

Report 1: The Arts & Humanities in the Creative Economy

Core Learning from the AHRC Creative Economy Hubs programme

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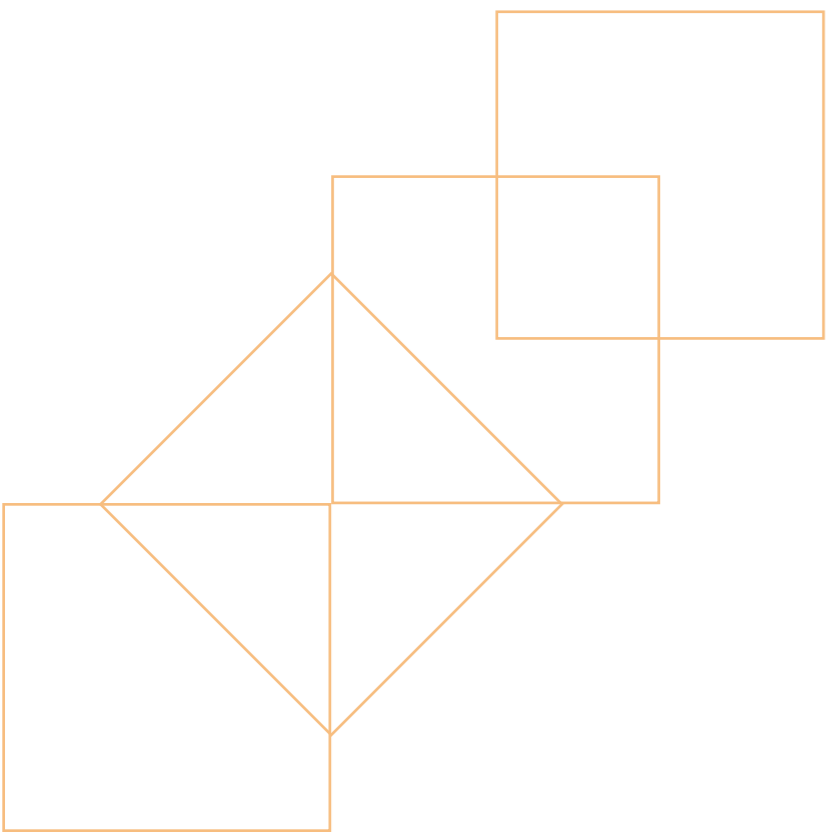
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Foreword

The Arts and Humanities Research Council (AHRC) funds world-class, independent researchers in a wide range of subjects: ancient history, modern dance, archaeology, digital content, philosophy, English literature, design, the creative and performing arts, and much more. This financial year the AHRC will spend approximately £98m to fund research and postgraduate training in collaboration with a number of partners. The quality and range of research supported by this investment of public funds not only provides social and cultural benefits but also contributes to the economic success of the UK. For further information on the AHRC, please go to: www.ahrc.ac.uk

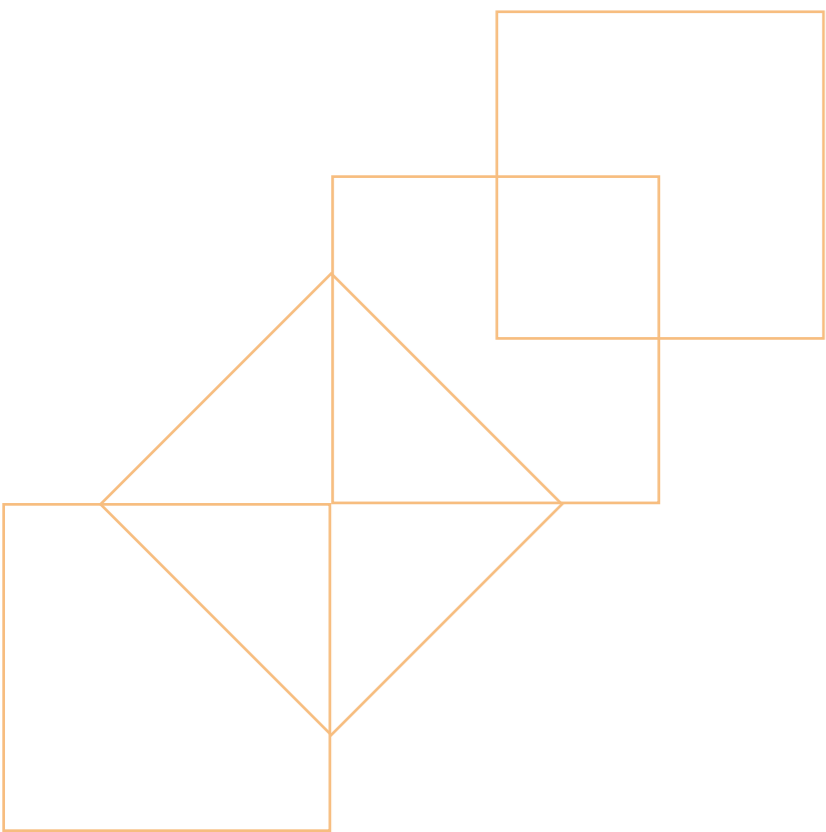
Between 2012 and 2016 the Arts & Humanities Research Council launched a remarkable experiment to mobilise the research base of UK universities for the benefit of the Creative Industries. They invested £16 million in four 'Creative Hubs'. Nobody knew then what a 'creative hub' was or could be. The 'Hub' has since become commonplace: high streets have print hubs where before they had printshops, and universities have learning hubs where before they had libraries. And, of course, many cities now host creative hubs, bringing together informal and formal networks of talent, technology and resources. The hub has become a ubiquitous idea for new ways of organising productive work that resonate with new forms of loosely organised social productivity. These reports capture the methods and approaches that the four Creative Hubs evolved for building collaborative networks that can coordinate academic effort with business expertise to have an impact on the Creative & Cultural Industries.

Since the end of the Creative Economy Hubs initiative, a policy hiatus has been worked through between the Cameron coalition and the May government's launch of an industrial strategy. The Nesta Geographies of Creativity research has landed very firmly in the policy arena, underpinning the 2017 Bazalgette report and its impact on a strategy for the Creative Industries. In particular, the idea of creative clusters has taken root as the framework for future investment through the Industrial Challenge Strategy Fund. There could not be a better moment for the contents of this research to inform and underpin the development of this new clustering approach.

One of the problems of innovation is its amnesia – innovators are less interested in building on the past than seeking new possibilities. These reports illustrate a range of approaches to university-led creative innovation, offering evidence to build on for the future. Equally, whilst cluster approaches do a good job of identifying and mapping creative potential, they don't always reveal the dynamics particular to creative industries that make them succeed. The 'small scale, fleet-of-foot, and first-to-market' energy of creative enterprises thrive through the rapid exchange of ideas between different backgrounds and skills. Again, these reports offer ample evidence of the ways in which such exchanges can produce value for a range of participants. Thank you to my fellow Hub Directors for supporting this evidence gathering effort, to the AHRC for commissioning the work and most all to its chief author and architect Dr Timothy J. Senior for his application, energy and insight.

Rachel Cooper
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Executive Summary

01

Shaping an Innovation Focus

The body of work generated by the Hubs programme reveals four core Innovation Themes in the creative economy influenced by the arts & humanities:

1. Culture and Heritage
2. Digital Social Innovation and Connected Communities
3. Market anticipation for Creative Business success
4. At the boundary between Physical and Digital hybridity

02

Leading on Innovation Activities

The Hubs programme has shown how arts & humanities scholarship, methods, and agendas can be enacted in a creative economy context, revealing the potential for a leading role in activities innovation. Five key observations emerge:

1. The Hubs have evidenced a wide spectrum of engagements between the arts & humanities and creative economy partners. With both traditional and applied subjects proving active in this arena, we suggest that no arts & humanities perspective is inimical – at least in principle – to creative economy engagement.
2. Hubs' projects have revealed the breadth of interests and motivations that drive arts & humanities researchers to engage with partners from outside of the university. More efforts are needed to uncover and channel this energy as well as support a younger generation of scholars in accessing collaborative opportunities.
3. Collaborative work in the creative economy can be a powerful means of making visible and reformulating disciplinary boundaries to the benefit of academic researchers and creative economy partners. What emerges is the flexibility and adaptability with which arts & humanities researchers can operate.
4. In this collaborative context, interests in narrative experience, place making, creative provocation, experience design, and material culture (amongst others) reveal a foundation on which common agendas with other disciplinary and creative partners can be built.
5. A triad of arts & humanities, computer science, and social sciences emerges as the academic core of a digital innovation ecosystem in the creative economy. The arts & humanities can take on a leadership role in this constellation.

03

An Important Partner in Collaboration

Within this innovation ecosystem, the arts & humanities enable at least four key operations, based around:

1. The role of practice-led methods in enabling collaborative knowledge work: These approaches are highly suited to supporting cross-sector partnerships in the creative economy.
2. The leadership role practice-led methods can take in mobilising Design, Critical Humanities, and Performance in meeting the innovation challenges faced in different cultural and creative arenas.
3. The role of scholarship in generating new sites for collaborative engagement through generating original content, contexts, types of analysis, and forms of delivery in cultural production.
4. The operation of researchers in supporting methodological reflexivity and criticality at the 'live collaborative edge' of cross-sector partnerships.

04

Opening Up Future Trajectories

The operation of the arts & humanities as part of a broader academic engagement with the creative economy has revealed where university-embedded creative Hubs can build on cultural, creative, social, and business innovation activities to address key emerging innovation challenge areas; these include themes such as Health and Wellbeing, Education, and the Environment.

Report Introduction

This report is the first of three commissioned in late 2015 by the Directors of the AHRC Creative Economy Hubs (2012-2016). Together, they follow on from a preliminary report into the Hubs' activities, titled Connecting to Innovate, further developing its focus on core Learning from the programme. To this end, the three reports bring together findings from observation work, data gathering exercises, and semi-structured interviews conducted between January 2015 and May 2016. Working with core Hub team members and selected project participants, these activities sought to identify, understand, and document the Hubs' experience of working in the creative economy. The three reports were completed in January 2017. It is hoped that this articulation of core learning from the Hubs programme may prove informative for future HEI strategy in this arena.

This first report explores the role of the arts & humanities in the creative economy as revealed by the four AHRC Hubs. It addresses the scope of this relationship (and those of non-arts & humanities disciplines); suggests what the arts & humanities bring to the creative economy when performed in this context; and demonstrates where different constellations of cross-sector collaboration have proven particularly powerful in generating new types of creative, cultural, and economic value. This report will argue for the need to recognise – and embrace – the innumerable ways in which the arts & humanities can form collaborative relationships with other disciplinary and creative economy partners. It foregrounds their collaborative potential in driving research impact beyond academia.

In the series, Report Two goes on to analyse the innovation strategies behind the work discussed in Report One, revealing the emergence of a common innovation framework for Hub activity in the creative economy. Finally, Report Three considers the organisational implications of the Hub model for actively gearing universities and the creative economy together.

AHRC Creative Economy Hubs:

The four 'Knowledge Exchange Hubs for the Creative Economy' were set up by the Arts and Humanities Research Council (AHRC) and operated between 2012 and 2016. They were established to support new forms of collaboration between university and creative economy partners. The four Hubs were:



Creativeworks London:

A consortium of 43 London-based universities, museums, cultural institutions, and business, led by Queen Mary University of London and their delivery partner The Culture Capital Exchange. Creativeworks London acted to bring new collaborative research opportunities to London's creative and cultural industries. For more information on Creativeworks London, please go to: www.creativeworkslondon.org.uk



Design in Action:

A Hub network of Scottish universities, led by the University of Dundee in collaboration with the University of Abertay, The Glasgow School of Art, Robert Gordon University, University of Edinburgh, and St Andrews University. With a focus on key issues facing Scotland today, Design in Action worked to embed design-led business innovation into the Scottish economy. For more information on Creativeworks London, please go to: www.designinaction.com



REACT:

A South-West Hub network, led by the University of the West of England and creative delivery partner Watershed (Bristol) in collaboration with the Universities of Bath, Bristol, Cardiff and Exeter. REACT (Research and Enterprise in Arts and Creative Technology) supported academics to work with creative enterprises in developing innovative products and new research agendas. For more information on Creativeworks London, please go to: www.react-hub.org.uk



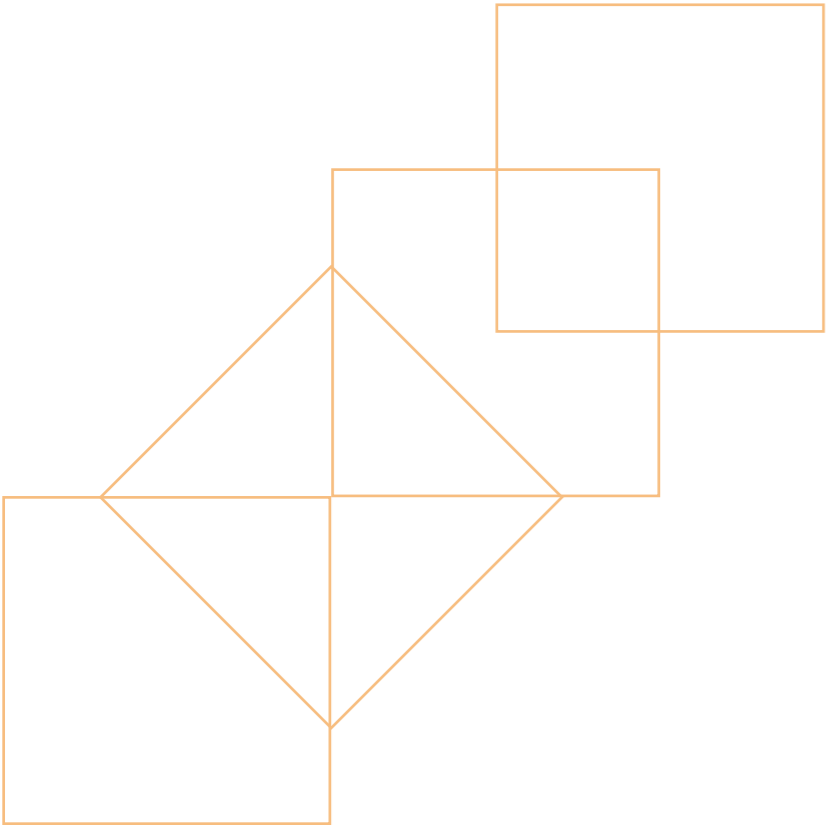
The Creative Exchange:

A Hub partnership with a focus on the North of England, connecting Lancaster University, Newcastle University, and the Royal College of Art in London. The Creative Exchange connected university and creative economy partners in the arena of Digital Public Space, exploring new forms of creation and experience around digital content. For more information on Creativeworks London, please go to: www.thecreativexchange.org

Contexts The Arts and
Humanities in the Creative
Economy

Section

01



1.1 A Long-Standing Relationship

The role of the arts & humanities as a driver of innovation in the creative and cultural industries is increasingly recognised^{1,2}. This role has developed considerably in recent decades, reflecting the changing role of universities in the public domain with the Impact agenda, the broadening of research and entrepreneurial interests in academia, and the increasing importance of the UK creative economy.

The arts & humanities, however, have long been embedded in the creative industries¹ (treated here as broadly synonymous with the creative and cultural industries), serving as a 'talent pipeline' for artists, producers, curators, and writers. Scholarship has also long had its place, acting as guarantors of quality and authenticity, for example, through the production of critical editions. Ostensibly the application of traditional forms of academic research practice to cultural industry interests, such connections have long been present, if not always visible. As noted by Geoffrey Crossick, it was the arrival of New Labour in 1997 that made the creative industries a force to be reckoned with in public policy^{3,4}. With the rising economic impact of the creative industries and the growth of interest in cultural spaces as a key to urban renewal, public discourse began to orient towards the economic potential of the arts and creativity more generally. This new attitude gave impetus to the development of university disciplines in the creative and performing arts, design, and media, an impetus further bolstered by the, then, newly created Arts & Humanities Research Board. The 2013 Nesta Creative Economy Manifesto⁵ developed the economic policy implications of the creativity agenda further, identifying not only how digital technologies and skills were critical in bringing coherence to the creative industries grouping, but also recognising the important role played by creative occupations in business sectors outside of that group to form the wider creative economy. In that research, the UK's creative economy was estimated to contribute 9.7% to the UK's Gross Value Added and to employ more than the financial services, advanced manufacturing, or construction sectors⁷.

For Crossick, an emphasis on the economic value of creativity has been one that "marginalises the more fundamental ways in which cultural and artistic experience is important; fostering individuals, families and communities that are reflexive, thoughtful, aware of diversity and complexity, conscious of themselves and of others, including others who are very different in place or time"⁸. This is a recognition of how the wider creative economy is deeply bound to motivations and valuing practices other than commercial; it impacts us as individuals, and our shared culture, in ways that operate outside of the economic sphere (e.g. 9). Although the creative economy concept has considerable instrumental value for deriving economic statistics and shaping policy, it reflects in reality a more complex underlying constellation of sector interactions, activities, values, creative roles, and so on. It has, inevitably, very porous boundaries.

¹Recognised by the Department for Culture, Media, and Sport in 2016 as including Advertising and marketing; Architecture; Crafts; Design (product, graphic, and fashion); Film, TV, radio and photography; IT, software, and computing services; Publishing; Museums, galleries, and libraries; Music, performing, and visual arts⁶.

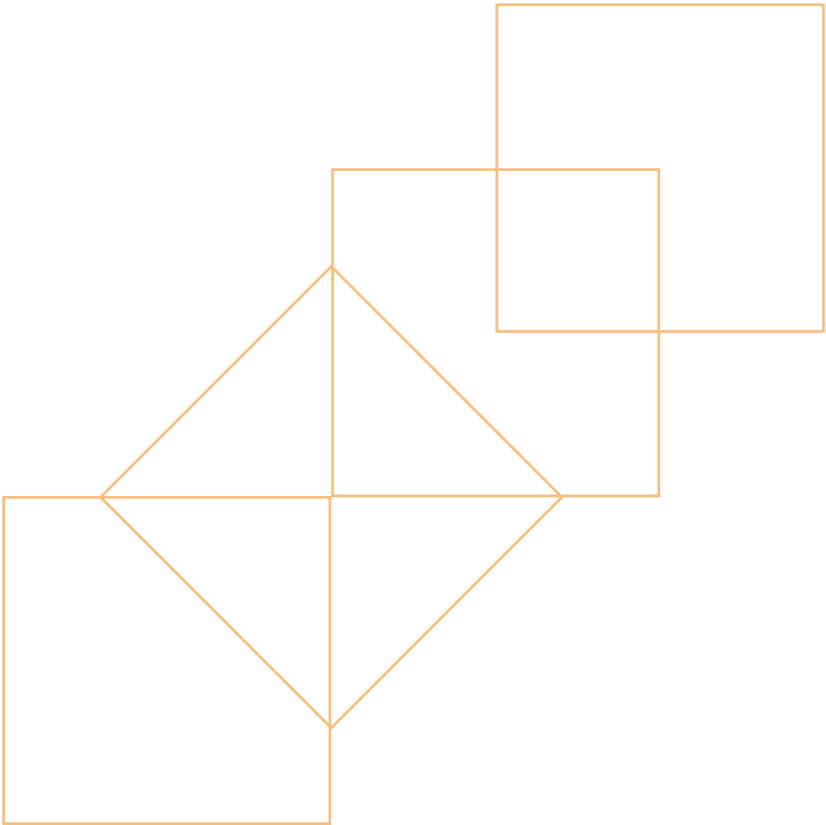
1.2 Realising a Post-Widget Age

In seeking to secure the economic benefits of university-led arts & humanities research, policy has turned to the adoption of pre-existing models of 'Knowledge Transfer' developed in the relation to STEM disciplines. This model, "in which a university research team develops a widget, patents it and transfers it out to industrial enterprise"¹⁰, has proven a poor expression of how research knowledge is constituted and mobilised in the creative and cultural arena. It is also a way of working that has excluded much of what the arts & humanities have to offer other external organisations, businesses and partners, and kept from view those connections and influences that are already in place. In research for 'Hidden connections: Knowledge exchange between the arts & humanities and the private, public and third sectors', UK academics from the arts & humanities were found to be engaged in a wide range of interactions with a diverse body of external partners for a wide variety of reasons¹¹. As these engagements, by and large, do not consist of technology transfer activities around patents, licences and spin-outs, they have largely gone unrecognised, giving a deeply misleading picture of the productive cross-sector connectivity that can be found. Further, a focus on technology transfer metrics was found to mask non-commercial explanations for why disciplines outside of the arts & humanities engage with external commercial and non-commercial partners, so hiding further commonalities with the arts & humanities around wider impact and engagement. A broader recognition of partnerships centred on people-based, problem-solving and community orientated activities, revealed the Arts & humanities to display "as rich and diverse a set of connections as other disciplines and a particularly rich set of third sector and community interactions" in addition to considerable private sector and commercial interactions, concluding that: "Academics from the Arts & humanities are highly connected within the UK economy and society in a process that supports scholarship and a two-way complementary interaction with external organisations"¹². The four AHRC hubs are the tangible expression of the post-Knowledge-Transfer-with-Widgets age, one a decade in the making. They have enacted a systemic approach to fostering the diverse relationships that can exist between arts & humanities researchers and a variety of cultural partners, creative businesses, and other areas of disciplinary expertise. This is the foundation for a healthy innovation ecosystem in the creative economy.

**Core Learning The AHRC
Creative Economy Hubs**

Section

02



2.1 Five Observations on the Arts & Humanities in the Creative Economy

Observation 1: *There is Enormous Potential for Arts & Humanities Activity Across the Creative Economy*

The Hubs programme has revealed the enormous scope for arts & humanities engagement within the creative economy, as demonstrated both in the variety of cross-sector partnerships formed (Figure 1) and the creative economy outputs produced (Figure 2). Although the Hubs engaged most strongly with creative industries partners, an active engagement with those outside of this grouping in the wider creative economy also emerged (for example, design roles in retail and manufacturing, or software development roles in social networking and healthcare-management). The porous nature of the creative economy's boundaries has also been reflected in the Hubs' working with industry roles outside of those recognized, for policy purposes, as 'creative', including certain educational, training, consultancy, management, coaching, and analytic roles. Further, the Hubs engaged with many third sector partners, including those operating in the traditional creative sectors, but also those operating outside, such as in the areas of data usage, land management, culinary craft, criminal justice, and youth representation. Each Hub developed its own unique fingerprint in this regard. Whilst REACT, for example, focused almost exclusively on creative industries work, nearly half of CWL's Fusion scheme projects engaged with creative roles outside of the creative industries, with its voucher scheme engaging nearly as many third sector organisations as private sector businesses, both within and outside of the creative sectors.

The diversity of the arts & humanities – reflecting their many different ways of producing, mediating, and mobilising knowledge – has enabled the Hubs to strategically target different areas of the creative economy in-line with each Hub's core creative aims (Figure 3 and Report Two). For example, with a focus on design-led business innovation, DiA have engaged most strongly with design-oriented disciplines and supported collaborative outputs with strong business and economic potential. For REACT, its focus on speculative R&D found expression in its support of a collaborative network that didn't privileging applied aspects of the arts & humanities or particular types of project output, leading to a stronger representation of traditional humanities research areas (including Literature and History) and collaborative partnerships operating with a cultural focus. Across the Hubs programme as a whole, arts & humanities engagement has been dominated by academic partners from applied and practice-oriented subjects such as Journalism, Media, Cultural Studies, Design, Arts research, and Performance.

We would like to suggest, however, that the stronger representation of 'applied' over 'traditional' forms of the arts & humanities in creative economy engagement may have a substantively cultural, rather than a disciplinary, foundation. The Hubs' projects have demonstrated that traditional disciplines have no less to offer full-spectrum creative economy activities, whether engaging with public or private sector partners. Researchers from History, Literature and Geography (with a human and historical focus) have engaged with seventeen distinct areas of creative economy activity (Appendix A.4), producing innovative outputs in areas as diverse as Culture and Heritage, Arts research and Production, Network and Community, Publishing and Documentary, Collaborative Place-Making, Health and Wellbeing, Gaming and Entertainment. Further, this work has resulted in some of the most original R&D to emerge from the Hubs programme in terms of new digital / technological practices and social / cultural interventions (See 6.3 – Hub Innovation Themes). As such, it may be that no single field or disciplinary perspective from the arts & humanities is – at least in principle – inimical to cross-disciplinary collaborative activity in the creative economy.

Observation 2: *There are Many Reasons for Arts & Humanities Researchers to Engage in Cross-Sector Collaboration*

The Hubs programme has exposed the many reasons for arts & humanities researchers to engage with creative economy work. Whilst it may crudely boil down to improving research, attaining impact or gaining new insight for teaching activities, there is a granularity to the motivation of researchers that has been shown to matter. For many arts & humanities scholars, as reported to the Hubs, there is an active desire to put research into practice in novel or innovative ways; to extend skills in criticality and analysis beyond the texts, instruments and methods of a given discipline; and to bring something new into the world that might impact positively on people's lives. To paraphrase one Hub researcher: This is a good starting point for any innovation activity, as it's only a short distance to collaboratively producing new products, services, processes, or ways of working that can make a difference in the world.

With this in mind, and in line with previous reports (e.g. 13), the Hubs have observed that researchers and practitioners in core applied / practice-oriented areas of the arts & humanities are perhaps most readily attuned to creative economy work as well as the broader proposition of the Hubs programme, reflecting core interests in experimental R&D, target-oriented problem solving and collaborative making. Whilst there has been strong interest from more traditional arts & humanities disciplines, challenges have also emerged with potential academic partners over imagining mutually beneficial cross-sector agendas, the status of collaborative research methodologies and research production, and concerns over the relationship between academic and entrepreneurial activities. There is anecdotal evidence that such attitudes may reflect 'generational' concerns, with early career fellows often reporting a greater willingness to participate in Hubs' work on the grounds of its closer alignment with the changing nature of disciplinary aspirations and collaborative engagements in the arts & humanities today. If, as we would like to suggest, there is no field of the arts & humanities inimical to collaborative work in the creative economy (at least in principle), how might existing, and still hidden, potential, be better channelled to broaden participation further? Future efforts in this area should include:

- the wider dissemination of successful and provocative cross-sector project work to serve as inspiration for future partnerships;
- the creation of spaces (both physical and online) to expose potential arts & humanities partners to new collaborative opportunities;
- the adoption of existing project partners as ambassadors in future recruitment activities;
- a greater responsiveness to the granularity of interests and approaches in the arts & humanities that could spark innovative cross-sector engagements;
- renewed efforts to reach scholars with an existing interest in cross-sector work and increased support for a new generation of scholars wishing to forge collaborative partnerships

Observation 3: *The Arts & Humanities Community has Broad Cross-Disciplinary Experience and Interests*

The Hubs have reported that a substantial number of the academics, practitioners, and creative companies involved in collaborative work formally acknowledge the multi-disciplinary, cross-disciplinary and non-disciplinary expertise they bring to project work. Recognising more informal contributions from across disciplinary experiences broadens this observation further still, with Hubs' projects often proving a stimulating venue for wider interests and expertise – normally unaided in professional disciplinary settings – to come to light. In this way, the traditional categorisations of arts & humanities disciplines frequently begin to break down into more original and productive inter-disciplinary formations when engaged in cross-sector collaborative work, adding an extra layer to the (already) diverse contribution of the arts & humanities community in this arena.

To a certain degree, this broader experience base may reflect a trend in traditional and applied work towards the need for increasing levels of generalisation in connection to specialist disciplinary knowledge, i.e. reflecting how new ways of working across traditional boundaries are becoming more common-place in a variety of sectors. The importance of specialist disciplinary expertise is strongly recognised by the Hubs, but its value is understood to increase when applied in combination with an understanding, awareness, or sensitivity towards other disciplinary points of view. This underscores a core perspective from across the Hubs programme, that whilst disciplinary expertise is important in shaping the form of projects, it is the capacity and willingness of academic partners to work around that expertise – and for these dispositions to be supported collaboratively – that is crucial to project success. In the words of one researcher, as our understanding of the multiplicity of roles required in a functioning creative economy develops, there will be far more space for “musician-slash-game-designer-cum-computer-scientist / historian / archaeologist / design[er]”. This isn't a claim made from an anti- or post-disciplinary position as such, but from a recognition that multi-disciplinary expertise is increasingly important, and that the positioning of this expertise from within and outside of different disciplinary frames can introduce a productive tension that generates new insight.

Observation 4: *The Arts & Humanities Exhibit Many Productive Alignments Beyond Their Traditional Boundaries*

With the interests of the Hubs programme extending up-to and beyond the traditional edges of creative and cultural industries work (coming to encompass, for example, rural economies, healthcare and wellbeing, and crypto-currencies), each Hub has found a need to engage a diverse body of disciplinary interests. The Hubs have not restricted their engagement to disciplines within the arts & humanities, instead, engaging with knowledge domains as appropriate to need. As succinctly put by DiA: “There are no boundaries when it comes to building a viable business” (DiA: Final Report). Similarly, there are no boundaries when it comes to driving innovative R&D in the wider creative economy, asking probing questions about connected digital futures, or testing the boundaries of HEI collaboration with external partners. Overall, whilst the arts & humanities (traditional and applied) have dominated the disciplinary mix across the Hubs programme, computer science and social sciences have also proven key to enacting creative economy work (Figure 1). Evidence suggests that the Hubs' disciplinary spread is broader still in the pre-project ideation events, DiA, for example, engaging with a wide range of STEM subjects during its Chiasma process, including Geochemistry, Civil Engineering, and microbiology, amongst others (DiA: Final Report).

The different cross-sector alliances that have emerged through the Hubs programme have reveal where points of entry for the arts & humanities into creative economy work are, indeed, common to

other disciplines, not least interests in narrative experience, place making, creative provocation, experience design, and material culture. This is partially captured in the close proximity between different disciplinary activities presented in Figure 1, for example between Cultures of Space and Place (Geography) and Spatial Practices (Architecture); or Creative and Social technologies (Computer Science) and Design for Social Intervention (Design); or Arts and Digital Innovation (Arts Research) and Digital Cultures and Practices (Journalism, Media and Cultural Studies). These are not category errors; rather, they serve simply to remind us of the multiplicity of routes into a shared constellation of interests, and the different inherited traditions of practice that shape and motivate those interests. As discussed in more detail later, it is precisely these critical points of difference that can be performed to drive innovation across disciplines and sectors.

Observation 5: *Putting the Arts & Humanities, Social Sciences, and STEM Back Together Again*

Together, the arts & humanities (traditional and applied), computer science, and social sciences encapsulate the core of a body of academic expertise and skills needed to enact a digital innovation agenda within the creative economy (Figure 2), with the Hubs revealing how different patterns of academic influence within this constellation can be brought to bear on business, cultural, social, and technological innovation demands (Figure 3). That many of the future innovation challenges we face cannot be addressed without a broad and effective interdisciplinary base from which to work is a common belief amongst the Hubs. In one Hub's perspective: “All parts of the [Hub] collaboration are interested in widening the disciplinary base at work in the future. We share an understanding that technological and social innovation arises in many different sites, our shared future should have an overarching goal of encouraging interdisciplinary collaborations in its University partners by enacting a STEAM agenda that leads with creative humanities approaches but collaborates with other research communities e.g. social science, bio medicine, earth sciences, computing, design and engineering to meet the challenges and disruptions of the 21st Century” (REACT: Final Report).

This is a perspective long-enshrined in many of the creative delivery partners and academic research groups that formed the Hubs programme (for example Newcastle University's Openlab or the Pervasive Media Studio in Bristol), and is now finding expression in a number of Hub legacy projects. These include the University of Bristol's Innovation programmes – which connect the arts, humanities, sciences, engineering, and enterprise to enable students to broaden their academic specialism and apply it to key innovation areas; the University of Bristol's Brigstow Institute – a centre committed to cross-sector and co-produced research in the investigation 21st century societal challenges); and the Centre for Doctoral Training in Digital Civics at Newcastle University – which engages academics from across several disciplinary areas, local government, and third sector partners to explore the creation of community-driven digital technologies and services, a reflection both of CX's innovative PhD model and its new thinking more broadly on Digital Public Space. Critically, the arts & humanities are not seen merely as a component of these new agendas, but as a leader.

Whilst the creative Hub model offers enormous potential as an infrastructuring mechanism for bringing the arts, humanities, social sciences, and STEM back together again in cross-sector innovation (addressed in detail in Reports Two and Three), there is much that could be done in the near-term to enact this agenda within universities. It is important that universities start investing in spaces for people to work together across disciplines, either on-campus or off-campus, and develop new ways for gearing together the different reporting and management structures that silo university faculties and departments away from each other. As one Hub director has suggested: “Having an interdisciplinary working space on every campus where people work empowered and funded, and it's recognised that as part of their day (or part of their week) they would spend time there developing new ideas across different disciplines ... this would be the most important single innovation that universities could make to have an impact on UK PLC. You would unlock an unbelievable torrent of potential value”.

2.2 Enacting the Arts & Humanities in the Creative Economy

The Hubs programme has offered insight into the operations performed by the arts & humanities when enacted in a creative economy context. Four key observations have emerged, relating to 1) The act of 'Making and Making Together', capturing long-established traditions within arts and design practices; 2) The integration of Making into innovation strategies, so enabling different agendas allied with Design, Critical Humanities, and Performance to be brought to bear on important innovation challenges; 3) The role of arts & humanities scholarship in generating new sites for collaborative engagement around innovation challenges – this may centre on, for example, original contents and contexts for collaborative work, or insight into new forms of analysis and delivery in cultural production; 4) The operation of arts & humanities researchers in cross-sector partnerships to support methodological reflexivity and criticality at the 'live collaborative edge'.

Operation 1: *The importance of Making and Making Together*

Woven into the creative Hubs model is a critical role for making as practice, one that takes a position on the nature of collaboration, and, through collaboration, knowledge. In many current models of engagement between HEIs and external partners, Knowledge is treated as noun – an object, a thing to be transferred, exchanged, and accumulated. But we can also think about 'knowing', 'knowing how', 'knowing that' – the many ways in which the term Knowledge is used in the everyday to point towards multiple practices around 'knowing' and the relationality between people, things, and ways of doing, thinking, and making. A strong recognition of this realist account of Knowledge has emerged within the work of the Hubs, i.e. the many ways in which multiple, rich forms of 'knowings' and 'know-hows' have been mobilised and made recognisable through practical, collaborative making. Here, Making isn't an activity through which knowledge finds a physical or digital form, i.e. taking place after the event, but as the very means of knowledge work itself. This is new knowledge "generated within the process of production, rather than elsewhere and then transmitted to it. There is often no separation, conceptually or practically"¹⁴. As described by one Hub researcher, Making, therefore, becomes "the spanner in dualistic thinking around Knowledge Transfer or Knowledge Exchange", one that challenges the separation between analysis and synthesis, or between different types of people and their role (e.g. academic versus entrepreneur, or practitioner versus theoretician).

In precisely this way, materials – both physical and digital – are good to think with. As sites of knowledge work, collaborative making engages multiple, often contrasting sensibilities and practices, bringing to light issues that engage project partners beyond their recognised areas of expertise, extending or altering normal ways of working, and forcing deliberative engagement to address differences. In this spirit of engagement – one in which partners must invest time, energy and effort in the perspectives of others – collaborative making becomes an iterative, sense-making exercise through which knowledge is created, shaped and mobilised in a variety of ways. Put another way, it enacts a collaborative border zone; at its 'live edge,' encounter with forms of resistance drive the development of new insight and skills¹⁵.

Operation 2: *Integrating Making back into the World*

Making as a process of 'collaborative knowledge creation' centres the innovation strategies developed by the four Hubs. The arts & humanities are highly generative in how collaborative making can be mobilised in this way, opening up different trajectories in relation to theory, method, traditions of practice, and organisational processes. In codifying these elements into an innovation programme, each Hub has laid claim to what it sees as important in our changing world, the questions it wishes to ask of it, the interventions it would like to make (and with whom), and the consequences that should result. The innovation strategies developed by the Hubs are detailed in Report Two, but, here, four Hub perspectives on the role of collaborative making in a wider innovation context are explored.

- CX developed its concept of joint-participation in making – termed creative exchange – to animate project participants' diverse concerns and skill-levels as a resource for creative productivity. The breadth of their approach made public making (both making in public and making publics) an important strategy for managing complex collaborations with different stakeholders. CX's making activities occupied a hybrid zone between workshops, open studios/labs, hackathons, installation and performance making. It is work that has been taken up by public institutions, arts organisations, partner businesses, and organisations promoting local entrepreneurship.
- CWL's creative voucher scheme served as a mechanism for seeding new collaborative potential and lowering the barriers to forming partnerships across sectors. In its support of diverse project aims (co-creating prototypes, installation work, research, and so on) the scheme helped put Making to the task of promoting equality and diversity in creative economy work as well as engage minority, marginalized, and disability groups. By linking these co-creative opportunities to their 'Women in Digital Culture and Economy Network,' CWL helped introduce women digital entrepreneurs to the Hub and encourage a good gender balance in its creative work.
- REACT sought to use iterative making around physical prototypes to immerse project teams in their core challenge areas; to support a cohort of project teams that can intensify that learning further; and to strengthen connections with external partners in a way that both enables diverse voices to enter into those conversations and for project work to better reach target audiences. A strong set of value propositions has emerged around a position of 'arts activism' in this regard – practice-based work around new products, services, processes that can find users in the world, impact their lives, take on a life of their own, and make a difference.
- For DiA, making (and making together) was codified through a constellation of questions, motivations and targets oriented around design practices. Encompassing a diverse body of approaches, Design is a field that has undergone considerable change as traditional industry drivers (and simple 'value added' models of design applied to products and services) have given way to new economics. Creating spaces to explore the role of design in mediating new types of value in innovation processes (from idea scoping to market launch), DiA targeted improved project outcomes through co-designing new products and services together with users and other stakeholders.

Operation 3: Building New Sites for Engagement and Sense-Making

Hub Innovation strategies centred around the act of cross-sector collaborative making have proven a powerful site of engagement with arts & humanities scholarship. Asking the question of what happens when we encounter or enact culture through texts, objects, artworks, music, literature, architecture, and so on, the arts & humanities offer considerable insight into the nature of human experience. In the context of the creative economy, which has cultural production at its heart, this understanding can be refracted along countless paths when enacted through engagement with other disciplinary and sector perspectives (detailed in 6.3 – Hub Innovation Themes).

Content and Contexts: The enormous contribution of the arts & humanities to our understanding of culture-as-generator of ideas, narratives, characters, artefacts, material cultures, and processes opens up new sites of interest for both commercial work and creative / cultural organisations. This wealth of understanding has as its foundation critical knowledge of underlying cultural contexts, social movements, and historical models. This is a key element of capturing your audiences or users for innovative work and asking new questions about the contexts of cultural and creative experience. This is particularly pertinent when operating outside of traditional areas of expertise in the creative sector; it can, for example, help uncover new audiences, shape the design of user testing, and de-risk project development.

Delivery: The cross-sector diversity of Hub's work has proven a fertile ground for re-thinking the delivery of new ideas through products and services. To paraphrase one Hub perspective: Today, if you're involved in media production of any kind (or producing content for different kinds of media platform), you're actually involved in designing experiences. The exploration of new contents and contexts, including those with arts & humanities origins, in the creative economy necessitates new processual and technological approaches to experience design such as innovative forms of digital-physical interactions and digital mediation.

Analysis and Intervention: In the expanded domain of innovative creative economy work, arts & humanities disciplines can contribute to the body of new analytical methods needed to explore areas of cultural production in depth. This includes the management and analysis of cultural assets, the identification of new collaborative potential across sectors with overlapping interests, and the deployment of innovative digital/technological approaches to probe cultural understanding or interactions.

Operation 4: Methodological Reflexivity and Criticality at the Live Collaborative Edge

Brought into collaboration, these offerings are bound into disciplinary ways of working and thinking that prove important when exploring new adaptations for such learning. This has been observed to play out in a number of ways in an arts & humanities context. It can manifest in particular sensitivities toward the complex relationship between how questions are asked, how answers are pursued, and the types of understanding that emerge from a line of inquiry; an awareness of the non-neutrality of researcher agency and the assumptions that underlie different methodological approaches; and, an understanding of cultural production that doesn't frame it in terms purely of instrumental power, but rather emphasises the power of users and audiences to make meaning in particular contexts.

These are qualities, we argue, that can be brought into stark relief in a creative economy arena when cross-sector collaborative partnerships have to negotiate different sector motivations and goals. It is here, then, at the border zones or 'live edge' of collaborative partnerships, that reflexivity around new forms of cultural production can emerge. This is a process that is particularly critical in the R&D stage of projects, where open-endedness is a key quality. It is a process that, in the words of one Hub researcher, "turns out to be quite useful when you're collaborating, and you're being asked to iterate, go back, reflect, start again – have a different kind of conversation".

2.3 Co-creating a new direction for the Creative Economy

Through these four operations, a foundational space emerges for arts & humanities researchers to support creative businesses and cultural organisations in the production of new assets (products, services, content, processes, and so on). This is a role similarly attributed to graduate employees from the arts & humanities in the sector, who help to stimulate business growth by strengthening their ability to identify, adapt, and integrate new ideas¹⁶. There is also, however, a different kind of relationship to be delivered in the creative economy, one strongly aligned to the ways of working and thinking enabled by the Hubs:

We are notoriously poor at making predictions of the future in a complex world. Whilst reacting to markets as they currently are, staying close to sector trends, or adhering to current technological developments may advance the immediate needs of a business or organisation, it can weaken any innovation ecosystem's ability to imagine future market potential, or advance solutions to emerging cultural and social challenges. Past business success can also obstruct future adaptations, such as through the adoption of new technologies or business models (the Innovator's Dilemma; 17). Through crowding diversity into collaborative partnerships, a live edge – as a site of both alignment and resistance – can be generated, driving innovation activity away from well-trodden, predictable paths to explore alternative future trajectories. It is these points of difference (emerging through an engagement between multiple disciplinary and sector perspectives) that create pivot points for reflexive action. This is precisely where arts & humanities thinking can be most effectively enacted in collaboration with others to generate a deliberative space for future-oriented provocation, one that can have its corners tested, its edges found, and holes poked through. This can be framed in terms of an anticipatory process, the shaping of current activities in accordance with possible future scenarios, i.e. an exploration of the present into multiple, possible futures, events that have yet to be realized or accomplished¹⁸. This should be understood in contrast to current activities shaped in accordance with the likelihood of future events based on the past alone, i.e. an orientation towards futures predicted by the technologies, ideas, and processes that are already available or widely adopted. Hubs' work suggests that cross-sector engagement, with the arts & humanities an active player, can better enable an anticipatory approach to future markets and complex cultural / social challenges.

From a different angle, here we see the opportunity for arts & humanities researchers to work with those driving digital, technological and scientific developments in imagining alternative forms of future living and working. What is at stake? In the words of one Hub researcher: "The possibility of writing the future in collaboration with those who empower the future with tools". This is a collaborative potential that speaks to Crossick's model of how education, research and dissemination in the arts & humanities should underlie creativity, one that doesn't just emphasize its economic value, but embraces "the more fundamental ways in which cultural and artistic experience is important; fostering individuals, families and communities that are reflexive, thoughtful, aware of diversity and complexity, conscious of themselves and of others, including others who are very different in place or time"¹⁹. The creative economy, in its broadest conception, is a space where this can happen through the development of new tools and processes alongside innovation in cultural production.

Figure 1: Cross-sector Partnerships

The co-occurrence of disciplinary and creative economy partner offerings in the work of the Hubs. The multiple incidences of column and row pairings reveal the rich cross-sector collaborative activities enabled by the four AHRC Hubs in a creative economy context. Grid data and a full explanation of the analysis behind Figure 1 is given in Appendix A.1

Report 1: The Arts & Humanities in the Creative Economy
Core Learning: The AHRC Creative Economy Hubs

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Creative Economy Offerings

Arts

Humanities

Applied

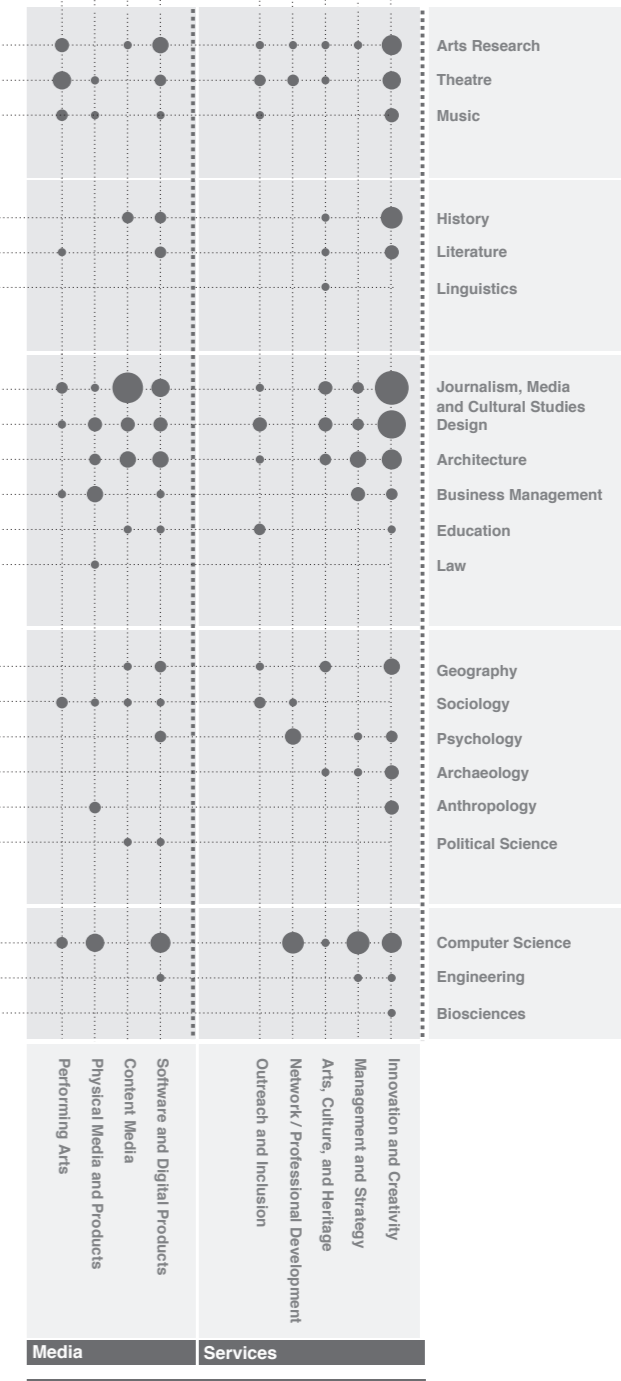
Social Sciences

STEM

	Pairs	
Services		
Innovation and Creativity	86	Innovation environments / programming (27) / Location-based interactive experiences (24) / Creative Agency (14) / Service Design (10) / Product and engineering Design (6) / UX & Interaction Design (3)
Management and Strategy	23	Communications & Media strategy (7) / Information Analytics & Data management (6) / Marketing & Retail Analysis (5) / Asset discovery & management (3) / Entrepreneurship & Business development (2)
Arts, Culture, and Heritage	21	Heritage and Conservation – Cultural (10) / Arts programming (6) / Heritage and Conservation – Natural (3) / Publishing and literary promotion (2)
Network & Professional Development	16	Network advocacy and support (5) / Training and personal development (5) / Knowledge Exchange & Events Networking (4) / Staffing and Recruitment (2)
Outreach and Inclusion	15	Community representation & welfare (10) / Education, reading & literacy (2) / Journalism & Investigative reporting (2) / Public engagement and awareness (1)
total	161	
Media		
Software and Digital Products	38	Mobile Applications & Apps (13) / Games & Playful Digital Products (9) / Interactive dig. media systems (7) / Social networking platforms (4) / Web & Internet development (3) / Programming Languages (2)
Content Media	30	Documentary and Film (10) / Graphic design and illustration (8) / Digital Media Production (4) / Data-driven visualization & artwork (3) / Animation (3) / Literature & creative writing (2)
Physical Media and Products	20	Craft and Lifestyle (5) / Transport & Mobility (5) / Textiles & Fashion (3) / Smart devices (2) / Music technology (2) / Gaming technology (1) / Culinary (1) / Medical and Healthcare (1)
Performing Arts	20	Theatre (10) / Music (6) / Dance (2) / Opera (2)
total	108	
Arts		
Arts Research	23	Practice-led Research (12) / Creative Technology and Interactive Performance (7) / Fine Art and Digital Print Research (1) / Arts and Digital Innovation (1) / Visual Cultures (1) / Audience Research (1)
Theatre	18	Theatre and Performance Studies (12) / Applied Theatre (5) / Creative Producing (1)
Music	9	Sound Arts and Computer Music (3) / Music Production and Technology (2) / Ethnomusicology (2) / Musicology (1) / Music and Performance Studies (1)
total	50	
Humanities		
History	12	British Social History (3) / History of Latin America (2) / History of Art (2) / History of Sexuality (2) / History of Landscape and Spatiality (1) / Animal History (1) / History of Medicine (1)
Literature	9	Modern and Contemporary Literature (3) / Literature and Digital Adaptation (3) / Children's Literature (1) / Literature and The Gothic (1) / Religion and Literature (1)
Linguistics	1	Syntax, Semantics and Language Models
total	22	
Applied		
Journalism, Media & Cultural Studies	45	Digital Cultures & Practices (13) / Film and Documentary (10) / Game Studies (10) / Cultural Studies (5) / Creative & Cultural Industries (4) / Science Communication (2) / Community Journalism (1)
Design	30	Innovation Design (7) / Product (7) / Interaction and Human-centred (6) / History and Methods (3) / Creativity and Environments (2) / Design Ethnograph (2) / Design for Social Intervention (1) / Graphic (1) / Industrial (1)
Architecture	24	Digital Information Environments (7) / Architectural History & Criticism (6) / Spatial Practices (3) / Environmental Design & Behaviour (3) / Urban & Town Planning (2) / Transport (2) / Landscape (1)
Business Management	12	Entrepreneurship and Innovation (6) / Marketing and Strategy (4) / Information and Knowledge Management (2)
Education	5	Community Studies (2) / Childhood Studies (1) / Disability Studies (1) / Arts in Education (1)
Law	1	IP and Technology Law
total	117	
Social Sciences		
Geography	10	Historical Geography (4) / Cultures of space and place (4) / Medical Geography (1) / Animal Geography (1)
Sociology	10	Death and Society (3) / Social Network Analysis (3) / Participation, Community and Citizenship (2) / Technology and Society (2)
Psychology	9	Media Psychology (6) / Marketing and Consumer Psychology (3)
Archaeology	5	Social Anthropology (3) / Biosocial Anthropology (2)
Anthropology	5	Bioarchaeology (3) / Maritime Archaeology (1) / Neolithic Archaeology (1)
Political Science	2	Politics of Knowledge
total	41	
STEM		
Computer Science	35	Creative & Social technologies (18) / Human-centric & interactive systems (9) / Computational & Artificial Intelligence (2) / Imaging & Sonification Research (2) / Multimedia Communication (2) / Distributed computing (1) / Computational linguistics (1)
Engineering	3	Medical devices (2) / Integrated circuit and signal processing (1)
Biosciences	1	Biotechnology
total	39	

Disciplinary Offerings

Arts
Humanities
Applied
Social Sciences
STEM



Creative Economy Offerings

● 20 ● 10 ● 5 ● 1 Number of Creative Economy – Disciplinary pairings

Figure 2

Creative Economy Outputs by Academic Discipline

The relationship between disciplinary project offerings and creative economy outputs. The multiple incidences of column and row pairings reveal the rich connections between academia and a broad swathe of creative economy work fostered by the four Hubs. Grid data and additional information on Figure 2 is given in Appendix A.2 of column and row pairings reveal the rich cross-sector collaborative activities enabled by the four AHRC Hubs in a creative economy context. Grid data and a full explanation of the analysis behind Figure 1 is given in Appendix A.1

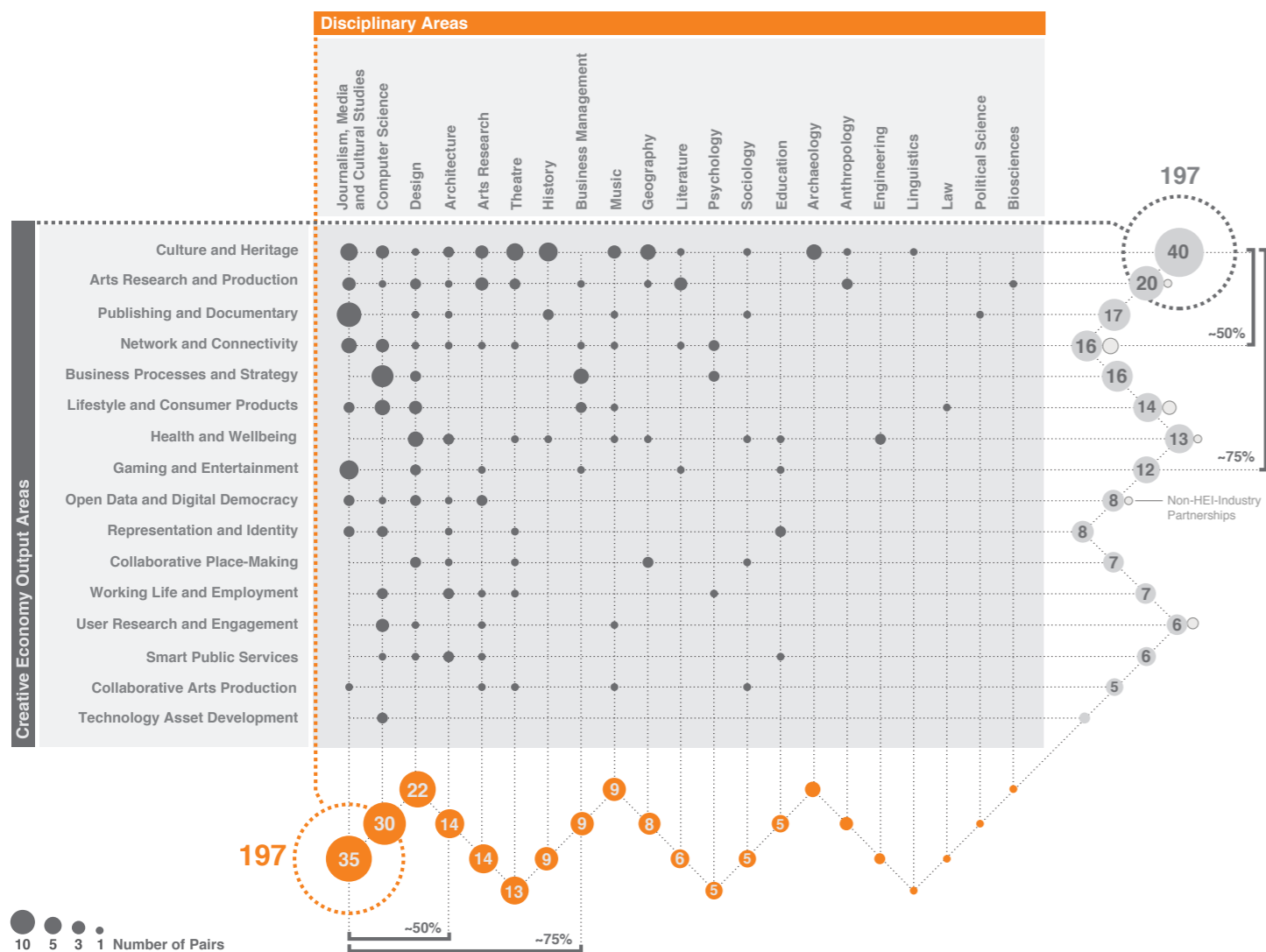


Figure 3

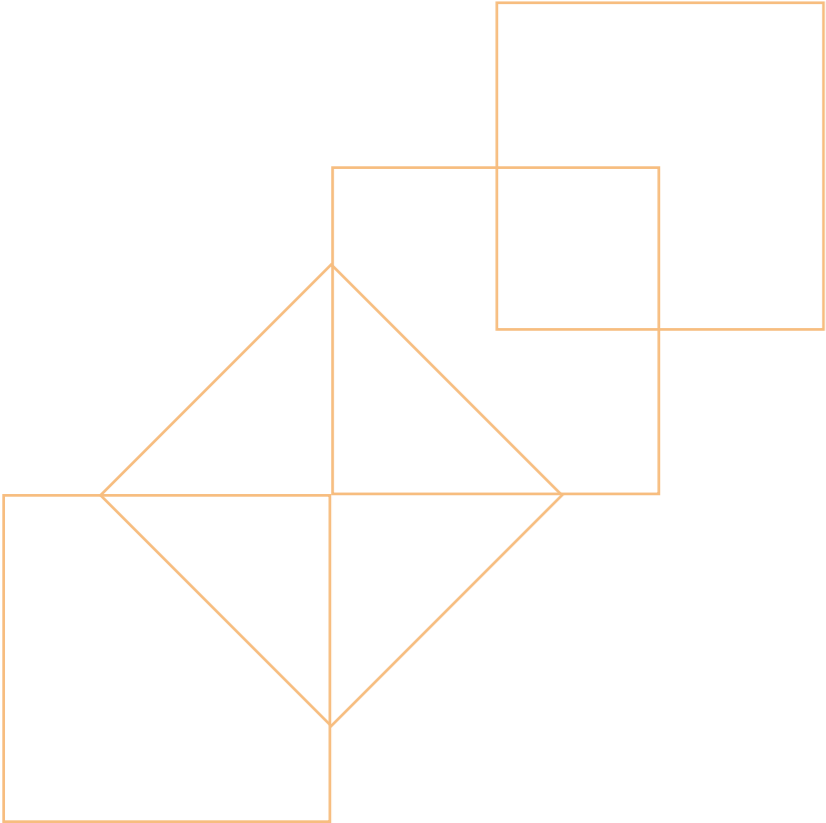
Creative Economy Outputs by Hub

Creative economy outputs in relation to different Hub entities. The breakdown of Hub projects is shown according to creative economy output area (left), as indexed by each Hub or Hub scheme (centre) and academic input for the selection of projects indicated (right). Data and additional information on Figure 3 is given in Appendix A.3



Innovation A focus on the
Arts and Humanities

Section
03



3.1 Four Emerging Innovation Themes

The body of work generated by the Hubs programme can be categorised into five key creative economy output areas (Figure 3). Each Hub's unique fingerprint reflects its particular aims in enabling cross-sector collaborative work (see Report Two for details) and points towards the interrelatedness or interdependence of different outputs areas that arise in devising a creative economy intervention strategy. With a focus on the arts & humanities, at least four important innovation themes have emerged from the Hubs programme, themes that sit within or cut-across the creative economy areas identified.

Innovation Theme 1: *At the Boundary between Physical and Digital*

In large part, Hubs' work has operated at new and emerging boundaries between the physical and the digital. With an explosive advance in digital technologies underway, the capacity to situate computational processing within everyday life has never been greater, opening up a contested space for exploration and provocation. The Hubs have tested this ground in three ways: 1) by putting established digital methodologies to new ends and users; 2) by exploring digital-physical hybridity as a means of asking new questions around cultural production; and 3) by proposing alternative futures for the Internet of Things and the role of Connected Objects. These activities have come to influence the full breadth of Hubs' outputs in the creative economy. Further, they point to the importance of engaging the arts & humanities with other disciplinary / sector expertise in imagining the future role of emerging technologies and digital tools.

The Hubs programme has enabled academic researchers to access core areas of contemporary digital innovation practices, such as software app development. These practices – largely well developed and articulated – have enabled collaborative projects to open up new digital content to questions of user access and experience design. Within this area of Hubs' work, the development of stand alone apps has proven a practical site for collaborative engagement, enabling new work in the area of game design, public engagement with archival data and collections, personalized-data gathering, and health and wellbeing services (see example projects 1-3). The relatively small number of such projects overall (under 5%) likely reflects the Hubs broader engagement with a variety of digital innovators, including those driving more experimental digital methodologies and approaches.

In this direction, mixed reality gaming in which mobile apps are used to situate digital content and user experiences around real-world behaviours has emerged as an important area of Hubs' work, especially for the arts, humanities and allied fields in the areas of human and historical geography (sometimes termed the geohumanities). Here, digital content can be remediated in the cultural, social, and geographical contexts from which it originally derived, or placed in contexts through which it might find new relevance with contemporary audiences. Themes have included literary encounters in public, commercial, and private spaces; the geo-location of historical urban and social data; and the creation of real-time artistic experiences to explore themes of cultural migration and physical mobility. See example projects p4-6. Interactive Documentary making (participatory iDocs) has also been an important site for new collaborative partnerships in this regard. Here, cross-sector work has helped bring together the diverse body of disciplinary and creative expertise needed to conduct innovative sector-leading R&D. Projects have explored the role of co-production in documentary making and tested new

ground in combining linear film with live data streams, interactive visualisation, and real-time physical / locative behaviour (see example projects 7-9).

Although the ubiquitous mobile device is a powerful means of delivering content in a way that anybody with a smart/android phone can experience, a strong focus within the Hubs programme has emerged on how the technology behind content delivery can be further embedded into everyday objects and scenarios to engender stronger site-specific experiences. It is at this junction – the immersion of the digital into the physical world – that the Hubs have sought to experiment with new forms of digital-physical hybridity and data objects, further expanding core interests in immersive place making, experience design, public making, and so on. For example, investigations into physical-digital hybridity have led to the development of innovative, immersive theatre pieces and gaming / play environments; systems for deeper immersion of audiences into specific historical or imaginary contexts; and better use of unique, place-specific characteristics to shape audience experience. See example projects 10-12. Further, the opening-up of 'digital action' to a greater variety of human behaviours (physical, locative, gestural, and social) has enabled projects to explore new forms of physical agency in relation to open-data, arts production, and valuing practice (see example projects 13-15).

The Hubs have extended this work further to explore Connected Objects within the Internet of Things (IoT) paradigm. The IoT paradigm speaks to the pervasive presence of internet-connected objects in the environment, that, through unique addressing schemes, interact with other objects to support new forms of connectivity between data, objects and people. Current technological developments are giving rise to an unparalleled capacity to network objects in their diverse spatial and temporal contexts, allowing human activities of all kinds to be influenced. The IoT paradigm is one believed to have wide implications for our lived social and cultural realities in the future²⁰. As networked objects move towards a state of ubiquity, an approach to the IoT paradigm is needed that can anticipate the full scope of its potential impact and demonstrate where cross-sector collaboration may be both beneficial – and indeed necessary – if that potential is to be fulfilled whilst remaining responsive to the cultural and social contexts that inform it. As such, the arts & humanities must be part of the IoT conversation.

Previous research from this author into the REACT Hub's IoT work has suggested that this is exactly where the arts & humanities (and the role of the creative Hub) operate. We see a "role of the arts and humanities in shaping the IoT, in broadening our conception of the IoT platform: 1) through providing comprehensive understanding around the aesthetic, cultural and social contexts in which networked objects can operate; 2) through revealing the wider scope of possible networked devices that can be conceived, and the distinctive ways in which they network people, objects and data; 3) by expanding notions of what 'user experience' in the IoT might be, so opening up new roles for networked objects in relation to more complex interactive, social and cultural activities; 4) through exposing the scope, impact and interconnection of valuing practices that can shape the creation of networked objects, practices that extend beyond the money economy to encompass education, innovation, well-being and creative citizenship."²¹ This work is possible because of the natural alignments with other disciplines in the digital innovation ecosystem defined earlier and how, together, they can work in anticipation of a more human-centred, connected future. Three REACT projects developed addressed innovative forms of Gaming, Education, and Haptic communication (see example projects 16-18).

Innovation Theme 2: *Connected Communities and Digital Social Innovation*

A second core theme in the work of the Hubs programme has been the use of creative digital approaches to help strengthen the connectivity between organisations and the audiences, users, and members they support. In their pursuit of Connected Communities, the role of the digital has been critical, helping to open up new means of mobilising communities, sharing resources and empowering people, work that has embraced both public and private sector partners. In exploring the role of digital innovation to help foster and support connected communities, five core areas have emerged: 1) Co-production in the arts; 2) Collaborative place making; 3) Network strength and connectivity; 4) Representation and Inclusion; 5) Open data and Digital Democracy.

This work has been achieved through the Hubs' support of diverse cross-sector partnerships that draw broadly from the arts & humanities, computer science and social sciences (Figure 2; Figure 3 – creative economy outputs B). These are areas where arts & humanities perspectives rise to the fore in generating sites for co-production that can engage people across cultural and social boundaries, help relate people to shared environments and engage with social similarities and differences, and enable people to explore a shared voice and identity through collaborative making. Many of the principles underlying the Hubs' engagement in this cross-sector work (discussed in Report Two) are now gaining wider recognition as a means of overcoming barriers to social innovation, with important roles attributed, for example, to co-design and co-creation of innovative solutions; the need to adopt new and collaborative service delivery models; the embracing of creative disruption from technology; the adoption of an experimental and entrepreneurial position (e.g. 22) – these are principles that can operate across different scales, from micro-activism to local and national governance.

1 - Collaborative Arts Production: Hubs' projects have worked to develop online tools and social media platforms for helping performance art organisations engage with their audiences, for example through enabling arts practitioners to access creative input from their broader community or directly undertake new forms of artistic co-creation. Projects have also created new software and hardware solutions for collective publishing and community based film and media production, whether operating remotely or in a co-located groups. See example projects 19-21.

2 - Collaborative Place-making: Hubs' projects have investigated the role that performance, arts practices, museum collections, and food cooperatives can have in fostering a sense of community and relationship to place, working to address specific issues faced by, amongst others, residents, young women, or inter-generational groups. Further, Hub's work has led to the development of methodologies for engaging diverse stakeholders in future visioning for urban areas in flux (whether temporary use or redevelopment), helping to connect place-understanding with place-making. See example projects 22-24.

3 - Enhancing network connectivity: Hubs' projects have enabled the creation of tools and insight required for active arts / cultural organisations to further strengthen their networks. This has included the development of tools for better-connecting creative activities, marketing and operations within organisations, so strengthening understanding for growth; also, the development of programmes and research methods /analysis for enhancing collaborative production within creative talent pools, across creative networks, community participants or institutions, and within industry sectors (e.g. between makers, industry and design graduates). See example projects 25-27.

4 - Representation and Inclusion: Hub's projects have asked how minority, disadvantaged, or vulnerable groups can be supported in becoming better-connected and empowered. Projects have included the development of platforms for showcasing excellence among blind and visually impaired musicians; the creation of digital tools for promoting artistic production between disabled and non-disabled groups; the use of artistic practises to give voice to young people from disadvantaged backgrounds and support young offenders in desistance work; and the use of digital and technological interventions to give voice to victims of political persecution. See example projects 28-30).

5 - Open Data, Community Journalism, and Digital Democracy: Hubs' projects have explored the role of the digital and participatory design in addressing civic and societal issues. Projects have developed digital models for enabling citizen journalism, so helping communities engage with the concerns and interests of their residents; explored attitudes to data privacy; developed an online game for playful political engagement in local democracy; investigated digital communal spaces in which people can own their own data and control how they engage in creative interactions with others; and tested the creation of a wearable open-data device to increase awareness around data foot prints. See example projects 31-33.

Innovation Theme 3: *Innovation in Cultural and Heritage*

1 - Engaging with Diverse Heritage Materials: As university-embedded entities, the Hubs have proven well placed to engage with the breadth and scope of contemporary interests in the heritage arena. Hub projects have engaged with musical, operatic, literary, film, theatre and performance cultures; they have engaged with natural as well as cultural and social heritage issues; they have explored a variety of public and personal archival materials and those materials not yet preserved or at risk of being lost; they have exposed to new audiences heritage subjects from pre-history through to contemporary society, including topics in migration and politics. See example projects 34-36.

2 - Working with rarefied culture: Hubs' projects have revealed the diversity of arts & humanities engagements with cultural artefacts and movements, enabling – through creative economy activity – a broadening of access to lesser known stories, narratives and materials. Projects have worked to capture rare oral and musical cultures; engage with cultural artefacts that are now rarely in the public eye or have resisted new forms of digital engagement; and bring archival material to attention in order to engage debate in the public domain. Part of this process has necessitated working with communities to co-design the right approach to engaging with rarefied culture. See example projects 37-39.

3 - Innovative forms of engagement: In bringing new audiences to heritage materials, or renewing that engagement for more familiar audiences, the Hubs have explored heritage applications of new and emerging digital / technological methodologies such as connected objects, internet of things, mobile gaming, interactive documentaries, and physical-digital interfaces. Projects have also not limited themselves to digital objects, but engaged with new types of material representation and digital manufacturing in their engagement with heritage and cultural practices. New forms of co-creation, event capture, and collaborative sharing have further enriched forms of audience engagement developed. See example projects 40-42.

4 - New tools for audience understanding: Hubs' projects have revealed how the innovation ecosystem composition developed within the Hubs programme can support the creation not only of new forms of engagement with cultural and heritage material, but also act as a means of asking more fundamental questions about audiences and value. Projects have explored the intricacies of Fandom groups; worked to understand audience experiences and expectations at arts venues; developed tools for engaging intergenerational audiences at cultural venues; and explored new forms of monetary transaction and value communication in cultural contexts. See example projects 43-45.

Innovation Theme 4: *Anticipating Markets for Creative Business Success*

The Hubs have shown how arts & humanities scholarship and ways of working can be a core component of creative economy business success. This emerging alignment reflects not only a deeper understanding of how the arts & humanities can be performed in a creative economy setting, but also a falling-in-place with the needs of external partners in the private and third sectors.

Businesses have benefited from the development of new assets (including prototype products, services, and process – around 600 assets recorded as directly coming out of Hubs work); have gained important, and often provocative R&D experience that would not have been possible in their everyday working context; have been supported in developing better strategies for sector entry and integration; have developed audience and user understanding; and have explored new possibilities – taking an anticipatory position – in the commercial domain.

On the timescale of Hubs work, these are business assets that may not find impact immediately in the market place, instead contributing to the future orientation and development of business practices down the line. Indeed, given the experimental nature of many of the Hubs' projects, the markets in which such work could find a place may only be in early stages of development or need still to be created. This is the operation of a healthy innovation system, one that can generate new provocations and bring disruptive inputs into markets. Even on the short time-frame of Hubs' work, however, a number of new businesses have emerged from the programme that have undergone rapid growth, taking, in a number of cases, highly innovative products and services to market.

Three Business Spotlights:

- 1. Beer 52:** DiA's commercial success story has been Beer 52, an online craft beer ordering service platform launched in 2013 that now helps 12,000 microbreweries to get onto the shelves of big supermarkets. The company was born out of the Design in Action Chiasma and is now the largest craft beer club in the world, with a turnover of over £2.0 million and 13 full-time employees. DiA's design-led approach was central to developing an effective user-centred business model and development strategy, one that has proven powerful in keeping customers on board as the company has developed, a process of including and valuing their participation to keep the company on track and responsive to its market. This can be framed in the context of design innovation in a Pull economy, where business growth is built closely on the support, experience, and values of its users.

- 2. Red Ninja:** For CX, the design-led technology company Red Ninja, based in Liverpool, has revealed the full potential for their PhD-led innovation model. Off the back of the prototype 'Open Planning' app (developed to better engage the public with urban planning processes), Red Ninja is now working with utility companies for whom intuitive and rapid access to planning application data is essential in the implementation of large infrastructure projects, but no successful provision for such data is yet commercially available. This has enabled the business to expand its workforce from 0.5 to 13 employees and start operating internationally. The success of the Open Planning project has been attributed to a broad cross-disciplinary team of practitioners and researchers, drawing on expertise from creative arts technologies, interactive data visualisation, and narrative processes to improve the articulation of public-facing urban planning materials.
- 3. Reach Robotics:** REACT have been critical in helping Reach Robotics become the first company in the world to develop gaming robots for young people, supporting the business in a multi-stage process to develop refined prototypes, build a gaming approach, and pursue product commercialisation. MekaMon are app-controlled game-to-life robots that come with developer software to let users customise robot behaviours. Following participation in the prestigious Qualcomm Robotics Accelerator in San Diego (worth nearly \$500k in investment and mentorship support), the product has now been launched; the business has taken on 6 employees in this process, with an additional 17 positions now advertised. REACT have been central to the product's development, where working with researchers on models of creativity amongst game players, gamer culture, and fan practises helped to add character and narrative into the product's appeal. Their research expertise has helped the business develop a more robust understanding of users in the marketplace.

3.2 Future Innovation Challenges

The operation of the arts & humanities as part of a broader academic engagement with the creative economy reveal where university-embedded creative Hubs can build on their cultural, creative, social and business innovation activities to address other emerging innovation challenge areas.

One important area touched upon by the Hubs programme as a good candidate for future cross-sector engagement in the creative economy has been Health and Wellbeing. Hubs' projects have explored a number of different creative challenges in this arena, including the use of creative / design methods to engage patient populations and their families in discussion around health-related issues, such as dementia, diabetes, and the design of healthcare settings; the design of new healthcare devices, for example in relation to stress relief and diabetes monitoring; and the creation of software apps and supporting digital platforms (addressing topics such as sexual health, healthy living and eating, patient monitoring). See example projects 46-50. The potential for further work in this area, and its development in connection with topics such as smart public services and connected communities, is considerable. For example, the creative Hub model is well suited to tackle some of the field's bigger challenges, those in which cross-sector and cross-disciplinary collaboration play a role: One such area for future development is the role of arts, cultural, and creative-technology-led interventions in health and wellbeing practices. Here, a pressing concern is the alignment of arts intervention design with hypothesis testing linked to contemporary medical research and the development of evaluation methodologies able to bridge clinical and arts contexts. It is work that reaches out to a diverse body of collaborative partners, including patients and caregivers, medical research scientists,

clinicians and healthcare managers, creative practitioners / businesses, and the triad of arts & humanities, computing and social sciences.

Across the breadth of the Hubs programme, at least three additional target areas for Hubs' work have also emerged. Firstly, Innovation in Education: Hubs' work has shown how a broad engagement around arts & humanities interests can lead to new software apps and connected objects targeting educational activities in diverse settings and for a variety age groups. Here, the creative Hub model seems highly suited in driving access to different educational contexts (including universities, schools, museums, archives, and home learning) and coupling disciplinary expertise in educational practices with creative economy partners and beyond. Secondly, Innovation in Technology: Whilst not always visible, the implicit development of new software and hardware underscoring Hubs' work reminds us of their potential in a Technology innovation context. Whether designing hybrid display systems, connected object interfaces, interactive digital platforms, or innovative ways of bringing non-proprietary, open source technologies (such as Raspberry Pi and Arduino) to bear on bottom-up innovation challenges, the Hubs have evidenced their claim in this area. Thirdly, Innovation and the Environment: One hub in particular – Design in Action – has explored the role of design methodologies in addressing innovation concerns around Energy Security, Rural and circular Economies, urban farming, and low-carbon futures. Whilst DiA's design-led innovation model has generated a number of projects in this arena (example projects 51 and 52, and with many more ideas under IP shelter protection), this is an area of work highly applicable to future creative Hub activity.

In the context of the creative economy, the interconnection between these four themes and the principal concerns emerging from the Hubs programme once again attests to the role creative Hubs can play in intensifying the value of ideas across sectors and disciplines. Reaching further across the creative economy opens up an opportunity to perform the arts & humanities as a body of disciplines in yet another way, testing our understanding of their role as part of a far-reaching and anticipatory innovation ecosystem.

Project Examples

1. The next time line: Classic texts reworked to create more dynamic and compelling timelines for the digital world (REACT) – <http://www.react-hub.org.uk/projects/books-print/next-timeline>
2. ScrAPP book: A community-orientated digital scrapbook (DiA)
3. BAUM: A physics-based game with platformer aspects and reaction-based puzzles (DiA)
4. Writer on the train: Travel writing that responds to a readers' journey in real time (REACT) – www.react-hub.org.uk/projects/books-print/writer-train
5. Tuning into T. Dan Smith: Exploring the role of digital technology in the interpretation of urban spaces and urban regeneration (CX) – www.thecreativeexchange.org/projects/tuning-t-dan-smith
6. Walking Journeys and Knowledge: Artist led walking tours exploring concepts of interculturalism (CWL) – www.creativeworkslondon.org.uk/creative_voucher/motiroti-and-city-university/
7. The Risk taker's survival Guide: An interactive documentary that takes you on a journey to explore your engagement with day-to-day risk (REACT) – www.react-hub.org.uk/projects/future-documentary/risk-takers-survival-guide
8. jtr125: A playable documentary that explores notions of crime and ethics in the Jack the Ripper case (REACT) – www.react-hub.org.uk/projects/future-documentary/jtr125
9. Red Tales: A Participatory iDoc (CX) – <http://www.thecreativeexchange.org/projects/red-tales-participatory-idoc>
10. Hyde: An interactive, and bio-activated horror attraction (REACT) – www.react-hub.org.uk/projects/alumni-books-print/hyde
11. Ghosts in the Garden: An audio geo-locative game where history and imaginative play meet head-on (REACT) – www.react-hub.org.uk/projects/heritage-alumni/ghosts-garden
12. Teleportation tent: A digitally enhanced children's den that can take you places (REACT) – www.react-hub.org.uk/projects/play/teleportation-tent
13. Numbers that matter: A project exploring people's understanding of data by co-designing a wearable open-data device (CX) – www.thecreativeexchange.org/projects/numbers-matter
14. This is how we do it: Exploring the value of digital technologies to capture and encourage reflection on craft practices (CX) – www.thecreativeexchange.org/projects/how-we-do-it
15. Money no Object: An artist's research exploring the future of currency and value (CWL) – www.moneynoobject.co.uk
16. Fabulous Beasts: A game of stacking smart objects, combining the depth of digital gameplay with a physical, social experience (REACT) – www.react-hub.org.uk/projects/play/fabulous-beasts
17. Reflector: A connected object to explore the stories of the Transatlantic Slave Trade (REACT) – www.react-hub.org.uk/projects/objects/reflector
18. In Touch: An exploration into the subtleties and qualities of haptic interaction in Internet-connected objects (REACT) – www.react-hub.org.uk/projects/objects/touch
19. Scratchr.net: Digital Collaboration between Artists, Audiences, and Producers (CWL) – http://www.creativeworkslondon.org.uk/creative_voucher/battersea-arts-centre-and-the-royal-central-school-of-speech-drama/

20. London Sinfonietta's CoCurate: Establishing a digital platform to bring audiences into the artistic process (CWL) - www.creativeworkslondon.org.uk/creative_voucher/elizabeth-davies-and-kingston-university-london/
21. Book kernel: Makes a book of your event and getting it to you before that event is over (REACT) - www.react-hub.org.uk/projects/books-print/book-kernel
22. Limehouse Cut pilot project: linking place and creativity (CWL) - www.creativeworkslondon.org.uk/creative_voucher/shared-assets-ltd-and-kingston-university/
23. See breeze: Using community engagement to create artistic interventions in contested and heritage spaces (CX) - www.thecreativeexchange.org/projects/sea-breeze
24. A Sense of Place: intergenerational arts practice and cultural collections (CWL) - www.creativeworkslondon.org.uk/creative_voucher/susan-langford-and-queen-mary-university-of-london/
25. Digital Shoreditch Festival: Deep Insight for understanding for growth (CWL) - www.creativeworkslondon.org.uk/creative_voucher/digital-shoreditch-and-city-university-london/
26. Power of the collective: developing a knowledge-exchange platform between UK manufacturers and young, London-based entrepreneurial designer-makers (CWL) - www.creativeworkslondon.org.uk/creative_voucher/stumped-studio-and-camberwell-college-of-arts-ual/
27. Stellar Network: Research-led Training to Develop Co-Created and Immersive Stories (CWL) www.creativeworkslondon.org.uk/creative_voucher/stellar-network-and-university-of-roehampton/
28. VIBE (pilot): A platform to showcase and promote excellence in professional practice among blind and visually impaired musicians, sound engineers and producers (CWL) - www.creativeworkslondon.org.uk/creative_voucher/drake-music-queen-mary-university-of-london/
29. Only Connect Arts Research Project: seeking to demonstrate the value of the arts in reducing offending behaviour. (CWL) - www.creativeworkslondon.org.uk/creative_voucher/only-connect-and-institute-of-education/
30. The Quipu project: Sharing the voices of people affected by Peru's unconsented sterilization policy (REACT) - <http://www.react-hub.org.uk/projects/future-documentary-alumni/quipu-project>
31. Blockanomics: A system to promote playful political engagement between people and local democracy, in the shared digital space of a locally tailored minecraft world (CX) - <http://thecreativeexchange.org/projects/blockanomics>
32. Indiedata: Enabling participation in a consumer facing fully open source product, and researching a mode of business that doesn't exploit user data. (CX) - <http://thecreativeexchange.org/projects/indiedata>
33. The News where you are: Exploring how citizen journalism can play a role in the production of professional news coverage (CX) - www.thecreativeexchange.org/projects/news-where-you-are
34. Connections: Advancing the June Givanni Pan African Cinema Archive (CWL) - www.creativeworkslondon.org.uk/creative_voucher/june-givannis-pan-african-cinema-archive-birkbeck-university-of-london/
35. The Ivory bangle lady: Unravelling the mysterious story of a young woman of African descent living in Roman York (REACT) - www.react-hub.org.uk/projects/heritage/ivory-bangle-lady
36. Big Journeys, Untold Stories: Telling the stories of migration (CWL) - www.creativeworkslondon.org.uk/creative_voucher/counterpoints-arts-royal-holloway-university-of-london/
37. Song Catchers: Archiving and promoting oral culture in London (CWL) - www.creativeworkslondon.org.uk/creative_voucher/song-collectors-collective-soas-university-of-london/
38. Curpanion: An internet-connected, personalised curatorial device that brings life to museum taxidermy (REACT) - www.react-hub.org.uk/projects/objects/curpanion
39. The Future Cemetery: Combining knowledge of commemoration, technology and audience experience to explore the future of death and dying (REACT) - www.react-hub.org.uk/projects/heritage/future-cemetery
40. God Article: Breathing technological life into an ancient Turkish instrument (REACT) - www.react-hub.org.uk/projects/objects/god-article
41. Department of Hidden Stories: Encouraging interaction with books and libraries using mobile games (CX) - www.thecreativeexchange.org/projects/department-hidden-stories
42. Playful Public Realms: Designing digital technology for experiences of play in a heritage space (CX) - www.thecreativeexchange.org/projects/playful-narrative-realms
43. CX On the precipice: Developing tools to capture audience experience in exhibitions (CX) - www.thecreativeexchange.org/projects/precipice
44. The Geeks will inherit the Earth: The 'geek pound' and new value opportunities in the widening appeal of science fiction (CWL) - www.creativeworkslondon.org.uk/creative_voucher/serendip-foundation-the-arthur-c-clarke-award-and-birkbeck-university-of-london/
45. Opera Live: Building audiences for live opera through understanding the appeal of 'Opera Live' at the cinema (CWL) - www.creativeworkslondon.org.uk/creative_voucher/aislinn-ryan-and-guildhall-school-of-music-drama/
46. Aging playfully: Co-designing interactive and playful ways to encourage dementia-friendly exercise and movement. (CX) - www.thecreativeexchange.org/projects/ageing-playfully
47. Art and Design interventions in healthcare: Transforming the micro-locality of Renal Unit through art and design interventions (CWL) - www.creativeworkslondon.org.uk/creative_voucher/vital-arts-and-central-saint-martins-college-of-arts-and-design-university-of-the-arts/
48. Know Sugar: Pop-up shops, products and services promoting a no/low sugar lifestyle (DiA)
49. Breathing stone: A hand-held device that senses and reduces stress by generating music from heart rate and breath (REACT) - www.react-hub.org.uk/projects/objects/breathing-stone
50. States of Mind: An interactive tool enabling the creation of virtual data objects representing emotional states (CX) - www.thecreativeexchange.org/projects/states-mind
51. Table farm: An innovative smart edible plant growing system (DiA)
52. UAN wool: Products utilising wool's natural health and anti-allergen properties (DiA)

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A.3 Data and Additional Information for Figure 3: Creative economy output areas in relation to different Hub entities (Left). Disciplinary areas active in projects in relation to Hub selections shown.

Creative Economy Output Area	Hub or Hub Programme				
	CWL (fusion)	CWL (vouchers)	Design in Action	The Creative Exchange	REACT
Culture and Heritage	3	11	0	4	22
Arts research and Production	0	3	0	11	7
Publishing and Documentary	0	1	0	1	15
Network and community	3	9	2	3	2
Open data and Digital democracy	0	0	0	9	0
Representation and Identity	0	8	0	0	0
Collaborative Place-Making	0	5	2	0	0
Collaborative Arts Production	0	4	0	0	1
Lifestyle and Consumer Products	5	3	5	0	4
Gaming and Entertainment	0	0	3	5	6
User Research and Engagement	4	1	2	1	0
Health and Wellbeing	0	2	4	4	4
Working life and Employment	3	2	0	2	0
Smart Public services	2	0	0	4	0
Business Processes and Strategy	16	0	0	0	0
Business Processes and Strategy	2	0	0	0	0

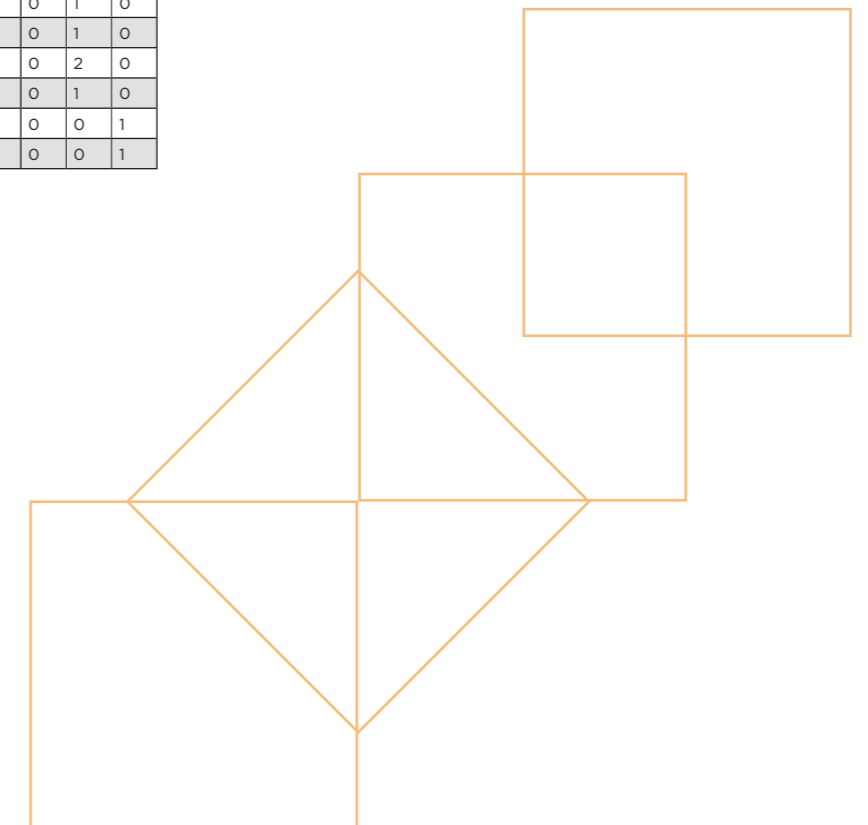
Project Selection	Disciplinary Area				
	Arts	Humanities	Applied	Social Sciences	Eng. and Comp. Sci.
A - REACT only	7	10	12	13	2
B - CWL (voucher) only	7	0	10	4	4
C - All Hubs	4	1	13	3	5
D - All Hubs	5	1	19	0	7
E - CWL (fusion) only	0	0	6	2	10

Table left: These data reflect the total number of Hub projects described in A.2 (numbering 209), i.e. including those that involved atypical collaborative formations, for example those lacking an academic partner.

Table right: These data reflect only those projects in the selection that included an academic partner.

A.4 Partnerships Between Traditional Humanities and Creative Economy Offerings.

Creative Economy Offerings (level 3; see A.1)	Humanities Disciplines		
	History	Literature	Geography
Product and Engineering Design	1	0	0
Creative Agency	2	0	3
Location-based interactive experiences	4	2	0
Heritage and Conservation - Cultural	1	0	1
Mobile applications and Apps	1	0	2
Social networking platforms	1	0	0
Graphic design	1	0	1
Documentary and film	1	0	0
Innovation environments and programming	0	1	1
Publishing and literary promotion	0	1	0
Education, reading and literacy	0	1	0
Digital Games and Playful Digital Products	0	2	0
Theatre	0	1	0
Arts programming	0	0	1
Community representation and welfare	0	0	1





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