critical theory, because it was more specific to communications activities. Whilst this led me away from social construction, a thematic review is sufficiently flexible to allow an examination of the aspects of power through the reflections of communicators as well as through examining the content. It should be noted that both approaches to analysis would have produced

useful insights, so it was largely a matter of preference and theoretical fit that led me to switch to a thematic analysis.

This thematic analysis is concerned with different aspects of the conduct, content and context of present-day scientific discourse, so it is important to elaborate on what ‘discourse’ means. The term discourse is used to describe meaning-making as part of the social process or the language associated with the particular social group or practice, and also to describe a particular social perspective or ideology (such as neo-liberal discourse).

The phrase is used slightly differently by Habermas, who describes discourse as the interactive process by which validity claims are redeemed, and disputes about objective truth, normative rightness, truthfulness (subjective sincerity) and meaning are resolved (see section 2.6). The ability to competently engage in discourse is crucial for members of society to enable different groups to share their understanding of the world with each other. Also, as noted in the theory of communicative action, Habermas describes how discourse allows co-ordination and causes events to happen (or not to happen) and this is recognised explicitly when he uses the phrase ‘speech act’ to emphasise the consequent social impact of words (Habermas, 1984; 1987).

Other theorists have defined discourse as a social practice to make sense of society; Hall (1997, p.220) defined it as:

> the capacity of meaning-making resources to constitute social reality, forms of knowledge and identity within specific social contexts and power relations.

Discourse is also deeply political. Lazar (2007) described it as the struggle between those who wish to maintain a social order and those who want to contest it, and Lyotard (1984) theorised that discourses are propaganda that act as cultural ‘grand narratives’ which provide legitimacy for the powerful and maintain social order. This struggle through discourse has been clearly observed during the coronavirus pandemic, as those who wish to contain the virus argue with those who wish to retain their liberty to socialise and travel (Perry et al., 2020).

When science becomes political or controversial – as it did during the MMR vaccine crisis and has during the COVID19 coronavirus pandemic – the scientific discourse continues within the scientific community, but at the same time, other discourses emerge in the public sphere. These may take the form of discourses on public health policies between experts and policy-makers, or discourses on the rights of individuals not to be vaccinated or wear masks between right-wing politicians and anti-science conspiracy theorists. In each of these, the language is different, the construction of evidence is different and the rules of engagement are also very different.

As a result, scientists need to be competent in communicating effectively. The prominence of science and technology in society means scientists are obliged to participate in more than one discourse about the same subject. Each different discourse on the same subject may be conducted to different standards of evidence, under different rules, with different hierarchies and influences. Whilst it is routine good practice for scientists to tailor communications for different audiences, it is a rare individual or organisation which anticipates or reflects that they may be entering a discourse with completely different rules, or that their 'expert' status may not be recognised or respected. The difficulties for all parties to navigate these differences reduce the likelihood of rational discourse or communicative action as described by Habermas (see Chapter 2). It is the incommensurability of these lifeworlds (by which I mean the way in which people interpret the world and understand the social environment) that led to my overarching research question:

> **How can we explain and understand the dissonance between competing and conflicting voices in areas of controversial science?**

Recognition of this phenomenon led me to a focus on communications for this research, which examines the approach of scientific organisations to communications and engagement with the general public over controversial science. The root of the research puzzle is the incommensurability of the opposing use of knowledge claims, language and narratives within different lifeworlds (the scientific lifeworld and the multiple lifeworlds that make up different social groups in 'the general public'). This is the root of the problem of communication between the scientific and natural lifeworlds (Husserl,1970 [1936]). The existence of these

separate discourses gives important context to the thematic analysis described in the next section.

Inductive approach using a thematic analysis

Thematic research is often associated with grounded theory (Strauss & Glaser, 2017), but it can be used in other types of qualitative research (Bryman, 2016). Inductive analysis is the most common approach used to analyse qualitative data and is most suitable where there is a gap in the knowledge about the area being studied, as is the case in this PhD (Lathlean, 2015; Burnard et al., 2008). Whilst I had already created a categorical framework based on Habermasian theory, there was no predetermined theory or hypothesis, so the analysis took an inductive approach, i.e. the data themselves were used to identify the themes. I used a method originally applied in psychology by Braun and Clarke (2006; 2012; Clarke & Braun, 2013) who were motivated to publish their framework because they observed that although thematic analysis is widely used, it is not well described in the literature. I was confident this would work because the same approach has been elaborated upon in Lathlean (2015) and applied in the healthcare setting as well as being used in a number of examples from research in nursing and dentistry (Burnard, 1991; Burnard et al., 2008). The process of thematic content analysis involves analysing transcripts, identifying themes within the data and gathering together examples of those themes from the text, a process described in the next section (Braun & Clarke, 2006; Burnard et al., 2008). The method of Braun and Clarke was later renamed by the authors as *reflexive* thematic analysis (2019) to emphasise the importance of reflexivity and the 'importance of deep reflection on, and engagement with the data' (Braun & Clarke, 2019, p.593).

Thematic coding

There are several stages in the process of a thematic content analysis through which the researcher constructs themes and categories within the data (Figure 2). The first stage is familiarisation with the data, and this was achieved by transcribing the interviews and reading them several times before moving on to coding. Charmaz (2006, p.46) writes that:

> coding is the pivotal link between collecting data and developing an emergent theory to explain these data. Through coding, you define what is happening in the data and begin to grapple with what it means.

Through the whole process, deliberate decisions are made by the researcher about the most important patterns emerging and, conversely, what is less relevant and can be excluded. Coding is an iterative process whereby themes are identified and coded in the interview transcripts and the researcher then verifies and expands upon them by searching through the data and repeating the process. The administration of this process was facilitated by use of a computer software package, NVivo12, which allowed me to catalogue, sort, search and retrieve items quickly. Whilst software programmes make the data management and handling easier, they do not replace the role of the researcher, and the quality of the analysis is still dependent upon the decisions made by the researcher.

To code the data, each text (interview transcript or document) was uploaded on to NVivo12. Each document was reviewed in detail and themes of interest were coded, for example ‘regulation’ or ‘corporatisation of science’. For each theme, a ‘node’ (an electronic folder) was created where multiple examples from the data that fit the emergent patterns were stored. A full list of these initial nodes is shown in appendix 5, table A). Once all the data had been coded, each theme on NVivo12 was reviewed for patterns or items of particular interest that shed light on the research questions, or which confirmed or refuted key themes in the literature review. At the same time, any duplication or redundancy between the nodes was deleted. What was generated at the end was a series of themes, and the data was aggregated and coded to each theme (appendix 5, table C)). The themes were then synthesised into the research findings and analysis (see Chapter 4), building arguments towards the conclusions of the research.

Figure 2: Steps in the thematic analysis adapted from Braun and Clarke (2006; 2019)

Step 1	Familiarisation with the data (transcribing and repeatedly reading)
Step 2	Generation of initial codes and aggregation of data into nodes
Step 3	Generating the themes
Step 4	Reviewing the themes, combining and rearranging nodes
Step 5	Defining and naming the themes
Step 6	Synthesis into empirical chapter

There are limitations inherent in thematic analysis. Interpretation of data is a subjective process, so different researchers may interpret the same data differently (Mays & Pope, 1995; Pope et al.,2006; Barbour, 2001). The potential for variations in interpretation led to a debate in the methodological literature about whether the data should be verified either by sharing transcripts and/or interpretations with study participants or a third-party researcher to check if the researcher has reached a reasonable conclusion (Mays & Pope, 1995; Barbour, 2001), thereby reducing errors of fact or interpretation (Lincoln & Guba, 1985; Bloor, 1997). Such independent validation has been used to confer respectability and build wider acceptance of qualitative research (Barbour, 2001).

In this study, it was not considered practical to verify the data by either approach. In the main this was due to time and resource constraints, but also because of the inherent subjectivity of the process; the interviews relied upon subjective accounts of the participants of their experiences and events. There was no guarantee that a different, rigorous interpretation of the data by the interviewees or another researcher would be any more valid than my own analysis. This conclusion is supported by Barbour, who argued that use of prescriptive ‘checklists’ to validate research (such as multiple coding and respondent triangulation) does not in itself confer rigour to the analysis (Barbour, 2001). Whilst there is no definitive answer about validity in qualitative analysis, it can be achieved by a systemic and rigorous

analysis, ensuring that all of the data is analysed and by considering all of the data, not just the elements which support the conclusions drawn.

Braun and Clarke argue researcher subjectivity should be 'understood as a resource' and this is embraced in their reflexive method of thematic analysis (2019, p.591). During this process, I was mindful to report only what was in the data, being aware of my own biases that might lead me to confirm my own preconceptions. This involved a constant re-reading of the data as arguments and themes were developed. Burnard et al. (2008) suggest actively looking for examples within the data that may deviate from the emerging theme, even if it is only one respondent, in order to test the strength of the argument. In addition, a detailed explanation of how the data were collected is provided in this thesis to enable other researchers to assess the value of my study. I have also been open in the reflexivity section about potential biases and influences upon my work and the consequent limitations of the interpretation. There is an opportunity for further research by testing the arguments and conclusions of this study with focus groups made up of communications professionals.

Data management

Data were collected and stored in compliance with all relevant legislation such as the General Data Protection Regulation of 2016 (EU Regulation, 2016) and Edge Hill University policies (2020). All data was password protected and will be retained until one year after publication of this PhD or acceptance to a journal article for publication, and deleted after this time. A data management plan was put in place for interviews whereby participant contact details were stored securely on a password protected account. These were not shared without permission or used for any other purpose than that for which permission was granted, i.e. this research. The interviews were digitally recorded, transferred immediately to a password protected computer and subsequently transcribed in full by me. The texts were stored and analysed on NVivo12 and individual participants identified by initials only. There was no data management plan required for the samples of documents as materials were selected and obtained from publicly available sources.

3.5 Ethics and politics

This chapter so far has explained my methodological approach and the rationale for the decisions I have made during the three years of this PhD. This section examines my approach to ethical and political issues that were anticipated when formulating the research and also which arose during the conduct of the research. These issues are important to consider because they can impact the integrity, quality and transparency of the research.

Approval was granted by the Edge Hill University Departmental and Faculty Ethical Review Committee in 2019. The submission provided an examination of the benefit and quality of the research proposal and conduct to ensure that 'Research should be worthwhile and provide value that outweighs any risk or harm' (Economic and Social Research Council, 2015). If the research is pointless or has poor methodology it is in effect worthless, so there is no justification for proceeding if one assumes even the smallest risk of harm to the participants, researchers and their institutions. In this research, the justification was the intended contribution to knowledge, and the quality of the research proposal was scrutinised in ethical review and by ongoing supervisory interventions and reviews. A number of specific issues were identified related to data security, consent, privacy and harm. Mitigation was put in place using documented informed consent and adherence to the General Data Protection Regulation (EU Regulation, 2016).

Most of the participants in this study could be defined as 'elites' within their organisation as they hold positions of authority and influence (Marshall & Rossman, 2015). However, this high profile also meant that identification of individuals was a potential risk to the research participants. In designing the study, the decision was taken to withhold the individual identity of the interviewees. This was to encourage greater openness and enable people to express opinions or suggestions about how their organisations currently engage with the public and how this might be improved. As the research involved asking individuals to be candid, the subsequent identification or attribution of specific quotations to an individual or organisation had potential to cause reputational damage to the individual or their employer.

Reassurance of the plans to mitigate this risk was important as otherwise participants may have been guarded or provided sanitised answers to questions in

the interviews. Participants were informed of this anonymity when they were approached for interview, as it was considered that this would increase the likelihood of their participation. However, due to the close-knit nature of the field, participants in these interviews were still potentially identifiable, despite use of anonymisation, and participants were informed of this possibility.

This research did not involve any of the areas that are traditionally associated with increased risk, such as use of human tissue, child participants, invasive procedures, justified deception, nor was there any need to withhold the purpose of the research from people participating. That said, my study is not entirely free from ethical concerns. In order to consider the ethical implications of my study I consulted the various frameworks and chose to work through them. There are a number of guidelines set for ethics in social research and I chose to use the guidance from the Economic and Social Research Council (ESRC, 2015) because they were directly relevant to social research. I also worked within the Edge Hill University (2020) guidance because my research was subject to the university's ethical review process.

Concern about research ethics was not limited to the formal ethical review process. Upholding high standards of ethics was considered over the whole PhD, from design to publication and dissemination of findings. This attention was necessary to anticipate and guard against any negative consequences for participants and their institutions, and myself as researcher. The nature of social science research in exploring and questioning social structures and processes means that there is potential for a negative impact on some of the research participants/organisations. There are a number of areas in which issues can arise and I will examine those which apply to this research in turn.

Before agreeing to participate in the research, individuals were provided with information about the study and then provided informed consent, verbally and in writing. The consent process noted the intent to protect their identities, but also acknowledged that it is not possible to completely eliminate the risk of identification. This was in line with ESRC guidance (2015).

The risk was mitigated in several ways. As previously noted, names and organisations are not included in this thesis and any publications; transcripts were

anonymised. As part of the preparation for the formal ethical review, all the risks identified in the ESRC guidance were considered and were not anticipated to be an issue for this study. This included potential for invasion of privacy and deception. In summary, not all risk can be eliminated – but it can be mitigated.

3.6 Reflexivity in this research

There is a dilemma when exploring one's own profession from an academic point of view; the apparent 'paradox' of being inside and outside of research at the same time (Bourdieu & Wacquant, 1992). In recognition of this, a reflexive approach has been taken to ensure realism about the objectivity of this work. Reflexivity in research is a process by which individual researchers raise their own awareness (through being introspective and thoughtful) of how their individual position, beliefs, habits and experiences can influence or shape the way they go about designing, implementing and analysing a research project. Reflexivity does not eliminate bias but creates self-awareness of it in the researcher. Such awareness of a researcher's subjectivity can be considered a positive if it is used to contextualise and enrich the approach to research (Gough & Madill, 2012; Braun & Clarke, 2019).

Reflexivity is a particularly important practice for researchers who have professional insight into the subject under examination (Sandelowski, 1993). Fairclough (2001, p.4) stated that:

> it is widely understood that people writing about social matters are inevitably influenced by the way they perceive them, as well as in their choice of topics and the way they approach them, by their own social experiences, values and political commitments.

He continued:

> I think it is important, not only to acknowledge these influences rather than affecting a spurious neutrality about social issues, but also to be open with one's readers about where one stands.

The concept of reflexivity in research was novel to me, having trained as a natural scientist. It has been argued that reflexivity is often overlooked in quantitative research as the scientific method and the data is considered to be objective

(Engward & Davis, 2015). The theoretical approach of Habermas invites reflexivity, and his concepts of knowledge interests and lifeworld served to make me more conscious of my own biases.

Discussing the impact of the researcher upon the research, Habermas said:

> The controversial relationship between the methodological framework of research and pragmatic function of applying the results of research can be clarified only when the knowledge-orienting interests invested in the methodological approaches have been made conscious. (Habermas, 1988 [1967]) p.14).

This section outlines my use of a reflexive model to capture how I have influenced this research.

Reflexive model

Use of a reflexive model serves several purposes: to improve the quality of research, establish credibility and make the researcher's position transparent (Patton, 1999; 2013; DeSouza, 2004). The Alvesson and Sköldberg (2017) model was applied to order my thinking and actions during the research process. I chose this model because it clearly outlines four stages (data collection, analysis, interpretation and communication), thereby providing some structure to this exercise. There is a danger with reflexivity that it becomes an ill-defined exercise, so use of a model provides a structure through which to use reflexivity to make the research process rigorous and transparent. The following paragraphs summarise the four stages of the Alvesson and Sköldberg (2017) model in relation to this research.

- **Data collection**: The nature and extent of the data collected are a direct result of my choices. The main body of data collected for this research was generated by semi-structured interviews and the major influences upon this were the questions asked and the participants selected. Initial interview guides were very detailed and precise, and as a result potentially leading. The questions were revised to be more in order to elicit longer answers and allowed me the flexibility to cover a wider range of subjects and so generate richer data. Participants were largely recruited by my professional network, as I sought input from people familiar with science communications and/or vaccines. Many participants were from my peer

group and some were former colleagues. I was mindful that this would affect the dynamics, aware that they may identify me as a colleague or an interested party rather than an independent academic researcher. I explained my role in these interviews clearly to participants as an academic, not a contributor. None of the participants expressed any reservations, and some saw my professional understanding of this field as an advantage as it ensured my academic research questions are embedded in real-world practice. To some extent the prior peer relationship was helpful because there was respect between all parties and a strong dynamic. The element of trust led to candid discussions in the interviews and a valuable co-construction of knowledge rather than a one-way flow of information (Berner-Rodoreda et al., 2020). The interviews offered the participants in the study an opportunity for reflexivity, which they welcomed. In the interviews I remained vigilant to remain in my role as researcher and to avoid lapsing into an unstructured discussion. The selection of documents for analysis was also influenced by my prior knowledge of the field, and the data influenced by the choices made in deciding which documents were relevant and which were not.

- **Analysis**: A number of my personal perspectives had potential to impact on the data analysis. As a researcher trained in the quantitative methods of medical and scientific research, I initially found myself disoriented by social science methodology, which is less structured and leaves more freedom to the researcher in how they approach their subject. I embraced the relative freedom of qualitative research and immersed myself in mixed methods to develop a better understanding of my field of study. As well as an area of challenge, it has also been an area for academic growth. This was particularly apparent during the literature review, which drew to my attention the major criticisms of the scientific method and of scientism by academics working in the humanities. As a natural scientist turned social scientist, I found myself in what I initially felt was an uncomfortable position of having a realist ontology yet developing an increased understanding that scientific knowledge and discourse is socially influenced. My enthusiasm for science remains but is tempered by a greater understanding of why the motives of science are so frequently questioned. This reorientation directly influenced my choice of Habermas's work as the theoretical foundation for the research. I was unable to embrace what I believe to be the

irrational relativism of the post-modern critics of science nor the arrogant excesses of scientism. In Habermas I found a pragmatic realist theorist, who believed that science was not perfect but could be rehabilitated, and who provided a basis to formulate a practical framework based around communications and rationality that could be used to investigate the approach of scientific organisations to controversies.

- **Interpretation of the context**: My interpretation of the social and political context of the study will undoubtedly have been influenced by a prior career working in communications for science-based healthcare organisations in the private and public sector, globally and in the UK. This experience directly led me to study whether there is a more constructive way to conduct debate about controversial science in public. My initial motivations for carrying out the research was to highlight the role played by anti-science organisations and to describe their contribution to the controversy over vaccine safety. It is fair to say that I was biased in favour of scientific organisations and had not actively considered their role in exacerbating these crises. However, the review of the literature identified new areas of research, challenged my assumptions and made me increasingly aware of the reality that the conduct and culture of the scientific organisations was also a major contribution to the problem. The literature drew my attention to the lack of reflexivity in the scientific community and led me to pursue this as my research topic instead. I became interested to understand how the power imbalance, culture and normative assumptions might be working against the system in the contemporary discourse environment, which challenges expertise, power and scientific knowledge. To some extent this whole project is a reflexive exercise.
- **Communication**: My experience as a communicator influenced how I conducted the research but also how I chose to write up and share my findings. Communication is practice-led and in my experience academic research has little influence into communications in real-world practice. One factor was how I represented myself: am I an academic or a communicator? They are not mutually exclusive, so I presented myself both as a communications professional with 25+ years of experience, and as a PhD researcher. The emphasis on the professional experience was important to build credibility to attract people to

participate in the research, and also the authority to convince people to listen to the findings afterwards. My role as a researcher was more prominent during the interviews, so that I could focus on the data collection. Another influence upon communication was a desire to make my PhD free of jargon and unnecessary complexity. I was keen to ensure that this PhD thesis met the highest academic standards, but also was readable and understandable for the audiences I was hoping to reach: both academic and professional. One of the interview participants noted how she was looking forward to reading my PhD because it was likely to be readable; this illustrated to me the gap between academic research and practice in communications. I also needed to be aware of my intent in disseminating the research conclusions. My objective is to clearly present observations that would create discussions and insight that could improve practice, holding up a mirror as a 'critical friend' rather than an enemy of the science community.

To summarise this section on reflexivity, my approach to this research has been influenced by my professional experience, education and scientific training. Reflexivity in qualitative research was important to make this explicit, thereby making any influences transparent to the reader. If a PhD is an apprenticeship to become a researcher, reflexivity is part of the development process and a way of consciously experiencing yourself as inquirer and respondent, becoming aware of how you work through the research process (Denzin & Lincoln, 2018).

Having shared the reflexive aspects, I will now move on to the limitations of the study, because 'the process of reflexivity identifies and acknowledges the limitations of the research' (Engward & Davis, 2015).

3.7 Limitations

The limitations of this study stem from choices made in the data collection, methods and analysis, which are discussed in this section. One of the limitations of this study is that it focuses on a small specialist group of people (science communications professionals). It does not include other senior managers in scientific organisations, nor does it include individual scientists. However, this focus can also be seen as a strength because this group is influential yet not studied to date. The use of

purposive sampling for recruitment of participants is effective to gather the insights of the target group, but the sample group is likely to contain the people who were easier to access.

As with all qualitative methods, the use of interviews has some limitations related to knowledge generation, such as how individuals recall and construct events, selection bias or the role of the interviewer within the interview dynamic. Different interviewees will interpret questions in different ways, so the data may be inconsistent (Mason, 2018, p.113). Similarly, the same individuals may construct their accounts in different ways outside of the interviews, or for different audiences. As a result, this research produced data that was indicative (but not representative) of broader trends (Bryman, 2016) and the findings may be transferable to different contexts but are not generalisable (Lincoln & Guba, 1985).

It should be noted that academic literature on the COVID19 crisis is still emerging, so this section draws heavily upon my observations, media reports and commentary articles in journals.

3.8 Conclusion

This chapter has described and justified strategic decisions made during the research design process. Key methodological literature has been included to support this description and situate this research in the context of wider methodological discussions. This research is designed to answer the overarching question:

> **How do we explain and understand the dissonance between competing and conflicting voices in areas of controversial science?**

And two sub-questions:

> **Q1**: How are policies and strategies for engagement and communications activities during public scientific controversies influenced by the culture and interests of the organisation that they represent?
>
> **Q2**: To what extent is the deliberative ideal behind programmes of scientific engagement distorted in practice, and why?

In this chapter I have explained the research design to answer these questions. I have highlighted that there have been several changes of approach and linked my decisions to the broader literature. Ethical issues relating to consent and identification have been considered and the risks mitigated. This chapter also included an opportunity to apply a reflexive methodology that elaborates my impact as the researcher on this thesis. Finally, it is important to note that this research was conducted during the coronavirus pandemic, which placed particular stresses upon the participants in the research, and the researcher; but this also made the research more topical and the findings potentially more pertinent. The focus upon the role of the scientific establishment in scientific controversies was to provide useful insights that will improve practice.

The first part of this thesis has summarised the context to this issue (both vaccination and public engagement in science), the theoretical approach and the methodological process. The rest of the thesis moves into the analysis and details the empirical findings.

Chapter 4 | Clash of the lifeworlds: Research findings and analysis

4.1 Introduction

Much of the existing research into how science is communicated has been among either anti-vaccine activists or scientists. I chose to gather the experiences and opinions of professional communicators who have worked within or provided consultancy to scientific organisations. My hypothesis was that they would offer a different perspective on the subject due to their senior-level experience and close involvement in setting and implementing policy – and this proved to be the case. The participants in this study not only provided a rich and thoughtful commentary on what goes on behind the scenes when a high-profile science controversy unfolds in the public sphere, but also provided insight into some of the cultural, structural and systemic issues faced by those in the front line of a communications crisis.

This chapter presents my research findings and highlights areas of consistency and divergence with the literature discussed in Chapter 1. The chapter is structured around the theoretical framework of the 5Cs laid out in Chapter 2 that were derived from the writings of Habermas. I will share the major findings from my analysis of the data in these five categories:

- the **context** in the public sphere
- the **conduct** of communications activity
- the **content** of the discourse
- the epistemological **construction** of knowledge
- the **competence** of participants in the discourse.

Each section in the 5Cs includes a brief reflection and discussion section where I will draw upon my own experience as a communicator to discuss the significance of these findings for the practice of science communications and engagement. Finally, I will explore how the findings in each category combine to influence how scientific organisations approach public communications and engagement on controversial science in the UK in the present day.

The quotations included in this chapter are illustrative rather than comprehensive. They do not represent the entire data set relating to that theme. The 16 participants were numbered P1 to P16 so as not to disclose their identities. Given that science communications is a relatively small field in the UK, the quotations do not disclose participants' institutional affiliation in order to protect their anonymity, although the sector is included where it is pertinent.

4.2 CONTEXT of the discourse: Further degeneration of the public sphere

Habermas's *The structural transformation of the public sphere* (1989) described the conditions in the public sphere at the time and highlighted the increasing dominance of mass media and a hierarchical model of societal communication. In the 1990s he declared that he may have been too pessimistic, but given today's context, one could argue that he was not pessimistic enough. Whilst society has probably never lived up to the ideals expressed by Habermas in his theory of communicative action, I would classify the current post-truth standards in political and societal discourse as a very serious further degeneration in public discourse since the 1980s.

For those working in the field of science communications, the emergence of social media has created a more fragmented and complex set of public spheres through which to navigate. Combined with a rise in political populism and an associated undermining of expertise, a rise in disinformation, conspiracy theories and a disregard for facts, the context for rational discourse about science is now extremely challenging. But my participants believed it was still possible.

Changing conditions for public discourse

The participants noted changes in the discourse environment that made it more difficult to have rational discourse about scientific subjects of controversy, such as vaccines. **This context is well-documented and the experiences of participants in this study were entirely consistent with the literature summarised in Chapter 1.** They reported issues with trust in science, government and experts and described how deference has given way to hostility to experts and institutions.

> **P8**: … but so much of that became boiled down to who cares about and trusts experts. [People are saying] 'Who are the "experts" to tell us what to think, or what we should think?'

A number of the participants spontaneously mentioned BREXIT as being directly relevant to the issues faced in discussions on controversial science. The events of 2016 were seen as a major contributor to a further deterioration in the public sphere. It was noted that populism was driving anti-intellectualism and that a stoking of differences was driving increasingly polarised debates.

> **P15**: We are operating in a post-BREXIT ... environment. Anti-government and anti-various groups rhetoric is floating around … I think it's been exacerbated by BREXIT, and if COVID had happened pre-BREXIT it might have been easier.

They also noted a reduction of standards in public life, whereby people in a position of influence or power make claims they know are unsupportable or untrue with no consequence. These powerful individuals use their fame to give credibility to misinformation.

> **P6**: The thing is when you get people in power – positions of power – saying those things, then it becomes really difficult, doesn't it? When you've got the Donald Trumps and the who-evers, questioning and questioning and saying ridiculously unscientific things or questioning their scientists.

The speed of social media and dissemination of misinformation is now a major challenge for scientific organisations**.** Social media has opened up direct networks of communications between activist groups and the public, bypassing formal and more hierarchical communications channels generally provided by scientific organisations. Organisations find themselves unable to keep up with this highly networked, informal communication environment.

> **P7**: I think the main challenge is speed. Because I think the way the online world has changed the status quo for health disinformation is speed – and speed at which people expect to receive information when they seek it out is just a lot quicker than it used to be. And that means that vacuums of good information appear and become filled by bad information very quickly and that's, I think, what we saw in a large part with coronavirus.

This inability (or unwillingness) to respond quickly, and the resultant information vacuum, is not unusual as scientific controversies start to unfold. The participants drew parallels between the MMR vaccine crisis in the 1990s and the COVID19 pandemic.

> **P9**: It is important to remember that it took the Department of Health six weeks to respond when *The Lancet* paper came out about the MMR vaccine, and during that six weeks people didn't just say 'Well, let's hold on and wait to see what the Department of Health thinks'. Newspapers were running front page stories and people were cancelling their vaccination appointments. Alternative doctors were putting forward their alternative theories and their individual vaccines and that kind of thing … it was all starting to happen. And again and again, we see the same thing … now with coronavirus.

Often the logical reason for not communicating is that there is no new science, or the position is not clear. However, tactically, interim measures could be taken to provide some useful information, and crisis leadership.

> **P7**: And that is not an easy fix [for] scientific organisations, because they can't speed up the good information appearing. But I do think there are ways to fill that vacuum with evidence and responsible information that isn't necessarily new information. Taking coronavirus as an example. They were not going to have enough information about coronavirus to fill that gap with coronavirus-related information, but they probably had a lot of relevant, useful, responsible information about pandemics and about other similar viruses and about National Health policies and public health guidelines ... the stuff that was readily available. And I think there was such a delay because of a desire to get new evidence-based information about coronavirus out to the public. There was just an enormous vacuum; a gap between when that was able to happen and everything that happened in between. I see that as probably being the biggest challenge.

The communication that does occur early on in a scientific crisis is often driven by governments and politicians, who are seeking to reassure the public, and also protect their own interests. Participants observed that scientists should not delay communicating until they had all the facts, as they could provide useful information about *what is known* in the interim.

Politicisation of science, and vaccines specifically

All of the participants noted an increase in the influence of politics on science communications (especially when controversial, such as vaccination or the various issues around COVID19). The interviews took place in the summer of 2020, which was relatively early in the pandemic, and tension between government scientists and politicians was speculated (Sample, 2020; Oliver, 2020). The UK government frequently claimed to be 'following the science', which implied that policy decisions were being made based on scientific advice (Ramakrishnan, 2020). This was perceived as politicians deflecting responsibility for unpopular decisions to their scientific advisers.

> **P12**: [I] think it has got incredibly muddled and 'follow the science', well, you can't follow science because, half the time you don't have the science, so these are actually political decisions that are being made. But it got totally blurred and that has led to both I think a problem with trust in government and how the decisions were made and may have led to a problem with trust in the senior scientists.

One participant highlighted that this blurring of science and policy had happened before during the 'mad cow disease' (bovine spongiform encephalopathy (BSE)) crisis in the 1980s, and that lessons had not been learned about the need for a very deliberate separation between the scientists, who are analysing data, assessing risk and making recommendations based on data, and the people making decisions based on social and political considerations *beyond the science*, as well as an evaluation of the expert recommendations:

> **P12**: There has been a breakdown between the science advice and political decision-making and no one is clear who is making the decisions. You needed absolute boundaries, very clearly that this was SAGE[6] advice, science advice and it was going into COBRA[7] but these people [politicians] make the decision.

[6] SAGE is the Scientific Advisory Group for Emergencies to the UK government.

[7] COBRA is the name for UK government meetings held in the Cabinet Office Briefing Rooms.

Participants noted how science and health announcements from the state NHS were used by the government politically, and that this became particularly evident during the coronavirus pandemic. An example was the blame apportioned to Public Health England for failures in containing the virus, which eventually led to the government criticising and disbanding this key organisation in the middle of the pandemic. Many felt this to be a strategic action and a way of deflecting public attention from the failings of the government:

> **P6**: The whole approach [in NHS England Communications] is to play one side off against another, to brief against one side. I think that's the culture of the organisation in many ways. It has become very politicised now. The whole thing that is happening with Public Health England is politics. They are a scapegoat for the failings of the government really, to make it work.

Whilst science as a whole is politicised, certain issues have been used to create political capital – and vaccines is one of them. Whilst vaccination raises questions about individual freedom of choice and state intervention into personal medical decisions, this moral question is then exploited to build political support for other causes or to cause disruption: as noted in section 1.4, there is evidence that Russian-based companies spread anti-vaccine information during the US elections in 2016 to cause dissent (Broniatowski et al., 2018). Vaccination has been political since the Compulsory Vaccination Act was introduced in England in 1853, but the recent resurgence of anti-vaccine sentiment can be traced to the MMR vaccine crisis in the 1990s (outlined in Chapter 2). A number of participants commented upon their experience of the original issue in the 1990s and the use of the discredited research by the mainstream media to criticise the government by fuelling the scientific row:

> **P14**: That's how [media outlets] saw it, no particular conviction about the vaccine, just that this was a great stick to beat [the government with].

> **P12**: At the *Guardian* and the *Observer* at that point there was a lot of scepticism around MMR and whether there were things that people knew that they weren't saying.

The media coverage during the MMR vaccine crisis damaged vaccine confidence severely in the long term. It also damaged the relationship between media outlets and scientific organisations. The ramifications are still being felt today as a number

of participants pinpointed it as the time at which the relationship between institutional press officers and reporters was damaged for the long term.

> **P14**: [The government was] utterly defensive, honestly hated the journalists. They said to us that they hated journalists.

> **P11**: I was hired … and literally the brief was 'just man the phones and keep the reporters away'.

Ultimately, participants felt that productive relationships between scientific organisations and the media is really important for communications, and open antipathy is unhelpful for the public sphere. They felt that it was important for organisations to respond to issues raised by the media on behalf of the public and not just to see the media as an instrument to distribute propaganda.

> **P14**: You have to have a culture of openness in organisations where their press office feels some kind of imperative to help journalists. And the culture in government organisations is 'defend, defend, defend'.

The media is not the only group that has used vaccines politically. The Trump US election campaigns of 2016 and 2020 used vaccines as a scientific populist cause to capitalise on their agenda:

> **P4**: They [the Republican party in the US] were just throwing enough mud to see what stuck and they were obviously getting enough traction with it [vaccines] so they carried on ... I'm sure there were lots of things they also got some traction on as well … I think the objective is to make people into Trump supporters, or in this case Joe Biden or Hillary; leave or remain; and sow division; and as part of that, you can do vaccine hesitancy or vaccine believers, Liverpool fans and Everton fans, I don't think it makes that much difference.

This behaviour is not limited to the US. Use of vaccines has also become politicised in other countries with populist politicians, including Italy and Kazakhstan.

> **P4**: I remember places like Kazakhstan where there's a big anti-vaccine lobby, it's run by a dictatorship and there is a weak opposition and they use whatever they can, sometimes vaccines get thrown into that.

Participants recognised that science can sometimes become embroiled in wider disputes and used opportunistically to further instrumental goals. As a result of this, and participants' experiences with vaccines, participants predicted widespread politicisation of the COVID19 vaccine when it became available (the vaccines were still in development when the interviews were conducted).

> **P4**: It will definitely happen with COVID19 if we get a vaccine. It will have been developed quickly and let's say it's 100% safe, we start giving it to hundreds of millions of people and shortly after somebody will have something go wrong that might have nothing to do with the vaccine but that won't matter, and it will be 'Oh, I took a vaccine and shortly afterwards …' So, I can see in the next two [years] ... that we will go from 'Everything is fantastic, isn't this great?' and whoever nationally did it 'this country is brilliant', or 'scientists are brilliant', 'everything is brilliant', 'isn't the government brilliant?' and then two years later 'Oh, look, someone's got a rash or something, whatever'.

This prediction was correct. The COVID19 vaccine has become very politicised in the first half of 2021. For example, the successful UK procurement and vaccination programme was publicised widely by the UK government. The vaccine developed by the *global* pharmaceutical company AstraZeneca with Oxford University was described by politicians in nationalistic terms as a 'UK vaccine' (Wearmouth, 2020). As noted in Chapter 1, the vaccination programme became embroiled in BREXIT politics and public squabbles with the EU over vaccine supply, with a number of EU governments and US government experts casting doubt on the safety and efficacy of the Oxford-AstraZeneca vaccine (Samuel, 2021). Powerful authorities with enormous influence have undermined public confidence in the vaccines that are vital in their efforts to contain the virus until the end of the pandemic. It appears that national governments are doing the work of anti-vaccine groups for them in a collective act of self-sabotage. It should be noted that the same governments demonise the anti-vaccine groups and blame them for reducing vaccine confidence. This leads to the question of how influential anti-vaccine groups really are.

Anti-vaccine groups are not the primary concern

A number of participants working on issues constantly didn't really perceive anti-vaccine groups as the primary concern. Whilst the participants were aware of the activities of anti-vaccine groups, they were unsure how influential they really are on the general public. This is consistent with the literature, as described in chapter 1.2 (Blume, 2006; Capurro et al.,2018; Rimmer, 2018). There is a suggestion that 'anti-vaxxers' are the subject of a manufactured moral panic. As noted in section 1.2, Cohen (2002 [1972]) described how those in a position of power marginalise a group in the public imagination, so that solutions to the issues they raise are never discussed. In this case, anti-vaccine groups are being held up as a scapegoat for a fall in vaccine confidence, in an ongoing narrative for media and politicians. The MMR vaccine crisis was described in this way by one participant, who blamed the media for the subsequent fall in vaccination levels:

> **P14**: It was an agenda; it was an agenda of certain papers – so it wasn't anti-vaxxers; it was something completely different.

Earlier in this section I described how the activities of politicians had undermined confidence in COVID19 vaccines. However, the fall in vaccine confidence is not the only reason for a fall in the uptake of vaccines. Another (less publicised) reason relates to the health system, which does not always meet the needs of the lifeworld. For example, the vaccinations services offered by the NHS are inconvenient or inaccessible to some people. This was recognised by Blume (2006) who also argued that taking anti-vaccine groups more seriously, would mean that healthcare providers would have to engage with parental concerns about choice, informed consent and dissatisfaction with the vaccination schedule. Participants agreed:

> **P1**: So many more women work now than they did when vaccines first came out … the world has changed ... it's bloody inconvenient now … so ... and we haven't changed the system, [it] has stayed the same … you've got to try and interact with it.

Further supporting evidence is provided by a recent study by the National Audit Office (2019), which concluded that anti-vaccine groups were less influential upon failure to vaccinate children than the lack of availability of appointments at convenient times. This finding is somewhat different to the prevailing wisdom that

anti-vaccine groups are largely responsible for undermining vaccines. Whilst they are not benign, it is clear that vaccine hesitancy and refusal in the general public is driven by a number of factors, and that these include the use of vaccines as a political 'tool' for ideological or commercial reasons, and institutional failures in the provision of health services by the government.

Discussion: CONTEXT

The public sphere and the communications environment have been changed by populism and the politicisation of science. The use of vaccines as a political football within this context is disastrous for public health and vaccine confidence. The increasing politicisation of science over the time of COVID19 is of concern. Science has become a powerful propaganda tool and source of legitimacy, which governments are unlikely to surrender (Habermas, 1971). Governments in dispute over vaccine supply issues and issues relating to BREXIT seriously damaged public confidence in the Oxford-AstraZeneca COVID19 vaccine in 2021 by emphasising safety concerns in a political move that could undermine the entire COVID19 vaccination programme globally (Samuel, 2021). In this context, the anti-vaccine groups have become a focus for a moral panic, which derides or scapegoats certain groups for their ideological or political positions. This serves to distract attention from other important contributing factors to vaccine hesitancy.

4.3 CONDUCT of discourse: Influences upon outcomes

Most science communications are instigated by scientific organisations or governments who have an interest in the subject concerned, and the outcome of the discussion. As a result, the scientific lifeworld influences the conduct of the research. This is unsurprising when one considers the description of the lifeworld (in section 2.3) as:

> the set of intuitive skills, competencies and background knowledge that people use to make sense of the world.

Communications between two lifeworlds becomes problematic when the information provided does not make relevant sense in the lifeworld of the listener. The process by which these interactions are conducted can influence whether the outcome is a true result of a communicative process, or an instrumental outcome based on

strategic action. The conduct of communications is of interest in this study because Habermas challenged the *process* of rational discussion, not the outcome. He invited people to reflect upon how the conditions for discourse can influence the outcome. The 'ideal speech situation' described by Habermas and its application in discourse ethics is intended to ensure that the voice of the lifeworld is heard and that the debate is rational, but it also takes into account people's social, moral and ethical values.

This section shares findings on how scientific culture influences the conduct of communications. I will also illustrate trends emerging in how communications has evolved in recent years within science organisations. Many of these changes have been made in response to the challenges posed by the difficult discourse conditions in the public sphere. This is the largest section in the 5Cs, reflecting the insight that the participants were able to provide on the workings of communications within the scientific establishment in the UK. The main findings in this section relate to two main areas:

- the influence of culture upon how scientific organisations communicate
- changes to how communications is conducted by scientific organisations

The influence of culture upon how scientific organisations communicate

The participants described the pervasive influence of organisational and professional culture (or lifeworld*)* upon their organisation's approach to engaging with the public. This culture is already widely described in the literature. The most frequently mentioned comments from participants related to an element of paternalism and elitism that still prevails in the scientific and medical professions to some extent.

> **P3**: It's a natural result of that paternalistic culture … they're slightly extreme words but that sort of 'elitist' culture in a soft way, the idea of a 'them' and 'us', the idea of 'those that know' and 'the masses'. So, it's a natural manifestation of that and it definitely gets in the way.

The assumptions made about the skills, competencies and background knowledge about the layperson's lifeworld influences how engagement and communications are conducted. The paternalistic and expert-led model is now being challenged by changes in society and policy demanding more public involvement. However,

participants said that there was still an assumption of a deficiency in the population's knowledge that means that they don't understand scientific positions. This prevailed over considering the layperson's information sources, their influences or the manner in which their questions are being answered. Participants noted that this criticism was often rejected by the scientific establishment who persevere with hierarchical communications:

> **P3**: They feel that [criticism is] slightly populist and oversimplified, and what they need to do is 'apply expertise' and 'govern' this [problem] in a high quality way. And sometimes that's gripping the problem too hard, I think.

This indicates a lack of reflexivity. Universally, the participants agreed that there was little reflection in the scientific community about how they were contributing to scientific controversy by the way in which they communicate and engage with the public. This is consistent with the literature, which describes a culture that is perpetuating a 'deficit model' of information provision and education described by Wynne (1993) instead of switching towards a policy of engagement and co-creation, as advocated by science policy-makers since 2000 (Science and Technology Committee, 2000). They described a persistent expectation within scientific institutions that the public would have an 'epiphany' once they were informed of the 'facts'. This is described in more detail in section 4.5 on construction of knowledge.

The communicators advocated for a more iterative approach that engaged with audiences on their terms and *served* audiences rather than instructing or directing them. They emphasised a need to listen to people's lifeworld concerns and 'hear things they don't like; it doesn't mean they aren't right'. Unsurprisingly, this group of individuals regard direct engagement as valuable and necessary given the increasing polarisation in the media and on social media:

> **P2**: Maybe it becomes increasingly important to have these kinds of conversations because where there is controversy on an issue there are small spaces where you can have sensible conversations about something where nobody else is having sensible conversations. That's why deliberative processes are so valuable because if you can get people to sit down and actually have proper conversations and hear from a range of people with a

> range of different views in a completely non-combative situation, they go on a journey.

This group of individuals are active champions of public engagement within their organisations and noted that whilst there are pockets of excellence, particularly in the NHS and public sector as part of policy consultations, it is not yet the norm. There are many barriers, which are explored later in this chapter, but one is cultural because it involves a shift from *telling* to *listening and co-creating*, and giving up some of the authority and power enjoyed by expert organisations.

> **P9**: The reality is that if you are serious with engaging with the public, you will lose something. In the long run you might gain; you will gain skills, you will gain confidence, you will gain a field you can work in, a society that you want to live in and all those things. But in terms of the transaction, you will lose something. You either have to put more effort in, or you find yourself more accountable and have to explain yourself more; you might actually have to give up some element of influence and control over the discussion that is had about your research. Just recognise that that's the transaction, otherwise why would anyone else come to this? The only reason that people are coming to this is because they get something from you, they get information, they get accountability, they get some sort of seat at the table.

An undertaking to public engagement is also resource-intensive. P8 explained that it takes a long time, effort and focus in order to truly, genuinely understand what the public is telling an organisation. Participants also observed that it can then be difficult to convey that information through the hierarchy of an organisation in a way that is meaningful and actually delivers change.

The final step in this process is to 'have the bravery to communicate back out again' about what has been done as the result of engaging with the public. This can be daunting as many organisations operate in a way that is far removed from members of the public. Because it is culturally daunting, those who worked directly with the public felt that the process was being made overcomplicated because the scientific organisations have now developed a whole 'science' of how to interact with the public:

> **P9**: I wonder how far along we've come? Loads of people have been to public engagement conferences, loads of organisations [have] ... a special day of their annual three-day conference dedicated to public engagement. But what have they really done? They've got academics in who are experts in public engagement, putting on slideshows about how to do it, make it look incredibly complicated and make you forget that it's public engagement, it is that conversation you have with your brother-in-law at Christmas about what it is you do in that lab … and instead make it look like it's a whole science unto itself, and it's incredibly scary because you could get it really wrong and let's look at all these other slides that'll show you 'when it all goes wrong'. And this is delivered to you by STS people who have never themselves gone out and persuaded anyone of anything, and they are now telling you what the theory is about how to do that.
>
> We need to improve our social imaginations about how to have these conversations, have confidence with each other and that kind of thing. A lot of what we're talking about is being a good human being, speaking in human language and when it comes to working our way through what the issues are and how to talk about them, we have perhaps overly complicated that and made it into a subject of study. In the sense of, not studying it as a phenomenon or historical development, we have almost … over professionalised it.

This positioning of public engagement as something risky and complicated is also related to the increasing professionalisation of communications and engagement teams. The change to how communications is conducted in scientific organisations was also a significant theme and is discussed in the next section.

Changes to how communications is conducted by scientific organisations

The features of the contemporary discourse environment around science referred to in 4.2 and summarised in Chapter 1 create great difficulties for scientific organisations. Experts are historically used to being afforded a great deal of respect, unquestioning acceptance and deference. Scientists are now compelled to engage with the public and listen to their concerns, yet individuals and their institutions can find themselves ill-equipped and overwhelmed by a public sphere dominated by irrationality, division, hostility and disinformation.

The participants all expressed a strong sense of obligation for their organisations to communicate about science. They described their duty to communicate in order to justify investment in research, demonstrate transparency and to build trust and credibility. It was considered to be a moral obligation, although the necessity of publicity in maintaining funding and support was also cited as a strategic objective. A key theme in the interviews was how communications as a function and a profession has evolved in recent years within science organisations. Some of these changes have been made in response to the increasing demands for communications from stakeholders, but also to meet their organisational objectives.

Corporatisation

Research is conducted in many different settings across government, academia and NGO sectors. Although these operate very differently, participants noted a move across all sectors towards a more instrumental approach to communications. Communications is now more likely to be a centralised management function and has more focused priorities than was previously the case. These factors align the communications function more closely with business goals and is usually observed in commercial organisations, leading to what could be termed the 'corporatisation' of communications across all the sectors. In Habermasian terms this can be described as a colonisation of the scientific lifeworld, whereby the substantive goals of science communication – to create dialogue about the nature of research – are unconsciously impinged upon by system imperatives to use communications instrumentally to generate income or to build a favourable reputation.

Participants noted a particular shift in universities. In higher education there has also been a change in how communications is organised in recent years in line with wider changes, whereby universities operate on a more commercial basis and are financially reliant upon undergraduate student tuition fee income rather than direct government funding. In place of the traditional press and communications office, most universities now have a marketing department combined with communications.

> **P14**: They [universities] have moved away from media … if you get someone friendly who is honest with you, it won't be an attractive story. It will be 'We were down on students; the head of marketing was moved over to be in charge of Comms' or 'Comms is in the service of marketing'. You can tell that

> what's happened here is they've stopped answering the public's questions about science because it doesn't fit the need of getting more students in and that's about the universities' funding.

This altered focus is reflected in recently advertised university role descriptions (see Appendix 4):

> *Uni job description*: The Director of Marketing & Communications is responsible for the strategic development and operational leadership of marketing and communications activity across the University. You'll provide strategic leadership to the team, with particular view to meeting the University's ambitious growth strategy aligned to the University's 2025 Strategic Plan, which raises the profile of the institution, builds brand awareness and drives undergraduate and postgraduate student recruitment.

> *Uni job description*: The department's priority is ensuring excellent levels of lead generation and conversion to support strong enrolment each intake, whilst supporting development of a strong internal staff and student community through engaging and inclusive communications.

This is driving a change in the skills profile of people working in the profession. One participant described an occasion when they had reviewed a new job description for a senior communications role in the public sector. They complained that the skillset required would not attract people who were skilled in areas they believed to be important, such as building relationships with reporters:

> **P14**: If you put a job advert like that out what you're **not** going to get is somebody like one of my team who loves talking to journalists – they're not going to get the job for a start and they're not going to want the job, so you end up with people who are very, very different.

The recruitment of people with different skills reflects the change in the focus of these roles to meet the instrumental goals of the system, rather than meet the communicative needs of the lifeworld. Participants in this study were concerned that the focus on marketing universities to their 'customer' base, i.e. students, was diverting resources away from science communications conducted by a press officer to publicising new research findings, connecting the media with academic experts and guiding scientists on how to engage productively with reporters and avoid being

misrepresented. But higher education is not the only sector to have undergone significant change.

Centralised control

In government organisations, changes have created greater centralisation of communications across publicly funded bodies. Science is central to many of the UK's economic ambitions as well as public health, with an intent to grow a 'knowledge' economy based on science and technology, with a particular focus on pharmaceuticals and the biomedical sciences (Department for Business, Energy & Industrial Strategy, 2017). Science is also increasingly politicised, as noted in section 4.2.

The recent changes to government communications functions have centralised and aligned civil service communications roles in line with government priorities (Government Communications Service, 2020). The direct supervision of communications was brought about in 2020 with the strengthening of the 'Government Communications Service,' described as 'the professional body supporting ministers' priorities'.[8] Documents related to roles in the new service indicate that communications jobs are not public facing but politically aligned. This is reflected in a recent example of a civil service job description from the Department of Health and Social Care (DoHSC):

> an area demanding strategic oversight, leadership, political nous and innovation, whilst leading the communications on one of the government's highest priorities.

One participant noted that these new roles did not appear to prioritise communications with the public.

> **P14**: We got the advert and … it didn't mention press once, not once, and it didn't mention the public once – and this was [public body] – it was all 'strategic comms' and 'meetings with ministers'.

[8] Government Civil Service website: https://gcs.civilservice.gov.uk

This is important because there is also a danger of political goals overcoming the core duty to communicate. An example was given of the UK government's disproportionate focus on reactive fact-checking and debunking negative stories about the government instead of proactively providing clear information to the public.

> **P9**: With coronavirus we see the Cabinet Office sets up a unit to tackle misinformation and they are busy talking about the need to take David Icke off YouTube and find ways of policing WhatsApp groups, and no one is actually saying 'Hang on a minute, you don't just take away misinformation without putting information in its place'. What you have just done is, you have put the whole country indoors at home and most of them are off work or to some degree not busy in society in the same way, kids are all off school and they are not going to be sending each other WhatsApp messages saying 'Stay safe, stay alert' – they are actually asking questions and looking for information and they need a whole lot more information to make decisions and start processing this experience for them and the people around them than they are being given.

On a practical basis, one of the participants complained that during the COVID19 pandemic, the centralisation of communications in the UK government was overwhelming their staff and creating a 'logjam' that meant communications were not published in a timely way. People working in medical organisations described how they had produced guidance and information for the government and when it was submitted 'nothing happens'. P11 said: 'It needs to go on their [NHS] website to tell people and then there is a logjam their end, and so nothing is communicated.'

> **P12**: So, they [NHS England/DoHSC] are increasingly asking organisations like ours [professional body] to do the communication. And so there has been a shift. In the beginning, they were very much in control of communication … That then shifted, the communications part became increasingly unable to deal with the workload or whatever it is that is stopping them dealing with it … they are increasingly coming to us to do that and there is a certain amount we can do ... but if it is NHS advice it should be on the NHS website.

As well as government departments, participants noted how there had been more government oversight of communications from state-funded organisations such as the NHS and associated bodies such as Public Health England, UK Research and

Innovation (UKRI) and arm's length bodies such as the Care Quality Commission. Whilst there was always a level of co-operation and co-ordination between these bodies, they were previously more autonomous and independent in their communications.

Most participants saw the establishment of more focused and aligned communications functions as a positive move for the profession and an opportunity to make science communications more strategic and professional. This professionalisation enables an increasing focus of scientific organisations on their proactive strategy, enabling them to be more impactful in chosen areas and to avoid being distracted into lower value activity that does not further the goals of the organisation. However, by its very nature, this approach can prioritise activities that are instrumental and may lead to what Habermas called strategic action dominating communicative action.

Requirement to demonstrate financial 'value'

Alignment with business goals can actually result in public engagement activities being stopped completely. When communications activity is directly connected to commercial goals the department usually has to compete for budget and demonstrate a financial return. Communicative action and true deliberative processes take time and effort. Done well, the involvement of the public can transform research, but many engagement activities are long term, have no clear outcomes initially, even though they may save money in the long term. Obtaining funding for open-ended work is usually only possible where there is visionary leadership or mechanisms to access non-restricted funding via external sources; an example of this was provided by one participant who is embedded within the NHS supported by a non-restricted grant from Wellcome. Wellcome is the largest funder of public engagement with science in the UK. Other major funders include the National Institute of Health Research and UK Research and Innovation (Holmes et al., 2019).

Instrumental use of public engagement

When research funding is conditional upon public engagement, it can lead to strategic action. As noted in Chapter 2, the incorporation of public engagement into research grant conditions and the research excellence framework (REF) created a tick box mentality among some scientists (Boaz et al., 2016). This is an example of colonisation of the lifeworld, where a well-intentioned target is subverted so that the focus is switched to low-value and low-impact engagement activity to fulfil targets instead of achieving the intended outcome of engaging meaningfully and democratically with the public. This phenomenon was also described by the interview participants, who expressed discomfort with engagement activities that sought to influence rather than really engage. Some noted that this approach does not work in any case.

> **P2**: So, if people think 'Well, this is clearly information coming from a particular perspective, where are the other points of view?' so if you can't go 'That's really interesting, we will find somebody. What is it you want to hear about?' If you can't do those sorts of things, then people will immediately assume it's a setup. People are smart and they can smell a rat very quickly.

One interviewee (P9) described instrumental consultations as a 'search for deference by a new name' whereby organisations realise that they need to assure their position with a broader public licence than just 'the fact that governments like them' and then arrange consultation meetings with the public to explain 'how brilliant they are' without considering what a member of the public would gain in that interaction, or more importantly what their organisation might gain too.

Impact on reactive work such as issues and crises

As well as the increasing move to instrumental goals, participants were also worried about the unintended consequences of a more strategic approach to communications. The main worry was that organisations were removing their responsibility to deal reactively with controversial and messy areas of science, leading to a reduced ability to manage issues and crises. More than one participant lamented that an increase in professionalisation was leading to the disappearance of skilled press officers and senior science communicators from the profession,

reducing the ability of organisations to react to events and issues. An example cited was the patchiness in proactive press work by universities during COVID19:

> **P14**: I would like to know why 10 different universities did nothing on COVID externally, zero. Whereas some really ramped up, they saw this instantly as a way to raise the profile of their university, whereas others were utterly unavailable.

The withdrawal of many universities from this work has created pressure on the NGOs who *do* continue to offer a press office and liaison service, such as the Science Media Centre, which has ended up being the most active press office in the UK during prolonged issues, such as the MMR vaccine crisis, climate science and the coronavirus pandemic:

> **P12**: I think during COVID19 the Science Media Centre has essentially been the conduit for *all* the covid information, data discussions. They've had meetings where they've had 50 journalists on, to try and fill them in on everything from masks to testing.

This reduction in scientific organisations' willingness to respond to questions, provide reliable information and expert interpretation of events reduces the ability of the public to make sense of events as they unfold. Although voluntary organisations can fill the gap to some extent, it does leave a vacuum that can be filled with misinformation, speculation, rhetoric or political propaganda.

Reduction in the media's access to information and spokespeople

The worrying consequence of increased government control over communications from public sector organisations is that there is increased government vetting of communications about science and health during a crisis, removing the autonomy of public bodies with respect to press activity. This was predicted by one contributor:

> **P14**: It means that No10 [the UK Prime Minister's office] will have to see every press announcement and that is tragic for the [public body]. And that … is exactly what happened.

It was also widely reported, during the COVID19 pandemic, that NHS trusts were gagged, and healthcare professionals were disciplined for speaking to the media or posting on social media (Oliver, 2020). This has reduced the amount of commentary

and access to information and independent spokespeople by the media to validate claims being made.

There is also a trend of organisations being selective about which media outlets they will work with. The reasons for this could be related to several factors:

- the proliferation of media outlets, which has driven up demand
- they will select who they speak to on the basis of their readership as part of their more strategic approach
- they will not engage with some outlets because of their editorial stance, or if the publication is highly polarised or sensationalised.

Many participants described unsuccessful or counterproductive attempts to engage with tabloid newspapers on pro-vaccine stories. Participants reflected upon an increasing trend in scientific organisations to seek out friendly publications or communicate with those who are already well-disposed towards science, or at least likely to publish a balanced story.

> **P12**: Pharma normally decides that there are just a few journalists that they will deal with and talk to those papers. So, at [Company X] they talked to the *FT*, they talked to the *Guardian*, talked to *Bloomberg* and *Reuters* when necessary but the general press ... absolutely not really. And the really big surprise when you go into a major corporate is that very often the press office will just decide not to comment, and in a public body that is not an option. If you are in government, you can't not comment, it's not an option to say, 'No comment'. That was very, very surprising; the amount of times 'No comment' was given on a whole range of issues.

This approach is now moving beyond private industry to the public sector and governments. The *Daily Mail* was mentioned by a number of interview participants as a publication they did not routinely talk to as it often takes an anti-vaccine stance (particularly for the MMR vaccine), yet it is one of the most influential publications in the UK. The reason for this unwillingness was often a fear of negative coverage:

> **P12**: I think it was to avoid risk. [The attitude was] 'these people are not our friends. And there is no real benefit in talking to the *Daily Mail* or the *Sun*, [their readers] … are not the people who work for us, they're not scientists, they're not going to understand it, they don't matter'.

One press-facing participant noted that this creates a problem, because the media – for all its faults – is 'very good at knowing what the public is interested in'. This non-co-operative stance eliminates the opportunity for these media outlets (and their readers) to have access to reliable spokespeople and information.

A number of participants talked about the importance of investing long term in developing good working practices with reporters to build trusting and long-term relationships.

> **P12**: I think the organisations like mine and others, they should get to know journalists and help the science correspondents a little better. And those relationships take a long time to deal with, so you need very skilled people to maintain relationships and have conversations that may go on for weeks before you do an interview, but can be well worth it, and they underpin good communication.

These relationships are important because they help to build mutual trust and understanding. In Habermasian terms, building trust is part of establishing a common lifeworld, enabling both sides to constitute and understand the word in the same way, so they can communicate and cooperate effectively. This would underpin the free and transparent communications emphasised in Habermas's concept of the ideal speech situation (ISS), and mitigate against systemic distortion of communication. Systemic distortion may occur when trust is manipulated or manufactured by being grounded in unrecognised power imbalances. In this case, the media can use its power to print articles it knows not to be based on scientific fact, and the scientific organisations have the power to refuse to engage with those outlets and deprive them of high-profile spokespeople that would make their stories more credible. The risk involved in engaging with people who you do not trust can also lead scientific organisations to seek out audiences that they know will be more positively disposed to their communications activities.

Preach to the converted

This is related to a tendency, documented in the literature, to 'preach to the converted', with a number of scholars noting an excess of 'entertainment' activities such as science festivals and activities in science museums. Such activities tend to attract people who are usually already interested in science (Grand & Sardo, 2017). Organisations have been urged to do more to engage with difficult to reach and sceptical audiences. The participants also described this phenomenon in non-press related communications:

> **P10**: For a long time, we've been engaging with the people that are easy to engage with and we need to go beyond that … and take a good look at ourselves and how we do that.

> **P14**: Whereas I think you could say that the Wellcome Collection … I think you could say that the people who walk in to see their exhibits are the London middle classes … But you could absolutely argue 'Why should the Wellcome Collection be anything other than in touch with people who go to museums in London?'

However, the appetite to engage more 'difficult to reach' audiences did not extend to engaging with entrenched anti-vaccine groups, and nearly all of the participants believed this would be unsuccessful. However, all of the participants did differentiate anti-vaccine groups from members of the public who were vaccine hesitant, noting that it was really important to engage with those who had not made up their minds.

> **P16**: We also decided not to engage with them [anti-vaxxers]. Direct engagement is a space that we should not enter because there is no winning when it is that far along. Who you should engage with, and those you should recognise, are those who are hesitant; if people have questions, it is our job to answer.

This refusal to engage may be justified by the strategic action of the most entrenched anti-vaccine groups. Whilst communicative action requires each party to listen to each other, if the claims made are invalid when evaluated against the validity criteria of truthfulness or rightness, they do not have to be accepted. Also, if one party is acting strategically, knowingly misleading the other, ideal speech conditions have been contravened. Another interpretation is that the lifeworlds of the

anti-vaccine groups and scientific institutions are so far apart that they are incommensurable. Claims made by one party make no sense in the other's lifeworld and cannot be meaningfully translated into a form that would make sense, as there is no shared ontology (understanding of how the world works).

Factors impacting the conduct of public engagement and communications

The features of the contemporary discourse environment around science described in 4.2 are not encouraging. Scientific bodies accept their responsibility to conduct activities to engage with the public and listen to their concerns, but the individuals working within them can find themselves ill-equipped and overwhelmed by a public sphere that features irrationality, division, hostility and disinformation. Such conditions do not encourage communicative action, so the narrowing of focus to strategic matters or business-critical work described above is understandable to a certain extent. But it is clear that this does not work either. There were a number of themes that emerged from the interviews that influence how engagement is conducted, and whether organisations choose to engage at all.

Disrespect in discourse

The differentiation by the participants of those with entrenched anti-vaccine beliefs from people who simply have questions is an important one. The participants were very concerned at the trend of dismissing or ridiculing people who question the scientific orthodoxy or who do not understand fairly basic scientific concepts. This concern is also reflected in the literature as counter-productive (Silverman & Wiley, 2017). Whilst non-engagement with entrenched anti-vaccine activists was uncontroversial, they did not feel it was acceptable to ignore people who ask genuine questions about science. Indeed, they felt it was a moral duty of scientific organisations and the government to provide this service.

> **P9**: I'm concerned to see that throughout COVID, the way we can talk disparagingly about conspiracy theories and misinformation … I'm concerned to see quite a resurgence of disgust in people's ignorance being openly expressed, whereas before it was a little under the surface.

The fear of communications people is that the trend of writing off the public as being 'easily led' or 'a bit stupid' is convenient for those who wish to dismiss or not engage in these concerns. The reasonable concerns and legitimate questions of the public

are being marginalised and they are being made to look irrational or unreasonable. Specialists on public engagement in this sample argued that it is important to engage with the public from whatever position they are coming from (even if it is not the accepted position), and if those responsible for communicating to the public believe that the starting point for those audiences is invalid, this undermines the engagement.

> **P16**: You can't demonise those who have questions, because they have to be able to ask questions. If people don't get answers, they will never feel secure. And told they are stupid. They just don't understand it. It just pushes them into the open arms of a group that is listening and welcoming, and tapping into their emotions. The whole calling anti-vaxxers, 'dumb, killers, pro-disease', that doesn't help the narrative. People with legitimate questions that are caught in the middle being told by one side that they are just too dumb. 'How dare you ask questions, just trust us and take it!' And being pulled by another side that is feeding them this wealth of misinformation that taps into their existing fears.

This disrespect of opposing views in the conduct of discourse is also prevalent towards scientific spokespeople. Experts such as Professor Christopher Witty in the UK, and Professor Anthony Fauci in the US, have faced significant levels of personal abuse on social media, and even in person (Wright, 2021):

> **P4**: You look at people like … Fauci in the States who knows everything in the world about vaccines; he's been there for donkeys' years. And everyone's been slagging him off, you just think 'poor bloke' … but you see the abuse he gets.

Participants saw this as an increasing deterrent to conducting activities that engage and involve the public, and felt that all parties needed to change their approach to enable constructive dialogue.

> **P12**: … it's really important that there is also mutual respect from both sides. That the health staff also respect people who have to live their lives, who have to go to work, who have to earn a living … so one of the dangers as we go through COVID is that that mutual understanding breaks down a bit more.

The importance of remembering that social media is not a reflection of real life, and the behaviour of the public at large, is vital. The human tendency to 'other' the opposition they have not met and do not understand can lead to polarisation and entrenchment of views, and it can magnify the difficulty or risk of dialogue and communicative action. The extent of the divide between groups of people can also be magnified deliberately in order to prevent the democratic process being conducted. Disagreements are prolonged rather than resolved. The next section explores the attitude to risk that can develop and become a barrier to public debate and to democracy.

Conducting engagement can be risky for organisations

Communications and engagement on controversial science such as use of animals in research, or vaccine safety, is often seen as an unnecessary risk within organisations. Participants noted that scientific organisations typically approach every decision from a risk perspective and have a conservative approach.

> **P5**: I think there [is] just this view that you don't go into any controversial stuff. Why would you? Why would you bother to mention something that people don't like if you don't have to? … from the corporate comms people's view and I can completely understand that as well. Science being what it is, so specific and technical and steeped in expertise, we take risk very seriously and that halo of risk culture extends all the way across communications, and we are very risk averse about communications.

> **P11**: Our appetite or our bandwidth to say, 'Why don't we take a step out there?' is very narrow. So, we very quickly hit the side where we go [intake of breath] 'Maybe we don't want to put ourselves out there'. 'Well, let's think about this a little bit more'. And it often comes in the form of a risk packaging: 'I don't understand … what risk are we trying to mitigate here by doing that?' So, we get very technical very quickly, rather than entrust in and value what we believe are the social dynamics that are shaping the operating landscape and our role as an actor in that picture. We don't want to recognise that because that seems very 'airy fairy' and soft and not anchored in a risk exercise.

The participants were frustrated by this as they believed that communications and engagement can actually mitigate risk, but that they sometimes fail to convince their organisation because their parameters for that discussion are social or reputational, not scientific.

> **P11**: We [communications people] never talked about evidence, and what if we had? Because that's the language of science. Right? Evidence-based medicine. That's the language of science, and we never tapped into that. We never tried to play by the rules of our own norms as a company. But had we had that – like marketing did, or like sales did – I think we would have been a lot stronger at the table.

> **P2**: The researchers look down their noses at dialogue and engagement people because 'You're not really doing proper research, so how can you testify to the value of your evidence? The robustness of your evidence?'

A number of reasons were mentioned for failure to engage proactively in areas of controversial science. Fear of losing funding was mentioned as an influence upon organisations around whether they take a stance during controversial issues. For example, some charities do not routinely acknowledge use of animals in medical research. Another reason was fear for personal safety or reputation. Speaking out has been personally risky for many scientists who have been physically threatened or mobbed on social media.

> **P5**: And it's all very well for me to say 'Oh, you should be open about your animal research' as someone who has never done any animal research, doesn't do it and hasn't ever had to look under their car [reference to car bombings] before they got into it in the morning.

Others mentioned the personal toll that being a spokesperson for controversial issues can take upon people, noting that it requires enormous personal resilience and can lead to burnout. P8 said: 'We need to humanise the company, so they put me out [as a spokesperson] … and honestly … I totally underestimated what that would mean.' This leads to some scientists declining to be publicly involved. Many of the scientists involved in the research around COVID19 have found themselves to be the targets of media attacks on their personal lives. In one egregious example, psychology Professor Susan Michie was personally attacked as a 'super-rich militant

communist' by the *Daily Mail* and other right-wing media, following her advice to the UK government over COVID19 lockdowns (Hitchens, 2021). In these cases, it was noted that the importance of scientific organisations supporting their spokespeople was vitally important:

> **P9**: I think that the other thing we have to look at is whether institutions will back their people. I feel like that if at the end of the day if you feel that your institution is desperate to apologise because they got accused of something that was considered to be insensitive or have caused offence in a description of research or whatever, and you know that the first thing they are going to do is wash their hands of you and [do] anything to avoid any besmirching of the university's reputation, then that's problematic. On the other hand, there have been some that have been brilliant at backing their people. But I think it's a bit hit and miss.

These factors combined mean that many organisations choose to stay completely away from an issue that impacts all sectors, because they are not the direct target of criticism. This leads to them not taking a position at all, leaving others who have no choice to face it unsupported.

> **P3**: I think the other thing is for industry to be super clear where it stands ... sometimes industry is reticent to do that for reasons of commercial risk, shareholder risk, reputational risk ... so that is another crucial ingredient. Persuading the organisation to adopt a position, a clear position, is also a challenge, and it goes right to the top of organisations really, I think. Because in some ways, very senior leadership can sometimes be not as sensitised to those issues of public opinion, but more sensitised to investor relations opinion, shareholder opinion, media opinion.

> **P16**: There is also a growing awareness, not just in [vaccine company], but across other players, that our silence is deafening as well. The silence was even more deafening. Even doctors were calling out 'We are under attack; you guys aren't providing a buffer. We are just left here exposed to the patients. They need to trust us, and you guys are silent when we are under attack. Say something, say anything.'

Safety in numbers: Working in a coalition

The participants were all highly experienced communicators and had worked on a number of successful issues or campaigns. These included climate science, use of animals in research, vaccine safety and COVID19. As well as sharing insights into the barriers to effective communications, they also provided examples of what does work, or what could work if the barriers were recognised, understood and perhaps removed. The most frequent example was when a coalition approach between multiple organisations can be very effective when it is perceived as too risky for one organisation to do it alone. One example was a group that publicly stated that they use animals in research and explained how they worked, sharing examples or medical breakthroughs, video footage and also insight into what the scientific community was doing to reduce the use of animals in research. The biggest factor in encouraging such openness was the number of organisations who signed up to it.

> **P5**: One thing about doing the concordat about animal research was ... the idea was safety in numbers. So, whereas I could understand that one company wouldn't want to say 'Yes, absolutely, we use animals' but if 72 were all saying [it] … We had 72 when we published [it] … Then you're spreading out that risk and it's not just one organisation or one person sticking their head above the parapet.

A number of participants believed that this approach is exactly what needs to be done on vaccine safety. In fact, this approach has been proposed for many years.

> **P16**: There is an old publication about vaccines and trust from the WHO and they already lay out what we should be doing. Which is: Come together, create the coalition, look for those alternative partners, understand where the real issues are and where the trust lies and work with those alternative stakeholders that already have access and are trusted by those who are at greatest risk, or those that are most marginalised and left out.

Only one participant thought there had been some good progress with successful collaborations to address 'really gratuitous' misinformation (i.e. myth-busting). But others felt not enough was being done, quickly enough, and although there was a lot of ongoing discussion about the problem the conversation never reached the point of 'What are we going to do about it?' The exact reasons for lack of progress varied

from a lack of understanding of each other's cultures and processes to incompatibility:

> **P1**: You will find one organisation that's hugely cautious that is dominated by a public health agenda versus a research agenda, for example, so definitely cultures play a huge part. Particularly in decision-making processes.

P1 also suggested that commercial organisations are more inclined to drive towards finding a solution and implementing it than academic organisations, who spent a lot of time and effort diagnosing and writing reports and recommendations about what to do.

> **P16**: There is a conference every year. It is this three-day retreat ... where they all gather, and they talk about this, you get the brains together, and then they produce these wonderful recommendations and they write a paper and they all say [pats herself on the back] 'Oh, it's fantastic, look, we are going to set the direction and others will pick it up and follow it'. Everyone is making recommendations and reports and setting directions but saying 'It's not our job to do it'. So, it has fallen through the cracks of the system.

> **P1**: You've got this whole dynamic going on and ultimately what it means is that there is a lot of talking and very little action, I would say.

A significant barrier to forming this sort of coalition in vaccines was the conflicts of interests between commercial, academic, governmental and public health organisations, and a certain amount of mistrust of industry, as well as formal governance about any interactions that are necessary but can also get in the way of getting the job done:

> **P1**: I think rightly the governance is there but actually what it is doing is stifling. It's stifling innovation. It's stifling experimentation. All these organisations are very strong in their own rights and often they don't co-operate with each other because either they've got funding agendas that are competitive with each other so they're all going after the same money or the governance pieces are restricting them, so you've got this slightly competitive but governance thing working in parallel … for health it's almost like 'Oh, no, you can't go there because it's terribly commercial and you shouldn't really be doing it…'

The pharmaceutical companies are also very concerned about being seen to do the wrong thing either alone or as part of a coalition.

> **P11**: The challenge I had with this whole proactive communication strategy development was that we were very tangled up internally about the rules and regulations for communicating. 'Well, you know … we can't talk about this, we can't talk about that' – we were always overly cautious.

All of this combines to get in the way of coalition building and ultimately results in all the organisations creating separate initiatives. As a result, there was an observation that there was a lot of unco-ordinated tactical activity and short-term thinking. P16 referred to this as 'boiling the ocean' of pro-vaccine communications, which described an enormous amount of activity that has little chance of success. Participants agreed that what was needed is a long-term, sustainable, inclusive approach so that all the stakeholders in vaccines – including the pharmaceutical industry – 'have a role within an ecosystem of people with roles' (P1).

But is it too late? Lack of trust in vaccines organisations

Whilst it is sobering to consider that the organisations involved in a common goal to support vaccination programmes struggle with issues of governance and trust, it is even more worrying to consider the extent to which public trust in all those same organisations is declining. Some participants were concerned that it was difficult to build trust in vaccines when the institutions that provide, fund and administer them are being undermined by populist governments and wild conspiracy theories.

> **P1**: So the big issue in vaccines at the moment is trust and that's what all those parties have in common, you know there is this whole stuff about Gates at the moment which is obviously a big funder of [vaccines], you have got a lack of trust in governments generally and then with COVID that is exacerbated, and then you have got [NGO] who aren't fully trusting the pharma sector because they don't understand it as well as they should or because they don't want to get too close – and that's what it needs is to get everybody around a table saying 'Well, if the whole issue is around trust, what are the challenges?'

One participant, P16, was pessimistic about the chance of success, and believed a new approach is needed. They observed that any campaign using the same channels 'that failed to reach people before, from the same partners that have seen trust in them eroded' would have issues. They advocated for new collaborations to be explored.

Participants acknowledged that this new context means scientific organisations have to change how they act within society

There was evidence within the group that recognising the intractable issues of trust in science and scientific institutions is driving a new way of thinking in their communications departments and executive teams. I argue that this is a task that the new 'strategic' approach to communications functions will be better equipped to implement than the more tactical and reactive press officer teams of the past. Senior communications staff are generally more influential and may be able to persuade organisations to extend the thoughtful and reflective approach they apply to their key stakeholder groups, to wider society as a whole.

> **P11**: I landed up in this company and everyone said, 'Please make us a corporate narrative' and 'Please get this out there quickly because we don't know who we are'. I said 'We're not going to do that. We're going to take time and work out what we think our role needs to be in society …' Why do we need to belong? What is the purpose?

A number of participants discussed their approach to science communications as heavily contextualised within the role of their organisation within society, and what society expected from them.

> **P11**: I think I would say when organisations communicate to the public, whether they communicate with a clear understanding of their role as an actor in that society. That would be, to me, the starting point of any good communications plan. Do you actually know what your role is? How are you contributing to this society? And from that perspective, what is it that you have to say? That I think is something we don't spend a lot of time on.

In this spirit, it is also important to recognise the contribution that laypeople can make to science and that activist groups can also be vital to driving organisational and societal change.

> **P8**: what we did very consistently … is to take that debate back into the company and represent their point of view; having obviously very actively represented the company point of view externally; but actually taking their point of view – and it was a big part of the research – facts and data – to persuade – it's a really nice tangible case of direct action changing a business.

It was noted that there is a legitimate role for activism to change practice in science, but not if the debate is based on misinformation. Participants described how testing cosmetics on animals would not have been banned without activism and campaigns, and how HIV drug availability was widened because of patient activism. Activism is a helpful thing for democracy.

Many of the participants expressed admiration for the activists who had brought about changes in science, and also felt that scientists were important activists for change within their own sector.

> **P5**: I think it's interesting that the opposition to animal research doesn't just come from activists, it's within the scientific community as well to a certain extent. I think it's recognised across the scientific community now that some models don't work.

All of this underlined the importance of communication and engagement about science, and how organisations need to not only be open to criticism but to also be self-critical to assure its legitimacy in the eyes of society.

Discussion: CONDUCT

Communication is important to democracy because it enables people to understand the point of view of one another, resist what they disagree with, have an argument and reach a consensus. Habermas makes a moral point about how people behave during public discourse by calling for inclusion, truthfulness, equal representation and consideration of values and social norms on an equal footing with factual or scientific evidence. This raises the importance of the **conduct** of public discourse. As noted in section 4.2, systemically distorted communication is a pathology of society that occurs unconsciously when the normative discourse conditions do not enable mutual understanding: for example, if discussions are dominated by the powerful in a way that makes it difficult or even impossible for other groups to

express their opinions and assert their rights. In this research the concepts of discourse ethics (including the ideal speech situation (ISS)) offer a way to describe the behaviour and processes that contribute to distortions in communication and discourse.

The traditional, deferential, top-down institutional model of science communication no longer works, and organisations are learning to adapt. There has been an increase in the professionalisation, corporatisation and strategic focus in scientific institutions. Being more strategic about where they spend their time means they are focusing on key stakeholders and engaging in a smaller number of activities that are more important for their organisation. Whilst encouraging, this approach can leave a gap in the messier and more difficult subjects areas – such as vaccines. Fewer institutional players have resources to feed the needs of the public for reference sources of information, and reputable news and social media channels. More communication is via networks and social media. As a result, it is harder for reliable factual information to cut through and be easily found. This further compounds the issue and decreases the possibility of rational discourse. However, I have argued that there are other barriers to engagement with the public.

Communicating and engaging with the public about science in this environment is difficult, time-consuming and risky. The endeavour of engaging the public on science is a long-term and resource-intensive one, which does not fit with the instrumental results-driven approach of our scientific organisations or the government in the current social and political environment. Scientists are understandably unwilling to engage with hostility or to take conspiracy theories seriously. Organisations are unwilling to be dragged into reputational risk by being associated with controversy. For many years scholars of science and technology studies (STS) have criticised scientific organisations for their failure to engage with the public in the current environment. The lack of movement away from the deficit model is sometimes presented as intransigence or a moral failing by some in the STS community, but it strikes me as a rational and logical response from the scientific lifeworld to what it perceives as hostility and irrationality. However, I would argue that the risks are lower than they are perceived, and that the risk of not communicating and engaging is much higher. Many parts of the public are already engaged and are open-minded,

but they face challenges in obtaining access to reliable information, as outlined in the next section.

4.4 CONTENT of the arguments and claims

Previously in this section I have noted the Habermasian issue of lifeworlds, which also influences the content of discourse. Many intractable issues of controversial science involve exchanges of information between parties that make no sense or are meaningless in the lifeworld of their opposition. For example, scientific information about a 14-year epidemiological study in thousands of children that finds no link between the MMR vaccine and autism, is meaningless to the parents of a child with autism who was diagnosed shortly after they received the MMR vaccine (and vice versa).

The concept of validity of information is central to Habermas's vision of rational discourse. Claims made during discourse must be substantiated using validity criteria that test whether a claim is objectively true, subjectively sincere and normatively acceptable. During discourse the claims are tested, and the participants agree upon a consensus position. This ordered and rational approach to testing the content of different arguments bears little or no resemblance to the testing of knowledge in current times. In short, the lifeworlds are so incommensurable that they are unable to reach consensus on anything. This section will outline some of the confounding factors that make this so difficult. A number of issues relating to content of communications and information available to the public arose in the interviews.

'Infodemic'

As noted in the literature review, the explosion in the amount of misinformation, disinformation and conspiracy theories via digital channels makes it extremely difficult for people to understand controversial subjects in order to make decisions.

> **P16**: I think this [anti-vaccine sentiment] is the biggest thing this year. Before, starting to talk about this, people would say 'Yes, that's a problem', then the measles outbreaks started and people [took it more seriously]; 'That really is a problem, we will get to that, we should deal with that'. Then the WHO puts it on the top 10 list; 'Good, the WHO has highlighted it, someone's going to get on top of this, now it's going to be dealt with.' And now COVID has slapped

> us all in the face and said, 'No one has dealt with this, this is a bigger issue than any of you have anticipated'.

Controversial scientific issues that have been politicised – such as climate change and public health – are particularly targeted by cleverly created disinformation.

> **P4**: If you Google, go on Facebook or Instagram you can quite rapidly find a whole load of anti-vaccine stuff and some of it sounds really plausible. I'm in the business and I can sort of see that 'It's wrong but I can see your argument'.

Spreading disinformation has become a long-term, well-resourced investment for some actors; this is very different to sporadic disinformation. One participant who was a specialist in online disinformation also noted that this is a global phenomenon, transgressing national boundaries:

> **P7**: You have extremely powerful nation state actors now using disinformation about health as a strategic channel for geopolitical end goals; China around coronavirus, Russia around vaccines. That poses quite a different set of challenges to the kind of generalised disinformation sphere that we see.

The issue is not just false information, but also false behaviours and false identities. There is a whole gamut of deceptive manipulative tactics being used by anti-science groups, governments, PR companies, celebrities and a whole range of other actors with different agendas. The participants felt strongly that the technology companies had not done enough to combat false information on social media and online:

> **P7**: … these companies have allowed ecosystems of this information to flourish in a way which means that they will have an enormous power and influence to spread much more harmful versions of this information to these concerned audiences than they would have been able to otherwise. It's that intersection that I think is really worrying.

There was also a feeling among the participants that the situation was unlikely to change because the technology industry is essentially unregulated, and governments had little legislative ability to influence them. Plus, the companies have little commercial incentive to change.

> **P7**: There's been a reticence from tech companies to deal with anti-vaccine conspiracies as a potential harm for a very long time. [They made] these tiny, tiny, changes so that information wasn't recommended to people proactively. [It] hasn't really worked, safe to say. The fundamental way they'd have to change their platform to actually get ahead of the curve on these information issues is just not enough of a trade-off for them in terms of profit to bother doing it … The more information, the more accounts they have on their platform the more [advertising] they can sell. So, it's a pretty basic trade-off for them at the moment. I think until regulators get their act together and think about how to impose some kind of duty of care and responsibility on these platforms for their proactive role in creating this information, and promoting this information, rather than just hosting.

Tackling misinformation and conspiracy theories

In the face of this, participants disagreed on how best to tackle misinformation. One felt that the current public sphere conditions make it difficult to 'cut through' with good information.

> **P7**: The whole idea that the best response to bad information is good information just isn't working in a social media ecosystem that profits off sensational nasty stuff … it will just never cut through in the same way so … there has to be some kind of more cut-throat response to the bad information put out there as well as just pushing out loads of good stuff.

The frequent response to misinformation is to correct myths, although research suggests that myth-busting is ineffective at best and counterproductive at worst. Despite this, it was noted by participants that organisations can be more interested in correcting misinformation that paints their organisation in a bad light, than they do in getting quality evidence-based information out to those who are looking:

> **P9**: The Department of Health didn't have a single public-facing platform on COVID at all and then eventually about halfway through lockdown they instituted a public-facing platform. The reason that they did it was because the *Sunday Times* ran a story about the Department of Health preparedness [on PPE] and they did a debunking of that story. They did a point-by-point rebuttal, and they needed a platform that was simply for press rebuttals and

> that's what the Department of Health had … it's the only public-facing platform for information. For press rebuttals, defensive press rebuttals.

The focus on misinformation serves the instrumental requirements of the author, rather than that of the audience. This was a recurring theme.

Content needs to meet needs and interests of audience

Where information has been provided, the concern was expressed by the communications professionals that it is not as engaging as the misinformation, and that work needed to be done to engage audiences better and meet their information needs more effectively:

> **P13**: … we continue to communicate science in as factual a way as we can, without understanding 'What's in it for me?' Or what is motivating the users. I remember when [website] first came out and I remember reading the piece on breast cancer, I think it was … and it said something like Marie Curie discovered radium in 18xx … That's fine if you're writing a piece for the *Guardian* but you are writing a patient information leaflet for someone who is terrified out of their head that they are going to die. The converse is that you then write something that says '23,000 women in the UK die of breast cancer every day or every year' and you're like … 'Well, that's not what you write either'!

The view was also expressed that scientific bodies needed to create content that was in the format and channels that their audiences engage with.

> **P7**: To be frank the WHO[9] and CDC[10] information online about coronaviruses is pretty clunky. It's not going to grab young audiences in particular who are used to visual video or sorts of other kinds of formats that are now the 'go to' for grabbing their attention.

This has been shown to be possible in other areas of controversial science, such as use of animals in medical research:

[9] World Health Organisation.

[10] US Centers for Disease Control.

> **P6**: If you look at the reasons it [campaign about animal research] did work really well, it was a concentrated effort to explain the benefits to each individual of using animal models. It was bringing it down to somebody's level – 'You couldn't have this medicine for your grandmother … if it hasn't been for the animals'.

The tailoring of information to make it useful, relatable and engaging is important because scientific organisations are effectively in competition for the same audience as the anti-science or anti-vaccine groups.

Anti-vaccines groups are great at connecting with the public in a way that scientific organisations are not

Content on anti-vaccine websites and social media connects deeply with people's lifeworld concerns in a way that facts and data often cannot:

> **P16**: The anti-vaxxers, they are very good at this, they are very good at seeing the commonality in their cause and that of others and making that link so that together they are stronger. Say, for example, the anti vaxxers are able to see people with the more libertarian standpoint of 'I'm not going to wear masks' because they don't trust the government. [They say] … 'You know what? Mandates. Vaccine mandates. We are against mandates, so join us: vaccines are fine, vaccine mandates are bad. So, we are going to fight together against mandates'. All of a sudden you have people fighting against vaccination that might not even care about vaccination, but they care about mandates. And then they will go to another community and say 'You care about natural living and the purity of things going in your body. Well, did you know how many poisons … [are in vaccines?]. So, we are going to band together'. They are very good at engaging based on what the actual identity or beliefs or fears or concerns are of the groups. There is evidence that they are already reaching out to Black Lives Matter (BLM) about systemic racism in healthcare provision, saying 'Hey, the system has been up against you, we believe this is wrong, let's fight the system, they are not going to force you guys to be guinea pigs in vaccination anymore'.

The use of information that appeals to people's ideology and emotion is also widely used in the mainstream media. This influences the nature of the content published about science.

News as entertainment in the mainstream media

The mainstream media has become more politicised and sensational, and the content printed reflects the increasing importance of news as entertainment, and content that attracts the highest possible number of readers and the associated advertising income. Some newspapers publish science or vaccine content that focuses on human stories or tragedies. One case was mentioned by several participants of a widely published but unverified news story about a teenage girl who died very shortly after she received the cervical cancer vaccine. Her death was in fact caused by an undiagnosed cancer, but it made the news internationally as being connected to the vaccine. In an example of the politicisation of the MMR vaccine described in section 4.2, a media story persisted for years about whether the Prime Minister Tony Blair's son had received his MMR vaccine, and it was later confirmed that he had been vaccinated (Meikle, 2013).

As well as the nature of the content, one practice in the media until recently was that of false 'balance' in media coverage, where even if there is a significant scientific consensus on a scientific matter, an alternative or opposing view was also presented, no matter how fringe it was. This proved to be very damaging during the MMR vaccine crisis, as it implied that opposing views have equal evidential weight, and perpetuated the impression in the eyes of the public that there was still a scientific dispute about the safety of the vaccine when there was not.

Discussion: CONTENT

The ability of people to access reliable and verified information is a central element of communicative action. Facilitated by social media, there has been an explosion in the volume of information, much of which is disinformation being used with instrumental, political or disruptive aims. Misinformation around vaccines has a number of causes and many different organisations or individuals with a range of different motivations and goals produce different types of misinformation or disinformation.

Tackling the 'infodemic' at source by regulation of the technology platform companies is likely to be the most effective way to stem some of the volume. However, it appears unlikely to happen as national governments find their regulations are inapplicable in the global information space, and technology

companies resist taking responsibility for the problems of what people choose to publish on their platforms.

Unfortunately, the published research does not provide organisations with much insight into how to address the prevalence of misinformation. Some organisations advocate for myth-busting, others for providing high quality information via expert institutions that carry authority. Neither approach has been found to be effective in the academic literature. In a media environment that favours stories over facts and data, scientific organisations struggle to attain coverage as they seek to find an acceptable balance between reliable factual information and engaging content. In crisis situations, the default is often the top-down, fact and data, education-led, deficit model of communications.

The participants in this study highlighted the requirement for organisations to better consider the requirements of the audience when communicating. The writings of Habermas encourage us to look at this from a number of wider perspectives:

- The concept of the lifeworld (section 2.3) highlights the need to consider the personal, familial and cultural world of the audience as this shapes their skills, competencies and background knowledge and directly influences how they make sense of information.
- The concept of knowledge interests (section 2.4) encourages consideration of the ways in which people engage with others and recognition of why people accept false beliefs.
- The concept of validity criteria (section 2.6) that are used to assess claims is helpful because it involves an examination of whether a claim is objectively true, subjectively sincere and normatively acceptable.

Habermas encourages the examination of hidden influences upon our actions and helps us to understand why people may accept untrue claims. It is possible that the lifeworld of the anti-vaccine groups has very different ‘norms’ to that of scientists, and they may share misinformation sincerely, believing it to be objectively true. They are motivated to believe claims that allow them to make sense of the world, maintain their sense of identity or continue to live a certain lifestyle.

Science may need to borrow the tactics of their opposition, focusing more on people's lifeworld concerns and ideology, and engaging with celebrities and influencers in order to engage audiences more effectively. This diversity of the issues relating to content makes it incredibly hard to address the problem. There is no one solution. It needs to be fought on all fronts. But it does appear that there is a big gap in proactive positive information as politicians and organisations focus more on positioning themselves and less on providing information to answer the questions that the public is actually asking.

This analysis highlights the danger of large volumes of misinformation and disinformation circulating in the public sphere, and the difficulty in either removing it or addressing it directly through myth-busting. To some extent, misinformation is effective because it appeals to the way in which some people make sense of information and the criteria they use to decide whether it is 'true' or valid. Another factor that influences discourse on science is the way in which people form knowledge, which is the subject of the next section in this 5Cs analysis.

4.5 CONSTRUCTION of knowledge: Epistemological incompatibility

One of the major issues in societal discussions about science is the privileged position afforded to scientific knowledge over other forms of knowledge. Many people object to vaccines for social, political or ideological reasons, not scientific ones, and so their concerns may be dismissed as not relevant because they are 'not scientific'. This is related to the conduct of scientific discourse (section 4.3), which often affords scientists the right to pronounce on what constitutes acceptable facts and procedure. The different types of knowledge interests described by Habermas refer to knowledge generated by:

- the natural sciences (which is regarded as explanatory)
- the humanities (which is regarded as interpretive)
- the critical or emancipatory sciences (which is ideological or political).

These differences are important when we consider the underlying reason for the disjointed or separate discourses that occur between laypeople and scientists over matters of controversy. It is useful to consider people's knowledge interests, preferences and the way in which they construct knowledge. This understanding can

then form the basis of a negotiation between scientists and those representing the public interests to come to an agreement on what evidence is considered and how different types of evidence may be weighted, depending upon the subject at hand.

The need to consider scientific evidence alongside societal and experiential knowledge has been officially recognised by the UK's scientific institutions since the publication of the *Science and society* report from the House of Lords (Science and Technology Committee, 2000). This report advocated for a shift from the 'deficit model' of education to an engagement model based on dialogue. Despite the report and its findings being well received and well understood, the scientific organisations appear to have found it difficult to move away from the deficit model and to recognise the right of laypeople to share their experiences, express their values and raise their concerns about science. The question is: Why? Some of this is undoubtedly cultural. The lifeworld of the sciences is steeped in a long tradition and, perhaps unsurprisingly, may not have evolved as quickly as the societal context in which it is situated. Much of this tradition is rooted in epistemology, which is explored in this section.

Cultural preference for facts and data

The cultural belief that scientific knowledge is superior to other types of knowledge is a major factor in the default to scientific evidence. The default is still one of correcting a knowledge deficit in the public and correcting misinformation (see section 1.2).

> **P11**: But so many of the proponents … who completely understand the importance of vaccines often use science to win or to 'right the balance' but actually science isn't what is behind the belief that vaccines are bad for you.

One participant noted an unrealistic expectation that any discussions about science should be rational, logical and fact-based, and this rests upon an assumption that everyone has the same understanding of what is reasonable, which they do not.

> **P2**: Part of my problem with that is the idea of how people interpret reason. So 'public reason': does that mean everyone's rational? No. Recognising that emotion and all sorts of … – I guess emotion – is bound up with reason, it's not a separate thing … recognising that emotion is going to play into these things, it's not logic.

The communicators said that those working in scientific and medical organisations can be somewhat physically removed from ordinary people. This may have been related to their position in society as highly trained individuals who are well respected and do not expect to be challenged on their areas of expertise. Many scientists are genuinely baffled, or even affronted, by vaccine scepticism or science denialism.

> **P12**: Yes, I think the healthcare community can be quite dismissive of people who have different views. Because ... doctors are all immensely bright individuals who have gone through years and years of training and they can, if they are not careful, become separated from the views of ordinary people and absolutely not understand what they are going through. I think there is a danger that ... it becomes more polarised ... That is, the medical community moves further away from how ordinary people see and view life and science.

To some extent this insularity was indicated by their low opinion of the general public, illustrated by one participant by an anecdote about the attitude to BREXIT supporters:

> **P14**: I do remember going to an … event about a week later [after BREXIT] where everyone was in mourning. They were so proud: 'I've never met a BREXIT voter' and 'I'm proud to tell you that I've never met a BREXIT voter'. I was thinking 'Are you really proud? Because that's half the country and what you're saying is you don't know what ordinary people think'.

And this may not only be the case for individuals, but also for large organisations, which can become insular and out of touch with how they are perceived externally.

> **P11**: There was this huge legitimacy gap between the Corporation and how it believed the public should care about it. And the position was: 'We cure cancer, and you all need to just stay over there and wait until we bring this stuff and then laud us. And leave us alone otherwise.'

Although conversely, many people working in commercial or government institutions are fully aware of their reputation and that they are not trusted. Communications professionals often see their role to be about 'bringing the outside in' to organisations. As they are external facing, they often have a more up-to-date and acute sense of either what the public is thinking or what the media is interested in and asking about.

> **P8**: In most organisations where I've worked … we have been able to persuade senior management to let us engage. I think too many companies just shut their doors and don't even converse.

The participants who worked directly with the public frequently were confident in their approach of allowing the public to guide the discussion and enter into a true dialogue.

> **P2**: But I think what we're interested in is how people negotiate across different sectors and different life experience and stuff, and how they take the information that they get from scientists and incorporate that into their thinking. So, what's the journey that they go on throughout the process? So, within the confines of a set piece, I don't think it is expert led, it's the whole system of the dialogue. There are multiple different interests, i.e. policy-makers, scientists … the participants will have their own interests … it's a big complicated system. I think it would be nice to move more towards participants actually setting up the set piece, which is the bit that's missing.

The participants, though, were aware that many people do not actually want to debate the science; they really want to debate normative issues.

> **P8**: [For] some of them the science isn't what is up for debate; however, the economics, the policy, the human rights issues, the right to access universal healthcare – they are the points of debate and then the science is misused within it.

> If you are fighting with science where an audience doesn't care about science, is it really the best tool to be fighting with? So, we keep trying to take the high road and talk about risk-benefit, immunity – I am not sure that is right. Then we beat ourselves up. 'We don't know how to simplify herd immunity, we need to find simpler language, we need to be able to talk about complex subjects in a simple way' … I don't think so.

The participants were clear that other forms of knowledge needed to be considered, and that more facts and data would not work to convince people who were opposed to vaccines. But they also warned against the potential to undermine the position of scientific evidence completely by accepting post-truth and other ideological stances rooted in post-modernism. One participant referred to the STS studies of the 1990s.

> **P9**: Nearly two decades ago there was a real fashion for post-modernism in the academy and this idea that 'nothing was knowable'. And it was taken quite seriously, particularly in history. I found that really frustrating, I was reading quite widely about that at the time, so I think that influenced, enormously, some of the early discussions about science and what science is, in society, and this whole question of science vs. opinion which … informed, even in policy terms. It was that question of 'Well, that's only your view as a scientist'; never mind that it is a systematic review of everything that has ever been done in the subject.

This warning is also echoed in Habermas's ideal of discourse whereby people are entitled to make knowledge claims, but the validity of their claims should be interrogated and dismissed if they do not stand up to scrutiny. Without this there is no communicative action. The group was concerned that lack of concern for the veracity of facts and the equivalence of emotions to facts that is inherent in post-truth is incompatible with rational discussions:

> **P11**: That doesn't work. And also, because your facts and my facts are different, and you may discredit my facts, but I will just discredit your facts. That's where we are right now.

This position assumes a binary process and that one fact will win over another and become accepted knowledge. This desire for simplification may be another reason for the incommensurability of the different arguments about vaccines, and about

science more generally. To put it bluntly, science does not offer the instantaneous certainty that some people, politicians and journalists crave in our post-truth public sphere.

Fallacy of one 'truth' in science and the danger of 'one message'

Science is a messy business, and progress is made through the constant emergence of new evidence, expert discourse and disagreements, with a consensus position emerging eventually (although this may take many decades). Politicians, the media (and, if we are honest, citizens) prefer certainty and instantaneous confirmation of the facts, and instant solutions. This is the fundamental point at which the lifeworlds and the knowledge interests of the natural sciences and the political sciences clash.

> **P8**: So, you often hear … and particularly academics more than commercial scientific organisations … putting lots of caveats around their work and not wanting to be as definitive as the journalists want them to be … and quite frankly the public want them to be. Because they can't be, they know that the science is up for debate.
>
> … But that doesn't wash in a public debate about what's right and wrong.

Unfortunately, a consistent characteristic of the initial stage of a scientific crisis is that evidence is lacking, emerging and uncertain, as was the position in the initial stages of the MMR vaccine crisis, the BSE crisis and the COVID19 crisis.

> **P3**: Obviously the challenge is that we are often in arenas where there is some scientific 'truth' for want of a better word and plenty of ambiguity, ongoing research, uncertainty. And so, communications is often holding the tension of the wish to be super clear and achieve a specific perceptual outcome in the audience. The tension between that clarity of purpose and the reality, that often there are elements of the subject matter which are not that crystal clear.

The fallacy of 'one truth' in terms of science simply comes unstuck when new information is emerging all the time. There is an underlying assumption that the public expect scientists (and politicians) to provide definitive answers to every

question, even when the situation is unprecedented, nuanced or there is a disagreement on what data really means.

> **P8**: There should be healthy debate between scientific points of view because that's how we get better – that's the nature of academia. However, that does not play in the public arena. In particular the media want a yes/no headline. Fact/fiction. Miracle drug/killer drug.

Participants described a reticence to simply admit that the answer or 'the science' is not clear. This can lead to an unhelpful vicious circle whereby demands for definitive positions on all matters leads to public figures making incorrect policy decisions or feeling obliged to incorrectly answer all questions in the absolute rather than appear ineffective. Participants advocated for more transparency about uncertainty in crisis situations and believed that this would be respected by the public.

> **P8**: … quite frankly our government ... will get, I'm sure, an enormous pass for screwing up the first month. Because people understand that nobody knew it was going to be like that, there wasn't the data, they weren't looking at existing models.

> **P12**: I think there would have been some sympathy for the government if they said, 'The evidence is emerging in these areas, we are all learning and doing what we can'. People get that.

> **P13**: There is something really fundamental to the human piece in all of this which says ... we don't know what truth is ... and turning around and saying, 'I don't know' is okay, I will trust a medic who says, 'I don't know but I'll help you find out', far better than somebody who starts with the obfuscation.

It was suggested by a number of participants that the increasing centralisation of state-funded scientific organisations (see section, 4.3) is to facilitate consistency of messages to the public during scientific controversies, in order to reduce the amount of public disagreement between scientists during a crisis and to support policy positions.

> **P14**: Because some of the culture in those organisations … there is this real belief that multiple messages conflicting from different scientists is damaging and harmful. I don't so much wish they would change their position on this because I think everyone can see all the merits of having clear public health messaging. [But] what I think they should deal with, is the fact that it's not going to happen: (a) it's unachievable; and (b) it's undesirable because a lot of those people who subscribe to that single public health message are government. And the truth is that we may have a benign lovely government, that's always possible, they may only care about saving lives. But in different times … governments will put their own survival in front of the public interest … There's no way that communications are independent of that, as we know. So, it's also desirable to have third party independent scientists in the mix so that they are hearing from government and, if anything, I would say to government people – and I have for years – often I would say probably 80 or 90% of the time the scientists … are saying the same as government and that is really powerful because **then** it is 'the science'.

They also noted an increasing rift between the scientists and the government as the COVID19 pandemic progressed about how to present the knowledge in support of policy and make it clear when the evidence was there and when it was not. One participant described how scientists were keen to share the complexity of decision-making with the public, whereas politicians sought to present a simplified version of the evidence that supported policy.

> **P8**: That debate is actually happening at quite a nuanced and intelligent level, you can see politicians trying to push it down and scientists trying to push it up and everyone is starting to cover their arses.

This quotation also highlights the concern from scientists that they will be blamed for political decisions at the eventual public inquiry into the COVID19 pandemic.

Discussion: CONSTRUCTION of knowledge and conflicting 'truth'

Scientific organisations have historically enjoyed an elevated position in society, their leaders are feted with honours, their organisations well-funded, their expertise and knowledge respected. Science has increasingly been presented to the public as holding all the solutions to social issues: disease, economic growth, and even the personal success of students (if they study a STEM subject – science, technology, engineering or maths – at university).

Governments seek to borrow the epistemological authority of science. With good intent in a crisis, they can exert their influence over science communications to create consistent messaging and thereby suggest scientific certainty to support their policy positions and boost their credibility. However, this credibility is being undermined. As previously noted, there have been numerous examples of changes in government policy on scientific and medical matters based on changes in scientific knowledge, and this has led many to be sceptical of any future advice from government bodies based on science. This is further compounded by a general deterioration of discourse about science in the public sphere caused by ubiquitous misinformation and post-truth populist challenges to expertise and knowledge.

In this less deferential, less respectful public sphere, the mismatch between how scientific knowledge is perceived in society and how scientists perceive it, is causing an epistemological mismatch of epic proportions that is proving difficult to overcome. The public express ideological or moral concerns about science and rather than engagement, they are met with a barrage of facts to educate them into agreement. This response is normal within the scientific lifeworld, where problems are solved by more data and science.

However, the public is seeking different information and a debate that reflects their interests. Communication fails because people inhabit different lifeworlds, constructed differently. The lifeworld forms people's sense of identity and belonging in society. Habermasian critical theory recognises that rational debate requires participants to consider people's knowledge interests and lifeworld perspectives, as well as facts and evidence. The science communicators participating in this research were clearly aware of this dynamic and were influencing the approach to

engagement to take account of it, but with varying levels of success within their organisations.

Dealing with this situation takes a great deal of skill and this is what I will discuss in the next section: my final 'C', competence.

4.6 COMPETENCE of the participants: Mutual misunderstanding

The changes in the public sphere require people to develop new and different skills and behaviours to enable productive discourse between the scientific 'system' and the public's 'lifeworld'. This section discusses the competence of scientific organisations to navigate the choppy waters of the public sphere and meaningfully and respectfully engage with the general public. This research did not investigate the competence of the general public in the discourse, although this is equally important. However, it did reveal several assumptions that are made by scientific organisations **about** the general public's competence to engage with science, which is likely to be a factor in the perpetuation of the deficit model approach to communications and engagement about science.

They don't really understand the new environment

The first thing scientific organisations need is an understanding of the challenges they are dealing with so they can decide what to do about them. One of these challenges is the use of social media and associated misinformation. Participants noted that they felt many scientific organisations were simply unsure what to do about it and whether it really matters.

> **P7**: I think that one element of it is a slight lack of technical literacy on how this works now. So, you still have a lot of people who are worrying about 'the bots'. And they don't know what it means and whether it affects them or not; and how you see them and how you don't ... So, there is a language and technical aspect which is confusing. I think the other side of it is a bit more cultural and it is … in terms of 'Has this actually changed?' 'Hasn't this always happened?' 'Or is this something new?' And this kind of obsession with the digital that sometimes we have now.
>
> Whether this online information really makes much of an attitudinal and behavioural difference is still very much up for grabs. It's impossible even

> really for anyone – even researchers – to properly understand without longitudinal studies on this so I think there is definitely an increased awareness of the problem and its potential implications for these issue areas, that various groups are concerned about. But very little understanding still if it really matters that much.

One participant, P7, described an 'obsession with digital' and another noted that concerns about social media were leading to poorly considered activities in the digital space.

> **P16**: Everybody is: 'Oh, my God, I've got to fix it; I will make an app!' 'Oh, my God, I'm going to make a podcast'; 'People aren't understanding the messages, how can we package it differently?'

A more meaningful response to social media may require expertise that often does not exist within scientific institutions – but which has existed for many years within commercial marketing organisations for consumer goods – and increasingly new approaches using behavioural science.

Slow to adopt marketing and behavioural science strategies

Participants noted how many scientific organisations had been slower to adopt marketing and behavioural sciences techniques used routinely in commerce. There is somewhat of a cultural aversion to anything commercial, and a continued belief that good scientific data is enough and will convince people: 'They are just a bit blind as to the best ways of doing it, that aren't specifically research-focused' (P10). Instead of a 'test and learn' approach, high levels of 'scientific' evidence is demanded to influence decision-making, and often communications departments are not equipped or funded to provide it.

> **P16**: You have to get your data; it can't just be a gut feel. When we present ideas, we present them as new and bold for us. They are not new and bold, this is standard.

> **P1**: … if we look at some of my other sectors and the things that we do, there is a lot of 'test and learn'... not major three-year studies with, you know, public health and academic blah blah blah. It's saying 'Actually, pragmatically, this sounds like a good idea, obviously ethically we have to

> make sure it is fine and it's safe, but beyond that why don't you pilot something and test and learn from it?' and actually use real-world insight rather than setting up a [large study] – and the problem is, that gets in the way.

The notable exception to this is the UK government which set up a behavioural sciences unit (known as the 'nudge' unit) in 2010, realising that traditional communications isn't the whole solution and there are much finer carefully calculated tweaks that can really influence people's behaviour (Halpern, 2016; Bavel et al., 2020). The 'try it' approach advocated by the participants was frequently used by the government during the COVID19 pandemic.

> **P15**: So, we are trialling something for two weeks before the strategy is completely finished, whilst we are still gathering some insight ... but we are hearing things ... and thinking 'Cool, let's give that a try'. They are letting us give it a try and a lot of them are low cost, no cost. Influencer activity in various forms.

This reflects the UK government's increased use of polling data and other measures of public opinion on new public policy measures (Johnson, 2021).

Participants noted that whilst scientific organisations are quite conservative in their approach to marketing, they have realised that they need to acquire this expertise from other sectors who have been using it for many years.

> **P1**: … the way in which insights are gathered to market [consumer goods] to people is incredibly sophisticated versus how we do it for health … so, if you're going to talk to someone about washing machines for example you don't go in and say to them 'Tell me everything you know about washing machines'. You say 'How do you live your life? What's life all about? What's important to you? How does the washing machine fit in with all of that?' And you do it in that way [that is] much more ethnographic ...

A more consumer-friendly approach to communications also involves addressing the cultural tendency of scientists (and large organisations) to use technical language and jargon that makes mutual understanding difficult. The barrier of jargon described by participants in this research is consistent with research in the literature. A simple

example, that came up in several interviews, was use of the word ‘assay’ in relation to COVID19 testing:

> **P14**: I’m getting a quote from people who use the word ‘assay’ five times, which is the word for ‘test’ and no one in the public knows that …

Participants felt that language is crucial to good communication. They also noted that communicating clearly about science to a non-specialist audience is a difficult skill to acquire. It is a hard habit to break for people immersed in a highly technical scientific lifeworld. But it is possible to overcome with time and effort.

> **P8**: Finding the right language to express scientific concepts … scientific and regulatory topics … finding the language that allows the language to travel both within geographies and functions and capabilities was far harder than we anticipated, and it takes a lot of strategic and careful planning if you genuinely want to listen to what patients actually think about your R&D programme.

It is important that the understandable inability of non-specialists to navigate technical terms and jargon should not lead to the assumption that they are unable to grasp scientific concepts. At times scientists claim that something is too complex for the public to understand, but what they are actually articulating is that they do not feel well equipped to explain it. This reluctance to explain is part of the previously noted tendency to place the deficiency in competence with the public.

Underestimating the public’s competence

The participants were united in their alarm at the prevalence and general acceptance of negative assumptions about the general public’s ability to deal with uncertainty, risk, science and complexity. Experts expect their expertise to be accepted and assume that their organisations are trusted. This may be related to the remaining paternalistic attitude in the medical and scientific culture. Or it may be because meaningful engagement with laypeople about science is very difficult to do well, needing a different skillset that may be less valued in scientific institutions, and people are afraid of the consequences of doing it.

> **P9**: Probably my biggest enduring insight. The one that I keep seeing again in new guises … the fear of doing it, nervousness about what's at stake or the fact that you are risking something is a barrier. [It] is often dressed up or inverted in that discussion as … 'Oh, my goodness, look how entrenched that is, look how stupid people are, look how many people read the *Daily Mail*'.

The above quotation indicates it may be easier to write off the public as a lost cause, than it is to develop the skills to engage with them.

Discussion: COMPETENCE

This section on competence perhaps reveals the reluctance of highly trained and educated people to recognise that their training and expertise is steeped in a particular habitus or lifeworld or culture with specific assumptions and ways of working. There is a confrontation or 'clash' between the scientific lifeworld and the various lifeworlds that make up social groups in the general public, such as anti-vaccine groups. For those who value scientific knowledge over other forms of knowledge (section 4.5) and prize their hard-won expertise and competence in the scientific field, it is probably deeply disappointing that they are challenged by non-specialists to justify themselves and their knowledge – and this creates a communication barrier. Those individuals and organisations that do embark upon public engagement about controversial science are more likely to reflect and understand that competence in a different and difficult set of skills is required, rather than assume that the deficiency in competence lies with their audience.

4.7 Summary conclusion of the 5Cs analysis

The 5Cs framework derived from Habermas for this research was a useful tool to enrich the analysis and provide a structure through which to explore the various aspects of public discourse from different angles. The framework facilitated a structured exploration of the context in which communications takes place, how organisations approach communications, the way in which they formulate knowledge into content and the skills required to engage and communicate in times of crisis.

This research confirmed many of the well-documented problems inherent in communicating highly technical and specific scientific knowledge to lay audiences who may not have a grounding in the scientific method and technical terminology.

Science has increasingly been presented to the public as holding all the solutions to social issues. Governments seek to borrow the epistemological authority of science. However, in a less deferential, less respectful public sphere, the epistemological mismatch between how scientific knowledge is perceived in society and how scientists perceive it is proving difficult to overcome. These factors have been exacerbated by the politicisation of science and the current populist-led backlash against experts and elite institutions. The ability of people to access reliable and verified information is a central element of rational discourse, but whilst the emergence of digital communications channels has facilitated easy access to information it has also resulted in an 'infodemic' of misinformation and disinformation. In a media environment that favours stories over facts and data, scientific organisations struggle to engage as they seek an acceptable balance between reliable factual information and engaging content.

For many years scholars of science and technology studies (STS) have criticised scientific organisations for their failure to engage with the public in the current environment. In crisis situations, the default is often the top-down, fact and data, education-led, deficit model of communications, reflecting positivist preferences to focus on facts and data that has been observed in the STS literature in this field. However, unlike much of the STS research, my research also explored the underlying reasons **why** this happens. This insight was gained from senior communications professionals working within scientific institutions. This group has significant insight into how organisations work, and experience of how policy intentions can be derailed by internal and external influences upon their organisations. However, the traditional, deferential, top-down institutional model of science communication no longer works, and organisations are learning to adapt. This research revealed a cohort of extremely motivated communicators and organisations who are trying to do the right thing but find themselves unable to overcome barriers; defeated by the degeneration of discourse standards in the public sphere. However, there are other barriers to engagement with the public that must be acknowledged or addressed.

Communicating and engaging with the public about science is difficult, time-consuming and risky. Habermasian critical theory recognises that rational debate requires participants to consider people's knowledge interests and lifeworld

perspectives as well as facts and evidence. Communication often fails because people inhabit different lifeworlds, constituted differently. These differences may be potentially incommensurable as they are based on a set of intuitive skills, competencies and background knowledge that are unique to an individual's personal, familial and cultural world. For example, many who object to vaccination do so in order to join a particular social grouping (Sobo, 2015) and shared beliefs provide group solidarity for those with anti-vaccine views (Kahan et al., 2011).

Dealing with this situation will take a great deal of skill, and this research revealed the reluctance of highly trained and educated people to recognise that their training and expertise is steeped in a particular habitus or lifeworld or culture with specific assumptions and ways of working. There is a confrontation or 'clash' between the scientific lifeworld and the various lifeworlds that make up social groups in the general public, such as anti-vaccine groups. Those individuals and organisations that do embark upon public engagement about controversial science are more likely to reflect and understand that competence in a different set of communicative skills is required, rather than assume that the deficiency in competence lies with their audience. The science communicators who participated in this study are aware of the need to navigate the variety of lifeworlds, but face barriers: their corporate priorities may be more focused on commercial objectives, there may be few resources or they face hostility when they do communicate.

As a result, there is a lack of reliable authoritative sources of information for the public during a science crisis. The gap is being filled by unreliable information from various actors, including anti-science organisations. This is important, because change cannot be made, or the problems well understood, without knowledge of the drivers that lead to the continued adherence to the deficit model for which scientific organisations are roundly criticised all the time. An understanding of these drivers may help address some of the underlying issues and lead to solutions. This is discussed in the final conclusions of my thesis in the final chapter.

Conclusion

In this research, I set out to answer an overarching research question, which was:

> **How can we explain and understand the dissonance between competing and conflicting voices in areas of controversial science?**

There were two sub-questions:

> **Q1**: How are policies and strategies for engagement and communications activities during public scientific controversies influenced by the culture and interests of the organisation that they represent?
>
> **Q2**: To what extent is the deliberative ideal behind programmes of scientific engagement distorted in practice, and why?

This concluding chapter will answer these research questions and summarise and explain the significance of the main findings of my research through the lens of Habermas's critical theory. Then I will place this work in the context of existing work on the topic and make recommendations for further research.

i Summary of main findings

My research specifically focuses upon the role of scientific organisations and how they approach science communications and engagement on controversial science, using vaccines as a case history. My review of the literature traced policy discussions relating to science in society over the last four decades, and the evolution of the UK policy approach relating to science in society, from the deficit model of education in the 1980s to one of engagement and involvement by 2000, and the subsequent persistence of the deficit model to this day, regardless of science policy. As a science communications professional the literature challenged my assumptions about science communications and led me to conclude that the conduct and culture of the scientific organisations was a major contributor to the problem of ongoing controversies in science. However, the implied intransigence of the scientific establishment described by STS scholars and post-modernists was not what I had directly observed, so I sought to better understand potential barriers to meaningful science communications and public engagement.

I argue that the dissonance between competing and conflicting voices in areas of controversial science is better understood as a 'clash of lifeworlds', which inhibits productive communication and discourse. In effect, scientific institutions are speaking a different language to politicians, activists and the general public; the various opposing sides do not agree on what constitutes 'truth' or valid knowledge; they also disagree about how any discourse should be organised and governed. Under these circumstances it is not clear that consensus agreements are possible (or even desired by the participants). Put simply, scientists and laypeople constitute their lifeworlds so differently that they live in potentially incommensurable worlds.

This is exacerbated by a degradation of the public sphere beyond that described by Habermas in the 1960s (elaborated upon in section 2.3), where the discourse environment does not provide the necessary conditions for democratic debates and discussions to be possible. Elite groups have become more powerful, inhibiting the ability of citizens to challenge power through rational argument, leading to exclusion and disengagement. The degradation of the public sphere opens the way for an intrusion of the system into the lifeworld, which Habermas termed the *colonisation* of the lifeworld. This takes various forms, such as social media's prioritisation of commercial goals over social cohesion, or the populist rhetoric of politicians against expertise and scientific evidence to undermine vaccines so as to secure and expand the power they have. This incursion of the system into the lifeworld leads to a legitimation crisis for scientific institutions, characterised by public challenges to their authority.

Contrary to much of the literature, I argue that the STS scholars and many scientists fundamentally agree on how scientific discourse *should* be conducted; in an open manner, involving different perspectives and considering societal conditions as well as technical science. So, to investigate the gap between policy and practice, I focused on understanding the underlying reasons for continued adherence to the deficit approach, to understand the internal and external barriers science communicators encounter when enacting the policy in practice. Using the artificially 'ideal' scenario for public discourse described in Habermas's *The theory of communicative action* as a framework, my research findings – as outlined in Chapter 4 – show that there are multiple cultural and contextual barriers which inhibit the

ability of scientific organisations and individual scientists to communicate and engage in an ideal way.

These barriers are explored below in direct answers to my two research sub-questions.

Q1: How are policies and strategies for engagement and communications activities during public scientific controversies influenced by the culture and interests of the organisation that they represent?

This research found an increasing professionalisation of communications and engagement across all sectors. On the one hand, this is encouraging, but on the other hand has brought with it a more corporate approach, focused on instrumental objectives, with resources targeted accordingly towards commercial priorities and away from more open-ended and difficult to measure activities such as public engagement. In addition, whilst the value of meaningful engagement and communication is prominent in the policies of scientific organisations, in practice there is still an adherence to the deficit model of communications and a bias towards the epistemological preferences of scientists, leading to a top-down, facts and data-based approach.

There were also additional barriers to a more enlightened approach. Many of these were predictably mundane, such as a lack of resources (both financial and allocation of human resources) in organisations where the immediate priority is funding scientific research, not communications. It is also relevant that although the policies for public engagement are formulated and adopted at a national level, the responsibility for delivering them is delegated to individual institutions and frontline scientists with little clarity on outcomes or priorities. This results in a high volume of heterogeneous and unco-ordinated activity, instead of concerted and co-ordinated professional-led efforts to address really difficult and thorny issues of science in society, such as vaccine safety or genetically modified organisms.

The delegation of responsibility for communications and engagement to people immersed in the practices and customs of a scientific *habitus* may explain the adherence to the deficit model of communications. Scientists and healthcare professionals already have full-time jobs; they are also immersed in the scientific lifeworld, which values competencies and skillsets related to delivery of research,

and engages in rational debate to professional norms of behaviour. Scientists may not always be the best people to deliver such programmes without support. Many see no value in it, although some scientists are undoubtedly exceedingly motivated and skilled communicators.

This highlights the importance of the role of professional mediators such as the participants in this study to ensure that the intended policy goals to engage meaningfully with the public are not inadvertently subverted into a tick box exercise. An increasing number of people are now employed in communications and engagement roles, but the activities for which they are responsible usually encompass corporate communications, marketing and public relations. Other intermediaries such as science journalists and press officers are also vital, but there are fewer press officers and science journalists working in the UK. Some of the gap has been filled by NGOs such as Sciencewise, the Science Media Centre and Sense about Science, all of which are high impact but relatively small and minimally funded organisations. As a result, much of the activity conducted in the name of 'engagement' is more instrumental in nature and should be classified as one-way education or public relations: Habermas would have described them as strategic actions. That is not to say that these activities do not have value, but they are not engagement in the true sense of the policy intention or the communicative ideal set out by Habermas.

Other barriers were more cultural, such as a rigorous intellectual focus on diagnosing the issues and then a failure to follow this with practical implementation of programmes to address the issues identified. There is a suggestion that communication is 'someone else's problem' rather than a collectively owned one.

An aversion to being 'too commercial' among public sector and NGO organisations was also identified as a cultural barrier. Participants noted a lack of co-ordination across the different sectors for common issues such as vaccine safety, despite the previous success of collaborations to address other issues, such as use of animals in research. This appeared to stem from a lack of trust across the organisations and a desire of people working within public sector and NGO sectors not to be too closely aligned with commercial industry partners due to governance constraints.

A distaste for commercial practices was also evident in a reluctance by scientific organisations to adopt marketing approaches that are well-proven in retail organisations, although the use of behavioural science and polling data has been enthusiastically embraced by the government. The inappropriate application of empirical evidence standards to justify social interventions such as public engagement is scientistic, and hampers progress. This is manifested in demands for high levels of 'proof' to justify funding communications interventions rather than applying a 'test and learn' approach.

The factors outlined above could help to explain how organisations fail to meet the public's need for reliable and authoritative information about science to help them make sense of a controversial area. Policy intentions of organisations are unconsciously subverted by internal or system concerns.

Many of the findings listed above in response to research Q1 are consistent with the observations of the STS literature relating to how the culture and normative assumptions of the scientific lifeworld might be working against its own desire to be more open. In addition, my analysis using the theories of Habermas revealed a number of wider issues such as lack of funding, training and support, a lack of trust leading to reduced co-operation across the sector, and the need for specialist skills for effective communications and engagement.

The scientific community is proficient in science, but we should not necessarily expect them to be competent at navigating the multitude of public opinions in a highly complex public sphere. Effective communication is difficult and time-consuming. Habermas not only highlighted the barriers of language, but he also drew attention to a sophisticated set of engagement skills, such as an ability to engage people and the ability to draw upon common cultural assumptions to build rapport. The challenge of mutual understanding is difficult in science but not insurmountable. The non-specialist or layperson's understandable lack of proficiency in scientific method and technical jargon does not impair their ability to engage in a discussion about their hopes, fears, beliefs and concerns about science and technology, such as a new vaccine. Discourse in science may suffer from fundamental misunderstandings and assumptions relating to the competence and intentions of all the parties. Scientists may underestimate the ability of the lay public

to understand science, engage in discussions about science and critically appraise information. Policy-makers in government and institutions may be overestimating the ability of scientists to communicate and engage (in terms of their skills and cultural assumptions but also because of organisational constraints). This suggests an important role for professional mediators, such as communications and engagement professionals and science journalists.

In summary, my Habermasian analysis highlights that there are problems of communication within scientific organisations at two levels:

- On one level there are systems failures, some of which are due to intentional actions, such as misleading the public on scientific knowledge or facts.
- However, at another level there are internal and external pressures acting upon scientific organisations that subvert their conscious intention and lead them to communicate in a less meaningful way. This may be due to the culture and norms of an organisation or because of external pressures such as funding conditions or reputational concerns.

Finally, there are deficiencies in communication skills, due to lack of experience, ability or training. This suggests that we do not simply need better communication techniques, but also a critical theory that will expose the unconscious forces of colonisation of the scientific lifeworld.

In the next section I also argue that the contemporary discourse environment which has politicised science and challenges expertise, power and scientific knowledge makes this engagement difficult and risky for organisations and also for individual scientists. Whilst the responsibility for meaningful engagement about science with society is (rightly) placed firmly with the scientific community itself, it is daunting to engage meaningfully with the public in a hostile, polarised public sphere. There is a reciprocal responsibility for **society** to engage constructively with science, recognising that attempts are made to distort the public discourse by actors including scientists themselves, politicians, the media, NGOs and activists.

Q2: To what extent is the deliberative ideal behind programmes of scientific engagement distorted in practice, and why?

The coronavirus pandemic has laid bare some of the issues related to how scientific controversies can be manipulated and cause enormous harm to public confidence and, ultimately, public health. There are a number of issues related to the context for scientific dialogue which mean that the deliberative ideal is hard to achieve.

There are many conditions set out in Habermas's *Communicative action* that discuss the required behaviours, processes and competencies. These include:

- wide participation
- people agreeing to come to the right decision for all, not just for them
- that the conclusion is reached by an open discussion where the validity of knowledge claims are tested
- that people must consent to the conclusion.

The reality is that people do not behave like this. Public discussions about science are frequently highly polarised and dominated by special interests, whilst knowledge claims are conflicting and contested and people enter into discussions with no intention of listening to others, or accepting evidence which may undermine their position or ultimately changing their minds and coming to a consensus. Many of the places where thoughtful discourse would take place no longer exist or their influence has been eroded; the mainstream UK media outlets such as the BBC and broadsheets are generally more reliable sources of information as they are regulated by the press standards, but their commercial model is under threat, and they have been significantly weakened by political attacks. On social media, studies of anti-vaccine information demonstrates that a small number of influential players wield disproportionate influence (CCDH, 2021a).

Finally, the negative influence of politics upon science is clearly evident in this research. Despite its reputation for objectivity and facts, science is deeply political and as a result is caught in intractable partisan battles of knowledge over important topics such as vaccine safety and climate change. Public standards in discourse have degenerated to the point where some organisations do not wish to speak up on controversial issues for fear that this will impact their funding, and individuals may find themselves being personally harassed by activists. Some organisations are

even reported to have been gagged on controversial subjects. This deprives the public of relevant information and alternative opinions.

The immense changes in the information environment driven by digital technology have influenced public discourse, for good and bad. The general availability of information online has driven transparency, undercut hierarchy and resulted in a vast amount of information being freely available to interested parties to analyse. In theory this should be a good thing and make information more democratised. However, the enormous volume of information available and wide variations in its reliability makes it difficult for non-specialists to usefully interpret. In addition, there has been a manipulation of publicly available information by deliberate disinformation campaigns. This is a particular problem for vaccines, which have become weaponised by political ideologists and commercial interests (CCDC, 2021b). Members of the public can be misled into believing conspiracy theories or misrepresentations of science, or they may choose to believe information which reinforces their existing beliefs and biases. There is effectively no regulation of misinformation by social media companies (CCDH, 2020b). This means that powerful organisations and individuals are able to manipulate the information environment in their commercial or ideological interests and drown out the reliable and authoritative information sources that help citizens make informed and rational decisions. There is a great need for independent expert analysis and commentary on publicly available scientific information, as well as a requirement for laypeople to critically evaluate the quality and provenance of the information they are consuming.

More than ever, society needs experts and authoritative reference sources for information about science in a crisis, so that people can make sense of the world they live in and how events relate to their lives. The importance of this has been illustrated by the COVID19 vaccination programme, which has been impeded by vaccine hesitancy. This situation is not surprising; and it was predicted by the participants in this research. In addition, over the summer of 2020, prior to the availability of the vaccine, there were many opinion polls which indicated that members of the general public would be hesitant about taking a COVID19 vaccine. Despite vaccine hesitancy being anticipated, there was initially very little information available on more static authoritative official sites such as the NHS website until the vaccination programme started, and even then, the information was initially fairly

sparse on reference websites, although there was a great deal of news coverage of people being vaccinated (Dunn, 2020). In their 2020 study of fact-checking organisations and misinformation on COVID, Brennen et al. (2020, p.6) concluded:

> Governments have not always succeeded in providing clear, useful, and trusted information to address pressing public questions. In the absence of sufficient information, misinformation about these topics may fill gaps in public understanding, and those distrustful of their government or political elites may be disinclined to trust official communications on these matters.

In effect, the system is not supporting people to make personal decisions in an informed manner by providing them with information.

The insights generated by my research findings do not offer an excuse for poor engagement practice by scientific institutions, but they do provide some understanding of the inertia observed by the STS community, as well as highlighting good practice. The participants in this study demonstrated a clear awareness of areas for improvement and an appetite to address them. More than ever, critical reflection is needed within scientific organisations to understand their own interests and those of others, and seek to create a more productive environment for rational scientific communications and engagement.

Scientists generally recognise the value of engaging with the public in a meaningful way and to strive to take into account human interests and social factors in research. However, having worked in this field and faced hostility from anti-science activists myself, I can empathise with institutions and individuals who are reluctant to step into the storm of a controversy exacerbated by politicians, commercial opportunists and ideologists. The ideal speech situation (ISS) for communicative action cannot take place when people are being threatened or coerced. Science is not perfect, but actors in society must recognise and protect the contribution that science can make to society and the value the knowledge and solutions it creates. It is important, when addressing the weaknesses of science, not to abandon its strengths. Scientific knowledge is vital to answer scientific questions, and this should not be undermined or replaced by pseudoscience or conspiracy theories. Regardless of what politicians may wish, the public still needs and wants – and deserves – authoritative, independent, expert opinion to help them navigate their lifeworld decisions. In recent

years, controversial science subjects have been hijacked by political and populist groups, which has caused confusion and division. It is in the interests of both scientists and the general public to recognise and resist this.

Having answered my research questions and outlined some of the major barriers to effective public engagement in controversial science, I will now elaborate upon a major issue that I believe has resulted.

Despite there being more information available to the public about science than ever before, there remains a gap in authoritative and reliable information sources for the general public. The instrumental use of communications for political or ideological purposes has left the public with few consistent reference sources that they can trust from non-partisan experts. Official information sources are extremely important in controversial science, such as vaccines. When people seek information from authoritative sources (such as the WHO or the NHS) they are less likely to believe misinformation (perhaps because they are never exposed to it). Without good information, people turn to unofficial and less reliable sources that are more likely to contain misinformation. The consequences of this are manifest; the tide of misinformation has impacted people's willingness to be vaccinated, thus endangering the recovery from the pandemic.

ii Is it time to rehabilitate the public sphere?

The conclusions of this research may suggest that currently a rational public debate on science may not be possible. However, I argue that there is an opportunity for the scientific community to build on and expand best practice approaches to public engagement, as well as to work with other concerned parties to expand or adapt spaces that provide the conditions for more rational public discourse.

The COVID19 pandemic has illustrated how misinformation and poor leadership has fed mistrust in societal leaders. The Edelman Trust Barometer (Edelman, 2021) showed historically low levels of trust in government leaders (41%), CEOs (48%) and journalists (55%). Public trust in scientists has also fallen, but relatively remains high at 73%. This high level of trust may be linked to the related finding that academic and company experts are still seen as very or extremely credible (59%). The same report shows how trust in all information sources is at a record low. People do not

know where to find reliable information. Only 35% trust social media and 55% traditional media. This has driven a shift in people's priorities, with 55% of people expressing the intention to increase their media and information literacy and 52% wishing to increase their science literacy. There is clearly an appetite for trustworthy content and science communicators who will also empathise and address people's fears and beliefs.

The issues described in this thesis are much wider than those relating to science communications and engagement, or indeed science itself. There appears to be a degradation in society's ability to engage in discourse and dialogue in order to inform decision-making. There is huge anxiety about societal change, and science and technology is part of that. Characterising the discourse environment for science in this way can lead us to a more sympathetic understanding of anti-science and anti-vaccine groups. They may simply be responding to their own confusion at being confronted by a world that simply makes no sense to them and where they are increasingly disadvantaged by economic and social changes brought about by forces such as globalisation, over which they have no control. Perceiving the system to be working against them and mistrusting those in power, they may reject expertise, scientific knowledge and rational debate and turn to complex conspiracy theories in order to restore meaning to their world.

Science communications practice is hampered by a continued focus on the ignorance of the public, the moral panic about anti-vaccine or anti-science groups, or the intransigence of individual scientists, the institutions and the policy-makers. A new approach will not only demand greater self-reflection on the part of science communicators, but also that those communicators acquire the capacity to critically scrutinise the cultures of those they try to communicate with.

On the surface, the political and media commentary about post-truth implies that facts have become irrelevant and that substantial proportions of the public appear to be aware they are not being told the truth, feel powerless to prevent it and have become resigned to it (Davis, 2017; D'Ancona, 2017; Ball, 2017). This situation has been interpreted by some populists as a rejection of objectivity, expertise and 'elite' technocratic political solutions. Alternatively, the 'rejection of truth' may instead be a legitimation crisis triggered by colonisation of the lifeworld; the public is rejecting a

political system that has rendered the world incomprehensible to them, and thus made the ‘truth’ redundant. The related idea that the public is not interested or too stupid to meaningfully contribute is then being used as an excuse not to engage with the public or to bypass public involvement or consultation. Powerful organisations and individuals are then free to dominate the public agenda unless experts speak up (Jones, 2021).

A wider acknowledgement that social norms of discourse are being distorted may ultimately be the trigger for citizen scientists and laypeople to reclaim the public sphere. Scientific organisations are trusted by the public and are well placed to lead this, as research shows that scientific consensus can be effective against politicisation of ‘facts’ (Linden et al., 2018). Scientific organisations are societal actors, and a communications approach that frames them as participants in society with the needs of society at its core could refocus science communications. Smallman et al. (2020, p.947) argued that the concept of public participation in science shifted the role of the science communicator:

> from one who explains science to the public, to one who helps scientists and technology developers understand society.

The agenda would be driven by the needs of society and how science might contribute to that, rather than the needs of science.

This is not a new idea. Broks (2017) envisaged a complete transformation of science communications to address societal needs. He described a radical shift in science communications away from science, towards a role of mediation and brokering relationships between science and society. Part of this is normalising arguments and debates about science, emphasising that certainty and consensus is rarely achieved. Debates and disagreements are part of the scientific process and the process of making political decisions about science. High quality arguments can contribute to a healthy public sphere where matters of public interest are negotiated in a process of genuine engagement (Heath, 2001; 2006). This is a pragmatic departure from Habermas’s ideal of communicative action, where consensus is always reached, but he was also a pragmatist who recognised that such an ideal was not possible.

iii Recommendations for further research

My research has made an original contribution to academic knowledge and has potential to impact practice in the communications profession in science-based organisations and industries.

- Firstly, I created and tested a novel analytical framework based on Habermasian theory, which enables a thorough examination of communications and engagement practice relating to the 5Cs: **context**; **conduct**; **content**; **construction** of knowledge; and **competence** of the participants.
- Secondly, my use of this analytical model highlighted and explained a number of barriers to public engagement related to the organisations' culture and ways of working – and signposted **why** these barriers appear to be insurmountable.

This research raises many questions, not least the challenge of how to conduct constructive arguments about science in public. This is an area for further research, examining best practices and sharing outcomes from successful programmes. There are also a number of follow-on questions raised by these findings, in particular concerning factors that inhibit co-operation and coalition building across different sectors and organisations in science to address controversy. A more detailed investigation of how organisations formulate communications and engagement programmes and the extent to which their activities align with organisational and national policy might also shed light on the spectrum of activities carried out by communications, marketing and PR teams within scientific organisations, and the relative prioritisation of public engagement within this mix.

Finally, there is the difficult area of evaluation of public engagement. It is clear that organisations invest resources in activities that are proven to add value, and that it can be difficult for communications to secure investment due to a lack of evidence of success. A more detailed investigation into funding decision-making would inform how to build a body of evidence to mobilise resources to meet policy goals related to public engagement.

These research findings will be shared through professional bodies, science communications networks, publications, conferences and seminars – with both academic researchers and science communications professionals. Drawing attention

to the underlying and perhaps unacknowledged cultural and social influences on scientific discourse is the first step to improving practice. In this way, I hope to contribute to improving the quality of the public debate in this area, supporting evidence-based policy implementation.

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Appendix 1

Characteristics of interview participants (see chapter 3.4).

ID	Current position	Sector of work	Career sector experience			Gender		Educational background		
			private	public	NGO	M	F	natural sciences	human-ities	HCP
P1	Executive Director, Comms in consultancy	Private	x	x	x		x			x
P2	Senior consultant Public engagement in consultancy	Public	x	x	x		x		x	
P3	Director, Comms and advocacy in pharma	Private	x	x	x	x		x		
P4	Consultant, Commercial in pharma	Private	x			x		x		
P5	Exec Director, Scientific advocacy in NGO	NGO	x	x	x		x		x	
P6	Director, Comms in healthcare provider organisation	Public		x	x		x		x	
P7	Dept. Head, Strategic advisor in consultancy	NGO			x		x		x	
P8	Senior Director, Comms and advocacy in pharma	Private	x	x	x		x		x	

ID	Current position	Sector	Career sector experience			Gender		Educational background		
			private	public	NGO	m	f	NS	H	HCP
P9	Exec Director, Scientific advocacy in NGO	NGO		x	x		x		x	
P10	Director, Patient engagement in healthcare provider organisation	Public	x	x	x		x	x		
P11	Exec Director,Comms and advocacy in health sector.	Private	x	x	x		x		x	
P12	Exec Director Advocacy, healthcare provider organisation	Public	x	x	x		x		x	
P13	Director, Patient engagement and advocacy in NGO	NGO	x	x	x	x				x
P14	Exec Director, Scientific advocacy in NGO	NGO	x	x	x		x		x	
P15	Manager, Comms in healthcare provider organisation	Public	x	x	x		x		x	
P16	Senior Manager, Comms and advocacy in pharma	Private	x	x	x		x		x	
Totals			13	14	15	3	13	3/16	11/16	2/16

Additional points of interest:

- Two participant have an academic qualification in science communications and both work in the public sector
- Two had worked as journalists and two had worked in politics

Appendix 2

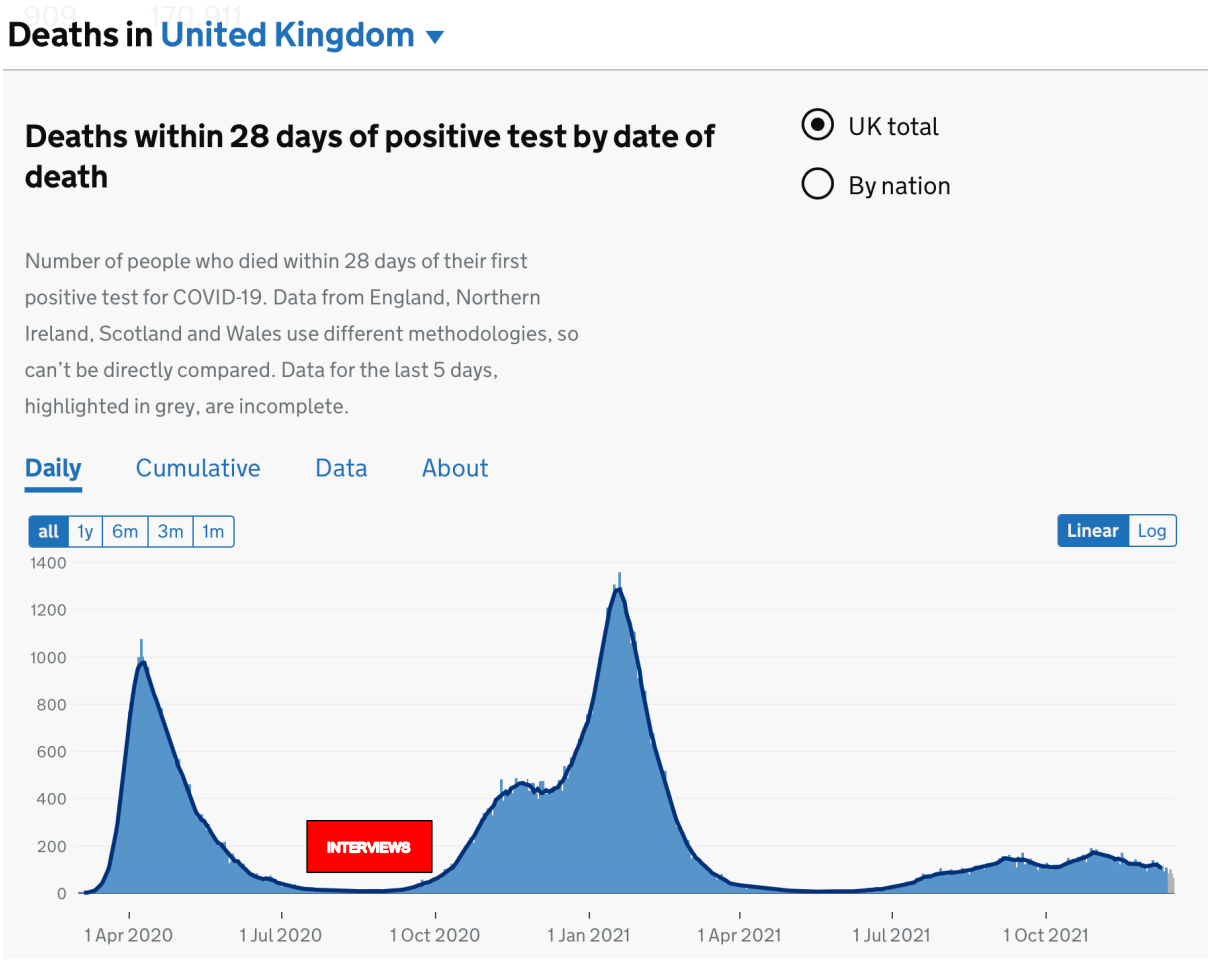
Timeline of pandemic events Jan 2020 - April 2021 indicating when research interviews took place.

Abbreviations: O-AZ: Oxford AstraZeneca, PHE: public Health England. EMA: European Medicines Agency, Vx: vaccine

UK Pandemic key events	Date	UK Vaccine milestones
New virus identified in China	Dec 2019	
WHO declares global health emergency	Jan 2020	SARS-COV2 viral genome is sequenced
UK national lockdown measures come into force for 3 months	March 2020	First human studies start for Moderna vaccine
Peak of first wave on 8 April. Over 1000 deaths/ day.	April 2020	First human studies start for BioNTech-Pfizer vaccine
Lockdown measures start to improve infection and death rates.	May 2020	
Phased re-opening of schools, shops	June 2020	First human studies for Oxford-AZ Vx
Local lockdowns introduced Re-opening of non-essential shops and hospitality	July 2020 3 interviews	Large scale (Phase II/III) studies start for several vaccines.
Restrictions further eased for theatres/ soft play Government disbands PHE and replaces it with a specialist unit.	Aug 2020 8 interviews	WHO warns against 'vaccine nationalism'.
14th: Restrictions on social gatherings introduced (6 people only), followed by hospitality curfew o 22nd.	Sept 2020 5 interviews	O-AZ vaccine trial paused due to SAE, resumes 6 days later.
Three tier system of restrictions introduced in England	Oct 2020	
Second lockdown comes into force	Nov 2020	BioNTech-Pfizer/ Moderna vaccines show high protective efficacy.
2nd: Lockdown ends, 3 tier restrictions in place 19th: New tier 4 restriction introduced	Dec 2020	First phase III trial data published. 3 vaccines approved for use in the UK. Immunisation of most vulnerable starts in UK
Third lockdown. Peak of the second wave on 19th Jan. Over 1,300 deaths/day.	Jan 2021	AZ announce delay I supplies to EU as UK has contractual priority. UK vaccination programme rolls out faster that rest of world.
Lockdown measures start to impact, reducing infection and death rates.	March 2021	30 million vaccines given in UK. Supplies limited in EU export ban threatened. EMA investigates rare blood disorder in recipients of the O-AZ vaccine. Subsequently declares it safe to use. O-AZ vaccine use restricted in several EU countries.
UK Lockdown eases.	April 2021	WHO declares that the risks from Covid-19 are much higher than the risks associated with O-AZ vaccine after 7 post-Vx deaths reported.

Sources:
https://bfpg.co.uk/2020/04/covid-19-timeline/
https://www.instituteforgovernment.org.uk/sites/default/files/timeline-lockdown-web.pdf

Pandemic-related deaths in the UK March 2020-mid December 2021



Source: UK Government.

Published online at: https://coronavirus.data.gov.uk/details/deaths (accessed 19 Dec 2021)

Appendix 3

List of documents related to the practice of science communications.

Document	Date	Organisation/ Source
JOB DESCRIPTIONS		(all accessed online)
Director of marketing and communications	November 2020	Birmingham City University
Director of marketing and communications	November 2020	London Metropolitan University
Head of priority campaigns	June 2020	Department of Health and Social Care
Head of patient public and stakeholder engagement	Nov 2020	Medicines and healthcare products regulatory agency (MHRA)
Head of communications	August 2020	Health Data Research UK
GUIDANCE DOCUMENTS		
Modern communications operating model. A blueprint for government communication	Nov 2019	Government communication service. LINK Accessed Dec 2021.
External affairs operating model	2018	Government communications service. LINK
Doing public dialogue. A support resource for Research Council staff	July 2012	Research Councils UK (accessed online)
RCUK public engagement with research strategy	2019	Research Councils UK (accessed online)
UKRI Vision for Public Engagement	Sept. 2019	UK Research and Innovation (accessed online)
REPORTS		
The State of Play: Public Engagement with Research in UK Universities	September 2016	Research Councils UK and the Wellcome Trust LINK
Factors affecting public engagement by researchers. A study on behalf of a Consortium of UK public research funders	December 2015	Policy Studies Institute LINK

Appendix 4

Sample role descriptions: University sector

Director of Marketing and Communications, Marketing & Communications Department

Location: Birmingham, City Centre Campus

Closing Date: Friday 06 November 2020

Interview Date: Friday 13 November 2020

Reference: 102020-383

Director of Marketing and Communications

Our university has a deserved reputation as a vibrant, ambitious and successful institution. The investment of over £300M into the estate has created a truly astonishing environment for students and staff, in the heart of our city. Birmingham itself, with its five universities and 65,000 students is the youngest city in Europe with under-25s accounting for nearly 40 percent of its population. With 50 percent of our students from a BAME background, we are proud of how we represent and positively impact this wonderful city, and with Sir Lenny Henry as our Chancellor, we are truly the University for Birmingham. The Director of Marketing & Communications is responsible for the strategic development and operational leadership of marketing and communications activity across the University. You'll provide strategic leadership to the team, with particular view to meeting the University's ambitious growth strategy aligned to the University's 2025 Strategic Plan, which raises the profile of the institution, builds brand awareness and drives undergraduate and postgraduate student recruitment. The position oversees high performance across all areas of home student recruitment, including marketing, admissions, school and college engagement, events, and internal and external communications – aligning these functions to deliver against student recruitment targets and deliver a great student experience. Responsible for all Marketing & Communications staff including selecting, inducting and overseeing their ongoing development, performance and management all resources within budgets associated with all marketing and communications activities. To be successful in the role, in addition to leading the university recruitment of students, you will:

- Maintain an excellent knowledge of current relevant government policies and regulations which may impact on marketing and communications activity.
- Contribute to university decisions on course additions and deletions as necessary based on market intelligence, using insights to shape short, medium and long-term portfolio recommendations.
- Develop and implement sector-leading media campaigns to support the promotion of strategic institutional projects, proactively generating coverage, raising profile and advancing the University's reputation.
- Establish and maintain a strong network of contacts for promoting and building the reputation of the University internally and externally.
- Influence University decisions through providing expertise on marketing and communications and leading or participating in relevant working groups, committees and consultations.

Skills, Knowledge, Experience and Qualifications

- Demonstrable evidence of creating a culture and vision that delivers successful outcomes through people, developing and challenging teams to succeed and taking pride in delivering professional services and solutions.
- Ability to enable teams to work together and across functions to deliver successful outcomes that exceed the needs and expectations of our audiences, creating environments that demonstrate equality, foster trust, respect and challenge.
- Professional credibility, integrity, strength of character, and the ability to influence others within the University and externally.
- Solid understanding of the Higher Education policy landscape.
- Recognised professional marketing qualification, such as membership of the Chartered Institute of Marketing, and /or significant comparable experience and experience of strategic leadership.
- A track record of leading large teams, utilising large budgets, to deliver large-scale marketing campaigns and clearly demonstrating return on investment.
- Previous experience of utilising market intelligence to make evidence-based marketing decisions and developing new business opportunities, generating diverse income streams.

- Professional credibility, integrity, strength of character, and the ability to influence others within the University and externally.

This is a fantastic opportunity to lead and manage an award-winning team of marketing and communications professionals. The chance to influence University decisions through providing expertise on marketing and communications and leading or participating in relevant working groups, committees and consultations and provide senior professional guidance to the University Executive Group. If this sounds like your next opportunity, please get in touch by applying with a full CV and covering letter (max 2 sides A4), setting out why you feel that you are the best candidate for us.

Director of Marketing and Communications
Posted: 22nd October 2020

London Metropolitan University: transforming lives through the power of education

Marketing and communications form an essential part of London Metropolitan University's ambition to grow student numbers and develop a strong global brand, ensuring long-term sustainability for the institution and the diverse communities that it serves.

The Department of Student Recruitment and Business Development is divided into three directorates: Student Recruitment and Business Development, Marketing and Communications, Admissions and Enrolment. The department is responsible for the entire prospective student lifecycle up to and including enrolment, as well as re-enrolment of continuing students, internal communications (staff and students) and graduation. Covering both domestic and international cohorts, the departments priority is ensuring excellent levels of lead generation and conversion to support strong enrolment each intake, whilst supporting development of a strong internal staff and student community through engaging and inclusive communications.

Marketing and Communications is an established team consisting of 18 staff, including a Head of Marketing and Head of Communications. With particular responsibility for internal and external communications, campaigns and digital/print marketing, the team also works collaboratively across the department to ensure achievement of shared departmental student recruitment and enrolment objectives.

A key pillar of the departmental strategy is to have a small, focussed team on campus who work in partnership with external industry experts to ensure we are leveraging the best the private sector can offer and are market-leading in our approach to marketing, communications, student recruitment and business development.

Following a recent restructure, the Pro-Vice Chancellor Student Recruitment and Business Development is looking to appoint a new Director of Marketing & Communications who will be responsible for the strategic development and operational leadership of marketing and communications activity across the University.

You will work closely with the academic Schools and Professional Services to establish an integrated and digitally focussed approach to the development of London Mets brand both internally and externally, ensuring the University community is appropriately represented within all promotional materials and campaigns. You will support internal and external communications, media relations, digital marketing (including social media and website) and print marketing. You will help to develop and implement a sector-leading marketing and communications strategy which both drives enquiries and applications for undergraduate and postgraduate programmes, and positions London Met as a desirable and unique study location locally, nationally and internationally.

The successful candidate will be strategic and innovative in their marketing practice. You will be able to demonstrate evidence of a creativity in your approach to attracting students from a diverse range of backgrounds, at different life stages, and throughout the academic year, from domestic, national and international markets. You will lead the development of engaging and inclusive communications, internally and externally.

With equality and diversity at its heart, the Vice Chancellors new Strategic Plan outlines the future for the University. London Met is an institution with a deep social purpose, and we are proud of the diversity of our students and of the positive contribution we make to London and its communities. Seeking out exceptional leaders, researchers and practitioners is in line with the strategic ambitions of our

institution. We are evolving and we would like to invite the very best to come and join us.

Do you want to join us on our extraordinary journey as one of the UKs most socially inclusive and diverse universities?

Appendix 5

TABLE A: Initial nVIVO codes created during initial analysis of interview data

This table was the product of step 2 of my thematic analysis (Braun and Clarke, 2006; 2019). Step 2 is the generation of initial codes and the aggregation of data into nodes (see Figure 1, Chapter 3.4).

Context	
• Anti vaxxer tactics • Blaming others for issues • BREXIT • Celebrities • Challenging authority of scientists • Comms as outsider • Corporatisation of science • Damage of polarisation and aggression • Dark Forces and disinformation • Experts • False balance in media • Ideology	• Impact of denialism • Industry and commercial • Information - too much • Mainstream media • Politicisation of science • Populism • Separate discourses • Social media • STS critique and the response • Tech companies • Think Tanks • Trust and mistrust
Conduct	
• Behavioural science • Boundary work and Framing • Communicative action • Cost • Duplication • Ethics • Evaluation or evidence • Exclusion • Fragmentation • Governance and regulation • Labelling sceptics as denialists • Lumping the public all in together • Obsession with digital • Over complicating it	• Policy should drive comms • Public led, expert fed • Rebuttals • Refusing to engage with the preposterous • Relationships, importance of • Risk aversion • Scientists motivation to communicate to public • Someone else's job • Strategic comms • Talking to 'friends' • Transparency • Information vacuum /slow responses
Content	
• Competing for attention • Facts vs feelings etc. • Cultural imperialism	• Deficit model • Fear • Heroes and villains
Construction of knowledge	
• Conspiracy theories • Critical thinking • Culture mismatch	• Experiential knowledge • Misinformation and pseudoscience • Paternalism
Competence	
• Fast moving field and new skills • Jargon • Reflection in science about their contribution to the problem	• Sci Comms Profession • Underestimating the public

TABLE B: Overview of total citations from raw data by individual interviewees (P1-P16) and grouped by sector (Private, Public and NGO).

	THEMATIC FRAMEWORK – THE 5CS				
	Total number of references in nVIVO database for each of the 5Cs				
	Context	**Conduct**	**Content**	**Construction**	**Competence**
PRIVATE SECTOR total	91	119	24	23	41
P1	9	30	1	4	6
P3	13	15	11	7	12
P4	28	13	6	7	1
P8	21	18	2	4	11
P11	10	14	3	0	10
P16	10	29	1	1	1
PUBLIC SECTOR total	57	65	12	13	17
P2	8	24	4	4	7
P6	6	6	4	1	0
P10	2	10	0	0	1
P12	30	18	1	5	5
P15	11	7	3	3	4
SCIENCE NGOS total	119	69	14	22	43
P5	14	15	0	4	1
P7	29	11	2	1	7
P9	15	27	8	6	8
P13	10	4	4	9	10
P14	51	12	0	2	17
Total number of coded citations All interviews all sectors	267	253	50	58	101

TABLE C: Refined codes and sub-codes used for themes in analysis chapter

These codes formed the themes drawn out in the analysis chapter in five sections (Chapter 4). This table was the product of step 4 of my thematic analysis (Braun and Clarke, 2006; 2019). Step 4 is combining and rearranging nodes within themes (see Figure 1, Chapter 3.4). The themes were then defined and synthesised into the empirical chapter (chapter 4).

CONTEXT Themes:

1. Trust in science, government, experts
2. Hostility to experts and institutions
3. BREXIT
4. Reduction in standards in public life
5. Inability to respond quickly to events
6. Gap in information provision
7. Blurring of lines between science and policy
8. Politicisation, apportioning blame to others for failure of government/ policy
9. Use of vaccine misinformation to cause disruption, discredit governments
10. Poor relationships between institutions and reporters
11. Need for openness, honesty, engagement with media
12. Politicisation of COVID19 vaccine
13. Anti-vaccine groups not the primary concern

CONDUCT Themes:

1. Paternalist/ elitist culture in science
2. Deficit model approach to comms/ the public
3. Need for high quality engagement / mutual understanding with the public and the media
4. Need to give up some control for some gain
5. Lack of real progress, despite much work
6. Move away from science communications in universities
7. Corporatisation of science – change in skills
8. Focus on rebutting / protecting rather than proactive provision of info for the public
9. Central control of comms
10. Strategic comms: seeking to influence not engage
11. Not responding on subjects of controversy/ crises
12. Reduction in capacity to serve the media during crises and issues
13. Centralisation reducing autonomy of public bodies with respect to press activity
14. Selectivity about which media outlets orgs engage with
15. Risk aversion, fear
16. Preach to converted/ friends
17. Refusal to engage with anti-vaccine groups
18. Ridiculing/ dismissing people who disagree
19. Lack of evidence for communications interventions impacts credibility
20. Lack of institutional support for openness on controversial subjects
21. Effectiveness of coalitions
22. Lack of cooperation / trust between scientific organisations/ sectors
23. Pessimism about success due to lack of trust in all scientific institutions
24. Positioning scientific organisations within societal context, part of the solution.

CONTENT Themes:

1. Infodemic, misinformation, disinformation, conspiracy theories etc.
2. Disinformation as a disruptive political tool.
3. Lack of action from tech companies
4. Disinformation more appealing/ interesting to the public than accurate/ factual info
5. Lack of proactive info, focus on defending and rebuttals
6. Science content needs to appeal to people's values and interests

CONSTRUCTION Themes:

1. Cultural preference for rational/ facts and data rather than feelings, experiences and emotion
2. Scientists baffled by scepticism/ denialism due to insularity.
3. Institutions out of touch with how they are perceived by the public
4. Central role of communications in bringing the outside in and confidence to engage with the public in a meaningful way
5. Epistemological incompatibility and the need for discussions about science need to focus more on implications for society and lifeworld concerns, not just on technical science.
6. Need to defend science from post-modernism/ relativism.
7. Need to acknowledge uncertainty and grey areas in science
8. Dangers of 'one message', controlling the message too tightly.

COMPETENCE Themes:

1. Organisations do not understand the new environment
2. Scientific organisations slow to adopt new practices, aversion to anything commercial
3. Government are adopting behavioural science. polling and new approaches
4. Continued adherence to jargon
5. Underestimating the abilities of the public

TABLE D: Coded citations used in the final analysis by sector

The table below was created to check if there was a significant patterns of coded responses between participants from the different sectors. Only citations included were those in the results chapter (chapter 4) were included in the analysis. The numbers in each column indicate sub-codes in the nVIVO coding (listed in previous table, C).

	THEMATIC FRAMEWORK – THE 5CS				
	Numbers in each section refer to the sub-codes for each of the 5Cs These are listed in the previous table				
Participant identifiers P1-P16	**Context**	**Conduct**	**Content**	**Construction**	**Competence**
PRIVATE SECTOR					
P1	8	22, 23			2
P3		1, 2, 15		7	
P4	8, 9, 12	18	1		
P8	2	24		4, 5, 7	4
P11	10	15, 19, 20, 24		1, 3, 5	
P16		11, 17, 18, 21, 22, 23	1, 4		2
PUBLIC SECTOR					
P2		3, 10		1, 4, 5	
P6	4, 8		6		
P10		16			2
P12	7, 9	3, 9, 12, 14, 15, 19		2, 7	
P15	3				3
SCIENCE NGOS					
P5		15, 21, 24			
P7	5, 6		2, 3, 4		1
P9	5	4, 5, 8, 18, 20	5	6	5
P13			4	7	
P14	9, 10, 11, 13	6, 7, 11, 13, 16		2, 8	4

Observation:
There did not appear to be major sector differences in citations used in the final analysis, although it is difficult to draw conclusions for the sample size. This may have been because many of the participants had worked across more than one sector.