



# Defining R&D for the arts and cultural knowledge domains

Elizabeth Lomas



# DEFINING R&D FOR THE ARTS AND CULTURAL KNOWLEDGE DOMAINS

**REPORT AUTHOR:** Dr Elizabeth Lomas, University College London

---

## **RESEARCH SCOPE:**

The aim of this research has been to understand how R&D should be conceptualised for the arts and cultural knowledge domains, defined for policy purposes, measured and evaluated. The work has considered approaches to R&D from academia and practice.

This is a piece of commissioned research which has been undertaken as a component of the Digital Research and Development (R&D) Fund for the Arts' programme. The Digital R&D Fund for the Arts was a strategic partnership between the National Endowment for Science Technology and the Arts (Nesta), Arts Council England (ACE) and the Arts and Humanities Research Council (AHRC). The research grant funded Dr Elizabeth Lomas part-time over a two-year period.

---

**ACKNOWLEDGEMENTS:** The author would like to thank all those named and anonymized contributors to this work. Particular thanks are due to Hasan Bakhshi, Ron Donaldson, Julie McLeod, Sam Mitchell, Emma Wakelin, Heather Williams and Tandi Williams.

---

**Funded by the Arts & Humanities Research Council (AHRC)**

Grant Number: AH/L503988/1

© University College London 2017: Use of these materials is permitted under the terms of the Creative Commons Attribution-Non-commercial- ShareAlike 2.0 UK: England & Wales Licence. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-sa/2.0/uk/> or send a letter to Creative Commons, 171 Second Street, Suite 300, San Francisco, California, 94105, USA.

## Executive Summary

This piece of commissioned research has been undertaken in parallel with the Digital Research and Development (R&D) Fund for the Arts' programme. The Digital R&D Fund for the Arts was a strategic partnership between Nesta, Arts Council England (ACE) and the Arts and Humanities Research Council (AHRC). As commissioned research it has been overseen by Hasan Bakhshi from Nesta.

The aim of this research has been to understand how R&D should be conceptualised for the arts and cultural knowledge domains, defined for policy purposes, measured and evaluated. The work has considered approaches to R&D from academia and practice. The study has been delivered through iterative multiple research methods, including interviews, questionnaires and workshops. The participants of the Digital R&D Fund for the Arts have provided a key data source for the work.

The headline findings of this work are that rather than having a unique definition of R&D for the arts and cultural knowledge domains there is a value in having one unified R&D definition encompassing all knowledge domains for policy purposes. Within the context of science and technology, an R&D definition first agreed by the Organisation for Economic Cooperation and Development (OECD) countries in 1963 has over the years given rise to various public funding structures for R&D, including subsidies and tax breaks. A unified R&D definition for all knowledge domains (the arts and science and technology) could in principle result in parity across all knowledge domains. The resulting definition should:

- recognise R&D as a legitimate and well understood practice delivered across all knowledge domains, e.g. arts, humanities, science, technology etc.
- aid collaboration and understanding across all those domains delivering R&D.
- provide a basis on which to build a framework to measure R&D, in a way in which R&D activity can be evaluated.
- provide a focus for policymakers and funders.
- foster greater understanding of the value of R&D in the eyes of the wider public.

As a result of this work, the existing science and technology definition of R&D in the *Frascati Manual* (OECD, 2002 6<sup>th</sup> ed. and 2015 7<sup>th</sup> ed.) was identified as the basis for a unified R&D definition for all knowledge domains and was tested and evolved with key stakeholders. Historically, the *Frascati Manual* R&D definition has been used to align to positivist and post-positivist perspectives which exclude some research paradigms. The *Manual* whilst expanding to acknowledge that R&D occurs across the arts and cultural knowledge domains still needs to rebalance its emphasis on science and technology and extend its R&D definition further. A definition of R&D for all knowledge domains needs to encompass approaches which alter or change people as well as producing products. Key to altering the definition is a need to extend the definition to include 'experiences' and 'behaviours'. As a definition for policymakers R&D must deliver 'value' albeit this will be judged in a range of ways. The proposed definition below explicitly recognises the contributions R&D makes not just to the economy but culture and society.

### PROPOSED R&D DEFINITION FOR ALL KNOWLEDGE DOMAINS WITH HIGHLIGHTED CHANGES TO INDICATE ALTERATIONS FROM THE FRASCATI MANUAL (2015) (red highlights are deletions whilst yellow highlights are additions):

**Research and experimental development (R&D)** comprise creative and systematic work undertaken in order to increase ~~the stock of~~ knowledge – including knowledge of humankind, culture and society – and to devise new applications **of economic, cultural or social value** of available knowledge.

**Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena, observable facts and **behaviours**, without any particular application or use in view.

**Applied research** is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific **intended** ~~practical~~ aim or objective.

**Experimental development** is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products, **experiences** or processes or to improving existing products, **experiences** or processes.

**FINAL PROPOSED R&D DEFINITION FOR ALL KNOWLEDGE DOMAINS:**

**Research and experimental development (R&D)** comprise creative and systematic work undertaken in order to increase knowledge – including knowledge of humankind, culture and society – and to devise new applications of economic, cultural or social value of available knowledge.

**Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena, observable facts and behaviours, without any particular application or use in view.

**Applied research** is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific intended aim or objective.

**Experimental development** is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products, experiences or processes or to improving existing products, experiences or processes.

During the course of this study, data was collected to provide illustrations of a range of R&D as it is delivered in practice across arts and culture. It is concluded that further research is required to develop a robust set of R&D case studies in the arts and cultural knowledge domains and a framework for measuring and evaluating arts and cultural R&D, consistent with how statisticians measure the volume of, and estimate the social rate of return from, science and technology-related R&D. This work should draw on the *Frascati Manual* survey mechanisms but in addition take into account the learning from the REF 2014 frameworks. This work needs to take account of the delivery models for arts and culture which include lone workers,

collaborations and SME as well as multinational global entities.

An agreed R&D definition will make the significance of R&D and the process more tangible. This can then be built on with case examples which will engage and capture the public imagination in terms of the arts and cultural knowledge domains delivery of R&D. It is important to recognise the global reach of the *Frascati Manual* and thus the significance of innovators engaging with the *Frascati Manual* frameworks provided these can be amended to better represent the delivery of R&D across all knowledge domains.

# CONTENTS

	Page
<b>Executive Summary</b>	<b>1</b>
<b>1. Introduction</b>	<b>5</b>
1.1 Research focus	5
1.2 Research context	5
<b>2. Methodology</b>	<b>6</b>
2.1 Overall project approach	6
2.2 Overall methodological approach	6
2.3 Project phases	6
2.3.1 Literature review	6
2.3.2 Semi-structured interviews with selected R&D stakeholders	7
2.3.3 Questionnaires disseminated across the Digital R&D Fund for the Arts' Participants	8
2.3.4 Workshops exploring the benefits of R&D	8
2.3.5 Focused interviews	9
<b>3. Literature review</b>	<b>10</b>
3.1 Introduction	10
3.2 What is R&D?	10
3.3 Research paradigms	11
3.4 Understanding R&D	14
3.5 Delivering and funding R&D	19
3.5.1 Higher Education and Further Education (HEFE)	19
3.5.2 Research outside HEFE	20
3.5.3 Industry	21
3.5.4 New delivery structures	22
3.6 Measuring R&D	23
3.7 R&D case examples	27
<b>4. Findings: Semi-Structured Interviews, Questionnaires and Workshops</b>	<b>37</b>
4.1 Introduction	37
4.2 What is R&D?	37

4.3 Do the arts and cultural knowledge domains need a bespoke R&D definition?	38
4.4 Considering the relevance of the <i>Frascati Manual</i> R&D definition for the arts and cultural knowledge domains	40
4.5 Delivering R&D	43
4.6 Measuring R&D	45
4.7 Funding R&D	47
4.8 Conclusions from the semi-structured interviews, questionnaires and workshops	49
5. Findings: Focused Interviews	51
5.1 Introduction	51
5.2 Defining R&D from the perspective of the Knowledge Exchange Hub Directors	51
5.3 Defining R&D from the perspective of policymakers	52
5.4 Conclusions from the focused interviews	54
6. Report conclusions	56
References	59
Appendices	72
Appendix A – Interview participants	72
Appendix B – Semi-structured interview questions	73
Appendix C – Questionnaire	75
Appendix D – Workshop participants	79
Appendix E - First definition shared with the Knowledge Hub Directors for interview purposes	80
Appendix F – Second definition shared with the Knowledge Hub Directors and policymakers for interview purposes	81
Appendix G – Final definition and commentary shared with the policymakers for interview purposes	82
Figures	
Figure 1: Breakdown of responses indicating whether respondents agreed that the Frascati R&D definition (OECD, 2002) was equally capable of being taken as a definition for the arts and cultural knowledge domains.	41

# 1. INTRODUCTION

## 1.1 Research focus

The project remit for this work was extremely challenging. There has previously been very limited work in this area and as such there were unknowns about the theories that would guide the work. The key research aim and objectives were evolved as part of discussions with the Digital R&D Fund for the Arts' Steering and Evaluation Group which included representatives from Nesta, Arts Council England (ACE) and the Arts and Humanities Research Council (AHRC). This was commissioned research. Hasan Bakhshi (Nesta), was provided as the main contact for reporting purposes. Emma Wakelin (AHRC) and Professor Julie McLeod (Northumbria University) provided additional reporting lines and support.

The aim of this research has been to understand how R&D should be conceptualised for the arts and cultural knowledge domains, defined for policy purposes, measured and evaluated.

## 1.2 Research context

This piece of commissioned research has been undertaken in parallel with the Digital Research and Development (R&D) Fund for the Arts programme. The Digital R&D Fund for the Arts was a strategic partnership between Nesta, Arts Council England (ACE) and the Arts and Humanities Research Council (AHRC). The Fund supported 52 projects which were three way collaborations between cultural organisations, academics and technology providers focusing on the delivery of projects whereby digital technology enhances audience reach and/or develops new business models for arts and culture (<http://artsdigitalrnd.org.uk/>). The research has been funded over a two-year period as a 0.3 ft. contract.

The aim of this research has been to understand how R&D should be conceptualised for the arts and cultural knowledge domains, defined for policy purposes, measured and evaluated. The emphasis on policy is important as this provides a very particular focus for the work. The work was commissioned as a multiple method study, making use of qualitative interview and quantitative survey techniques. Very little theoretical and empirical research has previously been undertaken on R&D definitions and metrics in arts and culture. The study has taken into account the viewpoints of those from beyond the traditional boundaries of academia, i.e. those undertaking research beyond the walls of the Higher Education and Further Education (HEFE) knowledge domain. A key resource for the work was the Digital R&D Fund for the Arts' projects and the experiences of the participants. However, the project was not limited to this one data pool.

## 2. METHODOLOGY

### 2.1. Overall project approach

The aim of this research has been to understand how R&D should be conceptualised for the arts and cultural knowledge domains, defined for policy purposes, measured and evaluated. The objectives of the study were to deliver a piece of research that:

- reviewed and refined existing definitions of R&D considering the context of policymakers.
- critically conceptualised the processes by which R&D happens in arts and cultural activities, in both academia and practice.
- provided examples of the economic and social value of engagement between the research base and arts and culture.
- derived implications for R&D funding and wider innovation policies.

### 2.2. Overall methodological approach

This work was delivered through iterative multiple research methods with inductive data analysis. This enabled a strategic review of the research direction after each research phase in order to ensure the approach was delivering on the project objectives and to take account of each set of findings. As a result of these reviews the six phases of the research completed were:

- i. A literature review ongoing throughout the project encompassing a review of the documentation of a sample of research bids
- ii. Semi-structured interviews with selected R&D stakeholders
- iii. Questionnaire disseminated across the Digital R&D Fund for the Arts' participants
- iv. Workshops exploring the benefits of R&D
- v. Focused interviews firstly with the Directors of the AHRC Knowledge Exchange Hubs for the Creative Economy and then to conclude policymakers.

By utilising quantitative and qualitative research instruments a rich picture was able to emerge. This research methodology enabled:

- access to beliefs, explanations and intentions of policymakers, practitioners and researchers.
- the triangulation of evidence by using more than one source of evidence.
- evidence collection based in authentic contexts in order to understand how R&D occurs in practice.

### 2.3. Project phases

Each phase of the research informed the design of the next phase. The literature review was undertaken throughout the work.

#### 2.3.1 Literature review

The literature review sought to gather examples of definitions, policy and value in respect of R&D specifically. It confirmed what the funders had stated in the initial call for proposals that very little has been published in peer-reviewed academic journals on R&D as it pertains to the arts and cultural knowledge domains. This was confirmed through searches of relevant abstracting and indexing databases (i.e. LISA, ERIC and the British Education Index) and journal and conference searches (via Zetoc).

The library catalogues of Northumbria University and UCL were used to conduct the searches of combinations of the word R&D with other concepts relevant to arts and culture (such as 'R&D + art' and 'R&D + culture'). It was extended into combinations of searches which



encompassed the lists of subjects covered under the AHRC's remit (<http://www.ahrc.ac.uk/funding/research/subjectcoverage/>). These searches were also mirrored on the search engine Google in order to establish what was present in the trade arena and the wider public domain in terms of definitions. The literature review was continued over the course of the project and new searches conducted as further themes for consideration emerged. It is to be noted that the literature review only included searches in English due to time and language constraints.

In addition, a review of the documentation of a sample of research bids was conducted for the purposes of discerning the methodologies, benefits and outcomes described for research delivery. The documentation for research bids require the research to be defined and also the study's anticipated outputs, benefits and impact to be described. All of the successful bids for the Digital R&D Fund for the Arts were reviewed, which provided the additional benefit of familiarization with the programme range. In addition, Northumbria University and AHRC provided a sample of research bids. The bids were limited in number to those where Northumbria University and AHRC had permission from the applicant(s) to share with a third party. In total the submissions for 117 research bids were reviewed.

### **2.3.2 Semi-structured interviews with selected R&D stakeholders**

Thirty semi-structured interviews were conducted in order to open up the subject and explore both the definition of R&D and perspectives on the value of R&D in different situations. The interviewees were purposefully selected with input from the Digital R&D Fund for the Arts Evaluation Group which comprised representatives from the three stakeholders (ACE, AHRC and Nesta). The intention of the interviews was to capture perspectives from stakeholders across practice, academia and policy making. A list of six participants from the Digital R&D Fund for the Arts (two academics, two technology providers and two representatives from an arts organisations), eight practitioners, ten academics (including six from the Digital R&D Fund for the Arts) as well as an additional six interviewees with a vested interest in arts and cultural policy was drawn up. In reality the boundaries between the domains of practice, academia and policy were blurred. Some candidates were unavailable to participate and in these instances the Digital R&D Fund for the Arts Evaluation Group suggested alternatives. In some instances, the initial candidate suggested an alternative participant and this person was then approached. In total, thirty interviews were conducted. A full list of those participants who agreed to be acknowledged is included at Appendix A. They included:

- practitioners in art, crafts, design, film, museum curation, manufacturing, technology, theatre, retail and writing.
- academics from the fields of archaeology, creative technology, dance, digital arts, English literature, history, practice-led-research in the arts, print, science, social science, technology and the visual arts.
- people with expertise related to the development of R&D from a range of perspectives including government policy, funding and tax.

The interviews were conducted with a semi-structured interview approach (see Appendix B). This enabled the subject to be opened out whilst still ensuring that key territory was covered.

Guba and Lincoln (1985, p.235) state that in regards to qualitative methods and data saturation "it is usual to find that a dozen or so interviews, if properly selected, will exhaust most available information; to include as many as twenty will surely reach well beyond the point of redundancy." However, this was a complex piece of research that crossed many stakeholder groups. This phase of the research collected data which opened up the topic rather than claiming to reach data saturation.

The interviews were taped and analysed. AtlasTI was used to code the audio tapes directly. Themes were identified from the qualitative data using coding practices as described by Lewins and Silver (2007, pp.84-85 and pp.91-100) who define the techniques of open coding, axial coding and selective coding. In addition, quotations were highlighted linked to themes.

Many of those selected crossed over between the domain of research, practice and policy. All

of the interviewees took part in a personal capacity and their comments were not affiliated to their employer organisations. Nor was their participation taken as an indication that they would support the eventual conclusions of this report. Interviewees were offered the opportunity for their contributions to be anonymised in order to enable a free and frank discussion.

### **2.3.3 Questionnaire disseminated across the Digital R&D Fund for the Arts' Participants**

The interviews were used to inform the development of a questionnaire (Appendix C) which was disseminated across all the participants in the Digital R&D Fund for the Arts. The questionnaire approach enabled a larger pool of participants to be targeted.

The questionnaires were sent out to all participants from within the Digital R&D Fund for the Arts in England. In addition, the questionnaire was disseminated to the project participants in the projects from the separately managed Digital R&D Fund for the Arts in Wales. The Digital R&D Fund for the Arts in England management team made up of representatives of Arts Council England, AHRC and Nesta was included in the pool of participants.

It is important to note up front that, even in the case of participants from within the R&D Fund projects, the interviews had highlighted that many had not previously reflected on the significance and nature of arts and cultural R&D and had not fully formulated their thoughts on the subject. Partly in anticipation of negative implications for the survey response rate, a very short presentation on the importance of this research study was undertaken by the researcher at two participant events organised by the Digital R&D Fund for the Arts team.

The questionnaire sought to understand concepts and environments for R&D work and to probe potential ways to measure and value R&D for policymakers. The questionnaire was developed on SurveyMonkey. The questions developed were a mix of open-ended and closed questions to ensure a reasonable range of valid responses and tease out specific issues. Defining the topic properly is, as Foddy, (1993, p.32) suggests, "a major step toward having different respondents give the same kind of answers". The questionnaire was emailed with a survey link to all those on a Nesta mailing list of 304 people. Contributions were anonymised in order to enable frank responses from the participants.

### **2.3.4 Workshops exploring the benefits of R&D**

Building on the work of the interviews and questionnaires, three workshops were organised (two in London and one in Bristol) in order to bring people together with different perspectives on the delivery of R&D across arts and culture. The workshops provided a structured space for sense making and mapping the role of R&D for the arts and culture as it currently exists and might ideally be directed and strengthened. The workshops mapped the benefits derived from R&D and the measures which could be employed to underpin a wider understanding of these benefits.

In total 28 people (see Appendix D) participated in the workshops incorporating policymakers, academics and practitioners. The Bristol workshop consisted entirely of practitioners working in the arts and cultural sphere whereas the London workshops were more mixed and included academics, policymakers and practitioners from a diverse range of knowledge domains. This mix of participants enabled different perspectives to be challenged and developed. The workshops were facilitated by the PI Dr Elizabeth Lomas and Ron Donaldson. Ron Donaldson is an accredited practitioner in Cognitive Edge and Participatory Narrative processes (see <https://rondon.wordpress.com/>).

At the heart of the process was a project mapping exercise entitled the 'Future Backwards' which was developed by Cynthia Kurtz (PNI) and David Snowden (Cognitive Edge) (see <http://cognitive-edge.com/basic-methods/the-future-backwards/>). This is a mapping method which incorporates participatory narrative inquiry (PNI) approaches. PNI involves the collection of qualitative data through the exchange of stories (narrative from experience), dialogue and sense making in order to construct new perspectives of future possibilities.

In particular, the workshop participants were asked to consider the place and role of R&D as it

exists in reality today. They considered the developments from the past which had led to this position identifying key events or actions which had brought about this state. Looking backwards breaks down linear thinking and entrained perspectives. It initiates a dialogue to capture differing perspectives based on past events about which people can have greater certainty but which may be limiting their future perceptions. This method was developed as an alternative to scenario planning and is designed to increase the number of perspectives that a group can take to see the range of possible futures. The approach builds networks of events recalled at a personal level but also the groups agree local, national and international events which are deemed significant. The process then requires people to project forwards as to where they would like to see R&D in the future. The groups then mapped the steps that would achieve this and the benefits that would be derived. The approach starts to build and articulate the complexity of R&D as it exists and is understood. Discussing the benefits of R&D enabled both qualitative and quantitative benefits to be translated into potential frameworks for measurement.

The dialogue was recorded as part of the outputs in addition to cards being used to capture snapshots of the discussions for mapping purposes. Themes were identified from the qualitative data across the workshops.

Group contributions were anonymised in order to enable frank responses from the participants. Individuals chose whether to be acknowledged for their participation or to take part anonymously.

### 2.3.5 Focused interviews

To conclude, the research rounds of focused interviews were undertaken. The purpose of the focused interviews was to determine the interview participants' responses to the findings and conclusions already developed through the research process by the research investigator. Thus, whilst the process allowed for open dialogue, the discussion and questions were centred around the interviewees' subjective responses to a focused definition. The approach was qualitative and participants brought into the discussion their own experiences (Merton and Kendall, 1946).

The first interview round was with all four of the Directors for each of the AHRC Knowledge Exchange Hubs for the Creative Economy (see [www.ahrc.ac.uk/innovation/knowledgeexchange/hubsforthecreativeeconomy/](http://www.ahrc.ac.uk/innovation/knowledgeexchange/hubsforthecreativeeconomy/)). The purpose of this research was to consider R&D from across the arts and cultural knowledge domains taking into account academic and practitioner spaces aligned to policy needs. The Knowledge Exchange Hubs provide a source of expertise for understanding and viewing this theme across different boundaries, albeit for the 'Creative Economy' which is a somewhat different scope but one which has crossover with the arts and cultural knowledge domains. The second round of focused interviews was with eight participants with a vested interest in making and using policy in the setting of arts and culture. Ultimately they represented the target audience for the commissioned research.

By this stage in the research, a draft definition of R&D had been developed attempting to take into account the earlier comments and findings on definition requirements. This definition was shared with the Knowledge Hub Directors (Appendix E). The definition was then further amended based on the first comments of the Directors which further opened out the definition to include arts and cultural perspectives rather the science and technology considerations. (Appendix F). This definition (Appendix F) and the current definition of the *Frascati Manual* (OECD, 2015), were then shared with policymakers. Based on the policymakers comments and input from Hasan Bakhshi, Nesta, a final summary with a commentary was then produced and this was again shared and discussed with the same set of policymakers as the target audience (Appendix G).

## 3. LITERATURE REVIEW

### 3.1. Introduction

It is important to situate this work within the pre-existing literature in order to understand how R&D is conceived, conducted and evaluated in arts and cultural contexts.

### 3.2. What is R&D?

The term 'Research and Development' has been accepted into the common parlance of the English language to such an extent that its abbreviated form 'R&D' is readily understood and is included in dictionaries of abbreviations (OED, 2011). Within dictionary definitions the term is most normally understood within the environment of a prescribed industry activity with examples linked to recognized scientific activities. The Oxford English Dictionary (OED, 2013) prefaces its definition of R&D specifically within the setting of industry:

"Esp. in industry: work directed towards the innovation, introduction, and improvement of products and processes". (OED, 2013)

The OED (2013) dates the linking of the terms 'research' and 'development' to the end of the 19<sup>th</sup> century whereby the linked terms are evidenced in the context of botanical studies. It further evidences the evolution of the linked term 'research and development' within industry and identifies the establishment of R&D industry positions appearing from the early 20<sup>th</sup> century onwards.

A review utilising Northumbria University's central search engine in January 2014 revealed over 4,000 journal articles with the terms 'research and development' or 'R&D' in the title. As a search term, 'R&D' was associated with nearly 9 million journal articles. Working through and breaking down these searches the term was deployed in line with the dictionary definition. The ten academic disciplines with which the subject indexing term 'R&D' was most frequently aligned were:

1. Pharmacology and pharmacy
2. Economics
3. Management
4. Sociology
5. Mathematical models
6. Health
7. Electrical engineering
8. Technology
9. Applied sciences
10. Mechanical Engineering

Searching on combinations of art and culture terms in conjunction with the term 'R&D' returned results which clearly demonstrated that this literature favours the sciences. For example, the word 'culture' returned more results relating to microorganisms than it did arts and culture, 'theatre' returned more results relating to 'surgical theatre' rather than the performing arts, 'film' returned more results related to material science than the film industry and even 'art' returned results relating to 'state of the art innovations' in for example engineering processes rather than visual arts holdings. Searching through R&D titled Journals (e.g. *R&D Magazine*, *R&D Journal* and *R&D Management*) revealed next to no articles with any link to arts and culture. Where art and culture were discussed, it was typically in relation to science processes. For example, Stüer et al (2010) discuss how artists were introduced into Vodafone's R&D Department in order to foster the creative individual as well as the wider R&D culture by challenging pre-existing views.

Whilst arts and culture are not necessarily precluded from work defined as R&D, the term R&D is rarely connected to the domains of art and culture. It is understood that arts and cultural knowledge is evolving through research and that new knowledge emerges from academia. This is recognised in the UK by the existence of the AHRC. It is not well understood that the arts and cultural knowledge domains deliver into industry. This link to industry lies at the route of the public's understanding of R&D as defined in the dictionary definitions. Science and technology have bridged this gap and the link appears well understood. However, some of the science research conducted from within HEFE walls was also described in articles as R&D. There is a question then about how and where arts and cultural research link to industry. There is also a question about whether the kinds of research delivered from the arts and cultural knowledge domains differ from the research undertaken and delivered across science and technology or whether in fact it could or should be rebranded as R&D.

### 3.3 Research paradigms

At a fundamental level there are a range of approaches to delivering R&D and these are influenced by prevailing research paradigms. Lincoln and Guba (1985) defined three major research paradigms

1. Positivism is the domain of the realist. In essence, it aligns to the idea that there is a fixed reality that can be objectively observed. This is sometimes attributed to the Newtonian legacy, although the term 'positivisme' was coined by Auguste Comte who is known as the first philosopher of science. This is the purview of logic and realism. Positivists hold that every rationally justifiable assertion can be scientifically verified or is capable of logical or mathematical proof. (Levin, 1988)
2. Post-positivism accepts that there may be uncertainty in research and that the researcher plays a significant role. This is the domain of the critical realist. While positivists believe that the researcher and the research subject are independent of each other, post-positivists accept that theories, background, knowledge and values of the researcher can influence what is observed and that there are uncertainties. In the 20<sup>th</sup> century, Einstein's influence in the realm of physics had a profound impact on the way that many viewed research. Einstein set out the idea that discovery was tentative. This was in opposition to positivist mechanistic perspectives that assumed that the natural world could be known. New theories of uncertainty and probability were developed such as the idea that you could only disprove rather than prove a hypothesis (Popper 1963). These ideas were extended to research into human behaviours and the social sciences (Kuhn, 1962). Like positivists, post-positivists also believe that there are some facts and certainties to be discovered. In this context, it is understood that there are some kinds of uncertainties that can be reduced through research and this is termed epistemic uncertainty. There are other kinds of uncertainty which may not be known or alternatively whilst they can be recognised and investigated may not be capable of being reduced, which are termed aleatory uncertainties. Kiureghian (2007) argues that the boundaries between these domains may be grey given that in the event of epistemic uncertainty there may be a network of factors at play in modelling the risk reduction.
3. Interpretivism is the domain of those who believe in "multiple constructed realities that cannot exist outside the social contexts that create them. Realities vary in nature and are time and context bound" (Pickard, 2007, p.7).

These different research paradigms inform approaches to research and the methods deployed by a researcher. In the latter half of the 20<sup>th</sup> century, the interpretivist paradigm was aligned to the delivery of qualitative research. Quantitative approaches, in contrast, were the domain of science and positivist and post-positivist approaches. Proponents of quantitative and qualitative approaches were therefore seen to be in conflict. Whilst some social scientists claimed that only through the interpretivist paradigm could human behaviours and society be understood, others from positivist perspectives claimed that qualitative approaches were biased and lacked rigour (Gorman and Clayton, 2005 and Tashakkori and Teddlie, 2003). In the delivery of positivist research the results can be deemed to be reproducible. In qualitative research, the extent to which findings can be generalized or transferred are often context-specific (Wainwright 1997). Yin (2003) describes how the case

study methodology allows for the delivery of generalizable findings. In the setting of qualitative research, it is the detailed description of events together with an audit trail of the data that underpin the work. Qualitative research has been the instrument of those studying and working with people, i.e. the social sciences, arts and cultural knowledge domains. The case has had to be made for the value of these approaches. Guba (1981, pp.75-91) define the credentials for the delivery of rigorous research in the qualitative paradigm as:

- Credibility, which relates to how congruent the findings are with reality.
- Transferability, which relates to the extent to which the findings can be applied in other settings.
- Dependability, which is addressed through the researcher's careful representation and auditing of the research process as a whole (Lincoln and Guba, 1985, p.318).
- Confirmability, which requires steps to ensure that the research is objective. Confirmability links into the other processes such as dependability.

The extent to which qualitative research may be transferable or generalizable is context-dependent. Hammersley (1990, p.108) says that ethnographers are generally 'not very effective in establishing the typicality of what they report'. In this setting, Riessman (2002, p.25) presents four points for validating research:

- persuasiveness and plausibility (the degree to which the interpretation is reasonable and convincing) which is provided through the account and the evidencing of the findings.
- correspondence (taking the work back to those studied).
- coherence at multiple descriptive levels (global, local and thematic).
- pragmatic in terms of the potential for future application and development by other researchers/practitioners over time.

These ideas matter to this topic because research rigour forms a component of the basis on which research is judged. This is demonstrated by Crossick and Kaszynska's need to defend the value of qualitative research in their recent report on cultural value for the AHRC, stating, "qualitative research (with the depth that it gives) need not be less rigorous than quantitative, experimental studies" (2016, p.9). Qualitative research is not underpinned by numerical data. Within a qualitative study the views of one carry as much weight as the views of many. It delivers a different kind of knowledge but the way in which this may be measured and valued implies a different perspective. A recent report from the Higher Education Funding Council for England (HEFCE) on the role of metrics emphasizes that quantitative research complements qualitative research (Wilsdon, 2015). Emerging from disputes about the value of paradigms has been a growing acceptance that research is delivered through a range of approaches, each of which can offer new knowledge in different ways. As a result, there has been a rise in researchers undertaking research through multiple methods which has the benefit of gathering data with different strengths. In addition, so-called mixed methods have become more popular, which claim to deliver a framework for qualitative research which can sit within a post-positivist paradigm (Tashakkori and Teddlie, 2003; Creswell and Clark 2011).

In the domain of art and design, there has been a further debate concerning the extent to which research can be recognized through practice with artefacts as the research output. In the 1940s, Kurt Lewin (1948) made the case that research needs to be linked to practice (i.e. work undertaken in the real world). Over time, Lewin's ideas were developed into an action research methodology (Reason and Bradbury, 2006). In action research, reflection and space for learning are critical components of the cycles of research delivery. McKay and Marshal (2001) define the dual action research imperatives of practical problem solving (action) as well as generating new knowledge and insight (research). Through this process the domain of the consultant has been transformed into a space for practice based expertise to link to research in order to provide new learning and delivery. In some forms of action research (such as cooperative inquiry) the subjects of the research contribute not only to the content of the research but also to the creative thinking that generates, manages, and draws conclusions (Heron, 1982). In the setting of art and design these ideas have been extended to encompass ideas surrounding experiential research and practice-led research. In the latter context, it is

contended that research can be delivered through the practice itself without the need for reflection. Here, the practice *becomes* the methodology with the research made explicit through the delivery of an artefact. Rust et al (2007) trace the significance of the evolution of these discussions to a series of conferences hosted by the Council for National Academic Awards (CNAA) in the 1980s. The culmination of this series was the publication of the Matrix of Research in Art and Design Education (CNAA, 1988). In 1995 Bruce Archer, Royal College of Art, contended,

*“There are circumstances where the best or only way to shed light on a proposition, a principle, a material, a process or a function is to attempt to construct something, or to enact something, calculated to explore, embody or test it.” (Archer, 1995, p.6)*

Over time, there has been an acceptance in the arts of practice-led research as a defined methodology (Biggs 2000 and 2009; Barrett and Bolt, 2007; Rust et al, 2007; Smith and Dean 2009; Lycouris, 2010). As such, a doctorate can now be awarded through the submission of an artwork. It is argued that other forms of research delivery favour numbers and writing but that transformation can occur through the domain of practice. Whilst the AHRC accepts research bids based on practice-led research approaches, there are still aspects of the research bid process where a written contextualization is required – both to obtain the research grant and to report back at the end of the process. In discussing the idea that the research might be articulated as an artefact rather than as writing, it is important to note that this concept may be equally valid in a range of disciplines from engineering to music to sculpture (Biggs, 2000). Through multidisciplinary work, these ideas work across boundaries, e.g. in the work of artist in residence in Civil Engineering Zoe Schoenherr (<http://malleablearchitecture.tumblr.com/>). These ideas have been expanded as concepts of performative research (Haseman, 2006).

In the context research delivered across the arts and culture it is important to recognise that no one approach answers all questions and that the choice of a research methodology depends not just on paradigm perspectives but the specific questions one is trying to explore. Conway discusses this complexity within design research:

*“when we talk about the design of a lamp, for example, we may be concerned with the mental processes and the domains and models that eventually result in that particular lamp; we may be concerned with the production process, the form and material of the lamp and how it is used; we could also be concerned with how the lamp was marketed, advertised, packaged and sold. Design history can be concerned with any or all of these aspects. (Conway, 1987, p.4)*

She states that design is not just about aesthetics, fashion or periods in time but about many more complicated dimensions.

Thus, in a research setting the parameters of research are shifting. This shift is both acknowledged and enabled by research definitions with wider and potentially open parameters. For example, the AHRC defines research (<http://www.ahrc.ac.uk/funding/research/researchfundingguide/definitionofresearch/>) in a broad way stating that research activities should primarily be concerned with research processes, rather than outputs. At the heart of the AHRC definition is the need to ask a question. The research definition is built around three key features all of which must be addressed to obtain funding:

1. It must define a series of research questions, issues or problems that will be addressed in the course of the research. It must also define its aims and objectives in terms of seeking to enhance knowledge and understanding relating to the questions, issues or problems to be addressed.
2. It must specify a research context for the questions, issues or problems to be addressed. It must specify why it is important that these particular questions, issues or problems should be addressed; what other research is being or has been conducted in this area; and what particular contribution this project will make to the advancement of creativity,

insights, knowledge and understanding in this area.

3. It must specify the research methods for addressing and answering the research questions, issues or problems. It must state how, in the course of the research project, the research will seek to answer the questions, address the issues or solve the problems. It must explain the rationale for the chosen research methods.

The UK Research Integrity Office (UKRIO) *Code of practice for research* (2009) which was used by the Research Assessment Exercise and the Research Excellence Framework 2014 (REF2014, [www.ref.ac.uk/](http://www.ref.ac.uk/)) across the HEFE knowledge domain to evaluate research, defined research as:

“to be understood as original investigation undertaken in order to gain knowledge and understanding. It includes work of direct relevance to the needs of commerce, industry, and to the public and voluntary knowledge domains; scholarship; the invention and generation of ideas, images, performances, artefacts including design, where these lead to new or substantially improved insights; and the use of existing knowledge in experimental development to produce new or substantially improved materials, devices, products and processes, including design and construction. It excludes routine testing and routine analysis of materials, components and processes such as for the maintenance of national standards, as distinct from the development of new analytical techniques. It also excludes the development of teaching materials that do not embody original research” (UKRIO, 2009, p.5)

These research terms frame the parameters for research funding. Funding for arts and culture in the HEFE setting is accepted by Governments. Inside academic boundaries the term research is the term in common parlance. Yet when science and technology links to external organisations we see the term R&D deployed for research deploying the same processes. This raises the question how does R&D differ from research?

### 3.4 Understanding R&D

The 19<sup>th</sup> century saw the recognition of the professional scientist which, over time, ended the idea of the Renaissance man or polymath, such as Leonardo da Vinci, who excelled in both art and science (Meadows, 2004). Although scientists were trained and employed in universities from the end of the 19<sup>th</sup> century and rising in number throughout the 20<sup>th</sup> century, one sees the introduction of ‘labs’ staffed by professional scientists situated in industry for example within the pharmaceutical knowledge domain (e.g. GSK, Pfizer, Johnson & Johnson, Roche), car industries (e.g. Ford, Honda, Mercedes-Benz, Rolls Royce) and the technology knowledge domain (Canon, IBM, Fujitsu, Nokia, Marconi). The methods and outcomes from these programmes did not necessarily differ from the approaches deployed by university labs. These industrial labs produced not only patented products, but over time contributions to the academic literature sometimes with carefully controlled branded journals such as the *Marconi Review* launched in 1928 and the *IBM Journal of Research and Development* launched in 1957. Godin (2006a) describes, from a largely USA perspective, the emergence of ‘R&D’ in response to a need to plan, manage and finance industrial laboratories from the First World War, driven in part in response to meet defence requirements in order to ensure that armies were equipped with state of the art technologies. In addition, there was a need in the 1930s to drive economic recovery from the Great Depression and a recognition that learning from academia and situating academic practice in industry could deliver economic benefits. Similar government exercises were being undertaken in Canada, Germany, Japan and the UK. In this context R&D was a process which drove production and economies.

Aligned to these developments, there was rhetoric from the sciences to justify the value of science to nations. Vannevar Bush, the head of the U.S. Office of Scientific Research and Development, post war report to the US President entitled ‘Science the endless frontier’ has continued to be quoted within reports which justify 21<sup>st</sup> century science policy today (e.g. Thatcher, 1988; Lane, 2011; Reid, 2014, p.6). Part of this rhetoric has established in the public mind the idea that pure research is valuable whether or not that research has an application in sight because at some point we may be able to apply the learning (Calvert, 2006; Womersley, 2013). However, there has in parallel also been the development of



measures clearly linked to economic impacts. Surveys were developed by industry, academics and organisations such as the National Research Council in Canada. However, as Mothe notes (1992, p.428), these surveys lacked standardization and often underestimated or misrepresented R&D activities. The USA was the first country to start systematically analysing, measuring and classifying R&D expenditures, developing simple models of return on investment into more complicated sets of measures which over time resulted in calculations linked to GDP (Mothe, 1992, p.428-429; Hirsch-Kreinsen and Jacobson, 2008; p.65-67; Godin, 2006a). In 1947, Steelman captured information on USA research across industry, academia and the Government linking research expenditure as a percentage of GDP (Godin, 2006a, p.62). In the USA in the 1950s, Anthony started to categorise the components for what was to be considered R&D and what would be measured (Anthony and Day, 1952). Market research, economic research and social research were all excluded from Anthony's early definition of R&D, as well as some aspects of testing that today would be considered part of the R&D process. These ideas around R&D measurement were also taken up in other countries. For example, in the 1950s, Dr J. Gerritsen as part of the OEEC (a forerunner to the OECD) produced two studies on R&D measures, one based on R&D in the UK and the other on France (OECD, 2002, p.151).

As a result of the different approaches to R&D measurement and the significance of this to positioning different nations' productivity, in the 1960s the OECD sought to produce an international standard to provide an agreed methodology for collecting and reporting R&D data for science and technology. This work was published as the *Frascati Manual* in 1963 (OECD, 1963). It met a policy need to consistently provide measures to inform policy making and decide priorities including funding requirements (Mothe, 1992, p.429). This *Manual* has continued to be revised through time and to provide a structure for nations to compare R&D spend. Notably in 1974 functional classifications were added which in theory extended the application of the *Frascati Manual* (OECD, 1974) beyond application in the sciences and technology to include the social sciences and humanities. The 1992 revision was intended to better elucidate the boundaries between industry and HEFE and to incorporate software R&D (Mothe, p.436). At the start of this piece of research, the sixth edition was the most current edition but in October 2015 while the research was being completed a seventh edition was published (OECD, 2002 and 2015). The related OECD literature includes aligned works, most notably the *Oslo Manual* (OECD, 2005) which deals with the measurement of innovation. The latest edition of the *Frascati Manual* (OECD, 2015, p.44-45) defines Research and *Experimental Development* as:

“Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge.”

It is important to note that the *Frascati Manual* (OECD, 2015, pp.44-45) does not use the term 'Research and Development' but adds in the term 'experimental' thus discussing 'Research and Experimental Development' which it abbreviates as R&D. The definition of R&D is explained by three sub-definitions which describe (OECD, 2015, p.45):

“Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.

Applied research is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective.

Experimental development is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes.”

These definitions would align to a subset of arts and culture research undertaken in university contexts although they do not encompass all research as it is delivered across the arts and cultural knowledge domains.

Further requirements underpin the existing high-level *Frascati Manual's* (OECD, 2015, p.45)<sup>1</sup> definition of R&D, namely that the R&D activity must be:

- novel
- creative
- uncertain
- systematic
- transferable and/or reproducible.

In the *Frascati Manual*<sup>2</sup> novel relates to building *new* knowledge and creative requires there to be an intentional objective to acquire new *knowledge* through R&D. The requirements for R&D to be 'novel' and the allied property for it to be 'creative' are discussed by Still and d'Inverno (2016) who see this understanding of creativity as a 1950s construct aligned to the ideas of productivity and measurement as opposed to ideas around creativity in the context of imagination and change. Certainly in the *Frascati Manual* this more positivist perspective holds sway in the *Frascati Manual's* practical examples although in the context of HEFE the same definitions are used in a much broader way, for example with doctorates awarded from London University, "for the creation and interpretation of knowledge, which extends the forefront of a discipline, usually through original research" (see [http://www.bbk.ac.uk/mybirkbeck/services/administration/assessment/award-criteria/phd\\_criteria](http://www.bbk.ac.uk/mybirkbeck/services/administration/assessment/award-criteria/phd_criteria)).

In its aim to deal with measurement the *Frascati Manual* (OECD, 2015, p.47-49 and 81) deals with 'uncertainty' in only a minimal way. Whilst there may be epistemic uncertainty in a range of organisational activities the *Frascati Manual* uses the five criteria to exclude what it determines as routine activities. Epistemic uncertainty must be combined with all the other attributes which underpin the definition in order to rule out, say, simple software fixes as a form of R&D. However, the *Frascati Manual* does not recognize the complexity of resolving epistemic uncertainty which may be understood through complex networks of cause and effect. Nor does the *Frascati Manual* deal at all with aleatory uncertainty.

'Systematic' is defined within the *Frascati Manual* (OECD, 2015, p.49) as 'planned and budgeted'. Systematic within the context of the wider scientific literature, however, has a more rigid definition which implies a precisely defined approach to research to minimise bias (Higgins and Green, 2008), but this is not intended in the *Frascati Manual*.

Finally, the requirement that research should be 'transferable and/or reproducible' within the *Frascati Manual* (OECD, 2015, p.48-49) refers to the requirement that new knowledge does not remain tacit but is conveyed to others, for example in a peer reviewed academic article. However, the examples given in the *Manual* are very limited. For instance, a new design or artwork may be displayed and interpreted within the context of an exhibition in a way that arguably performs the same function of providing a vehicle for knowledge transfer as that of a journal article. In other cases, creative practice – such as in performance art – may be geared at creating valuable knowledge which is highly context-specific and therefore neither transferable nor reproducible in the conventional sense of the words. However, the *Manual* in any case excludes performance on the basis that it is seeking new expression rather than new knowledge, which clearly is not necessarily the case. This qualification limits the application in range of significant art contexts.

The latest iteration of the *Frascati Manual* has tried to extend the definition of R&D to include

---

<sup>1</sup> I am grateful to Hasan Bakhshi for his contributions to the analysis of the *Frascati Manual* definitions within this section (p.16-17).

<sup>2</sup> The *Frascati Manual* is discussed throughout the report. Unless otherwise noted, all references relate to the *Frascati Manual's* seventh edition published by the OECD in 2015.

a wider range of knowledge domains more overtly. Although the sixth edition did include the humanities and social sciences the seventh edition includes a table which provides examples of R&D more explicitly from the knowledge domains of the humanities and social sciences (OECD, 2015, p.81). It also acknowledges that basic research, applied research and experimental development are carried out in a range of disciplines, including art history, musicology, theatre studies and literature. In looking at the research delivered in the field of the humanities and arts the *Frascati Manual* provides some limited examples (OECD, 2015, p.54) describing:

“The study of sources of all kinds (manuscripts, documents, monuments, works of art, buildings, etc.) in order to better comprehend historical phenomena (the political, social, cultural development of a country, the biography of an individual, etc.) is basic research. Comparative analysis of archaeological sites and/or monuments displaying similarities and other common characteristics (e.g. geographic, architectural, etc.) to understand interconnections of potential relevance to teaching material and museum displays is applied research. The development of new instruments and methods for studying artefacts and natural objects recovered through archaeological endeavours (e.g. for the age-dating of bones or botanic remains) is experimental development.”

These practices could be seen to align to the descriptions and processes of research undertaken within the walls of academia. However, the *Manual* does not acknowledge all research methodologies for example the field of practice-based research. If one were to recognise practice-based research as R&D, it would potentially present challenges for policy. A film maker might claim that the whole process of production up to the point of distribution was R&D and should qualify for tax relief. In car manufacturing, whilst R&D does carry on whilst the car is in the manufacturing stages, there are delineations between processes. Nevertheless, this definition of R&D activities does align to activities delivered from the arts and cultural knowledge domains. There are other areas specifically omitted from the *Frascati* R&D classifications, which arguably could have an R&D component e.g. the domain of marketing and opinion polling which is currently completely excluded. This study does not focus on the domain of marketing and polling activities.

The *Frascati Manual* has been critiqued from within the science domain too in regards to its application. For example, it has been criticized as assuming a linear model of R&D and innovation, which has limited application in resource-based economies (Gulbrandsen and Kyvik, 2010). Furthermore, the *Manual* relies on its link to the separate OECD manual for measuring innovation the *Oslo Manual* (OECD, 2005) although there are issues with the integration and gaps between the two (Holbrook, 1998; Godin, 2002; Carvalho, 2006). Key to the success of the *Frascati Manual* is how it is implemented in practice (Galindo-Rueda and Millot, 2015). It does not measure all the components which deliver R&D particularly when the R&D is not confined to a prescribed R&D department (Djellal and Gallouj, 1999; Brouwer and Kleinknecht, 1997). Brouwer and Kleinknecht (1997) discuss the fact that *Frascati* measures for R&D link to only one quarter of the total product and innovation delivered from the service industries. In addition, it is noted that the *Frascati Manual* does not align to all spheres of R&D delivery, e.g. the service sector is largely omitted (Djellal and Gallouj, 1999). The latest *Frascati Manual* (OECD, 2015, p.69) does acknowledge this problem. However, where it acknowledges issues it still has minimal coverage to address these points, for example it states that qualitative data as opposed to quantitative can be collected but it does not develop detailed advice on gathering this data (OECD, 2015, p.189). Across the *Frascati Manual* as a whole, the majority of examples provided relate to science and technology and are delivered largely from positivist perspectives. Thus, whilst the *Manual* has the potential for extension, it is limited by its current form. One has to question why this perspective is so limited given the role arts and cultural expertise in delivery into business over the last century, e.g. through design and also the wider creative industries.

In the 1930s, in the UK, the Society of Industrial Artists was founded which later became the Chartered Society of Designers for professionals working in this sphere. This echoed the evolution of multidisciplinary agencies in the USA, Bassett-Gray Group of Artists and Writers became the Industrial Design Partnership. In the UK, design was actively recognised and

promoted at the end of the Second World War in Britain in order to grow industrial enterprise. In 1944 the Council of Industrial Design (the forerunner of the Design Council) was established and subsequently delivered the *Britain Can Make It* exhibition and the *Festival of Britain*. Design in this context was seen to be delivered across arts, industrial, engineering and science boundaries in accordance with the original spirit of the *Great Exhibition* in 1851 (Walker, 1989). Key designers such as Milner Gray, Misha Black, and Frank Pick were also involved in advocating for design history and research. Giberti (1989) notes that whilst design has existed for a long time it transitioned in status when the study of the history of design evolved within academia. In the 1960s Misha Black commissioned Bruce Archer, an engineer, to research aspects of hospital design. With Kings Fund assistance, Archer researched all aspects of hospital design and revolutionised practices in the functioning of hospitals which significantly improved staff and patient wellbeing. For example, at the suggestion of a focus group of anaesthetists beds were put on wheels to make transfers between wards and operation theatres far easier and to benefit patient outcomes by limiting their movement immediately post operation. In addition, the beds were redesigned to be raised and lowered which minimised the risks of back pain for nurses (Lawrence, 2001). As a result of this work, Archer was appointed a Professor in charge of the RCA's Department of Design Research. Linked to the work of the RCA, in the 1970s and 1980s Roy Strong, the Director of the V&A promoted the role of design, establishing the Archive of Art and Design and the Boilerhouse Project (a space for exhibiting design) with Terence Conran and Stephen Bayley. Later the Boilerhouse team split from the V&A to establish the Design Museum in 1989. Increasingly throughout the twentieth century the role of designers in industrial enterprise have been recognised worldwide (see <http://www.dmi.org/?Design>). The Design Council's report on the value of design to business contends that design is a critical component of business delivery which increases turnover and maintains businesses' competitive edge (Design Council, 2007, pp.10-17). It is therefore surprising that this has not been more explicitly understood by policymakers as designers have clearly transitioned boundaries.

Whilst designers deliver into all areas of enterprise their role has influenced ideas around the 'creative industries'. The creative industries have been recognised only recently. In 1998, the Department for Culture, Media and Sport Creative (DCMS) Task Force formalised the definition of creative industries as:

“those industries which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property” (DCMS, 1998, p.5).

This was accompanied by a mapping exercise which identified sectors within the creative industries including advertising, antiques, architecture, crafts, design, fashion, film, leisure software, music, performing arts, publishing, software and TV and radio (see <http://www.creativitycultureeducation.org/creative-industries-mapping-document-1998>). In 2005, the Department of Trade and Industry (DTI) produced a paper on the link between creativity and design. Other bodies, like Nesta, have undertaken considerable research to provide a quantitative evidence base to define and understand these industries. For example, Nesta's *Manifesto for the creative economy* (2013, pp.8-9) included recommendations to:

- incentivise experimentation with digital technologies by arts and cultural organisations, developing local creative clusters,
- adopt new definitions of the creative industries and economy which are simple, robust and recognise the central role of digital technologies
- ensure government funding schemes – including policies to incentivise R&D – do not discriminate against creative businesses.

Despite these narratives which argued for the economic value delivered from the creative sector Bakhshi et al (2010, p.2) contend that there are entrenched prejudices in respect of how R&D is conducted for the arts and cultural sphere:

“First, arts and culture are excluded from R&D by definitions based on its Science and Technology (S&T) origins. Second, the arts and cultural sector relies on a conception of

creativity that mystifies too much of its work, preventing it from accessing valuable public resources”.

The reasons why this position is seen to exist resides around not only how these domains are understood but then how they are evaluated. This understanding and the subjective judgments which are made around value influence funding structures.

### 3.5 Delivering and funding R&D

As in the sciences, there are complex relationships which feed off each other from academia and practice in order to deliver R&D across arts and culture. The economics which underpin these relationships straddle private and public enterprise, and private and public investment.

#### 3.5.1 Higher Education and Further Education (HEFE)

Clearly a major deliverer of R&D is the HEFE knowledge domain. Universities are profitable businesses selling education services around the world. As such, the domains in which there will be research delivered are, to some extent, linked to teaching demand. Where specific courses remain popular and there is a need for teaching staff this will also tend to build research capacity. This is of course a simplification of the research/teaching balance as universities, and governments, have independent research strategies. However, the AHRC report which justifies funding arts and humanities research does this in part on the basis of the role of teaching. This report claims that overseas students studying arts and humanities in the UK boost the economy by between £2.05 billion and £3.29 billion both in student fees but also their wider spend whilst living in the UK (AHRC, 2009, p.11).

Universities also receive research funding through research grants to academics distributed by the Research Councils, with the AHRC picking up the cost of the majority of academic research in the arts and cultural knowledge domains followed by the Economics and Social Research Council (ESRC). In the UK, the process for judging and providing grants is the same across all research disciplines. The research grants are peer reviewed with reviewers giving a funding grade which ranks the quality of the bid on a range of criteria, which thus determine its eligibility for funding. It is possible that a bid will be given a grade which denotes that it is worthy of funding, but that money in a particular round of funding will not stretch to fund all bids. The bidding for funds is typically slow and uncertain.

As part of this work a review was conducted of the paperwork for 117 research bids. These bids were reviewed to provide insight into the research processes, vocabulary and values of funders and bid applicants. They determine the information which is required in order to judge whether or not a research bid is worthy of obtaining funding. Bids are normally judged by academic peers with relevant expertise. All available bids were reviewed in order to see whether there were differences between the bids from different disciplines. Bids were reviewed which had been submitted to the following organisations:

- African Economic Research Council (AERC) - 1 bid reviewed
- Arts and Humanities Research Council (AHRC) – 83 bids reviewed including the Digital R&D Fund for the Arts bids
- Biotechnology and Biological Sciences Research Council (BBSRC) – 1 bid reviewed
- British Council - 6 bids reviewed
- Collaborative Innovation Partnerships (CIP) – 4 bids reviewed
- Economic and Social Research Council (ESRC) – 7 bids reviewed
- ESRC - 4 bids reviewed
- European Research Council (ERC) – 2 bids reviewed
- JISC – 2 bids reviewed
- Leverhulme – 2 bids reviewed
- National Institute for Health Research (NIHR) – 2 bids reviewed
- Natural Environment Research Council (NERC) – 3 bids reviewed

An analysis of the bids revealed that no bids referred to the term R&D. Nonetheless each bid

had elements which aligned them to key elements of the *Frascati Manual's* definition of R&D (OECD, 2015, pp.44-45). Each bid had a clearly defined research framework with a research question and/or aims and objectives and a research approach sometimes framed as broadly as 'qualitative' or 'quantitative', but more normally with a very specific methodology deployed. A budget and plan were in all cases a requirement of the documentation processes, and in this sense the bids met the *Frascati Manual's* (2015) criterion of being 'systematic'.

In six bids, the term systematic was explicitly utilised in each case in relation to the idea of systematic searching and systematic literature reviews as outlined in the Cochrane Handbook (Higgins and Green, 2011).

All 117 bids, as a part of the bid structure, were required to discuss the outcomes and impacts of the research. The bids also needed to define the beneficiaries of the work. Clear distinctions were drawn between academic beneficiaries and beneficiaries beyond the walls of academia. The academic beneficiaries related to particular research communities and disciplines. The wider beneficiaries were unsurprisingly very diverse, including myriad organisations (e.g. banks, museums, schools), industry knowledge domains (e.g. advertising, graphic design, bio-technology), communities/populations (e.g. social groupings, age, religion, role) and needs (e.g. physical or mental health, social exclusion). A key part of the Research Councils UK (RCUK) bid documentation is the inclusion of a section to document the 'pathway to impact' which requires the bid to document how the findings will not only be disseminated but in effect deliver value, whether that be social, economic or cultural.

Whilst the bids clearly all had different research questions, methodologies and intended outcomes, they all were structured similarly regardless of the discipline. That is, in *all* of the bids there was a case explicitly presented that the bid would create new knowledge, sometimes expressed as 'understanding', with 14 of the bids spanning different knowledge domains referring to 'basic research'. Experimental research was discussed in eight of the bids. Aside from the Digital R&D Fund for the Arts bids, which naturally had an emphasis on developing new digital technologies, three other bids also had the ambition to create a new technological application. In 21 of the bids, the main intended output was a set of guidelines. In 11 of the bids, training programmes were a key outcome.

In making the case for research impact, value was discussed and presented in a range of ways as practical value (where something was useable for a utilitarian purpose) cultural value, economic value and social value. Values were often interrelated. For example, 'cultural placemaking' was interwoven with generating new knowledge, job creation, urban regeneration and thus social delivery in a range of different ways.

The bids reviewed focused on the research and its value. However, the individual(s) delivering the bid were presented either as demonstrating their capacity to deliver the specified research or, in some instances, investment in a researcher/individual was presented as a secondary outcome to build further capacity in a field.

Whilst researchers can apply to the RCUK with bids based on personal or institutional research agendas, the Research Councils, UK Government and the wider EU also issue calls for research to address particular challenges.

### **3.5.2 Research outside HEFE**

Beyond traditional university boundaries other organisations also deliver R&D. The establishment of Independent Research Organisations (IROs) has acknowledged the place of research in domains outside the HEFE. Notably, a number of heritage organisations are IROs which means they are eligible for research grants from RCUK, e.g. British Library, British Museum, The National Archives and the V&A Museum.

In addition, the UK government has established and invested in particular institutions in order to develop a targeted research agenda. For example, the government has also established Research and Innovation Campuses, bringing together academics and businesses in a formal setting focused on particular science research agendas. Their role is to enhance economic

growth, assure national security, and to contribute to interactions with important international trading partners. This particular model has yet to be translated into the arts and cultural domain. In 2015 the Alan Turing Institute brought together five universities to focus on data science research. This Institute does include representatives from a wide range of discipline, e.g. digital humanities.

In the arts and cultural knowledge domain, an unusual feature of the projects supported by the Digital R&D Fund for the Arts was that the three partners (the academics, cultural organisations and technology providers) had parity (Fleming, 2016). Thus the research crossed the boundary of academia into practice. Other cultural projects which have stimulated research, art and culture beyond HEFE walls are models such as the Brighton Fuse (<http://www.brightonfuse.com/>) and the Knowledge Exchange Hubs for the Creative Economy (<http://www.ahrc.ac.uk/innovation/knowledgeexchange/hubsforthecreativeeconomy/>).

Another area in which arts and culture R&D is delivered is in the third sector, which attracts both public and private investment. In regards to public grants, key grant making bodies are the separate Arts Councils of England, Scotland and Wales all of which receive public money from government. In addition, these bodies are involved in the distribution of grants from the Heritage Lottery Fund (HLF), which claims to be the largest funder of the heritage knowledge domain in the UK. These bodies largely support the delivery of art and culture rather than encouraging R&D in the arts and culture *per se*:

“We invest in art and culture for a lasting return. We're looking for organisations, artists, events, initiatives and others to apply for our funding and help us achieve our mission of great art and culture for everyone” (see <http://www.artscouncil.org.uk/funding>).

Grants are made to support individuals and organisations to deliver art and cultural activities in a wide range of ways. Applications are judged on their artistic quality and public engagement not necessarily whether the art pushes new boundaries, but it does not preclude the Arts Council from seeking to drive R&D and innovation. Organisations such as Watershed Media in Bristol ([www.watershed.co.uk/news/arts-council-england-invest-national-portfolio-funding-in-watershed](http://www.watershed.co.uk/news/arts-council-england-invest-national-portfolio-funding-in-watershed)) have been given Arts Council grants to undertake research and innovation activities. In this context the React Hub connects creative companies and academics to make new products (<http://www.watershed.co.uk/studio/projects/react/>). Other examples of this kind of approach include the Manchester Digital Lab known as the MadLab (<https://madlab.org.uk/>). R&D is also delivered as the component of other projects. For example, if the HLF funds the delivery of a travelling exhibition, it may pay for a curator as part of the costing and an outcome of the funding could be research for an exhibition catalogue. However, in these grant scenarios there is normally a clear deliverable and therefore there must be an end product or project. This means riskier R&D would be precluded, as failure is not an option within the funding structure.

More generally, in terms of the third knowledge domain, there are a wide range of organisations delivering research, for example think tanks (e.g. the public art think tank IXIA <http://ixia-info.com/>) and charities (e.g. The National Trust) with particular missions. On the high street, organisations such as Cancer Research have been very successful in driving an entirely research-specific agenda. Although some galleries focus on very specific subject areas such as the Arnolfini gallery in Bristol, there is no direct arts and culture equivalent.

### 3.5.3 Industry

R&D of course is undertaken across the commercial creative industries, although there is a question over the extent to which it occurs and the economic growth which might be generated if R&D activities were further intensified. A recent European Commission report analysed R&D expenditure in respect of ICT and the creative industries. As part of the picture, it looked at the role of telecommunications and the role of creative industries in respect of ICT. It concluded that IT multinationals had much larger R&D budgets than the creative industries and were highly R&D intensive. In contrast, even the largest multinationals in the creative industries did very little formally recognised R&D (Benghozi et al 2015, p.5). The question that arises from the study is whether this is because R&D happens in different ways in the creative

industries and therefore is not formally recognised. There has been some research into delivery in the creative industries and their business models (Benghozi, Lyubareva, 2014; Parkman et al., 2012; Tian et al., 2008; Benghozi, Paris 2007; Throsby, 2001; Howkins, 2001). There are only a small number of detailed R&D case studies. Benghozi and Salvador (2013) highlight the role of R&D into the publishing industry in order to identify new markets and deliver new business models in the light of the rise of e-books. Galindo-Rueda and Millot (2015) discuss how R&D is delivered in the domain of design. In a production context, it may be that R&D in one area may result in a product utilised in an entirely different area and therefore there is complexity in understanding the full picture (Griliches and Lichtenberg, 1984).

One issue is that there are a lot of metrics and cases of R&D in industry because there are R&D specific tax reliefs available and therefore data has been gathered in support of their management. Tax relief has become a key instrument by which governments offer public support. Over the last decade there have been a number of new creative industry tax breaks in the UK (see <https://www.gov.uk/guidance/corporation-tax-creative-industry-tax-reliefs> ). These are a form of public expenditure predicated on providing a tax relief to address market failures in accordance with EU state aid expenditure rules. They exist with a view to ultimately providing a public return. In the creative economy, tax reliefs currently exist for film, animation, high-end television, children's television, video games development, orchestras and theatre. All films, television programmes, animations or video games must pass a 'cultural test' or qualify through an internationally agreed co-production treaty that there will be a British product. This has been criticized as resulting in 'endless Mr Beans and Mr Bonds' rather than actually driving the delivery of high-quality products (Miller, 2008). These are not R&D or innovation tax breaks. Whilst there are elements that allow for losses, they do not provide a framework for risk as there must be certain guaranteed deliverables. The R&D tax breaks for science and technology, in contrast, allows for risk taking. This is significant, for example in pushing developments in the pharmaceutical knowledge domain where the majority of drug trials do not result in an end product on the market, although the overall benefits derived from enabling and supporting pharma R&D are based on the profits delivered when a small percentage of products do come to market.

In order to qualify for tax relief, one sees the Royal Institute of British Architects (RIBA) discussing how to deliver and describe work to maximize tax benefits. Engineering processes may receive R&D tax relief, whilst spatial design will be excluded (RIBA, 2012). Design Council chairman, Sir George Cox, recommended that the definition of R&D should be extended to cover all areas permitted under international standards, but rejected an extension to specifically include design (Cox, 2005). He said; "to isolate the costs associated with "design", to the accuracy necessary for a tax claim, would be a nightmare for all but accountants". However, in spite of this assertion, in 2006, David Godber (who had worked with Cox) won a test case for Nissan which confirmed that design work *could* be included within tax reliefs (Billings, 2006). It is not evident that this test case has resulted in any further extensions, although others have sought to argue that all forms of 'invention' should be classified as R&D (Cavallucci et al, 2009).

The purpose of a tax relief is to incentivise R&D activity which would otherwise be at suboptimally low levels from the viewpoint of social welfare (what economists would describe as a market failure) (Griliches, 1984 and 1992). In essence, this is a form of public funding, as are research grants, but predicated more overtly on economic returns, whereas research grants may be motivated by a wider range of returns, including cultural value. In practice, both funding forms may deliver a range of returns. It is important to think through the significance of the different models.

#### **3.5.4 New delivery structures**

Private investment is also a key component of the research picture which supports enterprise in all domains. Charities, individuals and businesses can and do choose to invest in R&D. This model is growing in prominence and incorporates ideas around the potential not just to reach the wealthy but to consider crowdsourcing funds from the wider public. In addition, funding models have extended beyond the idea of providing capital for traditional organisations into



ideas about developing new networks and empowering communities to actively participate and collaborate. Audiences are now actors. This work has been galvanised by the ability of social media to connect people and ideas. New ideas or 'grand challenges' around new multidisciplinary, transdisciplinary and cross-community initiatives can be evolved in this way. AHRC has been seeking to understand how communities can be empowered through new funding models (see <https://connected-communities.org>).

New models continue to evolve, often borrowing from old concepts in new domains. For example, businesses have always had the potential to apply for loans but now loan structures are also being investigated as a possible alternative for R&D grants. In the United States smart specialisation claims that innovation is best driven from the private knowledge domain (BIS, 2015) thus moving away from welfare models.

### 3.6 Measuring R&D

Any discussion about financing and funding turns quickly to valuation and measuring the return on investment. As Still and D'Inverno (2016) assert, "it was soon recognised that it was not enough just to have new ideas; they have to result in something of value" and they go on to cite Stein (1953, p.311), "The creative work is a novel work that is accepted as tenable or useful or satisfying by a group in some point in time." However, currently there is no one system for measuring all R&D as it occurs across the arts and cultural knowledge domains although there are some measures being deployed in different ways across a range of activities.

The AHRC recognizes that there is a need to make the case for public funding and commissions work to understand the value of arts and culture and also the specific value of research. In its 2009 report, it contends that research into these subjects is an investment that generates wealth, improves public policy and helps to maintain quality of life. It states:

"the arts and humanities touch people's lives at every level, they contribute to our quality of life because, once our basic subsistence needs have been satisfied, they encompass those things that make life worth living. They also contribute to the level of civilisation that makes this country such an attractive place in which to live and work. (AHRC, 2009, p.2)

It categorises the research into three core areas and highlights how the research delivered in these areas produces value to the UK taxpayer setting out as follows:

#### 1. *History, Thought and Systems of Belief*

Research in these areas discloses how people have lived in the past; how they have constructed identities and institutions; how they have expressed themselves in legal, political and popular documents, legislation and texts; and what this tells us about the values they share and where divergence lies. Research in these areas also identifies the spiritual, religious, moral, ethical and legal bases of human thought and behaviour.

#### 2. *Creative and Performing Arts*

Research in these areas enriches the originality, quality and significance of creative outputs in visual art, music, design, performance, exhibition and creative writing for contemporary audiences and probes the significance of creative practices in the past. It also offers innovative practice-based methods of tackling research problems across a range of disciplines.

#### 3. *Cultures and Heritage*

Research in these areas interprets material artefacts from the past and non-traditional textual sources (such as digital media) from the present to determine how and why they were made and used, how they were and are classified and displayed. It also explores why they have been valued and how we preserve, conserve and cultivate cultural heritage.

The AHRC report does not specifically set out a process of measuring this delivery. If one accepts the argument that there is a public good in regards to the delivery of art and culture and in addition that the fostering of R&D enhances growth and innovation in this field, this

could be deemed to make the case for R&D. The argument relies on the acceptance that R&D stimulates the knowledge domain for example in regards to growth, quality or reach and that this is positive for society. The case is underpinned by those arguments deployed to articulate the value delivered by arts and culture more generally (e.g. Matarasso, 1998; Holden, 2004; Frayling, 2005; Bakhshi et al, 2009; Bate, 2011; UCL CDH, 2012; Crossick and Kaszynska, 2015; Arts Council England, 2006). The public good case is attractive to those who believe that detailed measures can have perverse consequences on creation (Sharpe, 2010). However, in reality there has been an acceptance that some measures are needed for arts and culture. There are toolkits which look at delivery and measurement across arts and culture in practice, for example:

- ALMA-UK toolkit: [www.scoarch.org.uk/projects/economicimpact](http://www.scoarch.org.uk/projects/economicimpact)
- Bolton toolkit: [webarchive.nationalarchives.gov.uk/20120215211001/](http://webarchive.nationalarchives.gov.uk/20120215211001/)
- eventIMPACTS toolkit: [www.eventimpacts.com/project/resources/](http://www.eventimpacts.com/project/resources/)
- West Midlands Cultural Observatory toolkits: [www.eitoolkit.org.uk](http://www.eitoolkit.org.uk)

The missing element in this is measures specifically for R&D. For those that need additional R&D measurement, one can in principle extrapolate back from arguments which deal with the value of art and culture to isolate the R&D component and as such to develop proxy measures. For example, Crossick and Kaszynska (2016, p.7-8) highlight:

- production of reflective individuals
- production of engaged citizens,
- peace-building and healing after armed conflict
- impact on cities and urban life
- economic benefits of arts and culture
- a complex ecology of talent, finance, content and ideas
- improving health and wellbeing
- long-term arts engagement and positive health outcomes
- arts in education
- arts and cultural engagement and subjective wellbeing
- question of modes of engagement
- consideration of the growth of digital technologies

Underpinning each of these is an aspect of R&D implicit either in the route to the outcome or as part of a process to ensure continued growth or understanding in these domains. However, as Crossick and Kaszynska (2016, p.8) identify there is currently a lack of evidence available in relation to each of these. Crossick and Kaszynska's case has not been developed with precise measures in mind. Other such systems include the Western Australia Governments Department of Culture and the Arts which has developed a *Public value measurement framework* (Chappell and Knell, 2012). This defines the elements for measurement as:

#### 1. Creativity Including:

- Inquisitiveness – the extent to which the funded activity promotes curiosity in artist and audience
- Imagination – the extent to which the funded activity explores new possibilities and views
- Originality – the extent to which the funded activity breaks new ground (modes of practice and content)

#### 2. Risk – the extent to which the artist is fearless and negotiates new artistic approaches

#### 3. Rigour – the extent to which the funded activity has undergone thorough research and development

#### 4. Currency – the timeliness of the creative idea in relation to contemporary events

#### 5. Authenticity – the extent to which the funded activity respects cultural tradition or is uniquely Western Australian

6. Innovation – the extent to which the funded activity demonstrates an ability to realise creative ideas into real world outcomes
7. Excellence – the funded activity is widely regarded as best of its type in the world

These measures embed R&D components as parts of the creative process. However, these measures also do not directly address R&D in all its forms. In addition, there is complexity to be acknowledged around how the R&D component is specifically measured.

However, the AHRC model for measuring its research would be in line with research evaluation frameworks. UK academic research delivered from within university walls has historically been judged largely through a system of peer review (the Haldane Principle), but increasingly a process of prescriptively defined parameters has emerged. In the UK, the first Research Assessment Exercise (now termed the Research Excellence Framework) took place in 1986. 30 years later this process continues to evolve. The Research Excellence Framework 2014 (REF2014 <http://www.ref.ac.uk/>) measured the quality of research in terms of its originality, significance and rigour and determined whether or not it was nationally significant, internationally recognized, internationally excellent or world leading. In addition, the system measured research impact. These impacts were further divided into political, health, technological, economic, legal, cultural, societal and environmental impacts. REF2014 has been evaluated by the RAND Institute (Manville et al 2015), Kings College London (Grant, 2015) and Technopolis (Farla and Simmonds, 2015).

The RAND study (Manville et al, 2015, p.13 and p.35-37) highlighted that the process of documenting case studies for impact was perceived as burdensome by the academic community, but noted that if government does have a strategic desire to ensure value for money then this is an important component of measurement which needs to be evolved. It was noted that it is difficult to measure effectively many kinds of impact. In addition, measurement in this context focused on relatively short timeframes but it is known that some impacts may only be realised over decades (Manville et al, 2015, p.13).

The King's College study analysed 139 cases. One of the most striking observations from the analysis of this study was the diverse range of contributions that research from UK HEIs had made to society. This is illustrated in the heat map of 60 impact topics by the 36 Units of Assessment (Grant, 2015, p.8) and the resulting impact chord diagrams (Grant, 2015, p.35). Examples of impacts included impact reach detected in schools and education, future film and theatre practitioners, policymakers, offenders and ex-offenders, local communities and hospitals. Around one-fifth of the case studies involved some form of participatory process within the research, which resulted in direct impacts on the research participants. Examples included the involvement of students and members of the local public in performances, individuals with sickle-cell disease highlighting their own experience on film, connecting festival practitioners to systematically analyse their work and learn from shared experience to improve operations, and creating a network for public debate on Shakespeare. The study acknowledged problems with the impact measures, but noted that academics are now more aware of the need to gather evidence of impact which will result in the process being developed for the REF 2020. Wilsdon et al. (2015) contend that peer review continues to command more respect from academics than mechanisms to harvest data such as citation indexes.

The Research Excellence Framework (REF) is a model which is used across all academic knowledge domains in the UK – it is not an international model. There is an argument that the measures in place in UK academia could be extended to encompass research more broadly. The impact measures would have resonance in industry and with policymakers. However, from an industry and policy making perspective the REF processes gather limited economic data despite it being one of the identified impact measures. Economic return on investment has not been a strong part of the arts and cultural sector narrative although there are very strong areas where the arts and cultural knowledge domain does deliver into the economy. For example, the value of the art market is well recognized in the context of the trade

delivered through auction houses (Myerscough 1988). The sciences have articulated economic value whilst recognizing some of the challenges for measuring this over short timeframes. For example, Haskel et al (2015) make the economic case for grants to science research both in terms of private knowledge domain productivity and their impacts through increased interaction between academia, private knowledge domains and society more generally. The study claims that for every £1 spent by government on R&D in academia, private knowledge domain spending rises by 20p in perpetuity. The report also argues that businesses generate additional value by locating themselves next to universities with strong and relevant R&D capabilities e.g. pharmaceutical companies and technology companies have based themselves in reach of Cambridge University labs and researchers. Other work maps the relationship between natural capital and businesses, for example <http://www.ceh.ac.uk/news-and-media/news/linking-valuation-nature-research-business>. Allas (2014) has provided a benchmarking for science and industry innovation which maps a network of money, talent, innovation outputs, structures and incentives, broader environment and knowledge assets. However, the key text for measuring R&D is the *Frascati Manual*. Its definitions are a very significant baseline, because they are utilized by governments the world over in public policies to support R&D. This is mainly because the *Frascati Manual* has been used to promote a positivist paradigm for R&D which makes it easier to link R&D activities to seemingly tangible economic measures. Wenzel and Khalid (2009) discuss the value of these *Manual* surveys which exist to define a public good in terms of GDP and impact in a range of economic ways including notably improving living standards. The outputs are categorized in financial terms. Whilst it was initially developed for the sciences the *Manual* does state that no industry should be excluded from the reporting of R&D activities (OECD, 2015, p.204).

The *Frascati Manual* provides a framework for developing surveys and interview processes to measure R&D activities with templates available at <http://www.uis.unesco.org/ScienceTechnology/Pages/research-and-development-statistics.aspx>. The surveys are designed to categorise R&D delivery into a framework to enable international comparison. Key elements are:

- Sectorial definitions which are defined as business enterprise, government, higher education, private non-profit, rest of the world. Each sector has specific guidance for data collection.
- Classifications by fields of R&D (OECD, p.57-59) which include classifications for the social sciences, media, communication, languages, humanities and the arts encompassing art, history of art, performing arts and music.

Against these classifications the bulk of the *Frascati Manual* focuses on setting out how to gather data in terms of R&D expenditures identifying recognised R&D expenditure and funding sources. Included within the costs are labour costs, capital expenditures as well the processes for assessing this in the context of gross domestic expenditures on R&D.

Key within these measures are the positions which are deemed to be counted as R&D personnel. They are divided up into researchers, technicians and other support staff. The term researcher is deemed to apply to those with academic credentials and codes are listed to categorise these people as part of the survey collection. Technicians have specialised technical knowledge and skills. Support staff may be skilled or unskilled but their role within the project must be clearly defined. Some posts which do contribute to R&D are excluded from the framework for example library staff who support R&D are deemed to be an ancillary function and as such noted not to be included within the R&D data collection.

Examples of the impact of the *Manual* are demonstrated in terms of its use by the Office for National Statistics (ONS) in the UK, which produces statistics on R&D spend for the 400 large-scale R&D spenders (see <http://www.ons.gov.uk/economy/governmentpublicknowledge/domainandtaxes/researchanddevelopmentexpenditure>) determined by its understanding of the *Frascati Manual* definition of R&D. However, the ONS focuses on using the *Frascati Manual* in line with its original focus in the 1960s which related to measuring R&D from the science and technology knowledge domains rather than the widening remit of the *Manual* evidence in the 2015 edition. It is science and technology R&D which is measured and

recognised as qualifying for tax relief. This is underpinned by government guidelines (Department of Trade and Industry, 2004) which establish definitions of science and technology for accounting purposes. These guidelines deem that:

“Science is the systematic study of the nature and behaviour of the physical and material universe. Work in the arts, humanities and social sciences, including economics, is not science for the purpose of these guidelines. Mathematical techniques are frequently used in science, but mathematical advances in and of themselves are not science unless they are advances in representing the nature and behaviour of the physical and material universe. Technology is the practical application of scientific principles and knowledge, where ‘scientific’ is based on the definition of science above. These guidelines apply equally to work in any branch or field of technology.”

So although the *Frascati Manual* has shifted to encompass a wider R&D sphere national Governments have not altered their own application of the *Frascati Manual*. This is significant, because it perpetuates a limited public perception of the value of R&D beyond the more traditional domains of science and technology. Government can measure spend on R&D for those knowledge domains who account for and return financial reports in this domain. Where large parts of the economy have no incentive to recognise and capture this data then there is a missing component of R&D evidence. In 2012, six knowledge domains – covering both manufacturing and services knowledge domains – accounted for 66% of R&D spend in the UK according to ONS statistics:

- Pharmaceutical knowledge domain
- Telecommunications
- Motor vehicle industry
- Computer programming and information services
- Aerospace
- Machinery and equipment

Clearly, within these domains R&D is delivered at scale. However, the rise of the concept of ‘design’ and the ‘creative industries’ has enabled more evident delivery of arts and cultural learning/R&D into industry.

Key to all these discussions within these models are exactly what is being measured and why. There is still no consensus globally on what should be measured in respect of either research or R&D across all knowledge domains. The Research Excellence Framework in the UK offers an evolving academic perspective on research measures which could be extended. However, it is still in development and not recognised internationally. The closest point of international consensus is the *Frascati Manual* but this has limitations in terms of encompassing all knowledge domains. Across each of these models the terms associated with measures imply different biases and judgements on what is significant to measure whether it be in regards to the delivery of ‘value’, ‘benefit’, ‘impact’, ‘creativity’, ‘innovation’, ‘economic return’.

### 3.7 R&D case examples

There are very few carefully documented R&D case studies which demonstrate the delivery of R&D in the arts and cultural domains. This was highlighted by Bakhshi et al in 2010 and assisted with the case for establishing the Digital R&D Fund for the Arts. Within this context Bakhshi et al used the example of the NT Live project as an example of experimental development (2010, p.4-5). This project established a set of research questions and a method for collecting data to answer the research questions. NT undertook live broadcasting to two different audiences and venue types and gathered data on audience preferences through surveys. The work explored the potential of digital delivery models (see [http://www.nesta.org.uk/sites/default/files/nt\\_live.pdf](http://www.nesta.org.uk/sites/default/files/nt_live.pdf)). This case provided a backdrop for discussing what R&D is and is not within the arts and cultural context. Importantly the work assisted with framing the case to develop further evidence of R&D in the arts cultural knowledge. The Digital R&D Fund for the Arts is specifically framed to deliver R&D in this

context. As such it provides an evidence base of over 60 cases of R&D delivered within this sector and these projects as a whole have been evaluated (Fleming, 2016).

Other funding models such as the REACT Hub also provide a basis for providing R&D evidence. REACT is one of four Knowledge Exchange Hubs for the Creative Economy funded by the Arts and Humanities Research Council (AHRC). A collaboration between the University of the West of England, Watershed, and the Universities of Bath, Bristol, Cardiff and Exeter, REACT funds collaborations between arts and humanities researchers and creative companies to deliver R&D projects. See the React Hub (<http://www.react-hub.org.uk/>).

In addition, the REF2014 impact case studies highlight how research has delivered and impacted from the arts and cultural knowledge domains in a range of ways thus too providing a further evidence base.

On the following pages (pp.??) are some case examples taken from sample projects which evidence the ways in which each of these specific research/R&D projects was delivered and evidenced. Each of these evidence aspects of deliverables which can be measured and aligned to the *Frascati Manual* definitions of R&D but also to the REF. The research summaries are taken from the reports highlighted within each example case.

### **Example Case 1: Firestation Arts and Culture Neo Ticketing**

**Research context:** A Digital R&D Fund for the Arts project

This text is drawn from the Digital R&D Fund for the Arts project report. The full version is available at: <http://artsdigitalrnd.org.uk/wp-content/uploads/2014/09/Firestation-project-report-final.pdf>.

**Organisation:** Firestation Arts Centre for Arts and Culture

**Partners:** Monad Ticketing and Royal Holloway

**Context:** Arts and Cultural Centre encompassing theatre, cinema, art, music, business and community programming space for events and innovation

**Expenditure:** The work was made possible by an AHRC research grant totaling £122,877 as part of the Digital R&D for the Arts programme.

**R&D type:** Experimental development - new business ticketing models for the cultural sector

#### **R&D summary**

This R&D sought to better understand three dynamic pricing models and their impact on consumer demand and engagement in a cultural context. The R&D aimed not only to better understand approaches to revenue generation but also audience responses and engagement with the Firestation Arts Centre in the light of pricing changes. The work sought to explore not only how to maximise profits but also how to reach as large an audience as possible and in addition to make engagement with the arts possible for a wide range of stakeholders. These three objectives formed part of the analysis when considering the delivery of different pricing models.

The R&D was delivered through benchmarking the sales volume, average prices and buying patterns of customers at the Firestation Arts Centre for 335 events prior to the introduction of dynamic pricing experiments. It did this by analyzing ticket sales data against categories of event (e.g. comedy, kids' theatre etc.) and working out the average ticket price month by month for each event category. Different pricing models were then trialed and the data compared against the original benchmarked ticket prices. In addition, customers were surveyed for their qualitative reactions to the price changes delivered by different models.

#### **R&D outcomes/impacts**

Since the completion of the project Firestation has continued to deliver a dynamic pricing model. The economic benefits and seat sales continue to be a measurable outcome from the work. Building on this work the ticketing partner Monad Ticketing offers a range of dynamic ticketing models to all its clients. The findings have been more widely shared through the project report and papers.

## **Example Case 2: Nottingham Castle Riot 1831 – Augmented Reality Exhibition**

**Research context:** A Digital R&D Fund for the Arts project

This text is drawn from the Digital R&D Fund for the Arts project report. The full version is available at: <http://artsdigitalrnd.org.uk/wp-content/uploads/2013/07/NCMG-Riot-1831-Project-Report.pdf>.

**Organisation:** Nottingham City Museum and Galleries

**Partners:** Hot Knife Media and Nottingham Trent University

**Context:** A city museum

**Expenditure:** The work was made possible by an AHRC research grant totaling £162,000 as part of the Digital R&D for the Arts programme. In addition, the partner organisations provided funding to the value of £100,000.

**R&D type:** Experimental Development to improve visitor experience and learning from exhibitions.

### **R&D summary**

Nottingham City Museums and Galleries, in partnership with Hot Knife Media and Nottingham Trent University, received funding for an R&D project which explored:

1. How to create opportunities that allowed visitors to experience, connect and engage with an historical event by incorporating multiple perspectives.
2. Whether the relationships between digital and non-digital interpretation, the museum objects, heritage site and exhibition design were mutually supportive and could enhance the thematic content of the exhibition.

The development aims were set up to enable visitors to interact with an exhibition in the most dynamic way possible and to address the challenge that objects and events may be seen from multiple perspectives. The focus for the exhibition experience was protest and rebellion in Nottingham in 1831. As a central part of the project an augmented reality app was developed. The app was made available through tablets at each exhibition stand or could be downloaded through the visitors' own smartphones, along with the five augmented reality 'stories' on display through the exhibition. Actors were also used to develop the experience. The R&D was delivered through testing of the app, observing visitors and obtaining visitor feedback on the app and experience as a whole.

### **R&D outcomes/impacts**

The findings from this project have been shared through publications and papers. The additional learning around engaging audiences and using technology to enhance experiences are already being used by the Nottingham City Museum and Galleries in their current planning and will be used in different sites. The project provided new learning for the tech provider about the practicality of using different technical devices in Museum contexts and the benefits of different devices for a range of audiences.

This process meets the requirements for R&D as defined by the *Frascati Manual* as the app and exhibition were new products delivered through the process with capacity to be reproduced and transferred. However, a central benefit of the approach was that it provided better understanding regarding how to engage visitors and enhance their user experience and learning. Ideas around experiential learning have limited coverage in the *Frascati Manual* although they are covered in a REF context.



### **Example Case 3: Books and Print Sandbox**

#### **Research context:** A REACT Hub project

This text is drawn from the project website at <http://www.react-hub.org.uk/projects/books-print> and key project reports including <http://www.react-hub.org.uk/articles/books-print/books-print-sandbox-industry-insight> and <http://www.react-hub.org.uk/sites/default/files/publications/books-and-print-sandbox-insight.pdf>.

**Organisation:** REACT is one of four Knowledge Exchange Hubs for the Creative Economy funded by the Arts and Humanities Research Council (AHRC). A collaboration between the University of the West of England, Watershed, and the Universities of Bath, Bristol, Cardiff and Exeter, REACT funds collaborations between arts and humanities researchers and creative companies to deliver R&D projects. See the React Hub (<http://www.react-hub.org.uk>).

**Context:** R&D in publishing

**R&D type:** Experimental development providing new understanding, delivery models and product concepts for the publishing industry.

#### **R&D summary**

The purpose of the Book and Print Sandbox programme was to explore new models of interpretation, interaction, creative expression, publication, distribution, purchase and commercial exploitation. At their core each project remained faithful to the idea of the value of narrative and text but looks at mechanisms to to expand potential. In doing so the projects generated prototypes of entirely new product lines, not seeking to replace the physical but augmenting more traditional formats to suggest alternative routes to market, as well as engaging new audiences across an increasingly digital literate marketplace and also to look at new collaborations between audience and publisher. Projects included explorations of:

- how to make reading pleasurable on screens in new ways with prototypes developed that delivered new literary works delivered across devices and localities with capabilities for interaction with metadata.
- how to use the affordances of new technologies to maximise potential and not merely ape the printed form in order to meet and maximise demand in new ways
- how to deliver trusted content in new ways. This was delivered in particular through the Newstori project which explored citizen journalism, trust, reputation, motivation, and creative agency in Port Talbot where the local newspaper has closed.

#### **R&D outcomes/impacts**

The projects were each written up and shared on the Hub website. Individual project together provided some experimental developments that may be delivered into practice. The projects also provided critical new learning about user preferences and trust. To deliver this learning into the publishing industry a paper was commissioned for added impact.

**Example Case 4:** Brass musical instruments in history and the relationship of research to performance

**Research context:** A REF2014 Impact Case Study

This text is drawn from a REF impact case study. The full version is available at:

<http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?id=38044>

**Organisation:** Open University

**Context:** HEFE. REF classification Music, Drama, Dance and Performing Arts. Other REF classifications included Studies in Creative Arts and Writing: Performing Arts and Creative Writing Language, Communication and Culture: Cultural Studies History and Archaeology: Historical Studies

**Expenditure:** The work was made possible by research grants totaling £393,879 from the AHRC (£387,149) and the British Council (£6,730).

**R&D type:** Basic research to inform an understanding of the past, current and potential uses for brass instruments.

#### **R&D summary**

Over a ten-year period, Professor Herbert carried out scholarly investigation directed at key questions concerning the way brass instruments have been understood and used over a wide chronological period (c.1600 onwards). The research has sought to enhance the music community's understanding of repertoires that include brass instruments even where the notated music does not indicate their use, how performance techniques and conventions have changed, and how historic brass instruments designs have impacted on the sound balance of ensembles more generally. Professor Herbert was able to draw on his own experience from performing with most major UK orchestras, opera companies, chamber ensembles and period instrument groups.

This basic research into the history, repertoires and performance cultures of brass instruments has reconfigured the international music community's understanding of how brass instruments have been played in the past and has unveiled new repertoires for today which have been taken and applied in practice. Professor Herbert shared his knowledge through publications, papers and personal involvement in a number of practical projects. His publication *Music in Words* has been reprinted a number of times and has become the seminal textbook for teachers and students of music performance outside the higher education sector.

#### **R&D outcomes/impacts**

The REF classifies the impact of this work as cultural. In addition to the new knowledge Professor Herbert has shared and transferred in his publications. The findings from the research are recognised as major points of reference for professional and amateur performers. The research has contributed to work in the heritage industry and to that of print and broadcast media professionals. The research has been translated for wider consumption in pivotal publications such as *Grove Music Online*, which features new entries on bands and individual brass instruments.

The impact from Professor Herbert's work has been measured both qualitatively and quantitative and includes:

- Sales figures and review summaries for *Music in Words* provided by ABRSM Publishing and also *The Trombone* provided by Yale University Press.
- Visitor figures for *Grove Music Online* provided by Oxford University Press.
- Visitor figures from Merthyr Tydfil Museum Service for a related event.
- Evidence from Museum panels for use of Professor Herbert's text.
- Documentation of advice to key organisations on aspects of their performance development, e.g. Welsh National Opera, the Royal Opera House and Glyndebourne Opera
- Testimonials, emails and letters from organisations and individual researchers, professional musicians and teachers worldwide.
- Broadcast data
- Peer review of Professor Herbert's publications.

## **Example Case 5: Attribution, Auctions and Exhibitions**

### **Research context:** A REF2014 Impact Case Study

This text is drawn from a REF impact case study. The full version is available at:  
<http://impact.ref.ac.uk/casestudies2/refservice.svc/GetCaseStudyPDF/37242>

**Organisation:** Professor David Ekserdjian at University of Leicester

**Context:** HEFE. REF classification Art and Design: History, Practice and Theory

**Expenditure:** Not specified.

**R&D type:** Basic research and applied research – scholarly research into Italian Renaissance painting and sculpture used to authenticate works of art in practice.

### **R&D summary**

Professor David Ekserdjian has been engaged in research and has published widely in the fields of Italian Renaissance painting and sculpture since the late 1970s, with a particular focus on Correggio and Parmigianino, the subjects of his two major Yale monographs. Ekserdjian's research methodology is a traditional connoisseurial one, involving painstaking analysis of the paintings at hand to identify thematic motifs and formal styles in order to locate the artwork within the flow of the artist's career, or indeed to determine who did the painting when this might be unknown. This approach can only be sustained when a scholar has built up an encyclopaedic bank of formal, stylistic knowledge of artworks from across the period, and it is an approach that is not often practised in art historical scholarship within academia these days although it is within the art markets. Ekserdjian's authentication and attribution of Renaissance paintings and the curatorship of international exhibitions, have had substantial financial impact on institutions and individuals involved in the art market, in particular the auction house sector, galleries and museums. This includes cultural impacts on the public by introducing them to newly-discovered and attributed artworks which might previously have never been exhibited publicly and by offering innovative ways of exhibiting and understanding masterpieces.

The relative rarity of Ekserdjian's traditional approach to research and the unique skills required, means his opinion is much valued by the art trade, auction houses, collectors and museums. In many cases, Ekserdjian has been the first person to identify and publish specific works as being by Correggio or Parmigianino. In others, his confirmation or rejection of traditional attributions for particular artworks has decisively affected their fate in the art market and the exhibition circuit. The Portrait of Niccolò Vespucci in Hanover, for example, was identified by Ekserdjian by comparing it with a little known preparatory drawing and by identifying the sitter. This has led to the work being widely exhibited as a Parmigianino. Similarly, the Portrait of a Man by Parmigianino was first made known in Ekserdjian's monograph on the artist, and led to this private piece being publicly exhibited at the Sterling and Francine Clark Art Institute, Williamstown, Massachusetts in 2011. Other examples include the loans by private collectors of Parmigianino's Portrait of Lorenzo Pucci and his Mystic Marriage of Saint Catherine to the National Gallery in London, which would not be on loan and public display if Ekserdjian had not endorsed the attribution to the artist. It was, equally, Ekserdjian's expertise on Correggio that led to the acceptance of a newly discovered Virgin and Child and to its purchase by the Art Gallery of Victoria in Melbourne.

### **R&D outcomes/impacts**

The REF classifies the impact of this work as cultural. In addition, the body of the text makes the case for the economic impacts. Professor Ekserdjian has shared and transferred his knowledge through exhibitions and publications which have been peer reviewed and cited extensively. He has organized four major exhibitions devoted to Correggio and Parmigianino in recent years. Further impact metrics around the delivery of Ekserdjian work include:

- sales of merchandise, including an award-winning exhibition catalogue
- catering revenues were likewise substantial,
- substantial domestic and international tourism calculated by the Royal Academy as 39,000 foreign visitors to one exhibition.
- Metrics from the Royal Academy on the reach to a wider demographic of innovative events programmes and were evidenced in visitor feedback and emails.
- Ekserdjian's attributions cited in auction sales catalogues. In the case of the Virgin and Child with the Infant Saint John the Baptist by Correggio the eventual purchaser evidenced reliance on this for authentication purposes and this piece sold at Sotheby's for the highest price for an acquisition in the NGV's 150 year history.
- Testimonies from leading international art leaders.

## **Example Case 6: Architecture as City**

### **Research context:** A REF2014 Impact Case Study

This text is drawn from a REF impact case study. The full version is available at:  
<http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?id=35385>

**Organisation:** Architecture Research Unit (ARU) London Metropolitan University

**Context:** HEFE. REF classification Architecture, Built Environment and Planning for Panel allocation purposes. Further classifications were noted as 'Built Environment and Design: Design Practice and Management, Urban and Regional Planning Studies In Creative Arts and Writing: Visual Arts and Crafts

**Expenditure:** Not specified.

**R&D type:** applied research and experimental development to transform city spaces.

### **R&D summary**

The ARU focuses on the enhancement of the public realm at all scales in the city. Architecture as City is an idea of architectural space that makes a house into a (small) urbanism, i.e. the space is similar in character to the space between buildings on a street, a square, in a mews, both in the intimate and more public parts. This idea has been developed further by introducing a differentiation between the infrastructural and the inhabitational spaces in architecture. This design approach is applicable to large and small architectural scales. Within ARU Prof. Florian Beigel and Prof. Philip Christou have worked together since 1985 as key researchers with a team of Design Research Assistants at London Metropolitan University. Thinking about Architecture as City began with the design of the Half Moon Theatre in London which is 'a theatrical street with a roof over it'. This led to ARU's prize-winning international design competition entries for larger urban landscape design projects in Japan including Nara Mats (1992), and the Sky Mat, Yokohama Port Terminal (1994). Research into landscape infrastructure was taken further with international design competition projects that were built in Germany. Large open-cast coal mining landscapes were transformed into a city landscapes of lakes and new settlements, Brikettfabrik Witznitz (1st prize, 1996), Kunstlandschaft Cospuden (1st prize, 1997-2001). Following this, a large area formerly used as military training grounds was transformed into a new city district on the southern edge of Berlin, Stadtlandschaft Lichterfelde Süd, Berlin (1st prize, 1998). In these projects the dimension of time and the idea of designing for uncertainty became drivers in the design research process. Experiments with the concept of architectural infrastructures in the city were played out here, where the inhabitation could be designed by others. The researchers began to question the notion of the master plan. These projects led directly to ARU being invited to develop the Urban and Landscape Concept Design for Paju Book City, Korea, (1999-). Paju Phase 01 (completed in 2007) with over 300 buildings built by individual clients and their architects. An urban wetland that unifies the entire site and a number of cultural building clusters offer views of the Han River landscape and the nearby Simhak Mountain.

ARU has completed three publishing houses at Paju Book City: Youl Hwa Dang Publishing House 01 (2003), Positive Thinking People Publishing House (2007) and the Youl Hwa Dang Book Hall Building (2009). These buildings sit next to each other on Bookmakers' Street, forming a city cluster in Paju. Each building is claimed to be its own essay about architecture as an urban figure. Based on the strength and public influence of the Paju project, ARU was invited as one of seven international design research teams to make an urban design proposal within a 400 square km site on the South-West coast of Korea. The ARU Saemangeum Island City (2008) (<http://aru.londonmet.ac.uk/works/saemangeum>) anticipates a city of approx. 600,000 people to be built on land reclaimed from the sea. This project is a compilation of the design research concepts and strategies that ARU has developed over the past two decades.

### **R&D outcomes/impacts**

The researchers list six outputs from their research including exhibitions, policy outputs demonstrated in Government policy, publications, the very physical impact of buildings a number of which have won prizes, and the development of a network of learning which has built capacity in terms of people with research and practical expertise to work in academic and architectural practice. The outcomes of this R&D work is made tangible with the visible transformation of spaces providing space for business and public activities. The economic and social value of these transformation could be further measured. The REF cites the impact of this work as cultural value.

### **Example Case 7: Fashion and Textiles Sustainability at the University of the Arts London (UAL)**

**Research context:** A REF2014 Impact Case Study

This text is drawn from a REF impact case study. The full version is available at:

<http://impact.ref.ac.uk/casestudies2/refservice.svc/GetCaseStudyPDF/39826>

**Organisation:** Research Centres; Centre for Sustainable Fashion (CSF) and Textile Futures Research Centre (TFRC)

**Context:** HEFE. REF classification Art and Design: History, Practice and Theory for Panel allocation purposes. Further classifications were noted as 'Design Practice and Management' and 'Education'.

**Expenditure:** The work was made possible by research grants totaling £127,120 from the AHRC, £280859 from the AHRC in conjunction with EPSRC and unspecified grants from the Leverhulme Trust and DEFRA.

**R&D type:** basic research, applied research and experimental development across a number of fashion projects in order to better understand textile design, production use and consumption and to apply this knowledge and experimental development to collections in practice.

#### **R&D summary**

This impact case study pulls together projects from the Interrogating Fashion research cluster which delivered R&D in order to explore:

- the development of a deeper understanding of the synergistic and holistic nature of fashion and textile design, production, use and consumption systems and how understanding of these can help designers to make better informed choices.
- the articulation and application of sustainability within a fashion and textile context

The study provided to the REF2014, pulls together a number of pieces of R&D from researchers across the UAL, each of which demonstrated the importance of taking a holistic and interdependent view of all aspects of the cycle of production and consumption. Researchers included Professors Sandy Black, Professor Rebecca Earley, Dr Kate Fletcher (Reader) and Dilys Williams (Director Centre for Sustainable Fashion). The projects included a collaboration entitled '5-Ways' which explored the relationship between fashion/textile design and design for sustainability concepts. '5-Ways' showed that conceptual eco design principles found in other design disciplines could be applied to fashion and textiles. Fletcher's research brought together information about lifecycle sustainability, the impacts of fashion and textiles, practical alternatives, design concepts and social innovation. Fletcher's separate project a 'Local Wisdom' emphasized material or design development and cultural, personal and political issues, while 'Fashion and Sustainability: Design for Change' presented sustainability as an opportunity for fashion innovation, suggesting new ways for designers to work outside of the traditional production and consumption cycle. Black's 'Eco Chic: The Fashion Paradox' brought together a group of 38 academics, artists, designers, scientists and technologists in which The Fashion Paradox: transience and sustainability was a major theme. 'Eco Chic' examined the fashion life cycle from fibre to finished fashion and disposal, offering design strategies for improved sustainability, with case studies setting the eco-fashion movement in a contemporary context. A further project 'Worn Again: Rethinking Recycled Textiles' proposed environmental improvement through the creation of innovative, high quality, upcycled artefacts. It explored textile recycling in combination with new technologies, ethical production, short-life and long-life design strategies and systems and services. It ultimately led to the creation of 'TED's TEN' a set of strategies to help designers navigate the complexity of sustainability issues and offer them practical ways to design lower impact products. Finally, 'Shared Talent India,' led by Williams, applied sustainability thinking and values to fashion design and development. Stressing the contribution of all actors in fashion creation, working collectively to generate a more human systems-based approach, thus challenging the dominant reductionist focus on discrete parts of the process. Shared Talent India (2009) involved a programme of cooperative design workshops for UK/Indian designers, makers and communicators, culminating in ten days of active design participation and collaboration in Delhi.

#### **R&D outcomes/impacts**

The REF categorized the impact of this research as societal. This R&D was shared through publications and papers but also through engagement and experimental development and application with industry. Furthermore, the group input into policy making agendas. Evidence of these impacts included:

- Testimonials from industry leaders and organisations including H&M, Nordic Initiative Clean and Ethical (NICE), and Sustainable Fashion Academy, Stockholm Citizen Mobilization Director, Nike.
- Evidence of impact on policy debate and practice including statements Chair, All-Party Parliamentary Group on Ethics and Sustainability in Fashion and comments recorded in Hansard during the Clothing Industry: Ethical and Sustainable Fashion Debate in the House of Lords (2011), statements from the Department for Environment, Food and Rural Affairs, Sustainable Clothing Action Plan
- Evidence supplied of impact on raising awareness of issues with regard to fashion and textiles sustainability, e.g. statement from the Science Museum in relation to Trash Fashion.
- Impact on fashion products including the launch of Estethica at London Fashion Week and Delhi Fashion Week which won the EAUC Green Gown Award for Social Responsibility 2011.

## 4. FINDINGS: SEMI-STRUCTURED INTERVIEWS, QUESTIONNAIRES AND WORKSHOPS

### 4.1 Introduction

The findings have been written up in two sections (chapters 4 and 5). The first part (chapter 4) contains the analysis of the data gathered from across the semi-structured interviews, questionnaires and workshops. This part of the study explored participants' perspectives as to how R&D is defined and understood across the arts and cultural knowledge domains. It also sought to capture viewpoints as to how R&D is delivered and evaluated across arts and culture. The second part of the study (chapter 5) drew on the findings from this chapter to inform further focused interviews.

### 4.2 What is R&D?

The participants' responses from the semi-structured interviews, questionnaires and workshops highlighted that the majority did not have a prescribed definition of R&D. Those participants who had a pre-set idea of R&D specifically took their definition from the *Frascati Manual* (OECD, 2002, p.30). Whilst many did not have fixed definitions all participants were able to convey strong perspectives on the components of an R&D definition which was described as 'exploration', 'experiment', 'investigation', 'problem solving', 'space for delivering innovation', 'testing' and 'critical analysis' leading to 'discovery', 'new knowledge', 'new experiences', 'theory', 'proof of concepts', 'applications', 'business models', 'intellectual property including copyright and patents', 'economic impacts', 'products', 'social change' and 'social impacts'. In many of the definitions, there were ideas about processes and methods of research delivery. In this context some participants specifically defined the need for R&D to be delivered through systematic processes. In addition, R&D was discussed as a process of enabling risk taking to occur in a managed and understood way in order to push boundaries but reduce uncertainty. This was described as a mechanism for 'safe failure'.

Many participants knew that there were published definitions of research from various Research Councils. Whilst it was noted that these research definitions were not all identical they were perceived to be compatible with one another and also with the *Frascati Manual* R&D definition although it was acknowledged they were defined for academic spaces. The most commonly referenced research definition was the AHRC research definition ((see <http://www.ahrc.ac.uk/Funding-Opportunities/Research-funding/RFG/Pages/Definition.aspx>) but also cited were those which appear on the AHRC, ESRC, HEFCE, European Research Council and RCUK websites. It was noted that these definitions had needed to be evolved and challenged over time, for example in order to ensure the inclusion of practice-led research in the arts. In the context of the EU definitions it was highlighted that the EU has rules around the points at which funding ends. Thus funding ceases when a concept reaches a stage where it is competitively viable in other words capable of generating an economic return (EU, 2011, p6). However, the RCUK definitions are not as tightly defined.

In discussing R&D delivery across arts and culture, there was an emphasis on engaging people. What constituted a development in this context would include not only a 'tangible outcome' in terms of a physical product but in some instances might be a change in attitudes or behaviours. In this context as the process involves people it was noted that art R&D often happens through 'messy' and 'disruptive' events and may create not only 'new techniques' but 'new movements' which might not be foreseen at the outset, as occurred with art movements such as the Romantics, Surrealists or Punk. It was observed that the reason why the arts and cultural knowledge domains had not been perceived by some to undertake R&D was that current received wisdom had not formally accepted the rationale that R&D could focus on people.

For those within the policy domain the link between research potential for some form of understood development was vital in order to justify economic outlay and in the case of the public sector value for money for the national research spend. However, these policymakers

accepted that the R&D outcomes could be wide ranging and encompass individual and social change.

“It is important that there is the potential for tangible outcomes from research as a return on investment, ... I would see an academic paper and a new product both as such outcomes...so too are soft outcomes for example cultural understanding”  
Policymaker

One of the practitioners did describe how whilst his/her post was expected to undertake research with the potential to be applied, nevertheless the post title was designed to link to conceptual research projects outside the organisation and for this reason a purposeful decision was taken to call it Head of Research rather than Head of R&D which might have led to a greater expectation than work would be applied rather than conceptual. It was noted that this would potentially be different if there was a better understanding that arts and cultural knowledge domain R&D was capable of delivering ‘new knowledge and change’.

In terms of process, ‘research’ and ‘development’ was seen as sometimes occurring in tandem, and for some this was the better approach, whilst at other times being undertaken as a linear process moving from research through to development. It was observed that research projects are short term and whilst the development aspect is often anticipated, often it can happen much later potentially delivered by another party. However new forms of practice-led research which do ensure that research and development are happening in tandem were noted to resulting in quicker delivery of outcomes.

Example comments included:

“Research enables us to say here is a curiosity that we wish to explore out of which might be things that emerge”

“The opportunity to research and develop new ideas - creating space and time for this to happen, take risks, make mistakes, make new discoveries in an open and (if possible) risk free environment. The emphasis being on learning and pushing through barriers to progress new ideas.”

“The space to explore and discover new ways of working without being restricted by adhering to specific outcomes.”

“A structured exploration of a defined question or set of questions with a view to developing new products, processes and practices.

“A systematic process which brings together data and practice to create new products, services and ways of working for, with and by arts and cultural organisations.”

“Research is the discovery and creation of new knowledge.”

“Investigations and collaborations around an idea that lead to new ideas, artistic practices and outcomes.”

“The opportunity to test an intuition with a view to addressing a perceived problem or opportunity within the arts. Doing any kind of testing requires some risk, and R&D often implies that the risk has somehow been ameliorated and that there is a willingness to organisationally learn from mistakes.”

### **4.3 Do the arts and cultural knowledge domains need a bespoke R&D definition?**

Part of the data gathering encompassed questions around whether or not the arts and cultural knowledge domains needed a precise R&D definition and if so what were the unique requirements for these knowledge domains. Throughout the process there were a small number of people who were against the idea of having a definition as they did not wish to be



confined to practice within limited parameters. These were academic participants. However, they acknowledged that even in an academic domain the reality was that for research funding purposes certain accepted peer processes needed to be met. One person noted s/he would not wish to be 'confined' by a definition but equally a definition was vital to engage with policymakers and funders so had to be in place for pragmatic reasons. Ultimately the majority of participants were positive about the need for a definition and articulated that something must be defined to make it tangible and enable dialogue on that reality. Thus the definition was seen to be important in order to establish an environment and resources to foster R&D. This required having R&D in job titles and job descriptions to make it tangible. The starting point for this was having an accepted definition in terms of what R&D is and then based on that definition examples of what R&D can potentially deliver. Example comments included:

"We gave our work the name R&D within our organisation so people would know we were doing something valuable but we have not yet given it a strict definition and that would help with championing our work further."

Practitioner

"By having an agreed explanation for components of the R&D work process, or flow, it places it in a different value chain with potential for new ways of thinking about the creative output."

Practitioner

"It is vital to have an R&D culture within an organisation which means not only doing R&D but actually thinking about the environment within which it exists. That can only happen if there is a definition and a dialogue around what is R&D."

Practitioner

"Whilst the DCMS creative industries definition isn't perfect, it has enabled the creative industries to become an accepted reality into which resource can be focused. You need a definition to get started and then you can refine that definition through time. I would just get something on paper and go with it... It may need to be changed over time but you just need to get started."

Policymaker

In particular, a prescribed definition was seen as particularly valuable in business and for policymakers. It was noted that the definition should be written with carefully defined parameters so that it did not limit the development of R&D and could evolve through time but equally was capable of being useful for policymakers to understand the practices that would sit within the R&D umbrella. Academics, practitioners and policymakers all highlighted the benefits of ensuring fluidity in thinking and approaches. New ways of thinking had led to new links between academia and industry. In discussing the research definitions which existed it was highlighted that there was a real need to encompass the 'D' in order to overtly recognise this delivery from across arts and culture. One of the policymakers described the rationale in their Government work that R&D was funded and given tax breaks in the sciences because across the science knowledge domain as a whole there was perceived to be a clear economic return on investment even if the original research did not guarantee an end tangible product. S/he cited the example of how Teflon was discovered and the uses found for this after its development and how the hadron collider was delivering a return in unanticipated ways. S/he could not cite definitive evidence during the interview for this view. However, the key point s/he made was that there needed to be the potential for a development in order to merit certain kinds of public funding. It was seen as important to articulate R&D in the context of delivering engagement, influence and change in terms of people and society. This was highlighted as key to arts and cultural knowledge domain delivery and understanding of the social, cultural and economic delivery from this domain. A number of participants highlighted the need to acknowledge the soft and hard deliverables from across these domains.

Emerging from the data was a strong view that whilst it needed to be recognised that the arts and cultural domains deliver R&D it was important to have a definition which encompassed all knowledge domains rather than creating boundaries. Many participants highlighted the need

for multidisciplinary working across the arts and sciences. In addition, it was perceived that as R&D in the sciences already had the support of policymakers and the understanding of the public in regards to R&D delivery it was preferable to buy into the science definitions and build bridges not boundaries.

Sample comments included:

“the arts has not always been given the same level of respect as the sciences... both are equal and having one definition (of R&D) would help with how this is seen”.

Academic

“One definition would further assist me to build further links with science partners. I sometimes struggle to find science partners. Cross-disciplinary working is encouraged but cross-disciplinary can be interpreted in a very narrow sense for example cell biologists working with chemists whereas I want to see this opened up much more widely.”

Academic

It was suggested that definitions can be dry and unexciting as they are the domain of the policymakers. It was noted that to better engage public consciousness exiting case examples of the actual delivery of R&D against the definition needed to be publicized to raise the public consciousness of the value of the knowledge that can be delivered from the arts and cultural domains.

#### 4.4 Considering the relevance of the *Frascati Manual* definition of R&D for the arts and cultural knowledge domains

At the interview stage, the potential for the applicability of the *Frascati Manual* high level definition of R&D (OECD, 2002, p.30) was highlighted. One person strongly advocated that to develop a new definition for R&D across arts and culture entirely distinct from the *Frascati Manual* definition would be a mistake as this was understood at an international level and was used in a variety of contexts for delivering frameworks and funding, e.g. tax breaks.

“If you go down the route of creating a new definition then you need to get a whole range of stakeholders to understand that definition... It will be much harder to get buy in to the advantages that already exist for the science knowledge domain.”

Policymaker

It had been anticipated that in the interviews participants would find the definition to be fundamentally flawed which would rule out its applicability and require then the development of an entirely new approach to R&D for arts and culture. However, in fact the majority of participants felt that the *Frascati Manual* definition did fit their approach to R&D and therefore on this basis the applicability of the definition was further tested through the questionnaires and workshops.

The *Frascati Manual* definition at the time of the questionnaire (OECD, 2002, p.30) was:

"Creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of mankind, culture and society, and the use of this stock of knowledge to devise new applications."

A majority of participants resoundingly endorsed the *Frascati Manual* definition:

“This is a great definition and is exactly what I understand to be achieved by the process”

The pie chart (Figure 1) on the next page provides a breakdown of the initial reaction of participants to the definition when asked if they thought it was a definition capable of being taken as a definition for the arts and cultural knowledge domains.

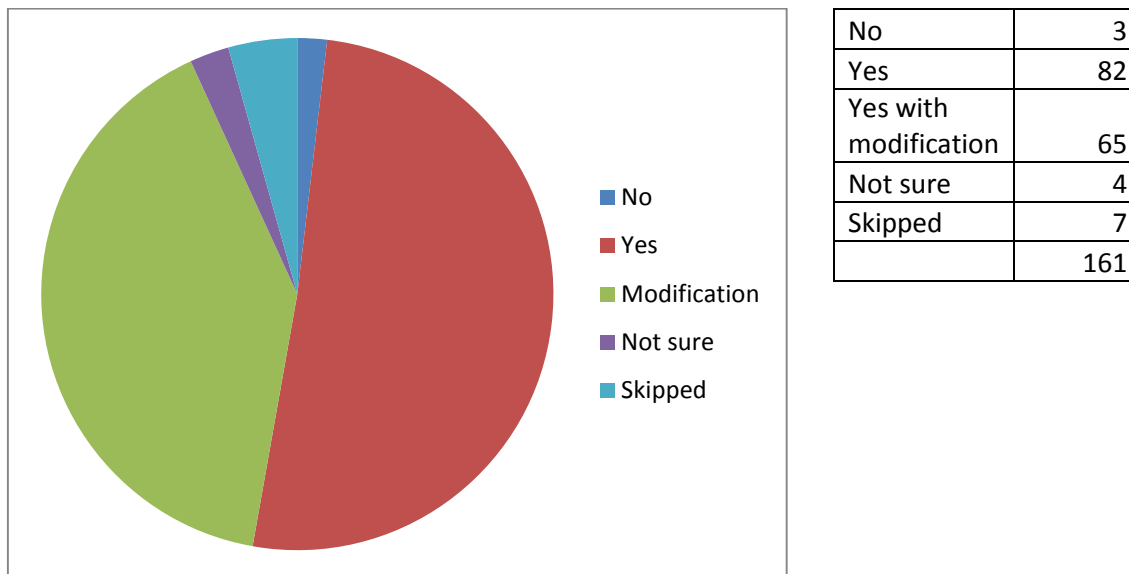


Figure 1: Breakdown of responses indicating whether respondents agreed that *the Frascati Manual* R&D definition (OECD, 2002) was equally capable of being taken as a definition for the arts and cultural knowledge domains.

One statement highlighted the lack of logic in how the UK's HM Revenue and Customs has chosen to apply this definition:

"I believe the statement is accurate. Other statements are accurate too. Interestingly, the only statement that isn't accurate (in my view) the HMRC's, which excludes humanities.... Please test HMRC's definition against yours. If HMRC could see things our way, much more R&D would take place in our industry (learning / museums / visitor centres)."

This refers to the fact that tax breaks are allowable against this definition except in the case of the arts and humanities.

The majority of respondents who raised an objection that the definition required modification highlighted the inappropriate use of the word 'mankind'. The revised *Frascati Manual* definition issued in 2015 has now changed this word to 'humankind' and in fact this is the only change it made in the high level definition.

However other components within the new definition remain which were commented as needing to be addressed both within the interviews and questionnaires. These included:

- 'applications'. Applications were seen as an important outcome from R&D activities but not sufficient to encompass all the outcomes from arts and cultural R&D. It was felt that the definition needed to be extended to include ideas about 'experience' and 'change'.
- 'stock'. The word 'stock' in respect of knowledge was felt to be misleading and an antiquated reminder of positivist ideas that knowledge would build in a fixed way rather than requiring review, interrogation, revision, rejection and multiple perspectives to emerge over time. In addition, it undermined concepts about the capacity for R&D to deliver change to individuals and communities which could not be banked as a fixed asset.
- 'systematic'. Systematic was seen as problematic at first reading because it implied mechanistic approaches which might exclude some forms of R&D delivery for arts and culture. However, the term is defined within the *Frascati Manual* in a very limited way to mean 'planned and budgeted', which was accepted by participants. It was noted that this would need to be clear in order to ensure that more 'intuitive' approaches to delivering

R&D from the arts and cultural knowledge domains were accepted within the framework of the definition.

- 'work'. A preferred term for work in arts and cultural contexts was noted to be 'practice'.

Below are sample comments providing a sense of these concerns:

"Use of the word 'stock' is uncomfortable in the arts context, aligned with capital, goods, productivity whereas the emphasis for the arts is on creativity, expression, freedom etc. Lacks the sense of energy and dynamism and experiential nature I associate with it. More about how to harness systematic processes - but in the arts you can also expect it to go 'off process' or off task and that is where the act of creation may happen."

"Knowledge - not just of, but how - especially how to do / get done Humanity / individuals – rather than man New applications - to do what? This has become a loaded term since the advent of 'apps' and there is a need to guard against seeing R&D solely in terms of technology or the use of technology."

"Creative and systematic might come into conflict with one another if both used as definitions of effective R&D practice – in the arts, R&D can come in the form of unstructured activities such as play, for example. I think "application" is too restrictive in the arts too. How about "new ways of working"; "new practices", "new forms of public engagement", etc."

"The only alteration I would include is that science has to be pragmatic and systematic to work – Arts and Culture should be the opposite and allow for the creative jumps & leaps to go anywhere without restriction - but it is the journey that should be documented accurately and there are not always connected trains of thought."

"Need to change 'devise new applications' to something like 'to create new experiences'."

"'Creative work': What is 'work'? Not sure I have an answer. Maybe use 'exploration'. 'Systematic': is problematic. In the arts as an acceptable research methodology may be chaos. 'man'. Really? Not even mankind? 'Culture and Society': Plurality is better: cultures and societies."

"It needs 'softening' a bit I think, but the essence is spot on. I also think the use of 'creative work' in an arts context could be misinterpreted to mean JUST artistic work, rather than innovation in technology, communications, management etc. Similarly 'new applications' may be read as only technology, whereas in the Arts it's important that it also drives innovation in systems, processes and attitudes. It needs to include 'systematic' or something similar, as most organisations don't see it as a regular, planned and ongoing activity."

"It is not just knowledge, but all practice - R&D can lead to new creative practices that encourage new forms of expression and interaction. Equally it can also result in products and new commercial innovations."

Participants were then asked to consider whether the sub-components of the *Frascati Manual* definition of R&D were appropriate for arts and cultural R&D delivery. These define the delivery of R&D through 'basic research', 'applied research' and 'experimental development'. When asked whether these definitions were applicable most did accord with the definitions. The majority of comments were a discussion of where the particular participant's work fitted into these definitions.

However, the majority of suggestions for amendment focused on the need to review the outcomes of each categorization to ensure that they extended to arts and culture. This echoed the earlier comments on the higher level definition needing to be focused on people orientated

goals and experiences. For example, the ideas of phenomena and observable facts seemed object centric rather than orientated towards people, society and cultural values. Example comments included:

“the language of the outcomes used are not recognizable within the broad spectrum of creative practice”.

“I believe all apply as the arts can make sure of deep theory, concrete practice and the development of work. The wording may need changing, as we are dealing with artistic works rather than "materials" or "devices", and that the arts more often deal with experiences than "observable facts". However, these aspects are still important: \* basic research seems to correspond to artistic theory (which primarily happens in academic contexts, just as in the sciences) \* applied research corresponds more to studies of particular artistic areas, movements, or work, either in terms of humanities studies or of practice based research \* experimental research corresponds mostly to research informed practice or practice based research.”

## 4.5 Delivering R&D

As part of the interviews, questionnaires and workshops the process of how and where R&D is being delivered and funded across the arts and cultural knowledge domains was explored. There was some division in the processes and objectives of R&D delivery from HEFE as opposed to other contexts outside academia:

### 1. HEFE and IROs

The academics in HEFE had well documented, established frameworks for delivering research across the arts and cultural domains. Such research was articulated as being delivered through ‘research methods’, ‘research methodologies’ and ‘accepted approaches’. ‘Accepted approaches’ were taken to be understood in the context of boundaries that were constantly shifting. Most of the academics from across the domain of arts and culture did not perceive there were strict divisions between research and R&D but did not typically describe their work in R&D terms. However, a number of people stated that in reality academic accountability meant that there had been a shift in research emphasis to outcomes which made the case for defining their work as R&D delivery. This had happened because of the need to measure research impact articulated in the Research Excellence Framework 2014 (REF2014 [www.ref.ac.uk](http://www.ref.ac.uk)) which was a broader set of measures than the *Frascati Manual* definitions and included impacts in terms of experience and changes in attitudes and behaviours. In addition, there was seen to have been a fundamental shift in research processes, understanding and outcomes due to new approaches, such as practice-led research. Practice-led research has meant that research and development are critically embedded into practice rather than being linear and as such the development is a given. In addition, the aligned approach of experiential research was highlighted. In this context the subjects of the research contribute not only to the content of the research but also to the creative thinking that generates, manages, and draws conclusions. This has strengthened networking with external organisations.

The rise of Independent Research Organisations (IRO) was felt to have further underpinned the process of linking HEFE organisations to a wider range of partners although it was noted that museums and galleries had taken advantage of the capacity to bid for IRO status but the list of IROs was still fairly narrow (<http://www.rcuk.ac.uk/documents/documents/eligibilityiros-pdf/>). Within the context of IROs key roles were performed by Directors of Research. One participant highlighted that these titles signify the importance of research funding to their respective organisations but possibly that they face the RCUK rather than industry. Thus in a Museum context, even though the role is key to exhibition delivery and audience engagement, the title norm is Director of Research not Director of R&D.

### 2. Outside HEFE

Those people currently working outside the HEFE but who had originally had research experience within the HEFE knowledge domain employed the same mechanisms for their work (i.e. accepted approaches, methods and methodologies) but had to consider their end

goals in different ways and placed much greater emphasis on the outcomes of their R&D. Their goals needed to be aligned to their organisational context. In this context it was stated that:

“R&D needs to be considered, purposeful and directed in order to solve problems, push new boundaries and follow through to conclusions.”

R&D needed to deliver one or more of the following objectives:

- bring in revenue for themselves or their organisations over relatively short timeframes.
- build resilience into the organisation through undertaking R&D which included delivering new ways of working and sharing knowledge, new product development, tested products, audience understanding and horizon scanning.
- share R&D findings as a form of marketing and brandings.

However, in delivering these a formal journal article was often not of particular value and therefore this meant there was less external meaningful knowledge exchange at an academic level. Public engagement was often through marketing. It was felt that there were certain types of R&D which HEFE did not fully engage with and evaluate, e.g. market research.

It was noted that in the arts, creative industries, humanities, and cultural knowledge domain academics working in practice were quite a new concept unlike the science knowledge domain where in certain industries, such as the pharmaceutical industry, this had been the norm for decades. The opportunities for work were perceived to be in Small and Medium Enterprises (SMEs) rather than in global corporations. It was noted in one of the workshops by several participants that within the context of an SME return on investment had to be seen as deliverable in less than five years. This was deemed to make a significant difference in the way that R&D could be structured and accounted for in these domains. Participants from this domain acknowledged that their job titles and R&D role varied significantly, e.g. a textile ‘Studio Producer’ and a ‘Creative Illustrator’ both with R&D in their job descriptions but not in their job titles. Four people noted that there were no formal academic or professional qualification requirements for delivering R&D in arts and cultural contexts and this was a barrier to obtaining HMRC tax reliefs given that the HMRC scrutinises job titles as evidence of professional qualifications which support the picture of research delivery. It was stated that the term, ‘scientist’ and ‘engineer’ are well understood and the software industry has had to reconsider job titles in order to evidence R&D tax claims.

In analysing the questionnaires and workshop mappings the following mechanisms for R&D deliverable across arts and culture were articulated:

- Theoretical research/R&D resulting in new knowledge, new theories and new perspectives.
- Curatorial research/R&D resulting in conceptual, material and interpretative outputs
- Creative research/R&D resulting in ideas, images, themes, formats and perspectives on beauty and use.
- Technical, design and production research/R&D related to new materials, technology, production, delivery of new spaces, functionality.
- Business research/R&D delivering new commercial models.
- Market research/R&D both commercial and non-commercial.
- Audience research/R&D targeting, acquisition and evaluation.
- Social science research/R&D delivering art and culture to aid wellbeing, happiness, social harmony and understanding across communities, including spaces for change and positive dissent, new spaces for collaboration.
- Economic research/R&D delivering new models of financial and transactional processes.
- Cultural and social research/R&D resulting in understanding of identity, UK reputation, narrative, cohesion, difference, change, diplomacy and tourism.

- Environmental research/R&D resulting in better designed environment, sustainable space and production, urban regeneration, beauty.
- Educational research/R&D resulting in new models to teach in order to engage and improve performance through time.

These definitions expand that of the *Frascati Manual*, which for example specifically excludes performance as a form of R&D delivery. It was to be noted that even when articulating these as examples of R&D the term ‘research’ instead of R&D was often deployed and then sometimes corrected and replaced with R&D.

In evidencing the need for R&D understanding across knowledge domains there were a number of examples given as to how research/R&D crosses arts and science boundaries for example:

- in history there has been a move towards social science methodologies.
- in archival research there are a range of research approaches from the science end in terms of conservation and IT, towards social science approaches understanding user needs, towards documentary research that leans towards the humanities.
- art and literature has been used to analyse cognitive thinking.
- a coding programme linked to musical output has been used to teach children to code.
- art has been used to bring new ways of engaging and educating audiences in science, e.g. a dance performance had visually been used to illustrate how a virus can attack cells.

#### 4.6 Measuring R&D

What value is delivered by R&D and how it can be measured is clearly a concern within a policy and funding context. Examples were provided as to how R&D in certain contexts can be seen to deliver value academically, economically, culturally and in a wider social sense. For many participants these elements were all seen as inextricable linked. A number of participants were concerned about the idea of measures. Comments were made that the arts and cultural delivery should be valued and resourced holistically as an accepted part of a civilised society. It was noted that the impact of art is not always immediate and in addition that impact can be subjective which is why peer review processes are undertaken by more than one person. Comments against the concept of measures included:

“There is a clear understanding of the value of a cultural agenda and it should be sufficient to say that we are doing this to produce great art for the country”

“Great art doesn’t need to be measured!”

Repeated perspectives included:

- starting to measure skews the understanding of the value of R&D to arts and culture as only certain things can be measured and therefore valuable deliverables may not be measured. People measure to prove certain things.
- a project may deliver life changing value to one person and this should be respected in itself.
- not all things can be measured equally.
- having measures costs money and therefore can be a waste of resources if there are not meaningful measures.
- measures have been shaped by politics and this is not always the best agenda.
- measures often happen over too short a time to really deliver understandable value.

However, most participants recognised that there needed to be ways of allocating resources and peer review was not always ideal. In addition, it was noted that even if some measures were flawed it was sometimes better to start to measure something rather than nothing. From a policy perspective, R&D measures were seen as providing an evidence base for analysis and decision making in the short and longer term. In addition, R&D was seen to provide an

improved understanding of humankind, society and the environment at a micro and macro level.

A mix of approaches was seen as having potential value. The model for measuring R&D was seen to be:

- Measuring individual benefits
- Measuring with risk models
- Developing a wellbeing model

#### 1. Individual benefits

In terms of valuing and measuring R&D, participants found it very difficult to provide examples which focused very specifically on R&D as opposed to the bigger picture of the work delivered by the art and culture more generally. Many of the R&D measures were defined around the later outcome, e.g. increased number of purchases. These are still potential metrics if one considers them as a picture of the value delivered by R&D compared to a picture of a control setting without the R&D in place but this is a difficult position to set up. The most commonly cited measure was ticket sales, although it was noted that this was not necessarily the most meaningful. This was deemed to be a measure of proof that R&D delivery had delivered a product which audiences were then engaging with in higher numbers as well as an economic measure. Other examples of measures included:

- Numbers linked to products and intellectual property, e.g. academic articles and other forms of publications, artworks, exhibitions, films and other digital media, licensing sales, new materials, patents, performances, products, technological applications, ticket sales, testing proof of concepts leading to IP.
- Numbers linked to individuals/groups and demonstrated through number of downloads, ticket sales, footfall.
- Usage measured through website analytics.
- Opinion measured through ratings, rankings, citations, peer reviews, independent assessments.
- Demand, engagement and participation from audiences/participants measured in numbers, diversity, comment through social media.
- Connections across communities measured through web analytics.
- Attitudinal and behavioural change measured through a range of quantitative but also qualitative measures.
- New audiences defined through change in audience diversity measured through time.
- Savings in terms of efficiency, money and time.
- Revenue generation and turnover.
- Impact of innovation measured in terms of successes and failures. It was argued that failure needs to be measured as evidence that boundaries are being pushed. An example was provided that GSK only bring to market 3% of the drugs for which R&D spend is costed.
- Change measured through defined baselines and agreed change measures sometimes linked, e.g. socio-economic measures linked to R&D outcomes such as regeneration, educational improvements, fall in crime etc. This would include interventions to change or assessing people's changing beliefs and values through interventions.
- Brand value which is measured and protected in some organisations and might be increased by R&D delivering not only better products/services but additional kudos by its existence.
- Impact through REF measures.

In considering measures, it was felt that the Research Excellence Framework in the REF2014 impact measures had shifted perspectives on measurement:

“impact measures have provided an agenda which has looked at how research reaches into the real world”.  
Academic



It was felt that the REF, aligned to the *Frascati Manual*, offered a way forward for developing measures.

In addition, it was noted that work could be undertaken to identify the R&D components by also looking into:

1. Building proxy measures from existing research

An extension of other projects determining value could be reviewed to build proxy measures. For example, within the context of the Cultural Value Project (see O'Brien, 2010 and Crossick and Kaszynska, 2015) and the *Public value measurement framework* both determine value delivered by the arts (Chappell and Knell, 2012). Neither work considers R&D but a number of participants suggested these could be looked at through a new lens in order to deliver proxy measures which are often used when something is difficult to measure.

2. Risk Models

Building on the idea of individual metrics it was suggested a framework could be developed through risk models which allow for metrics to assess opportunities as well as negatives to be considered. In the case of R&D it was suggested much greater emphasis could be placed on the opportunities and what would/could be the result if the R&D were not conducted. When undertaking a R&D project, a simple risk matrix could be developed. It was suggested that this could be developed and explicitly publicized as part of Government risk processes (see [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/220647/orange\\_book.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220647/orange_book.pdf)). It was suggested that the impact measures from the REF align to this model as they can be divided into impacts on the economy, society, culture, public policy or services, health, the environment and quality of life. In this context PESTLE models could be considered useful as they provide for measures against, political, economic, social, technological, legal and environmental factors. In a STEEPLE model there is an additional ethical domain. These models are often used to provide an analysis for a simple risk framework. When taking R&D measures into more complex domains it was suggested that causal measuring was needed and potential systems such as Monte Carlo measures could be adapted. R&D can and does deliver very complex networked outcomes.

3. Wellbeing

In the questionnaires and in all three workshops the concept of wellbeing and the models provided in this sphere were discussed. Wellbeing is now considered alongside GDP. A wellbeing model could clearly include great art and cultural innovation and understanding embedded within its fundamental measures. Within the context of measuring R&D it is still a difficult model to deploy unless one again resorts to the model with the inclusion of proxy measures.

## 4.7 Funding R&D

Aligned to concepts of measures are considerations for funding. In order to maximise R&D delivery for arts and culture there is a need to consider the funding models. The state of the global economy was seen as a key factor in how the field of arts and culture were seen to be supported and funded. It was cited that it was now accepted that the creative industries contribute significantly to the UK's GDP and that innovation in this sphere is critical to the UK. However, despite this recognition it was perceived that art and cultural education had been downgraded and funding had been cut disproportionately to the sciences. The potential to build a holistic environment that would foster arts and cultural R&D in a sustainable and productive way were discussed. R&D was seen as a critical component of the process as art and culture by its nature evolves, changes and innovates.

All of the participants saw the current model of funding R&D as deriving primarily from public intervention rather than through private funding models. Academics wanted protected Research Council UK funding for traditional funding models (i.e. funding delivered to HEFE)

but also new revenue streams to push new boundaries, e.g. The Digital Research and Development Fund for the Arts was seen as a positive model which provided a project structure in which there was parity between academic and non-academic partners. 'Collaboration' in terms of the funders (e.g. AHRC and ESRC) were seen as beneficial for ensuring that new research ideas did not fall between the gaps but there was real alarm about the idea of one research funding pot with no knowledge domain boundaries as it was felt the sciences would increase its share of the funding pot. In addition, there was seen to be a need for other kinds of collaboration. The possibility for new models with community partners was discussed and the idea that everyone could be a participant in R&D rather than a passive audience. It was stated that 'audience' is becoming an outmoded term and everyone is potentially a 'participant' although there is still a domain of 'experts'.

It was stated that it was much harder to get grants particularly as a lone or SME worker and that this needed to be addressed if the person putting forward a bid had the 'correct credentials'. What were the 'correct credentials' was much less clear in the arts domain as it was perceived that R&D in the sciences was undertaken by a much more clearly mapped and understood community. It was noted that in the arts and cultural domains widening funding models had been hugely beneficial as bringing practice into universities had resulted in new research knowledge and teaching, e.g. resident artists and writers. These models were noted as having the value to be further extended. It was highlighted that the academic models needed to catch up in terms of giving greater weight to artistic output as opposed to a peer reviewed article.

It was acknowledged that funding streams for arts and culture needed to be developed in order to build resilience in this domain. Tax was seen as one possible stream for additional funding. Two policy advisors noted that there are many avenues for reviewing tax positions, for example a museum would often have a charitable arm and a trading arm which presented opportunities for structuring R&D investments in terms of situating it within the trading arm if commercial tax breaks existed. However, three policy advisors noted that, whilst defining R&D in line with the sciences was helpful for understanding, there were too many unknowns to result in the same automatic application of tax breaks for R&D in the arts and cultural knowledge domain as currently applied in the sciences. They highlighted that much more systematic data was needed to gain these benefits but that the arts and cultural domain could start to move the position in a staged way, for example:

- Through developing an evidence base as to where the arts and cultural knowledge domains overall deliver a return on investment.
- To obtain tax breaks for very clear domains identifying any issues around competition laws. It was noted that the terms 'creative economy' might foster a tax break for a bigger domain.
- By providing some tax breaks in some domains over time a fuller evidence base would start to emerge.

One policy advisor stated:

"The arts and cultural sectors need metrics that can be comparable and show a range of outcomes. It is beneficial to see these as social outcomes, immediate economic impact... all the time resource judgements are being made and it is naive to assume otherwise... you must have many examples of the value of your work or it is an easy target for cuts. I would want to see 50 case examples where if I do x I will get y. The arts could do this in new ways... just as theatres showed that new productions create footfall to theatres they could think much more creatively about the value of their social outcomes. Science does this. We don't develop drugs for one person."

Finally, it was suggested that tax breaks could be provided for individuals in the sphere of art and culture, which would enable those individuals to roll back (and possibly forwards) a tax position to take account of the fact that all their profits might be accrued in a particular year whereas the R&D for their outputs might have taken several years. This would, in effect, enable the R&D to be subsidised to an extent where there was an economic output. So for

example someone working on a book might undertake a lot of research and take three years to write the published work. The development would be the publication. The problem for the author (from whatever sphere) under the current regime was stated to be that the profits from work over a number of years are delivered in a single year, despite the fact that the work has taken considerably input prior to publication. Allowing tax to be rolled back for individuals widens the break beyond R&D but could still be a mechanism for delivering R&D and innovation support. The case for this approach was that the cost would only be when there was a significant economic output and this would be more palatable to the Government. An argument was made that the tax ought to roll back but not forwards in order to encourage those on an upwards trajectory. It was noted that the wider economy does benefit from the success of individuals in an arts and cultural context.

It was suggested that some rebalancing of power structures would assist with R&D in an arts and cultural context. For example, practitioners noted that when they undertake R&D the cost and time is often borne personally. This was particularly highlighted in respect of publishing and programme making. Furthermore, within the context of programmes when an idea is considered by a company the innovator is required to enter into a contract just to have the work considered and the company then own the IP whether or not the idea is developed or any money paid for it. To do business with broadcasters the individual has no choices but to enter into a contract sacrificing IP as this is standard practice. It was suggested that this unfair practice should be highlighted. As a starting point the matter could be taken up with the BBC given its status as a public service broadcaster. A change in the IP processes in the UK would make it sought after as a place of production for global ideas.

It was acknowledged that more work needed to be done to develop new models of funding including pushing philanthropy and crowdfunding. It was suggested that

- a high profile individual could be identified as a figurehead for championing R&D for the arts and culture;
- new ways of funding linking practice and academia building on the Digital R&D Fund for the Arts;
- a hub from BIS advising practitioners on R&D funding sources;
- a figurehead to champion R&D and new funding streams.

#### **4.8 Conclusions from the semi-structured interviews, questionnaires and workshops**

Key finding was that a definition of R&D would be valuable:

- to make R&D a tangible and understood practice, albeit one that might extend and evolve in the future.
- to highlight where and how R&D is delivered. It was noted that many parties deliver R&D but do not formally brand it as such. This means that at present there is not a clear picture of the practice and value of R&D.
- to aid collaboration and understanding across those domains delivering R&D.
- to provide a focus for policymakers and funders.
- to foster greater understanding with the wider public.
- to provide parity with the science knowledge domain where an agreed definition has resulted in policy and tax breaks around that definition.

The majority of those participating within the research felt that the current definition of R&D within the *Frascati Manual* which is used by many in the science community could be considered as a holistic definition as alignment to an existing definition would bring certain advantages. Changes for the definition were suggested for testing in the focused interviews.

- i. alter the word stock,
- ii. ensure that the term systematic was properly understood to ensure that people understood it encompassed the potential for delivery of R&D through a range of methodologies. The *Frascati Manual*, 2015, p.48, does have a very limited definition of systematic which refers to the R&D being planned and budgeted.

- iii. extend the outcomes from the process to encompass human dimensions.
- iv. add some aspect of measures for policymakers

It was noted that when listing out the benefits of an R&D process it is possible to define these then as measurements and to consider the return on investment (ROI). Sometimes this may be financial but the return may need to be considered in terms of wider delivery and metrics. The ROI might be socially or culturally valuable as well as economic value. Where something was potentially very difficult to measure it was noted that it is sometimes possible to develop proxy measures. In addition, account needed to be taken of the models for delivering R&D in arts and culture which sometimes rely on lone workers. The suggestion to ensure that IP contracts with publishers and producers were entered into on more equitable grounds was seen to be highly significant.

In conclusion additional work needed to be done to evidence R&D delivery. This could be aided by a high profile champion to make the work more visible.

## 5. FINDINGS: FOCUSED INTERVIEWS

### 5.1 Introduction

The findings have been written up in two sections (chapters 4 and 5). This second section in chapter 5 draws on the findings discussed in chapter 4 to further evolve an understanding of how R&D can be defined and evaluated for the arts and cultural knowledge domains and utilized by policymakers. It is to be noted that the commissioned research focused on defining and evaluating R&D for policymakers.

The first set of interviews were conducted with the Directors of the Knowledge Exchange Hubs. The four Knowledge Exchange Hubs (<http://www.ahrc.ac.uk/innovation/knowledgeexchange/hubsforthecreativeeconomy/>) have been funded by the AHRC from 2012-2016. They have worked as consortia to connect excellent research in the arts and humanities with a range of creative and cultural organisations across the UK in order to accelerate growth and innovation through generating new knowledge exchange. This process is intended to foster entrepreneurial talent and contribute to the UK's Creative Economy. The four Directors have academic backgrounds but link into practice. As such, they understand how R&D is delivered and have perspectives on how that delivery is defined.

The second set of interviews were focused with eight policymakers. It was very difficult to get any policymakers to go on the record. All took part in personal capacities and would not allow their names or places of employment to be cited.

### 5.2 Defining R&D from the perspective of the Knowledge Exchange Hub Directors

The Knowledge Exchange (KE) Hub Directors<sup>3</sup> were provided with a developed definition of the *Frascati Manual* R&D definition which had been amended in an attempt to take account of previous perspectives on an R&D definition for the arts and cultural knowledge domains (Appendix E). They were asked to commit only a short amount of time (15 minutes) but the interviews in practice were all over 30 minutes with the longest lasting 1 hour 30 minutes. Through a focused interview each Director reviewed the language and commented on suggested alterations to amend the terminology to the more normal vocabulary, aims and objectives of those delivering R&D across arts and culture. They did this specifically with arts and cultural terminology in mind rather than the sciences in order to draw out distinctions. The most significant comments were in line with previous respondents who noted that the elements of human connection were those that were seen to be missing from the pre-existing definition. One Director stated:

“‘Research’ will always have a link to ‘Development’ even if the ‘Development’ component is initially through the dissemination of research findings or audience engagement. This is particularly important in the fields of art and culture which are intertwined with human experience and therefore the development may be in changing people.”

They suggested word changes to the high level. The changed version with all comments read:

“Research and Development (R&D) is creative work undertaken in order to increase knowledge, including knowledge of humankind, culture and society, and the use of this knowledge to devise new applications, art and cultural innovations in all forms and human experiences.”

In regards to the word systematic, which is included in the *Frascati Manual* R&D definition, whether or not this should be included was discussed. The idea that R&D should be planned and budgeted in accordance with the *Manual* was accepted, albeit it was established that

---

<sup>3</sup> The four Directors were Professors Rachel Cooper, Jonathan Dovey, Georgina Follett and Morag Shiach. Whilst they are to be thanked for their contributions and support, this is not an indication of their endorsement of the report conclusions as a whole.

practice-led arts needs to allow for the messiness of practice. However, it was noted that the word 'systematic' would be jarring for the purposes of engaging with those who deliver R&D in across the arts and culture. Thus whilst its significance was understood, particularly in the science context, it was suggested that this could be dealt with in supporting documentation.

The idea of experimental R&D resonated most strongly with three of the four Directors and two suggested placing this ahead of basic and applied research in the listing. In regards to the deliverables of the R&D process these were described as cultural, social and economic values which had the potential for inclusion in the definition.

The definitions were amended to take into account the Directors views and this revised version was then accepted. The revision is included at Appendix F. The components of R&D in the revised definition were:

Experimental research which is work gained from research and/or experiential learning, which is directed to producing new ideas, experiences, art forms, materials, products or devices, processes, systems, services through to understanding aspects of human behaviours, interactions, engagement and mechanisms for change. Experimental research may lead to theoretical knowledge (basic research) or be applied (applied research).

Basic research which is blue sky thinking and exploration of practice undertaken primarily to generate new knowledge of the underlying foundation of phenomena, observable facts or behaviours without any particular application or use in view. The sharing of this knowledge may result in a later application.

Applied research which is original investigation undertaken directed primarily towards a practical aim or objective

It was noted that each Director was thinking about this for the first time and the comments made were only initial reactions. One of the Directors did note that the definition should really capture and engage or be submitted in a context where it was made engaging through real and exciting examples, or s/he stated "it shall wither and die".

In further articulating how R&D is actually delivered on the ground, the Directors all highlighted that R&D work may be lone, co-created or collaborative. It may happen synchronously or as components of a process but it is important to understand the connection. R&D is delivered through highly complex networks. This context was seen as important to capture in relation to a definition. Networks were noted as making it complicated to consider measures for R&D as one input does not necessarily lead to an immediate output. Where measures are undertaken, the Directors stressed the importance of recognizing the place of culture and social impact as well as the complex networks in these processes. One Director suggested that the maturity models from innovation provided by Technology Readiness Levels could be adapted for the arts and cultural knowledge domains. These have been used to express technology maturity levels (see [http://www.earto.eu/fileadmin/content/03\\_Publications/The\\_TRL\\_Scale\\_as\\_a\\_R\\_I\\_Policy\\_Tool\\_-\\_EARTO\\_Recommendations\\_-\\_Final.pdf](http://www.earto.eu/fileadmin/content/03_Publications/The_TRL_Scale_as_a_R_I_Policy_Tool_-_EARTO_Recommendations_-_Final.pdf)). The measures from the REF2014 were also discussed as having potential for extension into a measures framework.

### 5.3 Defining R&D from the perspective of policymakers

Focused interviews were held with eight policymakers speaking in a personal and anonymized capacity. These interviews were conducted for 30-60 minutes with a follow up interview. The policymakers reviewed the *Frascati Manual* (OECD, 2015, pp.44-45) R&D definition (which all but one of the participants were familiar with) and also the KE Hub Directors' evolution of this definition for the arts and cultural knowledge domains (Appendix F). Overall the policymakers' views aligned with earlier findings from chapter 4, in as much as it was thought to be beneficial to have one R&D definition for all knowledge domains if they were to be reviewed and funded on the same basis. Three of the policymakers initially felt that the *Frascati Manual* (OECD, 2015, pp.44-45) definition as it

stands should be taken and accepted by all knowledge domains. One explained that this was necessary to enable the measurement of R&D output consistently across all industry players benchmarked against the historic data. One person felt that the arts and cultural domains had chosen to structure their work in industry in a manner which did not enable R&D to be explicitly identified and measured. S/he argued that were R&D processes and tax breaks thought to be important to a particular industry it would restructure and name personnel to make the case for their R&D delivery as occurs in the other industries. S/he provided the example that s/he was aware of film arguments where it had been claimed that the whole of the film making processes up until distribution was an R&D process. This kind of argument s/he felt was not helpful to aligning policymakers' perspectives on R&D delivery to the creative industries generally. Three of the policymakers felt that the *Frascati Manual* definition was far easier for policymakers to work with. A definition which is pushing future boundaries of research may be more open but this was seen to be the domain of HEFE policy more specifically. It was noted that;

“a definition to inspire the public imagination and make connections across spheres will have a different kind of language than a definition used by policy makers for evaluation purposes. This may be achieved potentially in language and connections beyond the domain of definitions.”

One other person expressed a similar perspective. The definition from the KE Hub Directors was felt by all of the policymakers to be too complicated and therefore needed to be refined at this high level to really pull out any critically missing elements from the *Frascati Manual* definition albeit that elements of the detail could be discussed in a body of text. It was noted that if there was to be one definition it did need to meet the requirements of science delivery. Three people expressed that some of the language in the KE Directors definition was not appealing at a policy level, in particular terms such as 'experiential learning' which by one person was felt to be the domain where AHRC funding would need to deliver. It was accepted that whereas some research can be used in reproducible ways that there is also knowledge which can be translated and used in diverse ways in a range of contexts. The value of qualitative research was noted in this context. It was stated that the *Frascati Manual* definition does not fully encompass the arts and cultural knowledge domains but that even where it does do so some Government policy in any case excludes this wider application for tax purposes. It was suggested that measures and values could seek to address this position.

However, scrutinizing the KE Hub Directors definition in greater detail did help make the case to the engaged policymakers that the *Frascati Manual* definition did require alterations. It was noted by five of the eight participants that there were important elements which did require consideration for future inclusion, namely including 'human experience' and 'change' into an R&D definition. Two people noted that these then needed to be linked to case examples. For one person 'behaviours' was the most significant omission from the *Frascati Manual* definition. The exclusion of the word 'systematic' from the KE Hub Directors definition was seen as significant for policymakers as any R&D measured for policy purposes needed to have some underpinning planning and budgeting mechanisms.

In considering their role as policymakers, it was noted that value is a core requirement for any policy definition. Value was seen to be measured economically, socially and culturally. In the latter context this was seen to include R&D evaluation from across arts and culture. The role of academics to peer review and influence the parameters of research was accepted as an important function.

Taking into account these first views a further iteration of the definition with a short explanatory text was produced in conjunction with Hasan Bakhshi, Nesta (Appendix G). This definition was then circulated and discussed with the same set of policymakers. In holding this further set of focused interviews, the policymakers also reflected on the *Frascati Manual* definition and the definition at Appendix F.

The definition at Appendix G, introduced the idea of economic, cultural and social value which some of the policymakers had raised and which the KE Hub Directors had discussed. Value to the public purse was seen as critical to all the policymakers. In addition it was seen as important to have engagement and understanding with the public which a definition linked to examples could achieve. For two people there were problems introducing the ideas of economic, cultural and social value because the science knowledge domain had worked to avoid any value judgments in a definition in order to gain acceptance that pure science concepts and blue sky thinking merit funding. However, this addition was noted as important for a definition from a policy perspective by three of the participants. The policymakers noted that their own needs for a definition were somewhat different than the knowledge domain as a whole. However wider definitions were already seen to be provided by academia and it was thought these could be linked to a higher level definition.

Two people noted that there are challenges in determining parameters around R&D. This was seen to be true in science as well as arts and cultural contexts. For example, it was noted that there can be problems identifying R&D in manufacturing processes as some design will push new boundaries and parts of the R&D will qualify for tax relief but in other context the design is part of a business as usual approach. One person noted that the UK Government does provide preferential treatment to certain knowledge domains. For example, the food manufacturing industry is highly significant to GDP but although the development of a ready meal will lead to a new product, work around preservatives or healthy options would not be resourced in a manner akin to the pharmaceutical industry. This position was perceived to have evolved from industry structures and ideas at an international level regarding market failure and support. It was noted that there are difficulties which are not addressed, for example the role of the market research industry.

When reflecting on whether the definition at Appendix G could or should be amended to further include some of the vocabulary and concepts from the definition at Appendix F there was resistance to the need for further changes. It was felt that the definition needed to operate for all at a high level and more discipline and industry specific terminology would then be used as required for delivery in practice. It was accepted that behavior and experience did need to be included within the definition or it would not encompass all knowledge domains.

However, in concluding all bar two (who were in favour of working with the existing *Frascati Manual* definition) accepted a refined definition of the *Frascati Manual* as amended with additions in yellow below as the best definition of the three provided:

**Research and experimental development (R&D)** comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of economic, cultural or social value of available knowledge.

**Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena, observable facts and behaviours, without any particular application or use in view.

**Applied research** is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific intended practical aim or objective.

**Experimental development** is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products, experiences or processes or to improving existing products, experiences or processes.

## 5.4 Conclusions from the focused interviews

The small sample of focused interviews concluded that whilst there is a desire from



policymakers for one unified R&D definition for all knowledge domains encompassing both the arts and sciences the definition must be underpinned by explanatory text. It was noted that a definition for policymakers needs to have clear parameters. A definition which is pushing future boundaries of research may be more open. Thus there may be a different definition for each of the Research Councils grant funding processes although this should be linked to the holistic higher level definition in order to publicize its relevance. However, in addition, a definition should seek to inspire the public imagination and this may in part be achieved by clear and engaging examples. It was stated that further examples are required to support the evidence base from across all sectors with a view to developing a framework of measures.

## 6. REPORT CONCLUSIONS

The headline findings of this work are that rather than having a unique definition of R&D for the arts and cultural knowledge domains there is a value in having one unified R&D definition in order to make R&D a tangible and understood practice across all knowledge domains. Within the context of science and technology, an R&D definition first agreed by the OECD countries in 1963 has over the years given rise to various public funding structures for R&D, including subsidies and tax breaks. A unified R&D definition for all knowledge domains (the arts and science and technology) could in principle result in parity across all knowledge domains. The resulting definition should:

- recognise R&D as a legitimate practice in all knowledge domains.
- aid collaboration and understanding across all those domains delivering R&D.
- provide a basis on which to build a framework to measure R&D, in a way in which R&D activity can be evaluated.
- provide a focus for policymakers and funders.
- foster greater understanding of the value of R&D in the eyes of the wider public.

As a result of this work, and consistent with the recommendations in Bakhshi, Desai and Freeman (2010), the existing science and technology definition of R&D in the *Frascati Manual* (OECD, 2002 6<sup>th</sup> ed. and 2015 7<sup>th</sup> ed.) was identified as the basis for a unified R&D definition for all knowledge domains and was tested and evolved with key stakeholders. It is important to recognise the role that the *Manual* plays in delivering policy level understanding and measures for R&D at a global level. Historically, the *Frascati Manual* R&D definition has been used to align to positivist and post-positivist perspectives which exclude some research paradigms. The *Manual* whilst expanding to acknowledge that R&D occurs across the arts and cultural knowledge domains, which is a significant shift, still needs to rebalance its emphasis on science and technology and extend its R&D definition further. A definition of R&D for all knowledge domains needs to encompass approaches which alter or change people as well as producing products. Key to altering the definition is a need to extend the definition to include 'experiences' and 'behaviours'. As a definition for policymakers R&D must deliver 'value' albeit this will be judged in a range of ways. The proposed definition explicitly recognises the contributions R&D makes not just to the economy but culture and society.

### PROPOSED R&D DEFINITION FOR ALL KNOWLEDGE DOMAINS WITH HIGHLIGHTED CHANGES TO INDICATE ALTERATIONS FROM THE FRASCATI MANUAL (2015) (red highlights are deletions whilst yellow highlights are additions):

**Research and experimental development (R&D)** comprise creative and systematic work undertaken in order to increase ~~the stock of~~ knowledge – including knowledge of humankind, culture and society – and to devise new applications **of economic, cultural or social value** of available knowledge.

**Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena, observable facts and **behaviours**, without any particular application or use in view.

**Applied research** is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific **intended** ~~practical~~ aim or objective.

**Experimental development** is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products, **experiences** or processes or to improving existing products, **experiences** or processes.

## **FINAL PROPOSED R&D DEFINITION FOR ALL KNOWLEDGE DOMAINS:**

**Research and experimental development (R&D)** comprise creative and systematic work undertaken in order to increase knowledge – including knowledge of humankind, culture and society – and to devise new applications of economic, cultural or social value of available knowledge.

**Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena, observable facts and behaviours, without any particular application or use in view.

**Applied research** is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific intended aim or objective.

**Experimental development** is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products, experiences or processes or to improving existing products, experiences or processes.

In underpinning the development of an R&D definition, this study sought to provide illustrations of a range of R&D as it is delivered in practice across arts and culture. There is much more work to be done in this sphere but it is important to evidence the key information highlighted. Examples provided included:

- Theoretical R&D resulting in new knowledge, new theories and new perspectives.
- Curatorial R&D resulting in conceptual, material and interpretative outputs
- Creative R&D resulting in ideas, images, themes, formats and perspectives on beauty and use.
- Technical, design and production R&D related to new materials, technology, production, delivery of new spaces, functionality.
- Business R&D delivering new commercial models.
- Market R&D both commercial and non-commercial.
- Audience R&D targeting, acquisition and evaluation.
- Social science R&D delivering art and culture to aid wellbeing, happiness, social harmony and understanding across communities, including spaces for change and positive dissent, new spaces for collaboration.
- Economic R&D delivering new models of financial and transactional processes.
- Cultural and social R&D resulting in understanding of identity, UK reputation, narrative, cohesion, difference, change, diplomacy and tourism.
- Environmental R&D resulting in better designed environment, sustainable space and production, urban regeneration, beauty.
- Educational R&D resulting in new models to teach in order to engage and improve performance through time.

There were a number of examples given as to how research/R&D crosses boundaries for example:

- in history there has been a move towards social science methodologies.
- in archival research there are a range of research approaches from the science end in terms of conservation and IT, towards social science approaches understanding user needs, towards documentary research that leans towards the humanities.
- art and literature has been used to analyse cognitive thinking.
- a coding programme linked to musical output has been used to teach children to code.

- art has been used to bring new ways of engaging and educating audiences in science, e.g. a dance performance had visually been used to illustrate how a virus can attack cells.

These provide a rationale for ensuring that a definition of R&D does cover all knowledge domains.

In accordance with the research objectives to assess mechanisms for R&D evaluation it was identified that there is a need to align models of R&D delivery to a framework of measures. It is concluded that further research is required to develop R&D case studies in the arts and cultural knowledge domains and a framework for measuring and evaluating arts and cultural R&D, consistent with how statisticians measure the volume of, and estimate the social rate of return from, science and technology related R&D. The REF2014 Impact Case Studies and the Digital R&D Fund for the Arts have provided a body of evidence which can be further evolved. This work should draw on the *Frascati Manual* survey mechanisms but in addition take into account the learning from the REF2014 frameworks.

Beyond the immediate scope of this work it was identified that across the arts and cultural sectors there are a range of issues relating to R&D and innovation which need to be mapped and considered in new ways to drive innovation. A significant amount of R&D is undertaken by lone workers. New ways of approaching and supporting these structures could be considered, for example providing tax allowances for individuals who conduct R&D and requiring more ethical and equitable power structures relating to the point at which IP is assigned from individuals to corporations. (Refer to pp.47-48 for additional discussions).

In regards to the promotion of R&D, an agreed R&D definition will make the significance of R&D and the process more tangible. This can then be built on with case examples which will engage and capture the public imagination in terms of the arts and cultural knowledge domains delivery of R&D. It is important to recognise the global reach of the *Frascati Manual* and thus the significance of innovators engaging with the *Frascati Manual* provided these can be amended to better represent the delivery of R&D across all knowledge domains.

## REFERENCES

- Ackermann, F., Eden, C. and Brown, I. (2005) *The practice of making strategy*. London: Sage Publications Ltd.
- Agarwal, R. (2001) 'Research in information systems: what we haven't learned', *MIS Quarterly* 25(4), pp. 5-15.
- Avidsson, A. (2011). 'General sentiment: how value and affect converge in the information economy', *The Sociological Review*, 59, pp.39-59.
- AHRC (2009) *Leading the world: the economic impact of UK arts and humanities research*. Swindon: AHRC.
- AHRC (2015) *The impact of AHRC research*. Swindon: AHRC. Available at <http://www.ahrc.ac.uk/documents/project-reports-and-reviews/the-impact-of-ahrc-research/2014-2015/>. (Accessed 1 November 2016).
- Alberts, B. (2010) 'Overbuilding Research Capacity', *Science*, 329, p.1257.
- Allas, T (2014) 'Insights from international benchmarking of the UK Science and Innovation System', *BIS Analysis Paper* 3.
- Allison, B. (1988) 'Research in art and design: research problems, programmes and databases', *Matrix of Research Conference*, Central School of Art and Design London, March 1988.
- Andari, R. Bakhshi, H., Hutton, W., O'Keeffe, A. and Schneider, P. (2007) *Staying ahead: the economic performance of the UK's creative industries*. London: Nesta.
- Altshuller, G. (1984) *Creativity as an exact science: the theory of the solution of inventive problems*. London: Gordon & Breach Publishers.
- Alvaredo, F., Atkinson, A., Piketty, T. and Saez, E. (2013) 'The top one percent in International and Historical Perspective', *Journal of Economic Perspectives*, 27(3), pp. 3-20.
- Alvaredo, F., Atkinson, A., Piketty, T., Saez, E. and Zucman, G. (2011), 'The world top incomes database', Available at: <http://www.wid.world>. (Accessed 1 November 2016).
- Archer, B. (1979) 'Design as a discipline', *Design Studies*, 1(1), pp.17-20.
- Archer, B. (1995) 'The nature of research', *Co-design: the interdisciplinary journal of design and contextual studies*. Jan. 1995, pp.6-13.
- Arts Council England (2002) *Measuring the economic and social impact of the arts*. Arts Council England
- Arts Council England (2004) *I made it – so can you*. Arts Council England.
- Arts Council England. (2005) *Grants for the arts evaluation report*. Arts Council England.
- Arts Council England (2005) *The impact of the arts: some research evidence*. Arts Council England.
- Arts Council England (2006) *How we assess artistic quality*. Arts Council England
- Arvidsson, A. (2009) 'The ethical economy: towards a post-capitalist theory of value', *Capital and Class*, 33: 13-29.
- Arvidsson, A. and Peitersen, N. (2009) *The ethical economy*. Available at: <http://www.ethicaleconomy.com/info/book>. (Accessed 1 November 2016).
- Atkinson, P. (2007) *Handbook of ethnography*. London: Sage Publications Ltd.
- Augenstein, B. (1979) *When can cost-reducing R&D be justified--a simple explanatory model*. Santa Monica, CA: RAND Corporation.

- Axelrod, R. (2001) *Terms of engagement: changing the way we change organizations*. San Francisco: Berrett-Koehler.
- Bachman, G., Dovey, J., Monaco, J. Sharpe, B. Reddington, C. Alexander, V. and Penny D. (2012) *Cultural value networks: research finding*. Research Centre. Swindon: AHRC.
- Baker, D. (2011) 'Queering practice-led research: subjectivity performative research and the creative arts', *Creative Industries Journal*, 4(1), pp.33-51.
- Bakhshi, H. (2013) *Digital Culture: how arts and cultural organisations in England use technology*. London: Digital R&D Fund for the Arts, Nesta.
- Bakhshi, H., Cunningham, S., and Mateos-Garcia, J. (2015) 'Public policy for the creative industries', *The Oxford handbook of creative industries*, pp.465-485.
- 
- Bakhshi, H., Desai, R. and Freeman, A. (2010) *Not rocket science: a roadmap for cultural R&D*. London: Nesta.
- Bakhshi, H., Freeman, A. and Hitchen. G. (2009) *Measuring intrinsic value: why the arts should stop worrying and learn to love economics*. London: MMM.
- Bakhshi, H., Hargreaves, I. and Mateos-Garcia, J. (2013) *A manifesto for the creative economy*. London: Nesta.
- Bakhshi, H. and Mcvittie, E. (2009) 'Creative supply chain linkages and innovation: do the creative industries stimulate business innovation in the wider economy?' *Innovation: management, policy and practice* 11(2), pp. 169-189.
- Bakhshi, H., Schmeifer, P. and Walker, C. (2008) *Arts and humanities research and innovation*. London: Nesta.
- Bakhshi, H. and Throsby, D. (2010a) *Hidden innovation in the creative knowledge domains*. London: Nesta.
- Bakhshi, H. and Throsby, D. (2010b) *Culture of innovation: an economic analysis of innovation in arts and cultural organisations*. London: Nesta.
- Banaji, J., Burn, A. and Buckingham, D. (2007) *The rhetorics of creativity*. Arts Council England, 2007.
- Barrett, E. and Bolt, B. (2007). *Practice as research: approaches to creative arts enquiry*. London: I.B. Tauris.
- Bastos, W. and Levy, S. (2012) 'A history of the concept of branding: practice and theory', *Journal of Historical Research in Marketing*. 4(3), pp.347-368.
- Bate, J. (ed.) (2011) *The public value of the humanities*. London: Bloomsbury Academic.
- Bateson, P., and Martin, P. (2013) *Play, playfulness, creativity and innovation*. Cambridge: Cambridge University Press.
- Belfiore, E. and Bennett, O. (2010) 'Beyond the toolkit approach: arts impact evaluation research and the realities of cultural policy-making', *Journal for Cultural Research*, 14(2), pp.121-142.
- Benghozi P-J., Gille L. and Vallée A. (2009). Innovation and regulation in the digital age, in a call for new perspectives, in Curwen P., Haucap, J. and Preissl, B. *Telecommunication markets drivers and impediments*. New York: Springer.
- Benghozi P. and Lyubareva, I. (2014), 'When organizations in the cultural industries seek new business models: a case study of the French online press', *International Journal of Arts Management*, 16(3), pp. 6-19.
- Benghozi P. and Salvador E. (2013) 'Investment strategies in the value chain of the publishing knowledge domain: how and where the R&D somehow matter?', Presentation at the XI international conference *TripleHelix*, 8-10 July, Birkbeck and UCL, London.

- Benghozi P. and Salvador E. (2014a) 'Are traditional industrial partnerships so strategic for research spinoff development? Some evidence from the Italian case', *Entrepreneurship and Regional Development*, 26(1-2), pp.47-79.
- Benghozi P. and Salvador E. (2014b) 'Strategies and business models of online platforms in CCI: convergence or differentiation in the e-book knowledge domain?' in Schramme A., Kooyman R. and Hagoort G. (2014), *Beyond frames: Dynamics between the creative industries, knowledge institutions and the urban context*. Delft: Eburon Academic Press, pp. 96-104.
- Benghozi, P., Salvador, E. and Simon, J. (2015) JRC science and policy report: models of ICT Innovation – a focus on the science knowledge domain. Seville: European Commission.
- Benkler, Y. (2006), *The wealth of networks. How social production transforms markets and freedom*, Yale: Yale University Press.
- Bentley, T. and Seltzer, K., (1997) *The creative age*. London: Demos.
- Bennet, T. (2008) *Critical trajectories: culture, society intellectuals*. London: Wiley.
- Biggs, I. (2009). *Art as research: creative practice and academic authority: a project-based examination of the politics of art-led research in a doctoral context*. Saarbrücken: VDM Verlag.
- Biggs, M. (2000) 'The foundations of practice-based research: introduction', *Working Papers in Art and Design*. 1. Available at: <http://www.herts.ac.uk/artdes1/research/papers/wpades/vol1/vol1intro.html> (Accessed 1 November 2016).
- Billings, S. (2006) Nissan wins R&D tax relief claim for design in test case', *Design Week*, 030306.
- Black, J., Hashimzade, N. and Myles, G. (2012) *A dictionary of economics*. Oxford: OED, 4<sup>th</sup> edn.
- BOP Consulting. (2012) *Measuring the economic benefits of arts and culture*. Arts Council England.
- Bougourd, J., Evans, S. and Gronberg, T. (eds), 1988. *The matrix of research in art and design education*. London: London Institute.
- Brouwer, E. and Kleinknecht, A. (1997), 'Measuring the unmeasurable: a country's non R-D expenditure on product and service innovation', *Research Policy*, 25, p. 1235-1242.
- Brown, B., Gough, P. and Roddis, J. (2004) *Types of research in the creative arts and design*. Brighton: University of Brighton.
- Brown, N. (2000) 'The representation of practice', *Working Papers in Art and Design*, 1.
- Buchler, P. (2001) 'New academic art', in Antonia Payne (ed.) *Research and the artist: considering the role of the Art School*. Oxford: OUP.
- Bud, R. (1985) 'The case of the disappearing caveat: a critique of Irvine and Martin's methodology', *Social Studies of Science*, 15, pp. 548-53.
- Bunting, C. (2007). *Public value and the arts in England*. London: Arts Council England.
- Burke, A. (2000) 'Legal structure and strategic regulation of intellectual property: who pays for R&D in arts markets?', *Louvain Economic Review* (66)2. pp. 193-211.
- Bush, V. (1945) *Science: the endless frontier*. Washington: USGP. Available at: [www.nsf.gov/od/lpa/nsf50/vbush1945.htm](http://www.nsf.gov/od/lpa/nsf50/vbush1945.htm). (Accessed 1 November 2016).
- Byrne, D. (2012), *How music works*. Edinburgh: Canongate.
- Cabe (2002) *The value of good design*. London: The Design Council.
- Calvert, J. (2006) 'What's special about basic research?', *Science, Technology and Human Values*, 31(2), pp.199-220.

Carnwath, J. and Brown, A. (2014). *Understanding the value and impacts of cultural experiences*. London: Arts Council England.

Carvalho, F. (2006) *The measurement of Innovation in developing countries: an overview of the main criticisms and suggestions regarding the adoption of the Oslo Manual approach*. Available at: [http://www.ocw.unu.edu/maastrichteconomic-and-social-research-and-training-centre-on-innovation-and-technology/economic-development-and-innovationstudies/Flavia\\_Carvalho\\_Paper\\_Verspagen\\_2006.pdf](http://www.ocw.unu.edu/maastrichteconomic-and-social-research-and-training-centre-on-innovation-and-technology/economic-development-and-innovationstudies/Flavia_Carvalho_Paper_Verspagen_2006.pdf). (Accessed 1 November 2016).

Casey, B., Dunlop, R., and Selwood, S. (1996) 'Culture as commodity?', *The Economics of the Arts and Built Heritage in the UK*, Policy Studies Institute.

Castells, M. (2010) *The power of identity*. London: Wiley-Blackwell, 2<sup>nd</sup> edn.

Cavallucci, D., Rousselot, F. and Zanni, C. (2009) 'Assisting R&D activities definition through problem mapping', *CIRP Journal of Manufacturing Science and Technology* 1, pp.131–136.

Caves, R. (2002) *Creative industries: contracts between art and commerce*. London: HMSO.

Centre for Reviews and Dissemination (2001) *Undertaking systematic reviews of research on effectiveness: CRD's guidance for those carrying out or commissioning reviews*. York: University of York, CRD. 2<sup>nd</sup> edn.

Chappell, M. and Knell, J. (2012) *Public value measurement framework: valuing and investing in the Arts - towards a new approach*. Western Australia: Department of Culture and the arts.

Chowdhury G., Koya K., and Philipson, P. (2016) 'Measuring the impact of research: lessons from the UK's Research Excellence Framework 2014', *PLoS ONE* 11(6).

Chynoweth, P. (2013) 'Practice-informed research', *Property Management*, 31(5), pp.435-452.

Cochrane, R. (1978) *The National Academy of Sciences: the first hundred years 1863–1963*. Washington DC: National Academy of Sciences.

Collins, H. (1985) 'The possibilities of science policy', *Social Studies of Science*, 15, pp.554-58.

Conway, H. (1987) *Design history: a student's handbook*. Abingdon: Harper Collins Academic.

Cowan, T. (1998) *In praise of commercial culture*. Harvard: Harvard University Press.

Cox, G. (2005) *The Cox review of creativity in business: building on the UK's strengths*. London: HMSO.

Creswell, J. and Plano Clark, V. (2011) *Designing and conducting mixed methods research*. London: Sage Publications Ltd, 2<sup>nd</sup> edn.

Crossick, G. (2006) 'Knowledge transfer without widgets: the challenge of the creative economy', *A lecture to the Royal Society of Arts*, Leeds, 31 May 2006.

Crossick, G. and Kaszynska, P. (2015) *Understanding the value of arts and culture: the AHRC Cultural Value Project*. AHRC.

Cunningham, S. (2003) *The evolving creative industries: from original assumptions to contemporary interpretations*. Available at: [prints.qut.edu.au/4391/1/4391\\_1.pdf](http://prints.qut.edu.au/4391/1/4391_1.pdf). (Accessed 1 November 2016).

Cunningham, S. (2004) 'The humanities, creative arts and the innovation agenda', in Wissler, R., Haseman, B., Wallace, S. and Keane, M. (eds.), *Innovation in Australian arts, media and design: fresh Challenges for the tertiary knowledge domain*, Flaxton, pp. 221–232



- Cunningham, S. (2005) 'Knowledge and cultural capital', in Rooney, D., Hearn, G., and Ninan, A., (eds.) (2005) *Handbook on the knowledge economy*. Cheltenham: Edward Elgar Publishing, pp. 93–101.
- Cunningham, S. (2006) 'What price a creative economy?', *Platform Paper*, 9, Australia Council, p. 10.
- Cunningham, S. (2008) 'Cultural studies from the viewpoint of cultural policy', In Lewis, J. and Miller, T. *Critical cultural policy studies: a reader*. London: Wiley, pp.13-22.
- Cunningham, S. Cutler, T. Hearn, G. Ryan, M. and Keane, M. (2004), 'An innovation agenda for the creative industries: where is the R&D?', *Media International Australia: Incorporating culture and policy*, 112, pp. 174-185.
- Cunningham, S., Cutler, T., Hearn, G., Ryan, M., and Keane, M. (2005) 'From culture to knowledge: an innovation systems approach to the content industries', in Andrew, C., Gattinger, M., Jeannotte, M., and Straw, W., (eds.) (2005) *Accounting for culture: thinking through cultural citizenship*, pp. 104–123.
- DCMS (2006) *Developing entrepreneurship for the creative industries*. London: HMSO.
- DCMS. (1998) *Creative Industry Task Force report*. London: HMSO.
- DCMS. (2001), *Green paper: culture and creativity: the next 10 Years*. London: HMSO
- Dearing, R. (ed.) (1997) *Higher Education in the Learning Society UK: The National Committee of Inquiry into Higher Education*. London: HMSO.
- Djellal, F. and Gallouj, F. (1999) 'Services and the search for relevant innovation indicators: a review of national and international surveys', *Science and public policy*, Oxford University Press, 26 (4), pp.218-232.
- Deloitte (2015) *Open R&D models increase chances for late-stage success*. London: Deloitte.
- Denk, O. (2015) 'Who are the top 1% earners in Europe?', *OECD Economics Department Working Papers*, No.1274. Paris: OECD.
- Department for Business Innovation and Skills (2015) *Smart specialization in England: submission to the European Commission*. London: HMSO.
- Department of Innovation, Universities and Skills (2008) *Innovation Nation*. HMSO: London.
- Department of Trade and Industry (2004) *CIRD81900 – R&D tax relief: conditions to be satisfied: BIS guidelines*. HMSO: London.
- Department of Trade and Industry (2005) *Creativity, design and business performance*. HMSO: London.
- De Prato, G. and Nepelski, D. (2013) *The global R&D network. A network analysis of international R&D centres*, JRC-IPTS Working Paper. Available at: <http://is.jrc.ec.europa.eu/pages/ISG/EIPE.html>. (Accessed 1 November 2016).
- De Prato, G. and Nepelski, D. (2014a) *Key findings and implications of the European ICT Poles of Excellence Project*. JRC85408, Available at: <http://is.jrc.ec.europa.eu/pages/ISG/EIPE.html>. (Accessed 1 November 2016).
- Design Council (2007) *The value of design factfinder report*. London: Design Council.
- Deutsche Bank Research (2011) *Cultural and creative industries: growth potential in specific segments*. Deutsche Bank Research. Available at: [http://www.dbresearch.com/PROD/DBR\\_INTERNET\\_EN-PROD/PROD000000000272899.pdf](http://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD000000000272899.pdf). (Accessed 1 November 2016).
- Dixit Avinash, K. and Pindyck, R. (1994) *Investment under uncertainty*. Princeton: Princeton University Press.
- Durose, C., Beebeejaun, Y., Rees, J. and Richardson, L. (2014) *Illuminating the evolution of community participation*. Swindon: AHRC.

- Earto Impact Delivery. (2014) *The TRL scale as a research and innovation policy tool*. EARTO Recommendations. Available at: [ile:///C:/Users/uczcej0/Documents/NESTA/LitDownloads/The\\_TRL\\_Scale\\_as\\_a\\_R\\_I\\_Policy\\_Tool\\_-\\_EARTO\\_Recommendations\\_-\\_Final.pdf](file:///C:/Users/uczcej0/Documents/NESTA/LitDownloads/The_TRL_Scale_as_a_R_I_Policy_Tool_-_EARTO_Recommendations_-_Final.pdf). (Accessed 1 November 2016).
- Elkins, J. (2001) *Why art cannot be taught*. Chicago: UIP.
- Elsevier (2013) International comparative performance of the UK research base as measured by the field-weighted citation impact.
- Eltham, B. (2013) 'Three arguments against 'soft innovation' towards a richer understanding of cultural innovation, *International Journal of Cultural Policy*, 19(5), pp.537-556.
- European Commission. (2011) New practical guide to EU funding opportunities for research and innovation: European Union Cohesion Policy. Available at: [http://ec.europa.eu/research/participants/data/ref/fp7/204008/practical-guide-rev3\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/fp7/204008/practical-guide-rev3_en.pdf).
- European Commission Joint Research Committee. (2010-2015) *Predict Reports: an analysis of ICT R&D in the European Union*. Available at: [http://ftp.jrc.es/pub/EURdoc/JRC57808\\_high.pdf](http://ftp.jrc.es/pub/EURdoc/JRC57808_high.pdf). (Accessed 1 November 2016).
- Evans, H. 'The Eureka Myth', *Harvard Business Review*, 83(6), pp.18-20.
- Fagerberg, J. (2005). 'A guide to the literature', in J. Fagerberg, D. Mowery & R.R. Nelson (Eds.) (2005) *The Oxford handbook of innovation* (pp.1-26). Oxford: Oxford University Press.
- Farla, K. and Simmonds, P. (2015) *REF Accountability Review: costs, benefits and burden*. Brighton: Technopolis.
- Florida, R. (2004) *The rise of the creative class: and how it's transforming work, leisure, community and everyday life: revisited*. New York: Basic Books.
- Foddy, W. (1993) *Constructing questions for interviews and questionnaires*. Cambridge: Cambridge University Press.
- Forge, S., Blackman, C., Goldberg, I., Biagi, F. (2013), *Comparing innovation performance in the EU and the USA: lessons from three ICT sub-knowledge domains*, EUR 25961 – Joint Research Centre – Institute for Prospective Technological Studies. Available at: <http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=6223>. (Accessed 1 November 2016).
- Foundation for Research, Science and Technology (2003) *R&D Strategy for creative industries-a discussion paper*. New Zealand: Foundation for Research, Science and Technology.
- Frayling, C. (1993) 'Research in art and design', *Royal College of Art Research Papers*, 1(1).
- Frayling, C. (2005) *The only trustworthy book: arts and public value*. London: Arts Council England.
- Fleming, T. (2016) *Digital R&D Fund for the Arts: evaluation*. London: ACE, AHRC and Nesta.
- Freeman, R. (1965) *R&D management research*. Santa Monica, CA: RAND Corporation, 1965.
- Frontiers Economics (2006), *Comparative Analysis of the UK's Creative Industries*, report to the DCMS. Available at: [www.eukn.org/dsresource?objectid=149334&type=org](http://www.eukn.org/dsresource?objectid=149334&type=org). (Accessed 1 November 2016).
- Frow, J. (1995) *Cultural studies and cultural value*. Oxford: Oxford University Press.
- Galindo-Rueda, F. (2007) 'Developing an R&D satellite account for the UK: a preliminary analysis', *Economic and Labour Market Review*, 1(12), pp.18-29.
- Galindo-Rueda, F. and V. Millot (2015) 'Measuring design and its role in innovation', *OECD Science, Technology and Industry Working Papers*, 2015/01.
- Gallouj, F. (2002). *Innovation in the services economy*. Cheltenham: Edward Elgar
- Gane, N. (2011). 'Measure, value and the current crises of sociology', *The Sociological Review*, 59, pp.151-173.

- Garcia, R. and Calantone, R. (2002) 'A critical look at technological innovation typology and innovativeness terminology: a literature review', *Journal of Product Innovation Management*, 19(2) pp.110–132.
- Garnham, N. (2005), 'From cultural to creative industries: an analysis of the implications of the "creative industries" approach to arts and media policy making in the United Kingdom', *International Journal of Cultural Policy*, 11(1), pp.15-29.
- Geertz, C. (1973) *Interpretation of Cultures*. New York: Basic Books Inc.
- Giberti, B, (1989) 'Design book reviews', *Design Theory*, 22, pp.53-56.
- Godin, B. (2001) 'The number makers: a short history of international science and technology indicators. project on the history and sociology of S&T indicators', *Working Paper*, No:9, Montreal, Canada.
- Godin, B. (2002) The rise of the innovation surveys: measuring a fuzzy concept. Project on the history and sociology of S&T indicators, *Working paper*, No:16, Montreal, Canada [10]
- Godin, B. (2003) 'Measuring science: is there basic research without statistics?', *Social Science Information*, 42(1), 57–90.
- Godin, B. (2006a) 'Concept of R&D: how the D got in R&D', *Science and Public Policy*, 33(1), pp.59–76.
- Godin, B. (2006b) 'The linear model of innovation: the historical construction of an analytical framework', *Science, Technology, & Human Values*, 31(6), pp.639-667.
- Godin B. (2007) Science, accounting and statistics: the input–output framework. *Research Policy*, 36: 388–1403
- Godin, B. and Lane, J. (2011) 'Research or development? A short history of research and development as categories'. *Gegenworte*. 2011, 11, 26, 44-48, Fall
- Grant, J. (2015) *The nature, scale and beneficiaries of research impact An initial analysis of Research Excellence Framework (REF) 2014 impact case studies*. London: Kings College London.
- Griliches, Z. (1979) 'Issues in assessing the contribution of R&D to productivity growth.', *Bell Journal of Economics* 10, pp.92-116.
- Griliches, Z. 1992. 'The search for R&D spillovers', *Scandinavian Journal of Economics* 94.
- Griliches, Z. and Lichtenberg, F. (1984) 'R&D productivity growth at the industry level is there still a relationship?.', *R&D, patents, and productivity*, pp.465-502.
- Gray, C. and Malins, J. (2004) *Visualizing research: a guide to research process in art and design*. London: Ashgate.
- Green, L., Miles, I. and Rutter, J. (2007) 'Hidden innovation in the creative knowledge domains', Manchester Institute for Innovation Research, Working Paper for NESTA.
- Green, J. and Thorogood, N. (2004) *Qualitative methods for health research*. London: Thousand Oaks: Sage Publications Ltd.
- Guba, E. (1981) 'Criteria for assessing the trustworthiness of naturalistic inquiries', *Educational Communication and Technology Journal*, 29, pp.75-91.
- Guba, E. and Lincoln, Y. (1994). 'Competing paradigms in qualitative research', in Denzin, N. and Lincoln, Y. (eds.) (1994) *Handbook of qualitative research*. London: Thousand Oaks, CA: Sage Publications Ltd, pp.105-117.
- Guba, E. and Lincoln, Y. (1998) 'Competing paradigms in qualitative research' in Denzin, N. and Lincoln, Y. (ed.) (1998) *The landscape of qualitative research: theories and issues*. London: Sage Publications Ltd, pp. 195-221.
- Guest, G., Bruce, A. and Johnson, L. (2006) 'How many interviews are enough? An experiment with data saturation and variability', *Field Methods*, 18, pp. 59-82

- Gulbrandsen, M. and Kyvik, S. (2010) 'Are the concepts basic research, applied research and experimental research still useful? An empirical investigation among Norwegian academics', *Science and Public Policy*, 37(5), pp.343-353.
- Hall, B. (2002) 'The financing of research and development', *Oxford Review of Economic Policy*, 18(1), pp.35-51.
- Harris, R. (2003) *The necessity of artspeak*. London: Continuum.
- Harvey, D. (1989) *The condition of postmodernity: an enquiry into the origins of cultural change*. Oxford: Basil Blackwell.
- Haseman, B. (2006) 'A manifesto for performative research', *Media International Australia Incorporating Culture and Policy*, themed issue *Practice-led Research*, 118, pp.98-106.
- Haseman, B. (2007) 'Rupture and recognition: identifying the performative research paradigm' in Barrett, E. and Bolt, B. (2007) *Practice as research: approaches to arts enquiry*, London and New York: I.B.Tauris, pp.147-158.
- Haskel, J., Hughes, A. and Bascausoglu-Moreau, E. (2013) *The economic significance of the UK science base: a report for the campaign for science and engineering*. London: UK IRC.
- Heron, J. (1982) *Empirical validity in experiential research*. London: British Postgraduate Medical Foundation.
- Heron, J. and Reason, P. (2006) 'The practice of co-operative inquiry: research 'with' rather than 'on' people', in Reason, P. and Bradbury, H. (2006) *Handbook of action research*. London: Sage Publications, pp. 144-154.
- Higgins, J. and Green, S. (eds) (2008) *Cochrane handbook for systematic reviews of interventions*, Version 5.0.0. The Cochrane Collaboration.
- Hirsch-Kreinsen, H. and Jacobson, D. (2008) *Innovation in Low-tech Firms and Industries*. Cheltenham: Edward Elgar Publishing.
- HM Revenue and Customs (2012) 'Corporate intangibles', *Research and Development manual*. HMSO: London.
- Holbrook, J. (1998) *Problems in adapting the Frascati Manual for use in resource-based economies*. Vancouver: CPROST Report.
- Holbrook, J., Wixted, B., Chee, F. Klingbeil, M. and Shaw-Garlock, G. (2009) *Measuring the return on investment in research in universities: the value of the human capital produced by these programs*. Vancouver: CPROST Report.
- Holden, J. (2004). *Capturing cultural value: how culture has become a tool of government policy*. London: Demos.
- Holden, J. (2007) *Publicly funded culture and the creative industries*. London: Demos.
- Holland, M. and Wile, F.W. (1928) 'Research, science and invention', *A century of industrial progress*. New York: American Institute of the City of New York, Doubleday, pp.312-334.
- Hudson, D. (2014) 'Proposed Regs. Clarifying research expenditure eligibility under Sec.174', *The Tax Adviser*.??
- James, M. (2012) *The UK research and development tax credit scheme – a guide for architects*. London: RIBA.
- Jones, K. (2009) *Culture and creative learning: a literature review*. Newcastle: Creativity, Culture and Education.
- Julier, G. and Moor, L. (2009) *Design and creativity: policy, management and practice*. Oxford: Berg.
- Jura Consultants. (2008) *Economic impact methodologies for the museums, libraries and archives knowledge domain: what works and what doesn't*. MLA Council.
- Kiureghian, A. (2007) 'Aleatory or epistemic? Does it matter?', *Special Workshop on Risk Acceptance and Risk Communication* March 26-27, 2007, Stanford University.

- Kuhn, T. (1962) *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.
- Lane, J. and Flagg, J. (2010). 'Translating three states of knowledge: discovery, invention and innovation'. *Implementation Science*. 5(9). Available at: <http://www.implementationscience.com/content/5/1/>. (Accessed 1 November 2016).
- Lawrence, G. (2001) 'Kings Fund beds', *The Lancet*, 358(8) September 2001.
- Lazzeretti, L. (2013) *Creative industries and innovation in Europe: concepts, measures, and comparative case studies*. London: Routledge.
- Levin, D. (1988). *The opening of vision: Nihilism and the postmodern situation*. London: Routledge.
- Lewin, K. (1948) 'Action research and minority problems', in G.W. Lewin (Ed.) (1948) *Resolving social conflicts*. New York: Harper & Row.
- Lincoln, Y. and Guba, E. (1985) *Naturalistic Inquiry*. New York: Sage Publications Ltd.
- Lycouris, S. (2010) Resources about practice-led research. Edinburgh: Edinburgh University. Available at: <https://sites.eca.ed.ac.uk/.../09/Resources-about-practice-led-research.doc>. (Accessed 1 November 2016).
- Mahdjoubi, D. (2009) *Four types of R&D*. Austin Texas: IC Institute.
- Manville, C., Morgan Jones, M., Frearson, M., Castle-Clarke, S. Henham, M. Gunashekar, S. and Grant, J. (2015) *Preparing impact submissions for REF 2014: an evaluation*. Cambridge: RAND Corporation.
- Marcus, G. (1994) 'On ideologies of reflexivity in contemporary efforts to remake the human sciences', *Poetics Today*, 15(3), pp.383-404.
- Martin, B. and Irvine, J. (1985). 'Evaluating the evaluators: a reply to our critics', *Social Studies of Science*, 15(3), pp.558-575.
- McKay, J. & Marshall, P. (2001) 'The dual imperatives of action research', *Information Technology and People*, 14 (1), pp. 46-59.
- Meadows, J. (2004) *The Victorian scientist: growth of a profession*. London: British Library.
- Mees, C. (1920). *The Organization of Industrial Scientific Research*. New York: McGraw-Hill
- Merton, R. and Kendall, P. (1946) 'The focused interview', *American Journal of Sociology*, 51(6), pp. 541-557.
- Meynhardt, T. (2009). 'Public value inside: what is public value creation?', *International Journal of Public Administration*, 32 (3-4), pp.192-219.
- Miles, A., and Sullivan, A. (2010). *Understanding the relationship between taste and value in culture and sport*. London: DCMS.
- Miller, M. (2013). *Testing Times: fighting culture's corner in an age of austerity*. Speech at the British Museum, 24 April 2013. Available at: <https://www.gov.uk/government/speeches/testing-times-fighting-cultures-corner-in-an-age-of-austerity> (Accessed 1 November 2016).
- Miller, T. (2008) 'The film industry and the Government: 'endless Mr Beans and Mr Bonds?'', In Lewis, J. and Miller, T. *Critical Cultural Policy Studies: A Reader*. London: Wiley, pp.134-141.
- Miller, W. and Morris, L. (1999) *Generation R&D managing knowledge, technology and innovation*. London: John Wiley & Sons.

- Mirza, M. (Ed). (2006). *Culture Vultures: is UK arts policy damaging the arts?* London: Policy Exchange.
- Moon, K. and Ngai, E. (2010), 'R&D framework for an intelligent fabric sample management system', *International Journal of Operations & Production Management*, 30(7), pp.721–743.
- Mothe, J. (1992) 'The revision of international science indicators: The *Frascati Manual*', *Technology in Society*, 14, pp. 427-440.
- Müller, K. Rammer, C. and Trüby, J. (2009) The role of creative industries in industrial innovation, *Innovation*, 11(2), pp148-168.
- Murray, L., Piper, T. and Robertson, K. (2014) *Putting intellectual property in its place: rights discourse, creative labor and the everyday*. Oxford: Oxford University Press.
- Nesta, (2013) *Digital Culture: how arts and cultural organisations in England use technology*. Digital R&D Fund for the Arts. London: Nesta.
- Nesta, (2011) *NT Live Digital broadcast of theatre: Learning from the pilot season*. London: Nesta.
- Nevius, A. (2014) Proposed Regulations Change Definition of R&D Expenditures. *Journal of Accountancy*, 217(1) p.62.
- Nonaka, I. (1991) 'The knowledge-creating company', *Harvard Business Review*, Nov-Dec 1991, pp.96-104.
- Nurse, P. (2015) Ensuring a successful UK research endeavour. RCUK.
- Oakley, K. (2009) *Art Works: cultural labour markets: a literature review*. Creative Culture and Education. Available at: <http://www.creativitycultureeducation.org/wp-content/uploads/CCE-lit-review-8-a5-web-130.pdf>. (Accessed 1 November 2016).
- O'Brien, D. (2010) *Measuring the value of culture*. London: DCMS.
- O'Brien, D. (2012) 'It isn't philistine to judge art economically', *Spiked*, 5.7.2012.
- O'Connor, G. and De Martino, R. (2006) 'Organizing for radical innovation: an exploratory study of the structural aspects of RI management systems in large established firms', *Journal of Product Innovation Management*, 23(6) pp.475–497.
- O'Connor, G. and McDermott, C. (2004) 'The human side of radical innovation', *Journal of Engineering and Technology Management*, 21 (1/2), pp.11–30.
- OECD (2002) *Frascati Manual: proposed standard practice for surveys on research and experimental development*. Paris: OECD, 6<sup>th</sup> edn.
- OECD. (2005) *Oslo Manual: guidelines for collecting and interpreting innovation data*. Paris: OECD. 3rd Edition
- OECD (2014) *Guide to conducting an R&D survey, Technical Paper 11*. Paris: OECD. Available at: <http://www.uis.unesco.org/ScienceTechnology/Documents/TP11-guide-to-conducting-RD-surveys.pdf> (Accessed 1 November 2016).
- OECD (2015) *Frascati Manual: proposed standard practice for surveys on research and experimental development*. Paris: OECD, 7<sup>th</sup> edn.
- OED (2015) *Oxford English Dictionary Online*. Oxford University Press. Available at: <http://www.oed.com/view/Entry/274046?redirectedFrom=research+and+development&.OED>. (Accessed 1 November 2016).
- O'Regan, T. (2002) 'Too much culture, too little culture: trends and issues for cultural policy-making', *Media International Australia incorporating Culture and Policy*, 102, February, pp. 9–24.

- Pickard, A. (2007) *Research methods in information*. London: Facet Publishing.
- Popper, K. (1963), *Conjectures and refutations: The growth of scientific knowledge*, London; Routledge.
- Potts, J. (ed.) (2009) *Special Issue of Innovation: management, policy & practice*, Volume 11, Issue 2, August 2009.
- Potts, J. and Cunningham, S. (2008) 'Four models of the creative industries'. *Cultural Science*. Available at: [ultural-science.org/FeastPapers2008/StuartCunninghamBp.pdf](http://ultural-science.org/FeastPapers2008/StuartCunninghamBp.pdf). (Accessed 1 November 2016).
- QUT CIRAC and Cutler & Co (2003), *Research and innovation systems in the production of digital content and applications*, Available at: [www.chass.org.au/papers/.../PAP20030901CG](http://www.chass.org.au/papers/.../PAP20030901CG). (Accessed 1 November 2016).
- Raein, M. (2005) 'Integration of studio and theory in the teaching of graphic design', *Art, Design and Communication in Higher Education* 3(3), pp.163–174.
- Reason, P. And Bradbury, H. (2006) *Handbook of action research*. London: Sage Publications.
- Redhead, S. (2004) 'Creative modernity: the new cultural state', *Media International Australia incorporating Culture and Policy*, 112, pp. 9–27.
- Reid, G. UCL Public Policy (2014), "Why should the taxpayer fund science and research?". Available: [www.ucl.ac.uk/public-policy/events/Why-fund-research](http://www.ucl.ac.uk/public-policy/events/Why-fund-research).
- Riessman, C. (2002). *Narrative analysis*. Newbury Park, CA: Sage Publications/
- Rekola, M., Mäkeläinen, T. and Häkkinen, T. (2012) 'The role of design management in sustainable building processes', *Architectural Engineering and Design Management*, 8(2), pp.78-89.
- Richard, R. and Nelson, R. (1982) 'The role of knowledge in R&D efficiency', *Quarterly Journal of Economics*, 97 (3), pp. 453–470.
- Roberts, C. (2007) *Intraprelearning (corporate entrepreneurship, organisational learning and change) within two Welsh NHS Trusts*. Unpublished PhD thesis. Bangor University.
- Rust, C., Mottram, J. and Till, J. (2007) *Research in art, design and architecture*. Swindon: AHRC.
- Rust, C. (2004) 'Design enquiry: tacit knowledge and invention in science', *Design Issues*, 20.
- Rust, C. (2007) 'Unstated contributions – how artistic inquiry can inform interdisciplinary research', *International Journal of Design* 1(3).
- Scullion, A. and Garcia, B. (2005) 'What is cultural policy research?', *International Journal of Cultural Policy*, 11(2), pp.113-127.
- Senior, T., Moreton, s. and Dovey, J. (2015) *Working Paper: the arts and humanities in the Internet of Things*. Bristol: REACT Hub.
- Sharpe, B. (2010) *Economies of life: patterns of health and wealth*. Aberdour: International Futures Forum.
- Shenton, A. (2004) 'Strategies for ensuring trustworthiness in qualitative research projects', *Education for Information*, 22, pp.63-75.
- Shenton, A. and Dixon, P. (2004) 'Debates and paradoxes surrounding the use of qualitative methods,' *Education for Information*, 22, pp.1-12.
- Smith, H. and Dean, R. (2009) *Practice-led research, research led practice in the creative arts*. Edinburgh: Edinburgh University.
- Snowball, J. (2008) *Measuring the value of culture methods and examples in cultural economics*. Berlin: Springer.

- Stanley S. (2006) 'Cultural competency: from philosophy to research and practice', *Journal of Community Psychology*, 34(2), pp.237–245.
- Steelman, J. [1947] 1980. *Science and Public Policy*. New York: Arno Press.
- Stein, M. (1953) 'Creativity and culture', *Journal of Psychology*, (36), pp.311–322.
- Still, A. and d'Inverno, N. (2016) 'A history of creativity for future AI research', *The Seventh International Conference on Computational Creativity*, 27-June-1 July 2016, Paris.
- Stüer, C., Hüsig, S. and Biala, S. (2010) 'Integrating art as a trans-boundary element in a radical innovation framework', *R&D Management*, 40(1).
- Tapscott, D. and Williams, A. (2006) *Wikinomics: how mass collaboration changes everything*. London: Atlantic Books.
- Tashakkori, A. and Teddlie, C. (eds) (2003) *Sage handbook of mixed methods in social and behavioral research*. New York: Sage.
- Thatcher, M. (1988) Speech to the Royal Society. Margaret Thatcher Foundation. Available at: <http://www.margaretthatcher.org/document/107346>. (Accessed 1 November 2016).
- Throsby, D. (1994) 'The production and consumption of the arts: a view of cultural economics', *Journal of Economic Literature*, 32 (1), pp. 1–29
- Throsby, D. (1999) 'Cultural capital', *Journal of Cultural Economics*, 23 (1), pp. 3–12.
- Throsby, D. (2001) *Economics and culture*. Cambridge: Cambridge University Press.
- Throsby, D. (2003) 'Determining the value of cultural goods: how much (or how little) does contingent valuation tell us?', *Journal of Cultural Economics*, 27 (3), pp. 275–285.
- UCL Centre for Digital Humanities. (2012) Humanities Matter infographic. Available at: <http://4humanities.org/2013/07/the-humanities-matter-infographic/>. (Accessed 1 November 2016).
- UKRIO (2009) *Code of practice for research: promoting good practice and preventing misconduct*. London: UKRIO.
- UNCTAD (2008), *Creative economy report 2008: the challenge of assessing the creative economy: towards informed policymaking*. Geneva. Available at: [www.unctad.org/creative-economy](http://www.unctad.org/creative-economy). (Accessed 1 November 2016).
- UNCTAD (2010), *Creative economy report 2010: creative economy: a feasible development option*. Geneva. Available at: [http://unctad.org/en/Docs/ditctab20103\\_en.pdf](http://unctad.org/en/Docs/ditctab20103_en.pdf). (Accessed 1 November 2016).
- Varsakelis, N. (2001) 'The impact of patent protection, economy openness and national culture on R&D investment: a cross-country empirical investigation', *Research Policy* 30, pp.1059–1068.
- Wainwright, A. (1997) 'Can sociological research be qualitative, critical and valid?', *The Qualitative Report* 3(2).
- Walker, J. (1988) *Design history and the history of design*. London: Pluto Press.
- Wenzel, L. and Khalid, M. (2009) 'Capitalising research and development: towards the new Systems of National Accounts', *Economic and Labour Market Review*, 3(9), pp.16-23.
- Whitman, W. (1953) Research and Development Board, Letter accompanying the questionnaire to respondents. Reprinted in *Scientific R&D in American industry: a study of manpower and costs*. US Bureau of Labor Statistics, Bulletin, 1148, p. 51. Washington DC: USGPO.



Wilsdon, J., Allen, L., Belfiore, E., Campbell, P., Curry, S., Hill, S. Jones, R. Kain, R., Kerridge, S. Thelwall, M. Tinkler, J. Viney, I., Wouters, P., Hill, J. and Johnson, B. (2015). *The Metric tide: report of the Independent review of the role of metrics in research assessment and management*. HEFCE.

Wirt, J., Lieberman, A. and Levien, R. (1974) *R&D management methods by Federal Agencies*. Santa Monica, CA: RAND Corporation.

Wixted, B and Holbrook, J. (2009) *Conceptual Issues in the Evaluation of Formal Research Networks*. Vancouver: CPROST Report.

Womersley, J. (2013) *Being unreasonable: the value of pure science*. Available at: <http://www.symmetrymagazine.org/article/february-2013/being-unreasonable-the-value-of-pure-science>. (Accessed 1 November 2016).

Yin, R. (2003) *Case study research: design and methods*. London: Thousand Oaks: Sage Publications.

## **APPENDIX A: Interview participants**

*Each participant took part in a personal capacity and their comments were not associated with any employer. Participation is not taken as an endorsement of any of the report's conclusions.*

<b>Name</b>	<b>Role</b>
Dr Nick Appleyard	Head of Digital, Innovate UK
Julia Bennett	Research and Policy Manager, Crafts Council
Simon Cronshaw	Managing Partner at CultureLabel and a technology partner in a Digital Research and Development Fund for the Arts project.
Dr Raphael Lynes	Reader, English, Cambridge University
Dr Ian Mortimer	Independent Historian
Dr Uriel Orlow	Artist and Senior Research Fellow, University of Westminster
Dick Penny	Watershed
Professor Rick Rylance	Chief Executive, AHRC
Professor Jon Rogers	Professor of Creative Technology, Dundee University and a research partner in a Digital Research and Development Fund for the Arts project
Dr Nick Salazar	Lecturer in Dance and Digital Arts, Surrey University
Annie Ukleja	General Manager Miracle Theatre and a partner in a Digital Research and Development Fund for the Arts project
Ben Weaver	Consultant in creative industries
Andrew Whitney	Owner at Hot Knife Digital Media Ltd and a technology partner in a Digital Research and Development Fund for the Arts project
Dr Marcus Winter	Lecturer, School of Computing, Engineering and Mathematics, Brighton University and a research partner in a Digital Research and Development Fund for the Arts
Anonymised	Arts sector academic with cultural value award
Anonymised	Arts sector academic and practitioner in visual arts
Anonymised	Ceramic designer
Anonymised	Chartered accountant from a global accountancy corporation
Anonymised	Economist OECD
Anonymised	Head of a regional arts museum
Anonymised	Fashion designer for a global label
Anonymised	Former academic and IT manager, arts establishment
Anonymised	Statistician and industrial economist
Anonymised	Tax advisor and government advisor from a global accountancy corporation
Anonymised	Head of R&D from an international software company
Anonymised	Head of Research, Government Department
Anonymised	Head of R&D National Museum
Anonymised	Government policy advisor
Anonymised	Government policy advisor
Anonymised	Producer film industry

## **APPENDIX B: Semi-structured interview questions**

*Note: The format of the interviews was semi-structured interview which allowed for a discussion to be opened up and additional questions to be asked. In addition, it is not necessary to ask all the questions to each participant. The format allows for an open structure. Some questions were clearly designed for particular groups of interviewees.*

### **Introduction**

- Can you tell me about your role and how it relates to R&D?

### **Defining R&D**

- How do you define research and development (R&D)? Are you aware of definitions of R&D? Do you find these definitions useful? How do you make use of these definitions?
- How do you define research and development (R&D) for the arts and cultural sector? [This should include a discussion of wider perspectives (e.g. humanities and social sciences.)]
- Do you see research as a different process from 'R&D'?
- What are the components of R&D in practice, e.g. basic research, applied research experiential research?
- Do you see the *Frascati Manual* definition of R&D/other definitions as having wider applicability?

### **Understanding how R&D occurs**

- What kinds of R&D does your organization undertake? Does it have a R&D policy or framework? Does it have people specifically undertaking this role? What activities within your organization/external agencies are classified as R&D, e.g. how is R&D codified, how is tacit knowledge captured? Are there other activities that you think could be beneficially viewed under this title and if so why?
- How do you think that the current R&D systems/structure could be enhanced?
- Is your approach more cautious about some kinds of R&D than others? Why?

### **Understanding R&D values?**

- What do you see as the value of R&D within the cultural sector? Specifically what do you see as the artistic/cultural benefits? academic benefits? social benefits? economic benefits? [Note: need to establish contribution to knowledge, economy and wider impact]
- Who do you see as the stakeholders for R&D within the cultural sector?
- Who do you see as the beneficiaries for R&D within the cultural sector?
- How do you and/or would you make the ROI case? What metrics do/could assist with conveying this impact?
- How would you see the role and value of R&D being enhanced within the cultural sector beyond academia?
- What has been the most rewarding R&D project you have worked on and why?

- What has been the most challenging R&D project you have worked on and why?

### **R&D across sectors?**

- Do you see important differences regarding the delivery of R&D across the cultural sector? Between other sectors? If so, what? How do you address these?
- Are you aware that there are currently different approaches to how the nation delivers financial/other support for science R&D versus R&D for the cultural sector? [If no then add prompts such as financial position of HLF and tax] What are those differences? If so why do you think that this is? Do you think there should be any change in this status? If so how beneficial changes be achieved?

### **Additional comments**

- Do you have any other thoughts about R&D in the cultural sector which would be relevant to this study?

## APPENDIX C – Questionnaire

### Page 1 QUESTIONNAIRE INFORMATION

This study is seeking to explore how research and development (R&D) in the arts and culture is conducted, defined and evaluated. The findings will be used to inform and influence policymakers. The study is drawing on the projects which form part of the Digital R&D Fund for the Arts programme.

YOUR contributions will make a significant difference. It is helpful for each of the three participants (the academic, organisation and technology partner) from the project to all complete a survey as each one of you will have different perspectives. The Fund support team will also be completing surveys. The survey has 12 optional questions - you can elect to skip questions but any information supplied will be valued. There are no right or wrong answers.

We know that you are busy and appreciate your time - it is possible to log in over time and fill in the survey. Your comments on each page are saved when you go onto the next page. You can navigate back and forth and exit the survey but make sure you have pressed the 'Next' page button to save your entries before pressing 'Exit the survey'.

The research is being conducted by Dr Elizabeth Lomas at Northumbria University. The information you provide within this survey will be retained securely and anonymously. Further information on the University's Research Ethics Policy is available at <https://www.northumbria.ac.uk/static/5007/research/reghandbook.pdf>. The reports from the study will be disseminated online.

This survey closes on the 13th March 2015.

If you do have any queries regarding the survey then please contact the Researcher:

Elizabeth Lomas Tel: ++44 (0)794 6614882 [elizabeth2.lomas@northumbria.ac.uk](mailto:elizabeth2.lomas@northumbria.ac.uk)

Thank you for your help.

## Participant Details

1. Tick which one of the following represents your role in the Digital R&D Fund for the Arts project:

- Academic partner
- Arts of cultural organisation
- Technology partner
- Fund administrator/management

Please state your name:

2. Please specify your job title and employment sector, e.g. ceramics curator in a national museum, artist in residence for a university, director of a regional theatre etc.

3. How would you define R&D in your own words for your sector?

## Page 2 R&D Delivery

4. Bearing in mind your description of R&D for your sector, please give an example of a piece of R&D you have carried out or are aware of having been conducted. This may or may not be your project funded by the Digital R&D Fund for the Arts.

5. What benefits do you believe that this example of R&D delivered?

6. Please give an example of a benefit delivered by R&D for the organisation in which the R&D is undertaken.

7. Is this benefit measurable?

- Yes
- No
- Not sure

If so how?

8. Please give an example of a benefit delivered by R&D for society more widely.

9. Is this benefit measurable?

- Yes
- No
- Not sure

If so how?

### Page 3 Arts, Culture and Science

Within the sciences there is a widely accepted international definition of R&D which is set out in a document entitled the *Frascati Manual* (OECD, 2002). This definition is referenced globally and used for a range of purposes, e.g. to have a shared R&D vision for academics working across a range of science disciplines, for governments as a definition underpinning science sector tax breaks.

10. This overarching definition of R&D for the sciences taken from the *Frascati Manual* is:

“R&D is creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.”

Do you think that this definition could be equally capable of being taken as a definition for the arts and culture?

- Yes
- No
- With some modification
- Not sure

Comment: please detail any comments on this definition including modifications/additions that would deliver a definition of R&D for the arts and culture. Alternatively please detail any reasons why this R&D definition would not work for arts and culture and unique aspects of R&D that must be conveyed for the successful delivery of R&D in the arts and culture.

### Page 4 R&D Delivery

Within the context of the sciences the *Frascati Manual* describes the delivery of R&D through:

- basic research
- applied research
- experimental research

**Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.**

**Applied research is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.**

**Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed. R&D covers both formal R&D in R&D units and informal or occasional R&D in other units.**

11. Do you believe that R&D in the arts and culture is delivered through basic research, applied research and experimental research?

	Yes	No	With some modification	Not sure
Basic research				
Applied Research				
Experimental Research				

Comment: please detail any issues with these definitions, additions that would strengthen understanding of R&D for the arts and cultural sector or other comments such as reasons why these definitions are not applicable or what the components of R&D for the arts and culture should look like

**Page 4 Final Thoughts**

12. Do you have any other comments to make in regards to how R&D for the arts and culture is defined and valued or should be defined and valued?



## **APPENDIX D: Workshop participants**

*Each participant did take part in a personal capacity and their comments were not associated with their employer. Nor is their participation taken as an acceptance of the report's conclusions. 28 people took part in total.*

The following participants consented to being named:

- Hasan Bakhshi
- Hillary Bauer
- Babs Behan
- David Bowen
- Sebastian Conran
- Sevrá Davis
- Rebecca Gouldson
- Lina Hakim
- Phil Jones
- Steve Legg
- Christopher Marsden
- Glenn Millward
- Sam Mitchell
- James Parkyn
- Dick Penny
- Zoe Schoenherr
- Ben Weaver
- Gillian Youngs

**APPENDIX E: First definition shared with the Knowledge Hub Directors for interview purposes**



## Defining R&D for the arts and cultural sectors

I am being funded by the AHRC to explore how research and development (R&D) in academia and practice across the arts and cultural sectors should be defined and evaluated. The findings will be used to inform and influence policy makers and funders, and as such could shape policy discussions and leverage resources. This work forms part of the Digital R&D Fund for the Arts Project which has been delivered by Nesta in conjunction with Arts Council England and AHRC. This work is drawing to a close and therefore I am now consulting key stakeholders on the draft definition for R&D in the arts and cultural sector which has been developed.

I would be very grateful for **15 minutes** of your time on the telephone to discuss the drafted definition at the end of this document. I hope that this will be possible and that you can suggest a time and contact number for me to call? My email is [e.lomas@ucl.ac.uk](mailto:e.lomas@ucl.ac.uk) .

I am very happy to answer any further questions you may have regarding this project.

Kind regards

Elizabeth

Dr Elizabeth Lomas  
Senior Lecturer  
UCL  
Tel: 0794 6614882  
Email: [e.lomas@ucl.ac.uk](mailto:e.lomas@ucl.ac.uk)

### **Draft definition of R&D for the arts and cultural sectors for comment**

R&D is creative work undertaken in order to increase knowledge, including knowledge of humankind, culture and society, and the use of this knowledge to devise new applications, human understanding and art and cultural innovations in all forms.

It encompasses:

Basic research which is work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena, observable facts or behaviours without any particular application or use in view. This may result in a later application for this knowledge.

And

Applied research which is original investigation undertaken directed primarily towards a specific practical aim or objective.

And

Experimental research which is work drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new ideas, art forms, materials, products or devices, processes, systems, services through to understanding aspects of human behaviours, interactions, engagement and mechanisms for change. Experimental research may lead to theoretical knowledge (basic research) or be applied (applied research).



## Defining R&D for the arts and cultural sectors

### **Draft definition of R&D for the arts and cultural sectors for comment**

R&D is creative practice undertaken in order to increase knowledge, including knowledge of humankind, culture and society, and the use of this knowledge to devise new applications, human understanding and art and cultural innovations in all forms.

This work may be lone, co-created or collaborative. Research and development may happen synchronously or as components of a process but it is important to understand the connection. 'Research' will always have a link to 'Development' even if the development component is initially through the dissemination of research findings or audience engagement. This is particularly important in the fields of art and culture which is intertwined with human experience. R&D encompasses:

Experimental research which is work gained from research and/or experiential learning, which is directed to producing new ideas, experiences, art forms, materials, products or devices, processes, systems, services through to understanding aspects of human behaviours, interactions, engagement and mechanisms for change. Experimental research may lead to theoretical knowledge (basic research) or be applied (applied research).

Basic research which is exploration or practice undertaken primarily to generate new knowledge of the underlying foundation of phenomena, observable facts or behaviours without any particular application or use in view. The sharing of this knowledge may result in a later application.

Applied research which is original investigation undertaken primarily with a practical aim or objective.



## DEFINING R&D

---

### 1.0 Context

The AHRC has funded a two year piece of post-doctoral research by Dr Elizabeth Lomas, UCL, to work with Hasan Bakhshi, Nesta to explore how R&D should be conceptualised for the arts and culture, defined for policy purposes, measured and evaluated. The work has considered approaches to R&D from academia and practice. It has been conducted in parallel with the Digital R&D Fund for the Arts – a strategic initiative led by the Arts Council England (ACE), the Arts and Humanities Research Council (AHRC) and Nesta.

Following consultation by Dr Lomas with academics and practitioners working in the arts and culture, we have concluded that a definition of R&D for policymakers is required which encompasses innovation-related activities in the arts and culture whilst also being aligned with current understandings of R&D in the science and technology areas. R&D policy – whether that is in the form of subsidy or tax relief – should recognize, for example, R&D that straddles both the arts and the sciences. Whilst the new material on R&D in the arts and humanities and social sciences in the latest revision of the *Frascati Manual* (OECD, 2015) is welcome, we believe more substantive revisions – outlined below – are needed to capture socially valuable R&D activities undertaken in the arts and culture.

### 2.0 Definition

The text in **yellow** is what we propose needs to be added to the seventh edition of the *Frascati Manual* (OECD, 2015) definition of R&D for it to be relevant to arts and culture. Words which we argue should be omitted are struck through.

**Research and experimental development (R&D)** comprise creative and systematic work undertaken in order to increase ~~the stock of~~ knowledge – including knowledge of humankind, culture and society – and to devise new applications **of economic, cultural or social value** of available knowledge.

**Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena, observable facts and **behaviours**, without any particular application or use in view.

**Applied research** is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific **intended** ~~practical~~ aim or objective.

**Experimental development** is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products, **experiences** or processes or to improving existing products, **experiences** or processes.

---

### 3.0 Comments on the components of the R&D definition

Important points to note when considering these definitions include the following:

1. Stock has been removed as it aligns to a positivist view of R&D which implies a fixed and bankable asset rather than one which in some knowledge domains will inevitably alter over time.
2. Economic, cultural and social value encompass the range of outcomes derived from R&D regardless of knowledge domain. Inevitably, policymakers must – and in practice do – evaluate and make judgements on the value which is delivered by specific forms of R&D. These judgements are highly complex, and projects such as the AHRC’s Cultural Value’s project<sup>4</sup> have sought to consider the different ways in which arts activities give rise to economic, cultural and social value. The *Frascati Manual* has provided a tool that historically has been successful in delivering scientific measures that are in fact predicated on assumptions related to value judgements eg the value of basic research in the sciences. Our amendment makes that explicit and recognizes also that policymakers in different jurisdictions may have different views on what type of R&D activity is of value.
3. Behaviours (UK spelling) and experiences are important additions to the proposed definition. The *Frascati Manual* (OECD, 2015) definition of R&D at the highest level speaks of knowledge of humankind and society. However, the components of this definition – basic, applied and experimental development – then only articulate the delivery of R&D through limited parameters which mitigate against many areas of research – in the sciences, social sciences, arts and humanities alike. The *Frascati Manual* (OECD, 2015) definitions of these components deal with R&D from an object centric stance. The proposed changes recognize that there are

---

<sup>4</sup> Crossick and Kaszynska (2016), 'Understanding the value of arts and culture: the AHRC Cultural Value Project', Swindon: AHRC

methodologies which seek to improve society's understanding of behaviours and experience beyond the limits of observation and product orientated goals.

4. Intended has been used in place of the word 'practical' in the existing definition of applied research. The 'intended' aim affirms that some applied research propositions do not have a practical aim in mind, yet have an intention to create knowledge that is nonetheless of value to society.

5. Change has been added to the definition of experimental development because R&D may be undertaken to alter, intervene or provide iterative developments in ways that may not immediately 'improve' an outcome but which, given the inclusion of value in the high level definition of R&D, rules out knowledge activities whose aims includes some that are 'destructive'. An example would be experimental development aimed at problematizing a product, experience or process.

---

#### 4.0 Qualifying the R&D definition

In explaining when, say, a software development project can be classified as R&D, the Manual explains that "its completion must be dependent on a scientific and/or technological advance, and the aim of the project must be the systematic resolution of a scientific and/or technological uncertainty." (OECD, 2015, p.65)

Further requirements underpin the existing high-level *Frascati Manual's* definition of R&D, namely that the R&D activity must be:

- novel
- creative
- uncertain
- systematic (defined as planned and budgeted as discussed at section 3 point 2)
- transferable and/or reproducible.

The requirements for R&D to be 'novel' – and the allied property for it to be 'creative' – is well understood and uncontested, as are distinctions the Manual makes between new to researcher/organization and new to society.

The treatment of 'uncertainty' relating to the acquisition and production of new knowledge in the Manual, however, belies a notion of epistemic uncertainty. It explicitly assumes that only knowledge acquisition which reduces epistemic ('knowable') uncertainty should be classified as R&D. Some knowledge creation in the arts, humanities and social sciences does reduce

epistemic uncertainties and this is more explicitly recognised within the latest version of the *Frascati Manual* (OECD, 2015, p.49). However, the logic is that a far wider class of knowledge creation activities in these disciplines should be so recognised e.g. those related to enhanced understanding of consumer behaviour – which has implications of course far wider than the arts. In principle, this could have obviously very great implications for the scope of public policies like R&D tax relief in countries like the UK, but should nonetheless be embraced by policymakers if they are serious about incentivising investment in innovation in all its forms, not just that related to science and technology.

Some knowledge creation may be of economic, social value or cultural value (innovation) even if it does not resolve any epistemic uncertainty, but this is not dealt with in the current Manual. This is especially so in the arts, humanities and social sciences, but it is also arguably a more accurate characterisation of many scientific uncertainties and indeed there is a whole literature on aleatory uncertainty in engineering. Such knowledge may be of value because it gives us alternative interpretations in situations of aleatory uncertainty. We believe such knowledge creation activities should also be treated as R&D.

Systematic is defined within the *Frascati Manual* (OECD, 2015, p.49) as ‘planned and budgeted’. Systematic in this sense is an essential component to a definition of R&D which is of practical use to policymakers. We recognize that planning and budgeting the creation of knowledge in this way may jar with some forms of creative practice. There are many reasons why such creative practice should be recognized and supported by policymakers, but it should not be defined as ‘R&D’ for policy purposes.

Transferable and/or reproducible within the *Frascati Manual* (OECD, 2015, p.48-49) refers to the requirement that new knowledge does not remain tacit but is conveyed to others, for example in a peer reviewed academic article or in intellectual property protection. However, the examples provided all relate to science and technology and even in this context are presented from a positivist perspective. In contrast, a new design or artwork may be displayed and interpreted within the context of an exhibition which arguably performs the same function of providing a vehicle for knowledge transfer and, over time, reproducibility as that of a journal article. In other cases, creative practice – such as in performance art – may be geared at creating valuable knowledge which is highly context-specific and therefore neither transferable nor reproducible in the conventional sense of the words. Care must be taken not to discriminate against R&D activities in these cases.

---

## 5.0 R&D Measures

In looking at examples of R&D delivery in practice further work needs to be undertaken on providing robust measures for gathering empirical data through time. During the course of this

work the following categories of R&D were provided:

- Theoretical research resulting in new knowledge, theories and perspectives
- Social research resulting in understanding of populations and group social patterns
- Cultural research resulting in understanding of human thought, behaviour and culture
- Practice-led research in art, design and architecture resulting in new ideas, practices, themes and formats
- Technical, design and production research resulting in developing new materials, technology, production, delivery of new spaces, functionality
- Curatorial research resulting in conceptual material and interpretive outputs
- Audience research evaluating engagement and influence
- Economic research delivering understanding of the production, distribution and consumption of goods and services
- Built environment research resulting in better designed sustainable spaces, production and urban regeneration

Suggestions to refine these definitions and provide real case examples against these definitions are to be welcomed.

**Dr Elizabeth Lomas (UCL) and Hasan Bakhshi (Nesta)**

#### References

OECD. (2015) *Frascati Manual 2015: guidelines for collecting and reporting data on research and experimental development*. 7<sup>th</sup> edn. Paris: OECD Publishing.