



Arts & Humanities
Research Council



Arts and Humanities Research and Innovation

Hasan Bakhshi, Philippe Schneider and Christopher Walker



CONTENTS *page*

Executive Summary **1**

- 1. Introduction and Motivation** **4**
- 1.1 The increasing importance of innovation 4
 - 1.2 A systemic perspective 4
-

2. A model of innovation system dynamics **6**

- 3. Knowledge is at the heart of innovation** **8**
- 3.1 The importance of knowledge 8
 - 3.2 The importance of arts and humanities knowledge 9
-

- 4. Dilemmas for knowledge accumulation** **12**
- 4.1 Specialisation 12
 - 4.2 Tensions with knowledge sharing 13
 - 4.3 Absorptive capacity 13
-

5. Knowledge Modes: the distinctiveness of arts and humanities knowledge **15**

- 6. The Arts and Humanities Research Council** **18**
- 6.1 The AHRC and Innovation 18
 - 6.2 The AHRC and knowledge transfer 22
 - 6.3 The AHRC in the funding environment 26
-

7. Conclusions **29**

Arts and Humanities Research Council
Whitefriars
Lewins Mead
Bristol
BS1 2AE

www.ahrc.ac.uk

National Endowment for Science,
Technology and the Arts
1 Plough Place
London
EC4A 1DE

www.nesta.org.uk

Published: November 2008

This report was written by Hasan Bakhshi (Research Director, Arts & Innovation, NESTA), Philippe Schneider (an independent researcher) and Christopher Walker (Impact Evaluation Manager, AHRC).

Editorial assistance was provided by Conor Ryan.

Executive Summary

Arts and humanities research in the innovation system

Policymakers increasingly recognise that the UK's ability to address urgent social issues and to remain competitive in global markets rests on innovation – the successful exploitation of new ideas.

But innovation does not happen in isolation. It requires cooperation between government, universities, third sector organisations, entrepreneurs, businesses and consumers. Innovative performance depends on their relationships and on the quality of the overall system. Innovation flourishes when there is a strong knowledge base combined with a culture of tolerance that embraces novelty and a diversity of ideas.

Traditional understandings of innovation emphasise the importance of science and technology research. In contrast, this paper investigates the role that arts and humanities research plays in the innovation system. It goes on to explore the funding structures by which the government supports this research in the UK, and the work of the Arts and Humanities Research Council in particular.

The functions of a healthy innovation system

A well-functioning innovation system is constantly evolving. Knowledge creators and entrepreneurs experiment with different ideas and technologies, thereby generating variety. Ideas are evaluated to distinguish between the 'good' and the 'bad'. Dominant designs emerge, and when they do, attention switches from exploring new alternatives to exploiting economies of scale. At the same time new entrepreneurs emerge and experiment, further pushing out the frontiers of our knowledge.

Innovation is increasingly a shared activity. It relies on networks built on trust, proximity, repeat engagement and 'social capital'. The strength of trust between actors in the innovation system determines how much collaborative learning takes place.

Intermediaries like the Arts and Humanities Research Council help to bring the different actors together. They 'cross-pollinate' between previously unrelated or unconnected groups, and

help link individuals and organisations to new knowledge created elsewhere.

The distinctive contributions of arts and humanities knowledge

The arts and humanities cover a very wide range of research disciplines, including archaeology, English literature, history, music and philosophy. They contribute to a constantly growing body of knowledge on human experience, agency, identity and expression, as constructed through language, literature, artefacts and performance. This knowledge nourishes the UK's cultural existence, and inspires creative behaviour, as well as innovative goods and services.

The arts and humanities have a particularly strong affiliation with the creative industries. There is growing evidence that this research helps to fuel those industries, and that the creative industries in turn stimulate and support innovation in the UK.

Sciences, technologies, arts and humanities complement each other. They are not hierarchically ordered. Science allows us to evaluate whether a proposed change is practical, by testing whether it will secure its intended goals. Yet it does not have a monopoly on setting those goals.

Arts and humanities research gives us the background that allows us to understand the complex effects of change on society. Examples include access to knowledge of historical experience, the understanding of foreign languages and cultures, and the capacity to use design-related solutions to solve social problems.

Arts and humanities research can also communicate and translate science for general audiences, for example using images to communicate complex health-related information to patients, or explaining the impact of climate change to the wider public.

Arts and humanities research often revisits ambiguous and fragmentary sources of evidence, reflecting the complexity of social phenomena and human behaviour. This research does have its own models and paradigms as much as any other subject domain; but these tend to be less binding.

This means that new knowledge in the arts and humanities does not necessarily supersede that which came before, unlike the sequential nature of discoveries in the sciences. The arts and humanities develop and re-evaluate earlier ideas and sources of evidence, viewing them from new perspectives and new contexts.

This can have implications for cost. The cumulative nature of many scientific knowledge advances lends itself to economies of scale in research: larger research teams may make greater advances at the margin than scientists working alone. It is no surprise that collaborations in the sciences often take the form of large-scale capital projects: bigger collaborations permit the fixed costs to be spread over larger numbers of researchers.

The arts and humanities researcher is often perceived as a 'lone scholar'. Interpretation in arts and humanities disciplines is often a characteristically individualistic process. Bibliometric studies, for example, show that sole-authored research publications are far more prevalent in the humanities than in either the social or natural sciences.

Yet the 'lone scholar' is a severely outdated model of the arts and humanities researcher. Arts and humanities researchers join with scientists to tackle complex societal problems. They work increasingly in collaborative teams inside and outside academia, especially to investigate large and complex problems where these teams are needed for 'big humanities', just as they have been needed for 'big science'. They are also involved in practice-based research, such as design and the performing arts, where costs can be just as high as in many science settings. Even in areas where individual research is widely used, the term 'lone scholar' denies the associations and exchange of ideas across the research community.

Differential knowledge modes

It is helpful to present the qualitative differences between disciplines through a simple model of three types (or modes) of knowledge:

- a scientific mode, that is predictive and universalisable;
- a research-oriented humanistic mode, that is interpretive, explicit and analytical;
- a practice-oriented humanistic mode, that is interpretive, intuitive and adaptive.

These three modes are not exclusive categories but discrete points along a continuum. So, for

example, interpretation is not an exclusive preserve of the arts and humanities. In the sciences, especially in fields that deal with complex subject matter, significant intellectual work can depend on individual insights and well-founded hunches. Likewise, some arts and humanities research draws on predictable and universal frameworks. Some branches of archaeology, for example, use scientific technologies such as carbon dating to build evidence.

Knowledge bases are not frozen in aspic but change over time. For instance, more practice-led research in art and design is changing as researchers incorporate features of the scientific and research-orientated humanistic modes into their work. This involves more documentation of the research process, with greater analysis and critical reflection.

Nonetheless, to the extent that these distinctions between knowledge modes are valid, they suggest important differences in how knowledge is created, stored and transferred. Thus, scientific modes of knowledge creation, insofar as they rely on more stable and standardised languages, are easier to codify, transfer and build on than research-oriented humanistic modes which, in turn, are more readily codified than practice-oriented humanistic modes. This has implications for how arts and humanities research is supported by public funding.

The AHRC and innovation

The Arts and Humanities Research Council (AHRC), a Non-Departmental Public Body sponsored by the Department for Innovation, Universities and Skills (DIUS), provides public funding for research, postgraduate training and knowledge transfer in the arts and humanities.

The establishment of the AHRC in 2005 followed a period of historically limited external funding for research in the arts and humanities. In part this stemmed from the persistence of the 'lone scholar' view. But as we have noted, this view is based on outdated assumptions on how arts and humanities research is conducted.

It also stemmed from the perception that such research was of limited social relevance in what has traditionally been a technology-heavy understanding of knowledge. Our nuanced knowledge modes begin to demonstrate the deeper role that the arts and humanities play in the innovation system. In supporting often

expensive team-based collaborations, encouraging different disciplines to work together, and promoting knowledge transfer with other actors in the innovation system, the AHRC helps arts and humanities researchers make wider contributions to society and the economy.

An analysis of AHRC Research Awards reveals that over 60% of the projects it has supported involve some degree of inter-disciplinary research, and many of these projects involve very high capital costs indeed. The AHRC is also increasingly involved in large-scale strategic programmes across the Research Councils, in areas as diverse as design, religion and global terrorism. Collaborative Doctoral Awards, which give opportunities for students to gain first-hand experience outside academic institutions, account for an increasing number of PhD studentships awarded (increasing by 57% to 74 studentships in the two years to 2007/8).

The AHRC's knowledge brokerage work extends to less formal activities, including networks, personal contacts, and representational work. Face-to-face networking is crucial in areas where knowledge is 'tacit', or less easy to communicate formally.

The AHRC in the funding environment

The UK Government funds research through a dual support system. This involves a core grant, which includes both teaching and research support from the four national Funding Councils, and project grants from the seven UK-wide Research Councils. The Funding Councils provide Quality-Related (QR) Funds for research, allocated by formula to individual universities and higher education colleges, and based on the results of the recurring Research Assessment Exercise (RAE).

There is a crucial interface between the two sides of the dual support system. QR funding provides the flexibility for universities to drive new initiatives and to react quickly to emerging priorities. It allows them to develop local strategies and to allocate funds internally in response to external stimuli.

Research Councils, by contrast, can provide guided strategic support that more directly takes account of wider policy requirements, and can react to cross-institutional and UK-wide issues for the research base. Research Councils can identify vulnerable areas of research that need particular assistance, and can support research considered to be a national strategic priority.

A well-functioning dual support system allows for a diversity of judgements and decision points, which has a clear benefit to the innovation system. It is this plurality and flexibility that are the major benefits of dual support, as both local and national perspectives are sustained.

It is striking how in the arts and humanities, AHRC funding accounts for only 23% of dual support funding, compared with the natural and physical sciences, where Research Council support is in the region of 65-70% (based on 2006/07 figures).

The arts and humanities' limited support from the Research Council side of dual support stems in part from the – increasingly outmoded – perception that arts and humanities researchers work as 'lone scholars'. The consequence is that overall funding levels may not adequately resource the increasing strategic importance of arts and humanities research to the wider economy and society.

Of course, some universities may use their QR funding to support collaborative projects in areas of strategic importance. But they do not always have strong incentives to do so. The benefits of collaborative work are shared by all participating universities, but the costs of initiating that collaboration may fall on one. This may lead to coordination failures. By setting strategic initiatives that guide research towards urgent challenges, Research Councils offer some assurance that such research is conducted.

Apart from the dual support system, there are other sources of UK research funding for the arts and humanities. This includes the British Academy and charitable trusts. The AHRC works within this broader landscape, and provides a strategic UK-wide focal point as well as providing significant amounts of funding across the full subject domain of arts and humanities research.

Conclusions

A systematic understanding of innovation, coupled with the growing importance of creative production and cultural consumption in the economy, leads to a fuller understanding of the role of non-technological knowledge. This is where most arts and humanities research is situated. The AHRC has a strategic leadership role in ensuring that policy takes account of the distinctive role and nature of arts and humanities research and related sectors through its discussions with government and with other organisations interested in innovation.

Arts and humanities research broadens our knowledge and provides new ideas that can be applied directly in innovation. It also illuminates the ethical foundations for the innovation system as a whole. If good ideas are to be picked up by society, then they must be mindful of different systems of culture and governance as well as respecting local structures of motivation and belief.

However, for that research to be valuable to the participants in the innovation system, several conditions have to be satisfied: there must be an awareness of the costs as well as the benefits of specialisation and decentralisation; participants must have incentives to create and spread knowledge; there must be a demand for new knowledge and the capacity to use it; and there must be robust mechanisms to transfer and circulate arts and humanities knowledge given its generally lower levels of standardisation.

While there is no substitute for actors preparing the ground by creating their own knowledge and scouting the terrain for ideas, specialist and institutional intermediaries can help them do so. While there is no fixed model, the AHRC's funding of collaborative, team-based research, its joint strategic initiatives with other Research Councils and its experience-based approach to knowledge transfer provide a distinctive and increasingly effective approach.

Ultimately, the success of intermediaries such as the AHRC will depend on this process and its impact on academic culture and the appetite for arts and humanities research more generally. As the benefits arising from connections between researchers, businesses, other organisations and government become more established, increasingly consistent expectations within those communities should emerge. This does not mean there should be a consensus. To try to achieve one risks unworkable expectations, with an emphasis on manageability over relevance, and the devotion of increased time and resources to reducing conflict. Rather it suggests a greater awareness of participants' interwoven fates and consequences of their actions for others. This would give everyone in the innovation system a truly systemic perspective.

1. Introduction and Motivation

1.1 The increasing importance of innovation

Innovation is the successful exploitation of new ideas. It is about adding value to products and services, to ways of undertaking tasks, and developing policies through the application of ideas that are new in a particular context.

Policymakers increasingly recognise that the UK's ability to address urgent social issues and to remain competitive in global markets rests on a wholesale commitment to innovation (DIUS, 2008). Solutions to social problems such as terrorism, climate change, public health issues and ageing populations will require fresh thinking and the combined use of technological, cultural, social and economic change.

The importance of innovation flows from an understanding that the future of advanced economies lies in exploiting knowledge. This application of new ideas is, for example, essential in creating and maintaining high-value products and services which are prized within global markets.

1.2 A systemic perspective

Innovation does not happen in isolation. The innovation literature describes it as being located within a system. This approach requires cooperation between a diverse set of actors – government, universities, third sector organisations, entrepreneurs, businesses and consumers. Knowledge is produced and spread by all of these actors. Performance is dependent on the relationships between them and on the quality of the overall system (Smits and Kuhlmann, 2004).

An increasing number of policymakers are embracing this systemic approach. Such a perspective has characterised innovation policy in Scandinavian countries for a number of years (Sharif, 2006). The Organisation for Economic Co-operation and Development places a systemic approach to innovation and economic performance at the heart of its evolving Innovation Strategy (OECD, 2007).

In the UK, the increased emphasis on systems can be seen in recent government reports related to innovation – such as *The Lambert Review of Business-University Collaboration* (HMT, 2003) and *The Race to the Top: A Review of Government's Science and Innovation Policies* by Lord Sainsbury (HMT, 2007). The most striking illustration of the acceptance of the systemic approach in the UK can be seen in the creation of the Department for Innovation, Universities and Skills (DIUS) in 2007, and the subsequent publication of *Innovation Nation* (DIUS, 2008), a national strategy for stimulating and harnessing innovation.

Lundvall (1992) defines a national innovation system as “the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge... either located within or rooted inside the borders of a nation state”. Studies of the national innovation system stress the importance of people, enterprises and institutions in the flow of knowledge within the innovation process. This national focus is a pragmatic and flexible way of showing the links between component parts of a system, while acknowledging the nation state as a political entity with its own innovation agenda (Lundvall et al, 2002).

The systems approach embraces the vast range of actors needed for innovation, where knowledge activities and institutional structures need to be mutually supportive. In this way, innovation is best enhanced by a strong knowledge base – mainly the nation's higher education and research infrastructure – and a wider tolerance of new and diverse ideas. It also requires a sound education system that supplies skilled workers and managers capable of giving those new ideas practical value.

A healthy innovation system needs a supportive competition regime that rewards innovations, together with flexible labour and financial markets that can quickly free up and allocate resources to more productive uses. More broadly, it needs a stable macroeconomic climate conducive to long-term planning and a reliable system of welfare and security to assist individuals displaced by change.

From this panoramic perspective, the network of actors necessary for innovation is complex. They are geographically dispersed and have dissimilar viewpoints, and yet are ultimately interdependent and closely knit. Their interactions may be predatory or cooperative, extended or brief; but an understanding of each other's differing interests is of vital importance for effective interaction.

As the components of the system are interrelated, payoffs from efforts to support one area are unlikely to occur unless other areas are functioning adequately. Indeed, even if each of these areas is individually working in the right direction, it is still possible that each can interfere with the effectiveness of another. This tension is explored with respect to knowledge creation and diffusion later in this paper.

Individual actors have different cultures, interests and motivations. They may speak with different languages, have different missions, and work to different timescales. Policy, therefore, needs to bridge gaps which would otherwise hinder the creation and diffusion of innovations.

2. A model of innovation system dynamics

A system relies on its internal dynamics. The components of a well-functioning innovation system are in a state of continual change (Ziman ed., 2000). Knowledge creators and entrepreneurs experiment with different ideas and technologies, and so generate variety. Evaluation mechanisms select between 'good' and 'bad' ideas. As a result, 'successful' projects flourish, while 'unsuccessful' ones fold. Successful projects tend to get replicated, draw more resources and expand. As a dominant design emerges, attention switches from exploring new alternatives to exploiting economies of scale. Figure 1 depicts the various functions of this innovation system.

Adaptability cuts across all of these innovation functions. Social systems have a tendency towards inertia or stability; as a result, once a particular practice is established, it can become embedded. If, for example, a region is overly reliant on a declining industry, and most of its skills and innovations are focused in this area, its lack of adaptability could hinder its economic and social prospects.

Systems can sometimes collapse, when their dynamics assume unsustainable behaviour, or if they are affected by external shocks, which can in turn allow new ideas and innovations to appear. Yet it is more often frustration with existing products or services that leads people to search for new solutions. This constantly creates losers who may have a vested interest to block change. Policy can either help or hinder the process of adaptability, depending on how swiftly and smoothly its focus is directed at new and emerging priorities, and how supportive the infrastructure is.

Systems have their own history and memory that must be understood when examining the role of policy (Arthur, 1994; Pierson, 2004). Even the most effective innovation systems face the dilemma that where an expensive investment has been made in a particular solution, that solution tends to maintain itself and reinforce connections with other parts of the system. So, a region can become closely linked with a particular industry as that industry reaches critical mass and becomes a hub of

activity. But it may still cling to that industry even after it has passed its peak.

Incentives to identify and stick with a single option can be strengthened by the presence of three factors:

- learning effects – the tendency to learn and become more accomplished through use;
- coordination effects – where individual actors derive increased benefits from an option, if others also adopt it; and
- adaptive expectations – the belief that unless choices are made based on what has happened in the past, there will be drawbacks later on.

These tendencies may all conspire to reinforce the standing of an industry within a region. But while this inclination to permanence can keep the system together and ensure its efficiency in more stable times, it significantly raises the costs of exit from existing arrangements (Hamalainen and Heiskala, 2007). Over time, this continuity may be less about current benefits and more about concerns around the costs of adopting alternatives – a calculation that again leaves the system vulnerable to gradual or sudden shifts in tastes, trade and technology. A region with an over-reliance on a declining industry could therefore suffer. This is one danger of using all one's resources to address the current requirements of the innovation system, rather than investing in more medium- and long-term exploration.

The innovation system must also deal with a high degree of uncertainty and risk. There is risk not only in the initial discovery of ideas, but also in the costs and timing of their development or commercialisation. There are potentially unintended and undesirable consequences, and there is the ultimate uncertainty about user acceptance. When a region moves away from its declining industry, it will be subject to higher levels of uncertainty, yet this may be preferable to the unsustainable status quo.

The effects of uncertainty and risk will be felt most where actors are unwilling to make innovation-related investments because there is

little perceived need or market for new endeavours. Yet demand for innovation is unlikely to materialise spontaneously unless users are confident that change is desirable (Georghiou, 2007). As a result, new relationships may not be established in the absence of clear benefits, where actors prefer to wait and observe others' experiences. Yet if everyone behaves in this way, innovation will be impeded.

This reluctance to form relationships can have a damaging effect on the innovation process, which is increasingly a network – not an individual – activity. These networking activities are built on trust, a complex social phenomenon with expectations of consistency in behaviour, as well as proximity, iterative engagement and 'social capital'. The strength and the nature of trust in the innovation system will determine the degree of interactive learning that takes place (Lundvall et al, 2002).

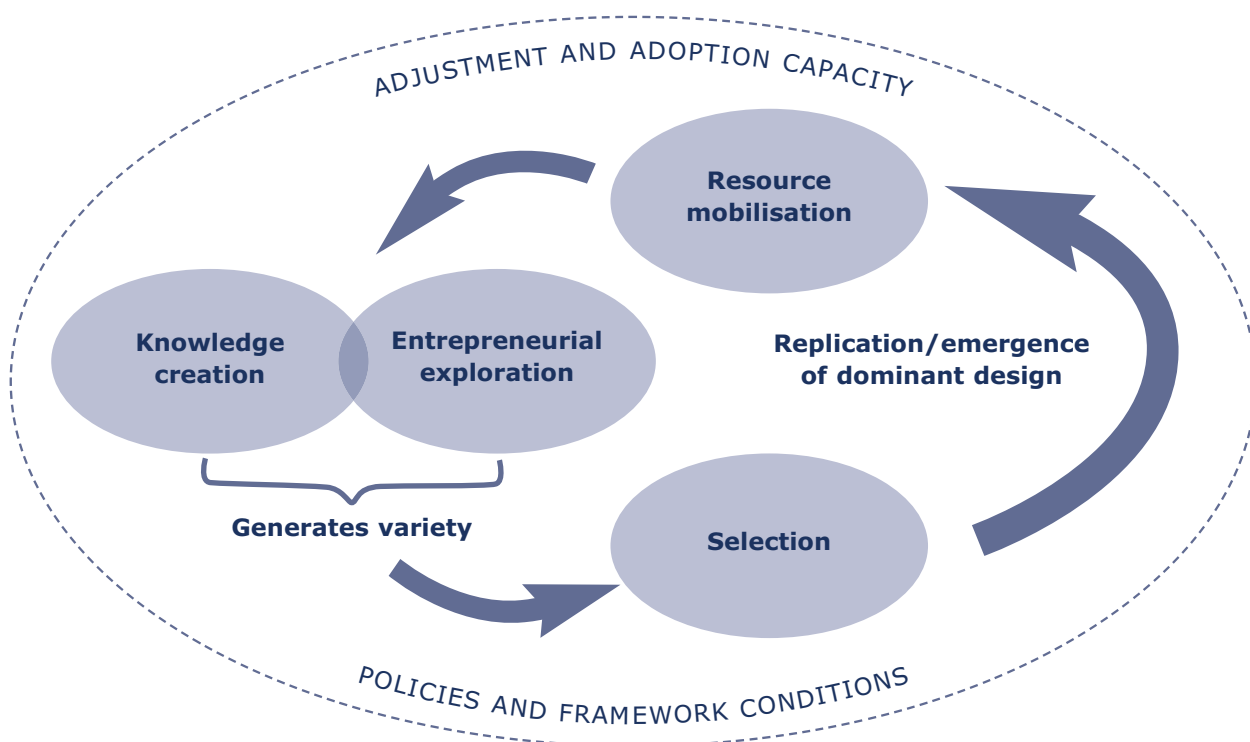
Intermediaries can bridge the gaps between the different actors. They are crucial in the creation of networks, particularly where there is a lack of information on the benefits of participating, or where it is hard to identify potential partners or to engage with them. Intermediaries can also stimulate new possibilities and dynamism within the system. They can 'cross-pollinate' – spread

ideas – between previously unrelated or unconnected groups, and can help to link actors to new knowledge created elsewhere (Howells, 2006).

The growing role of consumers and users in the innovation process means that intermediaries also need to manage the connections between producers and those users. They do this by raising awareness and stimulating demand with tailor-made strategic information (Smits and Kuhlmann, 2004). Intermediaries can also influence other agents within the system by undertaking connecting roles and by acting as standard setters or as evaluators of what works in the innovation process.

The credibility of intermediaries in the eyes of partners is crucial if they are to facilitate these networking activities successfully. They require sufficient legitimacy to have an influence, but they must also be at an adequate distance to offer something distinct to the interaction. When communities are particularly developed – notably in academic contexts – they require a fluency in a number of languages, and an ability to translate back and forth across them. There is a danger that the valuable role of effective intermediaries can be missed in the innovation process as their activities are essentially nomadic.

Figure 1: A functional model of an innovation system



3. Knowledge is at the heart of innovation

3.1 The importance of knowledge

Knowledge, whether wholly new or adapted from existing resources, provides the base for the discovery process. It provides the novelty and variety that drives innovation onwards.

In the new economics growth literature, knowledge is seen as the key input with labour and capital in determining output (Romer, 1986, 1990; Lucas, 1988; Aghion and Howitt, 1998). The non-rival aspects of knowledge, where the accumulation of public benefits are not reduced by an individual's use, means that the overall stock of knowledge can increase quickly over time, as the government, universities, firms and others invest in knowledge creation, and so generally raise everyone's productivity. In other words, investments in knowledge creation in one part of the system can have positive spillovers – even if unintended – on other parts of the system.

Universities provide a vital source of fundamental knowledge through their educational and civic roles and through open, declarative methods of research dissemination. While competitors, customers, suppliers and private research providers have often been viewed as the most important sources of commercial innovation, the growing tendency of universities to look outwards and seek ties with firms and other organisations means that they are of increasing importance in the exploitation of knowledge (Cosh et al, 2006; Yusuf and Nabeshim, 2007). Higher Education teaching is also a significant source of knowledge transmission, and the nexus between research and teaching is central to providing students and society with the skills needed to engage with the growing complexities of the modern world.

The strength of the innovation system also depends on the effectiveness of institutions in disseminating this knowledge to others who have the capacity to utilise it (Furman and Stern, 2004). Knowledge created by academic researchers, for example, can in principle be carried in at least two ways: embodied, with its emphasis on tacit knowledge, interaction, and the movement of people through the system, and disembodied, based on publications, manuals, patents, databases and other forms of written information.

When researchers collaborate with others to innovate, new knowledge is typically created in bi-directional knowledge transfer. Novelty is created when people with different knowledge, skills, competences, incentives and values come together in new combinations. This means that any assimilation strategy based on making the operational principles of universities closer to those of firms may be counter-productive, as innovation-stimulating diversity will be reduced (Kaufmann and Tödting, 2001; Page, 2007).

Nooteboom et al (2007) describe how 'cognitive distance', the different ways that actors interpret, understand and evaluate the world, can stimulate and stretch knowledge to bridge and connect. This process creates new combinations of complementary resources for all participants without underestimating the uncertainty and complexity inherent in language and understanding. Translational activities are needed to maintain this diversity, and this new language can in itself bring new perspectives to existing problems.

The relationship between universities and businesses has traditionally been seen by policymakers as a linear model of technology transfer. This model is shaped around science, technology, engineering and mathematics (STEM) activities, and is based on a mechanically literal understanding of the flow of research outputs from the laboratory to the market. It has been increasingly criticised in recent years, for example in the *Lambert Review* (HMT, 2003), as it does not explain or capture the innovative links required even within science and engineering disciplines. The discussion of systems in this paper highlights the limitations of linear models in describing innovation in relation to any sector.

The traditional definition of Research and Development (R&D) as only relating to scientific and technological advances has also been criticised, as it unhelpfully restricts our understanding of knowledge (Bullen et al, 2004). The limitations of conventional understandings of what constitutes R&D are illustrated by the *Cox Review* (HMT, 2005), which assumes that 'creativity' and 'design' feed innovation in a one-way process of skills transfer for the benefit of

the manufacturing sector. This linear view risks marginalising the integral place of research areas such as the arts and humanities in the innovation system, and has more recently been challenged by policymakers (DIUS, 2008).

The legacy of the linear technology transfer model and of traditional R&D definitions has had a damaging effect on the innovation system. Knowledge – broadly defined – is at the heart of innovation.

3.2 The importance of arts and humanities knowledge

The arts and humanities cover a very wide range of research disciplines, and there is an internal diversity as rich as that found in the sciences.

The disciplines included in the arts and humanities research base, as described by the AHRC, are: archaeology; classics; community arts; cultural policy and arts management; dance studies; design; drama and theatre studies; English language and literature, history, history and theory of art and architecture; law; librarianship, information and museum studies; linguistics; media; modern languages; music; philosophy; theology, divinity and religious studies; and visual arts.¹

At a broad level, arts and humanities research contributes to a constantly growing body of knowledge on human experience, agency, identity and expression, as constructed through language, literature, artefacts and performance. This knowledge nourishes the UK's cultural existence, and informs relationships, provides substance and inspires creative behaviour, goods and services in the innovation system.

The arts and humanities have a particularly strong affiliation with the creative industries. There is growing evidence showing that arts and humanities research helps to fuel these industries (Crossick, 2006; Oakley et al, 2008) and that the creative industries in turn stimulate and support UK innovation (Bakhshi et al, 2008).

The video games sector is a good example of where the creative industries make a significant contribution to the UK economy (Oxford Economics, 2008). Developers of video games increasingly call on art, drama, non-linear

narratives and music to produce innovative games. Content innovations in video games have a two-way relationship with the technological innovations that make them possible (Miles and Green, 2008).

More generally, the sciences, technologies, arts and humanities complement each other and are not hierarchically ordered. The distinctions between what is and what ought to be – between factual description and value judgement – show the difficulty in making sense of what is good purely on the basis of scientific verity (Habermas, 2003). Science may allow us to evaluate whether a proposed change will secure its intended goals. Yet when it comes to deciding those goals, science has no monopoly on expertise.

Innovations occur at a faster rate when technical feasibility is allied with cultural acceptance (Hargrave and Van de Ven, 2006). Thus, the possibilities opened up by biotechnology, for example, are not necessarily the same as what is acceptable to society. The social sciences can offer methods of understanding the social dynamics and economic realities of technological and social change, while the arts and humanities provide frameworks and languages that address the need to understand and explore the human condition in relation to society.

In this sense the arts and humanities provide a foundational understanding of the effects of change on society. If innovation generally develops when there is cultural acceptance, ethics can comprehend and create the spaces for public understanding of scientific and medical advances. For example, developments in stem-cell research and cloning require a dialogue on what it means to be human and on the acceptable boundaries of scientific progress (Harris et al, 2005; Plomer, 2005; Savulescu, 2006).

The ethical principles behind this dialogue are analysed through philosophy, legal theory, theology, political thought and other disciplines with historical perspectives and an understanding of beliefs and attitudes (Bauer ed., 1995; Bijker, 1997). Such research interrogates and communicates the impact of scientific and technological developments on wider society.

¹ The AHRC does not work under a precise definition of the arts and humanities subject domains, as disciplines are continually evolving and there are inevitable overlaps and boundaries that are shared with other research funding bodies.

The arts and humanities can also help translate science to the wider public. Insights from the cognitive sciences suggest, for example, that people think in terms of metaphor, rather than with logic (Lakoff and Johnson, 2003; Zaltman, 2003).²

The arts and humanities create languages that can communicate complexity in a comprehensible way. For instance, the great policy breakthroughs in the nineteenth century around the welfare state and the provision of public goods such as health and education occurred partly because of changes in people's sensibilities towards the poor. The long-standing attribution of poverty to idleness, debauchery and ill-character gave way to a more sympathetic view that the poor were hardworking victims of circumstance, rather than 'undeserving'. The catalyst was not empirical discoveries or new arguments but imaginative literature, such as *Hard Times* by Charles Dickens. This can also be seen in the portrayal of the structural plight of the poor in Adam Smith's *Theory of Moral Sentiments* and *Wealth of Nations* (Fleischacker, 2005).

More visually, art and design research can make complex information intelligible. For instance, John McGhee, an AHRC-funded researcher at the University of Dundee, has undertaken research to show how 3-D digital visualisations drawn from animation and computer imaging in the film, TV and games industries can enhance medical scans, and so help communicate the processes of disease to patients.

Movement, colour, form and light are all intrinsic attributes of animation, and they can offer alternative perspectives when conveying information and translating knowledge. The synthesis of these qualities creates aesthetic images that can connect to people, while communicating complex meaning. They can also help medical practitioners consider how they construct images to improve their own understanding of disease.

Arts and humanities research also provides an understanding of the legal and social construction of knowledge. Research in law and philosophy

underpins the efficiency of Intellectual Property as a way of rewarding innovation. The AHRC Centre for Studies in Intellectual Property and Technology Law at the University of Edinburgh, for example, is involved in understanding and responding to innovation, technological development, regulation, human interaction, human rights and the law. The Centre brings together researchers concerned with Intellectual Property law, biotechnology, ethics, medical jurisprudence, and the regulation of electronic commerce, the internet and virtual society.

Arts and humanities research similarly explores the construction of knowledge through research in Information Studies. This provides a fundamental understanding of how technologies transform and re-order knowledge by exploring how information is collected, stored and retrieved. Information Studies are concerned with how people interact with systems and how those systems can be improved. The growing simplicity of internet search engines, for instance, relies on mastering their underlying complexity, based on a research-based understanding of indexing systems. Information underpins much of the innovation system.

History can provide a better understanding of contemporary problems. Historians can present the long-term background or historical precedents, and their insights help to challenge policies that are based on false assumptions. The History and Policy network works with the House of Commons Library to provide historians who can speak on a variety of important policy areas.³ Historical research can also generate 'data' which social scientists and other researchers use to improve their own understanding (think of the importance of historical research by Charles Kindleberger in understanding the cause of financial crises).

Modern languages play an integral part in the globalised innovation system, where there is an increasing need to understand, and potentially collaborate with, other cultures (Bound et al, 2007). There is, for example, a strong business case for modern language skills within the UK economy, where languages are growing in importance as UK firms increasingly operate in a

² According to some studies, humans use six metaphors per minute during oral communication.

³ In 2007, for instance, Dr Mark Roodhouse of York University was asked to submit evidence to the Environmental Audit Committee on the historical parallels between consumer rationing during the Second World War and the growing use of carbon trading schemes as a means of reducing domestic CO₂ emissions.

global marketplace (CBI/Edexcel, 2008). The modern language research community has a role in underpinning the development of language skills and in the understanding of other cultures. A key area of growth in applied modern language research in the UK, for instance, has been in intercultural communication, translation and interpreting skills (Kelly et al, 2007). This supports the UK's ability to converse on a global scale.

Emerging research areas like design often offer imaginative solutions to social problems. The Design Against Crime Research Centre, based at Central St Martins, University of the Arts London, shows how practice-based design research can have a direct impact on modern society. The Centre is concerned with designing out the opportunities for crime, and uses a practice-based methodology that is qualitatively different from traditional anti-crime projects.

The Centre's approach is that design should address security issues without compromising functionality and other aspects of performance or aesthetics. This research-based design is human-centred and addresses user experience, and utilises an iterative process where designers test out design hypotheses in real-life contexts (Gamman and Pascoe, 2004). This approach also feeds into public policy, and the Centre works with, for example, the Metropolitan Police and the Home Office to develop innovative methods to stop crime. Design research brings new perspectives to social problems that can transform contemporary environments and related policy actions.

The contribution that some forms of arts and humanities research make to innovation of an aesthetic nature is both direct and at the same time complex. Intellectual opinion on what constitutes groundbreaking and innovative art helps to inform society's views on what is considered 'good' art (Galenson, 2005). Importantly, research-based understandings of what is and is not innovative may be a significant factor in determining which art forms receive public financial backing (DCMS, 2007).

As shown in this paper, the arts and humanities make vital contributions to the innovation system, even though some arts and humanities researchers may not perceive themselves as part of this system, and may resent attempts to

assess the relevance of their work in this way. This reluctance may also be linked to the traditional conceptions of knowledge outlined in Section 3.1.

Arts and humanities researchers have often taken a robustly independent line in this area, and there is generally less of a tradition of societal problem-orientation than found in other disciplines. Yet we have seen how the arts and humanities already offer new and innovative approaches that can have profound effects on society. The arts and humanities have the critical and analytical capacity to challenge assumptions and ways of working, while providing a sense of the historical context, traditions and cultural setting in which society and the economy function.

4. Dilemmas for knowledge accumulation

This paper argues that innovation analysts must give due consideration to the role of arts and humanities research in the innovation system. Policymakers also need to understand the barriers that exist to knowledge creation and transfer in this area.

4.1 Specialisation

Academic research disciplines arise for good reasons. The complexity of the world requires researchers to specialise because no individual can possibly know everything, even within a particular field or discipline. No one person could, for example, have a strong research interest in every period or in every branch of historical study.

Reducing aims to match capacities – specialisation – is a standard way of increasing efficiency, even if it requires greater coordination between individuals. Thus, the number of journals has grown exponentially: in 1900, there were fewer than 700 different peer-reviewed academic journals, by 1950, this number had climbed to 3000, and by 2000 it had topped 17,000 (Dodgson et al, 2005). In history alone, the literature produced between 1960-1980 appears to have been on a par with the entire output from the time of the Greek historian Thucydides in the fourth century B.C. to the year 1960 (Dill, 2000).

Specialisation allows for the concentration and critical mass needed to address complex issues. It also rationalises the storage of acquired knowledge and presents it in a manner suitable for academic institutions and for the reporting of research.

There are, however, some subjects that are inherently inter-disciplinary.⁴ Design, for example, normally involves itself in multiple problem contexts in combination with other disciplines. In the Research Assessment Exercise (RAE) 2001, Art and Design submitted 820 refereed journal articles from almost 500 journals. These journals represent a great diversity of disciplines, and highlight the inter-disciplinary nature of design in

particular (Rust et al, 2007). The Design Against Crime Research Centre, Central St Martins, Univeristy of the Arts London, for example, brings together the methodologies and practices of situational crime prevention, social anthropology, cognitive psychology and user-centred design in its research.

It has even been argued that design is the 'last liberal art', and that it needs to maintain its breadth and applicability to many contexts, rather than seeking to move towards a narrow disciplinary specialisation (Buchanan, 1992). In the context of collaborative innovation, designers have also increasingly evolved towards being facilitators of change among different groups (Thackara, 2005).

Highly educated groups with common interests may join together, inventing a specialist language, establishing a status hierarchy and limiting entry to their ranks. This is a beneficial process as it ensures that quality control is maintained, but it can reduce the overall effectiveness of the knowledge base, where real world problems and needs are largely indifferent to the internal structures and disciplines of universities or professional associations. Over time, the mismatch between narrowly-focussed research and the challenges faced in society may grow.

Gibbons et al (1994) argue that outmoded disciplinary structures ('mode 1') have been replaced by inter-disciplinary, problem-orientated approaches ('mode 2') in modern societies. In 'mode 2', knowledge is produced within the wider context in which problems arise, methodologies are developed, outcomes are disseminated and uses are defined. 'Mode 2' knowledge is considered to have a much greater diversity of knowledge production locations than that found in 'mode 1'. Inter-disciplinarity is also seen as a key factor for innovation in the 'triple helix' model of academia-industry-government (Etzkowit, 2008).

Both of these models emphasise the need for different disciplines and actors to come together

⁴ Inter-disciplinary research involves the combination of two or more academic disciplines or fields of study to effectively produce a new discipline or field of study.

to pool their knowledge so that they can stimulate innovation and address pressing societal challenges. Organisations that support multi-disciplinary and inter-disciplinary research and bring together different actors in the innovation system will add to the overall diversity of the knowledge base, enhancing novelty and bringing new perspectives.⁵

4.2 Tensions with knowledge sharing

The incentives to create knowledge in society frequently conflict with the incentives to share it. The non-rival characteristics of knowledge described earlier create the potential for system-wide gains. But this lack of exclusiveness – once I provide the idea to the world, it can be difficult for me to deny others access to it – hinders knowledge creation.

The value chains in the arts and humanities and the creative industries can be particularly long and diverse because patents cannot capture the results of much of their knowledge. So much of it is informal and tacit: it is common and beneficial within the creative industries to have an open dialogue in ideas between practitioners.

The value chains may be particularly widely spread in areas of 'soft innovation' where changes in goods or services are based on sensory perception and aesthetics (Stoneman, 2007). Changes in clothing fashions, new musical recordings and the publication of new books cannot be patented but they do strengthen the dynamism of the creative industries and the arts and humanities. Yet if actors who do not contribute to the creation of knowledge – 'free riders' – can benefit from it on equal terms with those who do contribute, how do we motivate knowledge creators?

Traditionally, intellectual property (IP) rights have been the main solution: in return for IP rights, inventors are required to disclose information about the invention to the rest of the world. More generally, knowledge may be shared to create reciprocal relations with others: in particular, where an actor needs to tap complementary knowledge or resources, it may be necessary to share one's own findings to keep conversations going, even among competitors (Stein, 2007). It

is particularly likely to occur in circumstances where there is an advantage in having standard-setting powers or the possibility of capturing network benefits (Shapiro and Varian, 1999).

The priority rule encourages researchers to release knowledge speedily by identifying themselves as the author of a finding as soon as it is published (Dasgupta and David, 1994). The reputational benefits that accrue from identification improve their chances of obtaining grants and peer recognition, though they can also encourage reputation-hungry individuals to focus on solving fashionable, challenging problems that exhibit their technical virtuosity rather than nitty-gritty problems that may be no less important in ensuring a well-functioning knowledge creation community (Sunstein, 2001; Lerner and Tirole, 2002). Individual researchers may concentrate on activities that have no intrinsic value other than they attract a large peer audience, or they may inherently obtain private benefits that are attached to the development of knowledge.

This last consideration may be understood as a preference for research, perhaps, because individuals value creative control or care about the project's goals and their discipline (Benz, 2007). This means, however, that it may be more difficult to control intrinsically-motivated actors and direct them towards more systemically valuable activities, such as engaging with the public and knowledge transfer, or to direct them towards the activities of others (Frey and Jegen, 2001). In this case the task becomes how best to match actors with similar missions (Besley and Ghatak, 2003).

4.3 Absorptive capacity

Sometimes it is not a question of voluntary or involuntary knowledge transfer, but of whether there is sufficient ability to use or even to understand the potential use of knowledge by other actors in the innovation system (Cohen and Levinthal, 1990; Zahra and George, 2004). Knowledge is not the same as the algorithmic properties of information or its Aristotlean and Cartesian representation as unbendable and unbending nuggets of reality. It is, therefore, not easily absorbed, interpreted and translated into new contexts.

⁵ Multi-disciplinary research involves the coming together of two or more separate disciplines or fields of study to conduct joint research.

So its exploitation can be long and scrambled. This largely reflects the trade-off between basic and applied research: basic research may generate new knowledge that has a far greater long-term impact than applied research, but it may be harder and slower to turn it into well-defined innovative outcomes. Exploitation may also be hampered by the problems with collaboration between partners from different backgrounds: while such partnerships can generate novelty by forcing partners to look beyond established boundaries, their differences in outlook can hinder mutual understanding.

There is some evidence that these problems are less acute in the arts and humanities where many researchers already target their work at the general public: in literature, up to 75 percent of publications address non-scholars (Nederhof, 2006).

Still, the imperatives of translation and understanding cannot be ignored. They partly explain the importance of proximity in, for example, city- and regional-based innovation networks, where universities undertake work with local firms and organisations in clusters. It has been argued that the more individuals lack a common communication system or shared values, the more geographically concentrated innovation becomes (Hussler and Rondé, 2007)

These interactions enhance absorptive capacity, and, in turn, create an environment where useable knowledge is increasingly sought out by different actors. This demand has a significant effect where users can and know how to exploit useful research and are able to adapt or reject innovations – a process that can involve an element of reinvention, where the innovation is changed when it is adopted by a user.

Rogers (1995) sets out five attributes needed for the rapid diffusion of research knowledge and innovations through the system: relative advantage over alternatives; compatibility with current values and existing needs; the level of complexity and the ease by which it can be understood; the extent to which new ideas can be tested; and how obvious their use and benefits are to others.

Tensions can exist in this process where, for example, the reinvention inherent in the

adoption process is seen by researchers as a distortion of their work. This is where intermediaries play a vital role in the diffusion of knowledge by assisting in the navigation through the dissimilar values, experiences and attitudes of different actors in the system, and by articulating the benefits of collaboration.

Organisational culture and a lack of effective structures and knowledge management practices may also act as a barrier to the spreading or diffusion of ideas. Risk-averse officials, for example, may be less willing to use controversial or groundbreaking research. Government departments may have a tendency for short-run, choreographed specific projects, using consultancy firms rather than academic research.

The *Sainsbury Review* (HMT, 2007) recognises that all government departments can make a significant contribution to innovation in their interactions with companies, but that these opportunities are not always realised because of 'short-term political and operational problems'. There is a role for public bodies to stimulate the absorptive capacity for research in the innovation system.

Small firms in the creative industries, in contrast, may be more likely to be drawn towards the cutting edge. Yet they will face particular challenges in absorbing knowledge if they lack the relevant in-house management and capabilities to utilise research (Bougrain and Haudeville, 2002).

5. Knowledge Modes: the distinctiveness of arts and humanities knowledge

Overcoming these dilemmas requires an understanding of the distinctive nature of arts and humanities research. As we saw in Section 3.2, the arts and humanities seek to understand human experience, agency, identity and expression, as constructed through language, literature, artefacts and performance. Because of this affinity, arts and humanities research frequently revisits sources of evidence that are often ambiguous and fragmentary. After all, social phenomena and human behaviour are more nuanced than the operation of physical artefacts, such as the motion of colliding billiard balls (Kline, 1995). Dominant paradigms do emerge with their own particular methodologies and assumptions, validated by procedural authorities and epistemic communities (i.e. peer review) and so create a degree of stability where researchers refine rather than reject what came before (Dworkin, 1986). But this process is generally less binding and aims for lower levels of generalisability.

This pluralism and dissent is a vibrant and creative element in the arts and humanities, and is often concerned with the different ways of making fragmentary and ambiguous evidence comprehensible. This differs from many areas of scientific tradition, where knowledge is more cumulative and rooted in discovering increasingly predictive and universally applicable insights. In particular, the sciences are able to repeat experiments under exact conditions, so they can examine a particular state of affairs from whatever new perspective is necessary to isolate or disclose its ultimate cause of failure or success (Nelson, 2005; Foray and Hargreaves, 2003).

This means that knowledge in the arts and humanities is not generally superseded in the same way as found in the cumulative, sequential nature of many scientific discoveries. Garfield (1980), for example, points out that once Watson and Crick published their article on the double helix structure of DNA, the structure had been discovered and nothing more had to be said; and so scientists moved on from this point. Yet if a book was published on Bach, for instance, this would not preclude further

research as nobody could ever have the last word about Bach and his music. The arts and humanities form an inheritance that can be re-evaluated from new perspectives and new contexts.

The universalistic tendency of the sciences also means that the background to a problem is more likely to be accepted without the need for long clarifications, while the arts and humanities are more particularistic and interpretive, with more time needed to define the context and to explain the interpretation being taken. Becher and Trowler (2001) describe the difference between subjects with 'contextual association', where assumptions have to be developed from the beginning at greater length, and subjects with 'contextual imperative', where much of the background argumentation is already established. The longer form of the book is considered as the primary mode of communication in the humanities because of this need to elaborate on context and interpretation, coupled with more complex forms of obsolescence and the need to interrogate literature over longer periods.

As a result, journal articles are less important in the humanities as a means of disseminating research. In the Research Assessment Exercise (RAE) 2001, for example, only 31% of submissions in the arts and humanities overall were journal articles, compared with 67% in the social sciences and 96% in the natural sciences. Journal articles in Art and Design were particularly low at 9%, which in this case is linked to a high level of research outputs that are not text-based, with over 40% of submissions in this area consisting of exhibitions.

Where journals are used, they are also less likely to use an online open access model (Antelman, 2004). There is a less intense pace of scholarly exchange that might limit the incentives for immediate and free online access to the latest journal articles. Nevertheless, the use of online journals in the arts and humanities is growing, and this is set to continue (Heath et al, 2008).

The cumulative nature of many knowledge advances in the sciences lends itself to economies of scale; larger research teams may make greater advances at the margin than researchers working alone. It should not therefore be surprising that collaborations in the sciences often take the form of large-scale capital projects. The cost of running scientific 'experiments' to test formal hypotheses – sometimes repeated many times under identical conditions – is a further reason why scientific work is often costly. Bigger collaborations can help researchers spread these fixed costs. Where they are funded by grants, the need to ensure that neither time nor money is wasted may in turn give rise to enhanced mechanisms of dialogue, interaction and supervision.

The generally higher fixed capital costs for research in the sciences compared with the arts and humanities are reflected in the relative cost weightings used by the national Funding Councils for research funding purposes. The Quality Related (QR) research formula multiplies funding allocations – which includes elements based on Research Assessment Exercise (RAE) ratings and research volume (i.e. number of active researchers) – by a subject cost weighting for each Unit of Assessment (UoA).⁶ So, for example, the QR calculation for England in 2008/09 weighted subjects such as clinical medicine and engineering at around 25% more than for design and creative arts, and 60% more than for the humanities (See Annex 4).

These differences give rise to the 'lone scholar' view of the arts and humanities researcher: the academic working alone and publishing independently. The individual researcher does remain a reasonable description of how research in some areas of the arts and humanities is done. For instance, one bibliometric study of Australian publications finds that 80 percent of the natural and life sciences papers are multi-authored, a figure that drops to 50 percent for social science papers, and only 12 percent for humanities papers (Bourke, 1997).

The critical role of interpretation in arts and humanities disciplines – particularly in those that utilise archival research – is a characteristically individualistic process, where the synthesis and analysis of material comes from the critical and

reflective process of the individual mind. In modern languages, for instance, individual research remains the most widespread form, where its predominance is grounded in literary and critical traditions, which typically depend on close reading and critical analysis of a limited range of texts (Kelly et al, 2007).

Yet the 'lone scholar' is an increasingly outdated view of the arts and humanities researcher. It ignores the associations in which all research is conducted. And it does not apply, for example, to situations where arts and humanities researchers come together with scientists to tackle complex societal problems. Nor does it apply to arts and humanities researchers who work increasingly in teams and who collaborate outside academia. Nor is the 'lone scholar' characterisation relevant to much practice-based research, such as design and the performing arts, where the fixed costs of producing knowledge can be just as high as in many science settings.

It is instructive to consider these qualitative differences between different disciplines in a simple model of three types or modes of knowledge:

- a **scientific mode**, that is predictive and universalisable;
- a **research-oriented humanistic mode**, that is interpretive, explicit and analytical;
- a **practice-oriented humanistic mode**, that is interpretive, intuitive and adaptive.

Lest this appears simplistic, we should see these three modes less as exclusive categories than as discrete points along a continuum.

Thus interpretation is not a unique feature to the arts and humanities. In the sciences, especially in fields that are close to the knowledge frontier, significant intellectual work can depend on individual insights and structured hunches, and where trained judgement is central in uncovering the scientifically significant from the merely background (Kline, 1995; Daston & Galison, 2007). Similarly, there is great variety within the arts and humanities: thus, some branches of archaeology exhibit properties of the scientific mode in that they endeavour to create precision on the nature of the claims they make, in part because they rely on many scientific techniques to do so (i.e. carbon dating).

⁶ A full discussion of Funding Councils and QR is included in Section 6.3.

Knowledge bases, moreover, are not frozen in aspic but follow paths that change over time. For instance, more practice-led research in art and design is in the process of transformation as researchers incorporate features of the other two modes such as greater documentation of the research process with elements of analysis and critical reflection.

Practice-led research in many areas can still be considered as emergent within universities, although there is a growing recognition of its distinctive contribution to knowledge, as discussed in Section 3.2. It is likely that this type of research will maintain some characteristics of the more practice-orientated humanistic mode as it develops. This will require a delicate balance between explicit and tacit elements, as the critical role of uncertainty and open-endedness needs to be maintained if the practice integral to the research is to be meaningful. This is combined with a reflective consideration of the process (Rust et al, 2007).

To the extent that the distinctions between the different knowledge modes are valid, they do suggest important differences in how knowledge from the research base is held and, crucially, the speed at which it is created. Thus, scientific modes of knowledge creation insofar as they rely on more stable and standardised languages are easier to transfer, pick up and build on than research-oriented humanistic modes which, in turn, are more readily codified than practice-oriented humanistic modes.

For those actors within the innovation system who have made the expensive initial investments to learn and maintain a language, codification generates significant benefits. It permits activity to be distributed and organised widely, thereby encouraging collaborative research; by contrast, deeply tacit knowledge must be accumulated and transferred gradually between individuals. Likewise, without an explicit base of knowledge to build on, the same breakthrough will be repeated *ad infinitum* or made in isolation of other breakthroughs, thereby reducing efficiency. So, codification strengthens the embedded memory and retrieval capacities of the system; knowledge that is largely tacit or *sui generis* to individuals, teams, networks and organisations risks being dissipated where there are long development times and high rates of turnover.

But this is not the whole story. Ease of codification is not the only factor determining the productivity of knowledge creation. For instance, competition both provides actors with incentives to generate new knowledge and compels others to imitate or adopt knowledge created elsewhere in order to stay competitive. The resulting infrastructure then becomes a powerful mechanism for capturing the knowledge benefits (or spillovers) of others' research (Foray and Hargreaves, 2003).

It would also be a mistake to ignore the costs associated with codification. During periods of change, excessive codification can obstruct the creation of radically new knowledge by raising the costs of 'unlearning' defunct codes and developing new ones in order to make sense of that knowledge (a pattern discussed in Section 2). From this perspective, the fact that the arts and humanities are less amenable to codification should be seen as a strength rather than a weakness, as they are better placed to disrupt and challenge standardised practices and conventional wisdom (Kenway et al, 2004). The inclination to codify everything – what Daniel Dennett calls 'greedy reductionism' – can have the perverse effect of leading research towards areas that are easy to codify, rather than areas that are crucial (Lester and Piore, 2005).

There may also be a trade-off in some forms of collaboration between the need to exploit complementarities among individuals with different knowledge and the loss of room for individuals to pursue independent work (Sunstein, 2006). This may in some cases stifle variation as people defer to the informational signals given by others rather than follow their own private views. Joseph Roux, the eighteenth century French cartographer and hydrographer, captured the subtle balance to be struck in the following terms: isolation kills, solitude vivifies.

An understanding of the arts and humanities' distinctive nature is important if the innovation system is to make the best use of its knowledge. The arts and humanities are part of an integrated research landscape, and offer distinctive approaches to the understanding of human experience and activity that adds to the overall diversification of knowledge creation. This has implications for how arts and humanities research is supported by public funding.

6. The Arts and Humanities Research Council

6.1 The AHRC and Innovation

The Arts and Humanities Research Council (AHRC), a Non-Departmental Public Body sponsored by the Department for Innovation, Universities and Skills (DIUS), provides public funding for research, postgraduate training and knowledge transfer in the arts and humanities. It was established in 2005, and is the successor body to the Arts and Humanities Research Board (AHRB), which was formed in 1998. The creation of the AHRC marked the final stage in placing the arts and humanities on an equal footing with the sciences, where there has been long-established Research Council support (Herbert, 2008).

The establishment of the AHRC should be seen in the context of historically limited external funding for research in the arts and humanities. In part this no doubt stemmed from the persistence of the 'lone scholar' view, where the individual arts and humanities researcher conducts low-cost research. As we have discussed earlier, this view is based on an outdated assumption that the fixed costs of conducting arts and humanities research are in all cases low.

It also stemmed from the perception of limited social relevance in what has traditionally been a technology-heavy understanding of knowledge, one that we have critiqued in Section 3.2. The more nuanced conception of knowledge modes outlined in this paper begins to demonstrate the deeper role that the arts and humanities play in the innovation system. In supporting team-based collaboration, encouraging different disciplines to work together, and facilitating a culture of knowledge transfer with other actors, the AHRC can help arts and humanities researchers make wider contributions to innovation.

To help understand the role of the AHRC in innovation, a small-scale consultation was undertaken with a broad range of individuals involved in research, research funding, and in non-academic organisations with links to research. The findings of this consultation can be seen in Annex 3. This exercise has allowed the AHRC to reflect on its role in innovation.

The AHRC's main instruments for supporting the arts and humanities research community are funding, brokerage and advocacy. Its position within the research funding environment allows the AHRC to support collaborative, often large-scale, projects, and networking and workshop activities, while also continuing to support valuable smaller scale research where needed.

The AHRC funds a wide range of projects across the arts and humanities research base through a combination of strategic programmes and responsive, open competitions. In 2007/08, AHRC-funded projects involved a total of 2,400 researchers across these three areas. It also made funding awards of over £58.7 million for new research awards and £3.1 million for new knowledge transfer awards. Collaborative projects accounted for 85% of these new awards. There was also support for 885 new doctoral and 739 new Masters students. See Annex 1 for the distribution of AHRC awards by subject area for 2007/08.

The AHRC funds a diverse range of disciplines, and supports the many distinctive ways in which arts and humanities research contributes to innovation, as described in Section 3.2. In 2007/08, the subjects that accounted for the largest amount of AHRC research funding were (in order): history, visual arts, modern languages, archaeology, and English language and literature.

A good deal of the collaborative research supported by AHRC is multi-disciplinary and inter-disciplinary (Table 1). This is beneficial as the recombinations and new approaches inherent in these types of research add to the overall diversity of the knowledge base, as described in Section 4.1. The AHRC main Research Grants are for periods of up to five years, and this support sustains large, multi-faceted research projects.

Table 1: Completed AHRC Research Awards that reported multi and/or inter-disciplinary research, 2007/08

	Completed Research Awards	% of total
Projects involving multi-disciplinary research	222	43
Projects involving inter-disciplinary research	313	61

Note: AHRC awards-holders are asked to indicate whether their project included multi- and/or inter-disciplinary research on Final Reports.

Multi-disciplinary research activity is defined as that which involves researchers from two or more different disciplines. Inter-disciplinary research applies the methods and approaches of several disciplines.

Efforts to stimulate multi-disciplinary and inter-disciplinary research are particularly relevant in the development of joint strategic initiatives with other Research Councils.

For example, the AHRC has set up a variety of joint strategic schemes, such as:

- *Designing for the 21st Century* with the Engineering and Physical Sciences Research Council (EPSRC) to support design research which tackles contemporary challenges;
- *Religion and Society* with the Economic and Social Research Council (ESRC) to further understanding of religion in a complex world; and
- *Global Uncertainties*, which brings together all seven Research Councils to advance understanding of conflict, crime, environmental degradation, poverty and terrorism

These collaborative schemes illustrate again how arts and humanities research increasingly challenges the 'lone scholar' view.

AHRC funding also involves collaborations with non-academic sectors, with over 8% of new Research Awards in 2007/08 involving non-academic partners. This is additional to the directed funding for knowledge transfer discussed in Section 6.2.

The AHRC also funds research in museums, galleries, archives and libraries, a vitally important sector for arts and humanities research, both through collaboration with Higher

Education Institutions and through Independent Research Organisations. These organisations – The British Library, The British Museum, National Museum Wales, Royal Commission on the Ancient and Historical Monuments of Scotland, Tate, the Victoria & Albert Museum, amongst others – are able to apply directly for AHRC grants. The AHRC Museums and Galleries Research Programme 2008, for example, awarded over £3 million to thirteen individual projects. This funding allowed museums, galleries, archives and libraries to participate in high quality research that enables them to better interpret, communicate and present their collections to a wider public

Aside from its research funding streams, the AHRC also funds postgraduate study at doctoral and Masters levels. This has obvious implications for the innovation system: aside from the skills that are central to arts and humanities research, the AHRC also supports training in transferable skills, such as project management, communication, problem-solving and team working. Support for this latter training is provided for all Research Council doctoral students. Special funding was set up in response to the recommendations of the Roberts' Review *SET for Success* (HMT, 2002), particularly around the need to improve transferable skills and employability.

Even at postgraduate level the AHRC stimulates collaborations between arts and humanities researchers and non-academic institutions. For example, through its Collaborative Doctoral Award (CDA) Scheme, the AHRC provides opportunities for doctoral students to gain first-hand experience of work outside an academic environment. As well as giving students employment-related skills and training, the studentships also help to establish links between collaborating partners, providing access to resources, knowledge and expertise that might not otherwise be available.

CDA awards account for an increasing number of PhD studentships awarded: 74 in 2007/8, an increase of 57% over the number awarded in 2005/6 (see Annex 2 for more details). Awards in 2007/2008 included collaborations between Higher Education Institutions and the Royal Botanic Gardens Kew, The British Library, The Rothschild Archive Trust, the Science Museum, Geoscan Research and the Edinburgh International Festival, amongst others.

The short AHRC case studies included here illustrate some of the diverse areas that are covered by the arts and humanities. They also indicate what AHRC funding can bring to research activities by its support for various forms of collaborative project.

Interrogating cultural value in the 21st Century: the case of 'Shakespeare'

AHRC Research Grant

This project uses the Royal Shakespeare Company's Complete Works Festival, which ran from April 2006 to April 2007, to explore how England's literary heritage meets the different demands placed on it: the combination of social expectations and commercial requirements. The project team is investigating the different ways of talking about the value of 'Shakespeare' in literary criticism, educational and cultural policy, as well as theatre practice.

The research looks at commercial culture of early modern theatre and how that developed in the twentieth century. It draws on the Royal Shakespeare Company archive to research the traditions of performance in the Company and their changing relationship to public expectations.

The project explores the connections between cultural value and the cultural institutions that produce it. It also tests the claims of organisations that reproduce 'Shakespeare' for multi-cultural and inclusive public engagement.

The project is based at the University of Birmingham, and includes a Post-Doctoral Research Fellow and two Doctoral Students. This team-based approach allows for collaborative learning and for associations to be made across a range of research areas. The project team, by combining different strands of research, provides a much more comprehensive account of the relationships between the artistic, educational, economic and commercial dimensions of the cultural value of Shakespeare than could be provided by any one or more researchers working independently. This project will also inform future cultural and educational policy.

3D Reinforced Natural Fibre Woven Preforms and Eco-Composites

AHRC Research Grant

This inter-disciplinary project explores the synergies between 3D weave design and engineering composites. 3D woven fabric provides an opportunity to explore how aesthetic considerations within design can be combined with technical engineering approaches. The aim is to redirect technical design expertise, which has been optimised in aerospace engineering, with a creative impetus that will lead to the application of woven composite fabrics in more accessible design applications for public use.

These applications include interior, moulded textile composite parts for use in public seating, wall partitions, panels and fascias. The new materials will be able to compete in strength and appearance, and offer structural superiority and versatility, compared with a vast range of cosmetic laminates. It offers contemporary, dynamic, patterned composite surfaces, coupled with this in-built strength. This is also an environmentally conscious, safe disposal material for use by the design community. The research should also help the UK woven textile industry to compete globally by producing radical, new high-quality products.

This research requires high quality equipment, including a full digital weaving studio, various loom parts, moulding tools, raw materials, highly specific textile design software and numerous ancillary devices. The project is an example of where arts and humanities research has increasingly high capital costs; the AHRC grant for this two-year project is in the region of £400,000.

Through weave design, this project enables creative practice to be integrated into science and engineering fields. It is being led by the School of Art and Design, working in collaboration with the Engineering Composites Research Centre, at the University of Ulster.

Image, Text, Interpretation: e-Science, Technology and Documents

AHRC-EPSRC-JISC Arts and Humanities e-Science Initiative

Deciphering and interpreting manuscripts and documents is a central component of research into all periods of literature and history. Texts can, however, be difficult to read, particularly those in ancient Greek or Latin papyri, writing tablets and inscriptions, or medieval and early modern manuscripts. Even some modern handwritten texts require some extra help.

Advanced imaging and computational technology can overcome this obstacle. This project seeks to develop a system which will help arts and humanities researchers to read manuscripts and documents from a wide range of literatures and cultures by utilising e-Science technologies. Arts and humanities researchers are being trained as well as being provided with tailored tools and software.

Realising the potential of emerging computer technologies, including digital imaging, for researchers across the entire range of the arts and humanities to deal effectively with often obscure, damaged or difficult to interpret texts and documents will have an impact on how research is undertaken. The new software will support research that is characterised by the frequently collaborative deployment of complex, expert and often tacit knowledge, and which seeks to make clear the best possible fit of the textual evidence and minimising uncertainty in interpretation.

This inter-disciplinary research involves the Centre for the Study of Ancient Documents, University of Oxford, in co-operation with the Department of Engineering Science, also at the University of Oxford, and the School of Library, Archive and Information Studies at University College London. The team also includes a Doctoral Student, who will receive expert training in a field which will be increasingly important for the next generation of arts and humanities researchers working with textual material. The inter-disciplinary becomes stronger and more embedded in the research community by the joint support by the AHRC, EPSRC and JISC.

6.2 The AHRC and knowledge transfer

The sharing of knowledge – knowledge transfer – is fundamental to the innovation system. It is through the exploitation of knowledge that innovation happens. This importance is reflected in the AHRC's growing support for knowledge transfer projects (Table 2).

Table 2: AHRC New Knowledge Transfer Awards

	2005/06		2006/07		2007/08	
	Projects	Amount Awarded	Projects	Amount Awarded	Projects	Amount Awarded
Knowledge Transfer	4	£188,206	21	£1,714,185	34	£3,327,569

Note: Knowledge Transfer schemes include Knowledge Transfer Fellowships, Knowledge Catalyst and the AHRC/BBC Pilot Knowledge Exchange Programme, plus the AHRC co-funded Knowledge Transfer Partnerships with the Technology Strategy Board.

This increasing support for knowledge transfer is based on an understanding of the distinctive forms of knowledge creation and transfer in the arts and humanities, as discussed in Section 5. This support has been developed to address specific perceived barriers in the arts and humanities and the non-academic sectors they underpin, and will help to overcome the dilemmas for knowledge accumulation outlined in Section 4. For example, the *Knowledge Catalyst* scheme supports partnerships between the research community and non-academic partners that do not have the capacity to participate in the larger *Knowledge Transfer Partnerships* by allowing shorter project durations. This responds to the particular challenges faced by small firms in utilising research, as described in Section 4.3.

The AHRC knowledge transfer support encompasses interactions and partnerships with business, engagements with exhibitions and performances, media content, and the new learning that flows into public policy. Because AHRC knowledge transfer schemes are co-funded they have placed the partnerships between academic and non-academic organisations on a more strategic level, meaning that they are more likely to create sustained forms of knowledge transfer.

The AHRC also acts as an intermediary between other actors within the innovation system. It has, for example, an important strategic role to play in encouraging knowledge transfer from arts and humanities research to the creative

industries. This involves bridging activities between the other main interests in this area – including DIUS, the Department for Culture, Media and Support (DCMS) and the Technology Strategy Board (TSB). The AHRC has also, for instance, worked with the TSB to develop tailored support in its Collaborative R&D programme and in its Knowledge Transfer Network for the creative industries.

The AHRC recognises that brokerage is central to any knowledge transfer activities. So it engages actively in networks, with personal contacts, and through representation on external boards, panels and steering groups. Face-to-face networking has been instrumental in, for example, the AHRC/BBC Pilot Knowledge Exchange Programme, which supports arts and humanities researchers and BBC Future Media and Technology staff to work together on collaborative research and knowledge transfer projects.

As an intermediary, the AHRC also acts as a standard setter and an evaluator of good practice in knowledge transfer. As a public body, the AHRC's evaluation techniques ensure accountability by considering the quality, value for money and impact of the activities it funds. The AHRC also uses evaluation to investigate how collaborations develop and whether funding schemes are providing the right opportunities for researchers and non-academic partners, given the motivation of researchers described in Section 4.2.

The sharing of reflective practice from the experiences of researchers, non-academic partners and the AHRC is an effective way of identifying beneficial approaches for knowledge transfer. In June 2008, for example, a focus group of individuals from AHRC-funded knowledge transfer projects was held to explore the nature of effective collaborative partnerships and knowledge exchange in the arts and humanities. The survey group concluded that there were four principal means of knowledge transfer:

- *generation of new knowledge at the interface*, using generic research and problem-solving techniques as well as mobilising the specialist knowledge of both parties;
- *exchanging resources and skills*, where the project is a bi-directional gateway for opportunities for learning, joint work and even recruitment;
- *developing or adapting methodologies*, by exploiting existing knowledge or by forming new methodologies to address new problems; and
- *carrying out joint business activities*, such as strategic marketing campaigns and interactive audience exercises.

The AHRC/BBC Knowledge Exchange Programme also provided a significant source of experience in developing knowledge transfer in the arts and humanities. The programme has had a transformative impact on both organisations and on the individual researchers and BBC staff who participated. The AHRC and the BBC have been working together since 2005, and have developed a long-term collaborative strategic partnership. This co-funded pilot programme was launched in 2007.

The programme developed from extensive explorations of mutual research interests, joint workshops, a community consultation and a collaboration agreement between the AHRC and the BBC. It specifically addresses novel forms of engagement that create reciprocal benefits for both researchers and the BBC. The programme has also fed into the AHRC's understanding of creating collaborations with other organisations, and has enhanced its understanding of how best to support knowledge transfer in the arts and humanities.

The short case studies on AHRC Knowledge Transfer projects illustrate the diversity of interactions with non-academic sectors. They also give some indication of the different types of knowledge transfer schemes. Knowledge Transfer Fellowships, for example, are planned around an existing piece of arts and humanities research which has the potential to make a significant difference beyond the world of academia. The Knowledge Catalyst scheme, meanwhile, places a recent graduate, supported by an academic, into small organisations to enhance their operations.

Patient involvement in medicines choice: improving policy and practice

AHRC Knowledge Transfer Fellowship

Patients are increasingly given a stronger voice and are seen as the major drivers of service improvement in the NHS. This project brings together lessons from applied philosophy and healthcare practice to develop policy guidelines and supporting case study materials on the subject of patient involvement in medicines choice.

The project seeks to address the gap between what policymakers hope to see from patient involvement in medical decisions and what happens in practice. Policymakers' idealisations have the potential to contribute to better practice if they are based on a realistic understanding of the demands of policy and practice. This more realistic understanding of patient involvement will be developed as this project progresses.

A researcher in bioethics and education at King's College London, working with a co-investigator from the School of Pharmacy, University of London, is collaborating with the Hammersmith Hospitals NHS Trust. The project will also involve other researchers in bioethics and national policy organisations, such as the National Prescribing Centre, the Royal College of Physicians and the Association of the British Pharmaceutical Industry.

Exploring networks: the contribution historical evidence for social networks can make to the modern use of network theory

AHRC Knowledge Transfer Fellowship

There is a similarity between the decentralised structures of heretics, such as the Cathars, and the very loosely connected terrorist organisations of the twenty-first century, such as Al-Qaeda.

Counter-terrorism strategies have traditionally centred on the capture of terrorists themselves. By exploring the applicability of medieval investigations against heresy, this Fellowship hoped to draw lessons relevant to modern society.

The Fellowship brought together a medieval historian from the University of Glasgow and Volterra, an economic consultancy, to look at network theory. The historian, with expertise in the analysis of networks from his research on medieval heresy and the early Inquisition, provided training and participated in the consultancy's work in providing practical solutions to business problems. This has enhanced the social network models built by Volterra in areas such as consumer and financial markets. The willingness to use 'softer' evidence, such as provided by this Fellowship, has given the firm comparative advantage in securing new business.

The Management of Critical, Promotional and Contextual Writing for ArtSway

AHRC Knowledge Catalyst

Improved public understanding of art was at the heart of this project, which brought together the Arts Institute of Bournemouth and ArtSway, a small company that presents a changing exhibition programme of contemporary visual arts in the New Forest.

The main objective was to bring the expertise of the academic partners to exhibitions curated by ArtSway in the New Forest and at the 52nd Venice Biennale. This research-based expertise was used to develop texts for publication and to organise a series of public seminars during the exhibitions in the UK and Italy. There was also an evaluation of the procedures for collaborative projects involving verbal and visual art forms, and an appraisal of audience motivation and behaviour. ArtSway will continue to develop a data collection system on audiences with other galleries in the region.

The relationship between the two institutions has deepened and strengthened, and there was a valuable learning experience for both partners. The MA Course at the Arts Institute, for example, has been enhanced by the materials produced by this project.

The Arts Institute of Bournemouth and ArtSway intend to continue with their collaboration in the future. ArtSway has helped to curate exhibitions at the Art Institute's gallery, and academics have provided text for ArtSway exhibitions.

What do children want from the BBC? Children's content and participatory environments in an age of citizen media

AHRC/BBC Knowledge Exchange Programme

For over 35 years, *Newsround* has been the flagship BBC news programme for children. It has evolved with technology to embrace a digital and internet presence. But it faces a very different young audience with many more choices in 2008 than young people had in 1972.

The project examines the changing relationship between the BBC and its young audiences, with particular attention to *Newsround*. It considers ways of offering young audiences innovative ways to participate in dialogue and debate around issues which affect them as citizens.

The project team works with a sample group of children including equal numbers of boys and girls in two age ranges, from different socioeconomic and cultural/ethnic backgrounds in four different regions. The aim is to find out the opinions of young people in relation to how *Newsround* and children's educational content in general might be made more responsive to their needs and interests.

Interactions with the sample groups have led to collaborative partnerships between *Newsround* web journalists and young people, which stimulate new ideas, content and engagement in public dialogue about news and current affairs for young people.

The project is led by Cardiff University and the BBC, with co-investigators at the Universities of Ulster and Bournemouth

6.3 The AHRC in the funding environment

The UK Government funds research through a dual support system. This involves funding in two streams: one as part of the core grant, which includes funds for both teaching and research from the four national Funding Councils, and the other by project grants from the seven UK-wide Research Councils.

The Funding Councils provide Quality-Related (QR) Funds for research, allocated by formula to individual Higher Education Institutions (HEIs), and based on the results of the recurring Research Assessment Exercise (RAE). (See Annex 5 for a chart summarising the dual support system structure.) This QR funding is generally for basic research infrastructure, including researcher salaries, support staff, equipment and libraries, as well as for some blue skies research.

The Research Councils in contrast provide a competitive stream for project-specific funds. Both sides of the dual support system aim to support excellence. Funding decisions rest on retrospective results for QR, determined by the RAE, and on the prospective results of project applications for Research Council funding, based on peer review.

There is a crucial interface between the two sides of the dual support system. QR funding provides the flexibility for HEIs to drive new initiatives and to react quickly to emerging priorities. It allows institutions to develop local strategies and to allocate funds internally in response to external stimuli. In addition, because QR is funded by formula, it brings continuity and predictability to research infrastructure and so supports forward planning. The concept of block grants also sees institutions as autonomous bodies and allows for academic independence.

Research Councils, by contrast, provide guided strategic support that more directly takes account of wider policy requirements, and can react to cross-institutional and UK-wide priorities for the research base. Research Councils can identify vulnerable areas of research that need particular assistance, and can support research that is considered to be a strategic priority at the national level. Research Councils also provide a focal point for their research communities, supplying a national voice and strategic leadership, as well as support and advice.

A well-functioning dual support system allows for a diversity of judgements and decision points, which has a clear benefit to the innovation system. It is this plurality and flexibility that are the major benefits of dual support, as both local and national perspectives are sustained.

In the arts and humanities, AHRC funding accounted for only 23% of the dual support system in 2006/07, compared with the natural and physical sciences where Research Council support was in the region of 65-70%. And overall, only 5% of total Research Council expenditure on Research and Postgraduate funding was allocated to the arts and humanities in 2006/07, despite representing 25% of UK academic researchers (Table 3).

The arts and humanities' limited support from the Research Council side of dual support stems in part from the - increasingly outmoded - perception that arts and humanities researchers work as 'lone scholars'; an implication being that the potential for exploiting economies of scale is lower than in other disciplines. But we have argued that in highly collaborative research areas, such as design and performing arts, the associated fixed capital costs can be very high indeed, and so the potential for economies of scale is that much greater.

Table 3: Dual Support Figures, 2006/07

	Funding Council Quality-Related Research Funds ¹ , £ million	%	Research Council expenditure on Research and Postgraduate funding ² , £ million	%	Research Active Staff ³	%
Arts and humanities	273.7	19	82.4	5	12,200	25
Other subject areas	1,143.4	81	1,590.3	95	35,819	75
Total	1,417.1	100	1,672.7	100	48,019	100

Notes

¹ Funding Council data are constructed from apportioning 2006/07 funding by Unit of Assessment to Research Council subject umbrellas.

² Research Council data are taken from Annual Reports, 2006/07

³ Research Active Staff relates to 'Category A/A* Research Active Staff (FTE)' from RAE 2001

More importantly, the proportionately low Research Council funding relative to the sciences may not adequately resource the increasing strategic importance of arts and humanities research to the wider economy and society, discussed in Section 3.

Of course some HEIs may use their QR funding to support collaborative projects in areas of strategic importance. But they do not always have strong incentives to do so. The benefits of collaborative work are shared by all participating HEIs, but the costs of initiating that collaboration may fall on one institution in particular. Coordination may be weaker as a result. By setting strategic initiatives that guide research towards urgent challenges, Research Councils offer some insurance that such research is conducted. While Research Council funding gives a significant amount of flexibility and autonomy to researchers in areas such as project definition, management, and in the particular forms of dissemination of research outputs, it requires researchers to have an awareness of their wider environment, to engage with the general public, and stipulates that researchers must exploit their research results where appropriate (RCUK, 2008).

Research Councils fund research on a competitive basis by independent expert peer review, a process intended to place excellence at the centre of research funding. While there are arguments that peer review can reinforce an embedded conservatism, militating against unconventional 'risky' fields and multi-disciplinary and inter-disciplinary research, the evidence clearly suggests that higher quality research is funded as a result of peer review. Criticisms are often directed at deficiencies of practice rather than at the principle of peer review itself (British Academy, 2007).

In 2008, the AHRC revised its decision-making structures to enhance the effectiveness of its peer review process. This new structure replaced a system of standing discipline-based panels with a broader Peer Review College, including increased non-academic and international representation, from which members are drawn for each individual round of panels. These 'prioritisation panels', functioning as moderators, make decisions based on evidence of quality provided by expert peer review. Thus expert peer review remains at the core of this process, and the new decision-making structure allows for a wider engagement from a

broader range of stakeholders, addressing the perception of barriers to multi-disciplinary and inter-disciplinary applications. The new structure allows the AHRC to be more agile and transparent in its funding decisions.

The focus of this section has been on the dual support system in relation to arts and humanities research. There are, of course, other sources of support for this research.

The British Academy, an independent self-governing body, is the UK's national academy for the humanities and social sciences. It receives funding from DIUS, as well as generating private funds from gifts and legacies. The British Academy is both a learned society and a funder of research. In 2007/08, its expenditure on research activities was £20.3 million. This funding was for both the humanities and the social sciences, and was mostly aimed at individual researchers and small-scale, primarily responsive-mode, research projects. This complements the support given by the AHRC in the humanities.

Charitable trusts also fund research. The Leverhulme Trust, for example, emphasises individuals and responsive support for research across all academic disciplines, particularly where it moves beyond traditional disciplinary boundaries. The Leverhulme Trust's total budget for all disciplines is around £40 million per annum. The Wellcome Trust, which is a medical research charity, also offers some support for research in ethics and the history of medicine, as well as supporting collaborative work across the arts and sciences to help communicate medicine to the public. The Wellcome Trust's total charitable expenditure for 2007 was over £500 million, though the vast majority of this was for the support of biomedical research.

Sectors linked to the arts and humanities research community, such as museums, galleries, archives and libraries, also undertake internally-resourced research themselves. Research is also commissioned by Government Departments, public organisations, the private sector, the European Union and other international bodies.

These are all important in creating a diversity of sources for UK research funding. The AHRC works within this landscape, and provides a strategic, UK-wide focal point as well as providing significant amounts of funding across the full subject domain of arts and humanities research.

Penguin Archive Project

AHRC Research Grant

Penguin books were the defining literary experience for two or three generations of readers. This publishing house transformed the range and greatly extended the availability of books to a general readership with its affordable paperbacks

The Penguin Archive, a vast collection of the company's papers including letters from many authors, has much to reveal about how Penguin responded and influenced many areas of our cultural and political lives.

The Archive, held at the University of Bristol, ranges through literatures, history, sociology, politics, education, psychology, philosophy, book design, architecture and art history, the law and beyond. Any study of its contents requires a multi-faceted, multi-disciplinary approach.

This project demonstrates the rich multi-disciplinary potential of the Archive by pioneering research in three areas of Penguin activity: Modern Poetry; British politics and current affairs (from the 1930s to the 1970s); and the Greek and Latin Classics in English translation. The project will also enhance the public accessibility of the Archive by establishing an online catalogue, which is of especial importance in relation to the ethos of Penguin publishing.

This multi-disciplinary project brings together the Departments of English, Historical Studies and Classics at the University of Bristol. The project team also includes a Post-Doctoral Research Fellow, two Doctoral Students, and an archivist. The University of Bristol provided pump-priming support for an online archival management system, with the AHRC grant allowing for the large, multi-disciplinary team to undertake research and dissemination activities with the Archive. This highlights the critical interface between the two sides of the dual support system.

Spanish and Spanish American Theatres in Translation: A Virtual Environment for Research and Practice

AHRC Research Grant

The rich seam of Spanish-language theatre is rarely seen by English-speaking audiences. This project aims to create a virtual research environment that acts as a creative and productive meeting place for researchers and theatre practitioners, providing English-language access to Spanish-language theatre.

An interactive website will facilitate a two-way process of knowledge transfer by encouraging participation, which will create a self-sustaining and constantly renewing resource.

The resource will also be developed by a series of rehearsed readings and full productions, which will enrich the repertoire of Spanish-language plays available for English-language performance. This more practice-based element of the research involves working closely with a network of theatres. In this way, the project engages with the two most important elements of cultural practice: translation and performance.

Without this project, the repertoire of Spanish-language plays performed in English would likely remain static, and the range and quality of debate around them would be limited. This project offers support for a sustained engagement with Spanish-language theatre, and creates an interactive model that can be developed in relation to other international theatres. This should bring more diversity to UK theatre and will open up new cultural experiences.

This collaborative project involves King's College London, the University of Oxford and Queen's University Belfast. By different routes, the three main investigators have become acknowledged experts covering the three main areas of theatre production in the Hispanic World: the history of performance; translations and theoretical work on translation and performance; and methodologies for the study of performance and cultural transmission. The project also includes three Post-Doctoral Research Assistants and a Doctoral Student. This inter-institutional collaborative team-based project is made stronger and more ambitious by the support of an AHRC grant.

7. Conclusions

A systematic understanding of innovation, coupled with the growing importance of creative production and cultural consumption in the economy, leads to a fuller understanding of the role of non-technological knowledge. This is where most of the arts and humanities research is situated. The AHRC has a strategic leadership role in ensuring that policy takes account of the distinctive role and nature of arts and humanities research and related sectors through its discussions with government and with other organisations interested in innovation.

Arts and humanities research broadens our knowledge and provides new ideas that can be applied directly in innovation. It also illuminates the ethical foundations for the innovation system as a whole. If good ideas are to be picked up by society, then they must be mindful of different systems of culture and governance as well as respecting local structures of motivation and belief.

However, for that research to be valuable to the participants in the innovation system, several conditions have to be satisfied. So there must be:

- an awareness of the costs as well as the benefits of specialisation and decentralisation;
- incentives for actors to create and spread knowledge;
- a demand for new knowledge emanating from the research base and the capacity to use it; and
- robust mechanisms to transfer and circulate arts and humanities knowledge given its generally lower levels of standardisation.

While there is no substitute for actors preparing the ground by creating their own knowledge and scouting the terrain for ideas, specialist and institutional intermediaries can help them do so. While there is no fixed model, the AHRC's funding of collaborative, team-based research, its joint strategic initiatives with other Research Councils and its experience-based approach to knowledge transfer provide a distinctive and increasingly effective approach.

Ultimately, the success of intermediaries such as the AHRC will depend on this process and its impact on academic culture and the appetite for arts and humanities research more generally. As the benefits arising from connections between researchers, businesses, other organisations and government become more established, increasingly consistent expectations within those communities should emerge. This does not mean there should be a consensus. To try to achieve one risks unworkable expectations, with an emphasis on manageability over relevance, and the devotion of increased time and resources to reducing conflict. Rather it suggests a greater awareness of participants' interwoven fates and consequences of their actions for others. This would give everyone in the innovation system a truly systemic perspective.

Annex 1:

New AHRC awards made and amount awarded by subject and programme for 2007/08

Research

Subject	Awards made	Amount awarded (£)
History	73.2	11,128,082
Visual Arts	53.3	6,303,594
Modern Languages	45.2	5,175,406
Archaeology	26.3	4,581,544
English Language and Literature	48.8	4,446,141
Theology, Divinity and Religious Studies	31.5	4,381,205
Philosophy	26.8	3,439,993
Music	26.7	3,174,068
Librarianship, Information & Museum Studies	18.8	2,385,630
Law	15	1,886,697
Drama and Theatre Studies	16.3	1,828,152
Classics	10.8	1,528,065
Media	16.7	1,486,975
Dance Studies	5	1,367,060
Linguistics	7.5	1,310,140
Design	6.2	1,210,712
History and Theory of Art and Architecture	7.7	574,220
Cultural Policy, Arts Management & Creative Industries	2.7	537,933
Community Arts (including Art and Health)	2	190,071
Other	12.5	1,271,130
Not Known	9	496,756
Total	462	58,703,573

Knowledge Transfer

Subject	Awards made	Amount awarded (£)
Media	9	864,840
Music	2.5	531,474
History	5	531,089
Librarianship, Information & Museum Studies	1.5	276,470
Philosophy	1	230,502
Community Arts (including Art and Health)	2	221,725
Visual Arts	1	165,929
Design	4	143,658
Cultural Policy, Arts Management & Creative Industries	1.5	102,173
History and Theory of Art and Architecture	1	11,182
Other	0.5	13,707
Total	29	3,092,747

Based on award dates of between 1 April 2007 and 31 March 2008.

Where projects cover more than one subject area, awards and award amounts have been apportioned across subject areas giving a notional value.

Knowledge Transfer Awards do not include the AHRC co-funded Knowledge Transfer Partnerships with the Technology Strategy Board.

Postgraduate awards

Subject	Doctoral Competition	Collaborative Doctoral Awards (CDA)	Project students	Total Doctoral Awards	Research Preparation Masters	Professional Preparation Masters	Total Masters	Total
English Language and Literature	143	3	0	146	74	10	84	230
History	140	16	0	156	73	0	73	229
Modern Languages	64	0	0	64	43	23	66	130
Philosophy	70	2	0	72	46	0	46	118
Visual Arts	29	1	0	30	16	63	79	109
Music	39	2	0	41	20	41	61	102
History and Theory of Art and Architecture	44	14	0	58	26	11	37	95
Media	25	2	0	27	14	50	64	91
Archaeology	42	8	0	50	21	17	38	88
Librarianship, Information & Museum Studies	12	6	0	18	0	49	49	67
Theology, Divinity and Religious Studies	32	3	0	35	15	0	15	50
Drama and Theatre Studies	14	6	0	20	4	13	17	37
Law	13	1	0	14	7	15	22	36
Linguistics	19	0	0	19	12	0	12	31
Classics	17	0	0	17	10	0	10	27
Design	6	1	0	7	4	15	19	26
Cultural Policy, Arts Management & Creative Industries	2	1	0	3	0	5	5	8
Other	22	6	0	28	27	15	42	70
Unknown	0	2	78	80	0	0	0	80
Total	733	74	78	885	412	327	739	1,624

Based on start dates between 1 April 2007 and 31 March 2008.

Annex 2: AHRC Collaborative Doctoral Students

Partner Organisation Type	Collaborative Doctoral Awards			
	2005/06	2006/07	2007/08	Total
Industrial / Commercial	22	32	20	74
Local / Public Authority	10	12	18	40
Charity		4	15	19
Govt Department / Research Establishment	10	3	2	15
Academic Analogue		2	5	7
Research Institute	3		1	4
Professional Institution	1	1	1	3
Other	1	4	12	17
Unknown		1		1
Total	47	59	74	180

Annex 3: The AHRC and Innovation consultation

During August 2008, 70 people involved in a broad range of activities in research, research funding, and in non-academic organisations with links to research, were invited to respond to an email questionnaire. The questionnaire included six open questions to allow for nuanced responses, and was divided into two sections:

- Perceptions of the AHRC: in its leadership of the arts and humanities; in the priority it gives to innovation; in its understanding of the issues of the arts and humanities and related sectors; in its role as an intermediary, advisor and funder; and in its agility in addressing new challenges and in accepting risk.
- Perceptions of the arts and humanities: where there are barriers to engaging in knowledge exchange, and where there has been effective engagement.

A total of twenty responses were received – not enough to be comfortably representative of the wider population of the AHRC’s stakeholders, but large enough to give indicative feedback on the AHRC’s perceived strengths and weaknesses. Eight responses were received from people involved in research funding, including three from individuals at the AHRC, two from other Research Councils, two from Funding Councils, and one from a charitable trust. Eight responses were received from arts and humanities researchers, two of whom serve on AHRC Committees, and four further responses came from non-academic organisations that have links with research.

All of the respondents considered that the AHRC had an important role in mediating between government policy and the arts and humanities research community. One respondent pointed out that the AHRC had had a strong role in influencing national policy concerning creative industries and in questioning R&D assumptions that excluded arts and humanities research. Another respondent, however, thought that there may be a tension between giving a voice to the research community and in meeting the requirements needed to inform government policy.

Twelve of the respondents thought that the AHRC should take a lead in influencing policy through an understanding of the value of the arts and humanities, rather than by undertaking a more traditional lobbying role for the community. This should also include guiding researchers on how to engage with the priorities identified by Government.

One researcher described the AHRC’s role as both “serving and challenging” government policymaking. Another researcher, however, perceived the AHRC to be “overly driven by fashionable government targets and policies”, which highlights the difficulty in constructing a position between policy agendas and the research community.

Six of the twenty respondents considered that the AHRC has not been successful in creating a persuasive collective voice for the arts and humanities, though with some acknowledgement that the research community itself still has significant work to do in articulating the value of its work and in engaging with public policy.

Eleven of the respondents perceived that innovation was a high priority for the AHRC. There were, however, concerns around the definition of innovation, particularly in relation to the arts and humanities and the technology bias of much of the innovation discourse.

Survey respondents mostly considered the AHRC to be well placed to understand the issues and priorities of the arts and humanities research community, but that its understanding of related non-academic sectors was less strong. One respondent thought that it was a “big ask” to attempt to understand all relevant sectors, and that there is a “danger in seeing the community and sectors as monolithic when they are in fact highly diverse and fractional”.

Five of the respondents thought that the AHRC lacked the strong organisational memory needed to be an effective and knowledgeable intermediary between the research community and other sectors, and that it was too often reliant on a few individuals to undertake these

tasks. Others stressed that while there had been significant achievements in raising interest in collaboration in both academic and non-academic communities, it was important that such activities continued to be resourced.

The AHRC was seen as an organisation that generally responds quickly to change by eleven of the respondents, although even amongst this group there were concerns about its awareness of future threats and opportunities. Without effective horizon scanning, it was felt that the AHRC would miss many of the important broad social challenges where arts and humanities research could make a real difference. Four respondents felt that the AHRC was unresponsive and slow at engaging with new challenges because of under-resourcing, time lags between ideas and actions, and because of the peer review system which – in the eyes of one respondent – was excessively conservative.

Survey responses also revealed a number of perceived barriers that may deter the arts and humanities community from engaging in knowledge transfer activities. Thirteen of the respondents highlighted the limited culture of knowledge transfer in the arts and humanities. One researcher thought, for example, that “humanities researchers are by their nature sceptical and individualistic in their ways of working.” This, in the researcher’s view, “led to low skills in collaboration and a suspicion of ‘the media’ in general and of possible ‘ideas theft’ in particular.”

Comments were also made about the lack of the acknowledgement of knowledge transfer in the Research Assessment Exercise, and about suspicions that “research may be compromised by other agendas and the Government’s talk of economic impact factors is unhelpful in this respect”. This is a reference to the focus put on economic impact by the Research Councils since the publication of the Worry Report (RCUK, 2006), which it was felt may have sidelined the innovation agenda within the Research Councils.

One respondent from a non-academic organisation considered that there is a “widespread perception amongst policymakers and agencies...that the arts and humanities are not concerned with innovation”. It was also felt that there was no shared understanding of the

role of external engagement across the research community, policymakers or potential partners, which all have different languages, priorities and budgetary situations.

There were general concerns about the use of metrics in evaluating knowledge transfer, and in the arts and humanities in particular. Many felt that collaborations with the arts and humanities often took place in fleeting yet creatively important encounters, which were impossible to capture with metrics. There was a need to quantify the collective and individual effects of knowledge transfer in more textured and subtle ways. One researcher argued that “metrics tend to rile arts and humanities scholars, and while this is largely understandable, their attitude makes it difficult to progress with the co-defining of original, more appropriate forms of measurement of cultural value. By fleeing the field and refusing to address this question, arts and humanities scholars make themselves more vulnerable to inappropriate metrics and evaluation mechanisms.”

On a positive note, there was a feeling that the barriers to knowledge transfer in the arts and humanities were surmountable. One researcher observed how he is “constantly surprised by the diversity, breadth and depth of engagement that arts and humanities academics have with the wider world”. Others argued that the AHRC has a continuous responsibility to rehearse the potential benefits of knowledge exchange to the research community, through creating case studies that demonstrate good practice in knowledge transfer, targeted brokerage activities, and strategic partnerships with organisation such as the Technology Strategy Board and the BBC. If there were a growing body of evidence on knowledge transfer activities, then, as one respondent from a Funding Council put it, this “could influence allocation, distribution and prioritisation” within the research funding landscape.

Annex 4:

An example of the relative cost weightings used by a Funding Councils for research funding purposes

This table shows that the Quality Related (QR) research funding formula assumes that, for example, Clinical Laboratory Sciences have costs 1.6 times more than that needed in History.

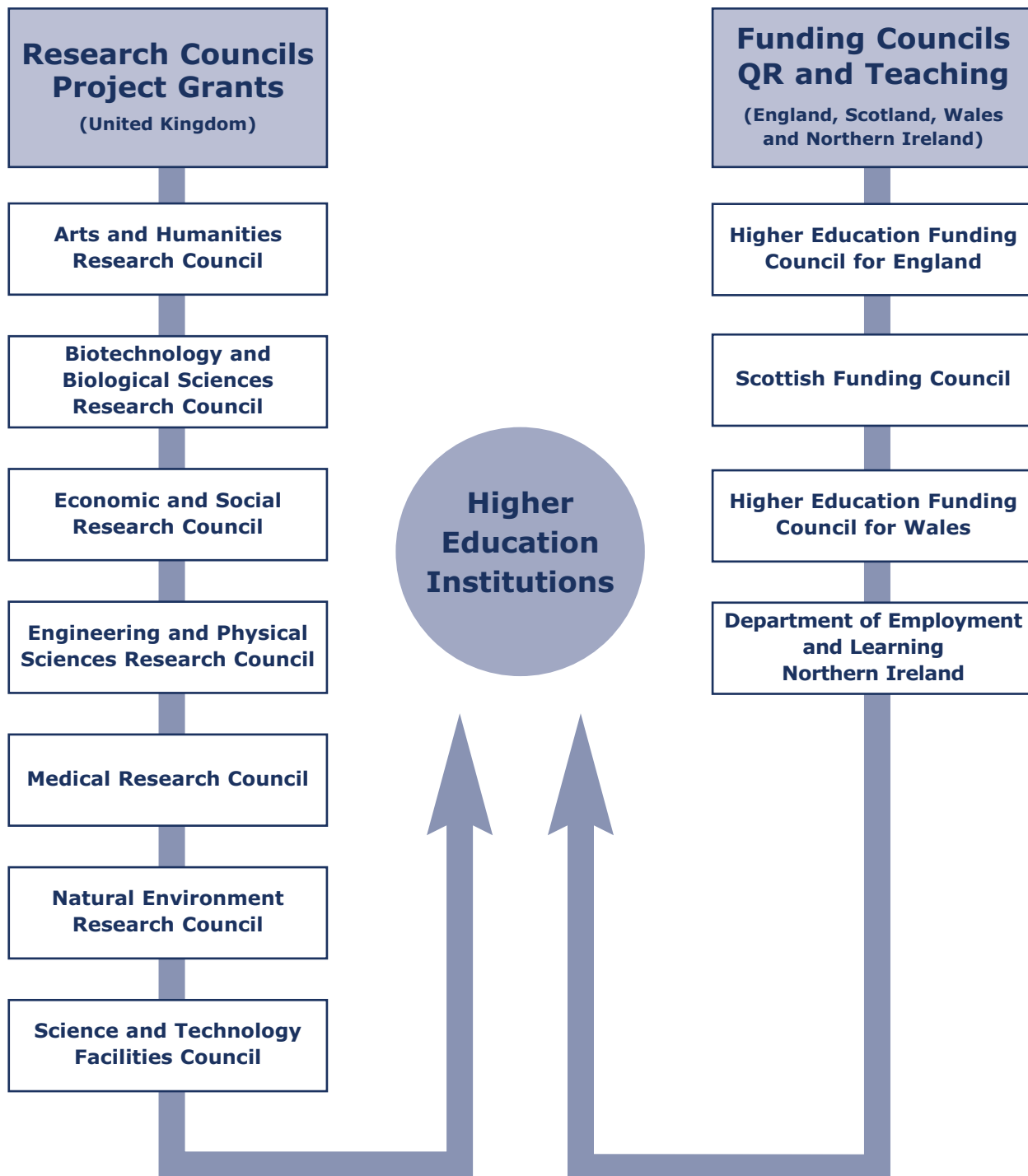
Higher Education Funding Council for England (HEFCE) assignment of units of assessment to research cost bands as used for the 2008/09 allocation

2001 RAE unit of assessment	Research cost weight
1 Clinical Laboratory Sciences	1.6
2 Community Based Clinical Subjects	1.6
3 Hospital-Based Clinical Subjects	1.6
4 Clinical Dentistry	1.6
5 Pre-Clinical Studies	1.6
6 Anatomy	1.6
7 Physiology	1.6
8 Pharmacology	1.6
9 Pharmacy	1.6
10 Nursing	1.3
11 Other Studies and Professions Allied to Medicine	1.6
12 Biochemistry (discontinued)	
13 Psychology	1.3
14 Biological Sciences	1.6
15 Agriculture	1.6
16 Food Science and Technology	1.6
17 Veterinary Science	1.6
18 Chemistry	1.6
19 Physics	1.6
20 Earth Sciences	1.6
21 Environmental Sciences	1.6
22 Pure Mathematics	1.3
23 Applied Mathematics	1.6
24 Statistics and Operational Research	1.6
25 Computer Science	1.6
26 General Engineering	1.6
27 Chemical Engineering	1.6
28 Civil Engineering	1.6
29 Electrical and Electronic Engineering	1.6
30 Mechanical, Aeronautical and Manufacturing Engineering	1.6

31 Mineral and Mining Engineering	1.6
32 Metallurgy and Materials	1.6
33 Built Environment	1.3
34 Town and Country Planning	1.3
35 Geography	1.3
36 Law	1
37 Anthropology	1
38 Economics and Econometrics	1
39 Politics and International Studies	1
40 Social Policy and Administration	1
41 Social Work	1
42 Sociology	1
43 Business and Management Studies	1
44 Accountancy	1
45 American Studies (Canada, the Caribbean, Latin America and the USA)	1
46 Middle Eastern and African Studies	1
47 Asian Studies	1
48 European Studies	1
49 Celtic Studies	1
50 English Language and Literature	1
51 French	1
52 German, Dutch and Scandinavian Languages	1
53 Italian	1
54 Russian, Slavonic and East European Languages	1
55 Iberian and Latin American Languages	1
56 Linguistics	1
57 Classics, Ancient History, Byzantine and Modern Greek Studies	1
58 Archaeology	1.3
59 History	1
60 History of Art, Architecture and Design	1
61 Library and Information Management	1
62 Philosophy	1
63 Theology, Divinity and Religious Studies	1
64 Art and Design	1.3
65 Communication, Cultural and Media Studies	1
66 Drama, Dance and Performing Arts	1.3
67 Music	1.3
68 Education	1
69 Sports Related Subjects	1.3

Source: HEFCE Analytical Services Group

Annex 5: The Dual Support System



References

- Aghion, P. and Howitt, P. (1998) 'Capital Accumulation and Innovation as Complementary Factors in Long-Run Growth' *Journal of Economic Growth*, 3/2, 111-130
- Antelman, A. (2004) 'Do Open-Access Articles Have a Greater Research Impact?', *College & Research Libraries News*, 65(5), 372-382
- Arthur, W. B. (1994) *Increasing Returns and Path Dependence in the Economy*. Ann Arbor: University of Michigan Press
- Bakhshi, H., McVittie, E. and Simmie, J. (2008) *Creating Innovation: Do the creative industries support innovation in the wider economy?* London: NESTA
- Bauer, M. ed. (1995) *Resistance to New Technology: Nuclear Power, Information Technology and Biotechnology*. Cambridge: Cambridge University Press
- Becher, T. and Trowler, P. (2001) *Academic Tribes and Territories: Intellectual enquiry and the culture of disciplines, Second Edition*. Maidenhead: The Society for Research into Higher Education & Open University Press
- Benz, M. (2007) 'The Relevance of Procedural Utility for Economics' in Frey B. and Stutzer A. eds., *Economics and Psychology: A Promising New Cross-Disciplinary Field*. Cambridge, Mass: MIT Press
- Besley, T. and Ghatak, M. (2003) 'Competition and Incentives with Motivated Agents', *LSE Discussion Paper* No. TE/03/465
- Bijker, W. (1997) *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*. Cambridge, Mass: MIT Press
- Bougrain, F. and Haudeville, B. (2002) 'Innovation, collaboration and SMEs internal research capacities', *Research Policy*, 31, 735-747
- Bourke, P. (1997) *Discipline Boundaries in the Social Sciences*. Canberra, Australia: Academy of the Social Sciences, Occasional Paper Series 1.
- Bound, K., Briggs, R., Holden, J. and Jones, S. (2007) *Cultural Diplomacy*. London: Demos
- British Academy (2007) *Peer Review: the challenges for the humanities and the social sciences*. London: The British Academy
- Buchanan, R. (1992) 'Wicked Problems in Design Thinking' *Design Issues*, 8,2, 5-21
- Bullen, E., Robb, S., and Kenway, J. (2004) "'Creative destruction": knowledge economy policy and the future of the arts and humanities in the academy', *Journal of Education Policy*, 19/1, 3-22
- Cohen, W. M. and Levinthal, D. A. (1990) 'Absorptive Capacity: A New Perspective on Learning and Innovation', *Administrative Science Quarterly*, 35(1), 128-152
- Confederation of British Industry/Edexcel (2008) *Taking stock: CBI education and skills survey 2008*. London: CBI/Edexcel
- Cosh, A., Hughes, A., Lester, R. (2006) 'UK PLC: just how innovative are we? Findings from the Cambridge-MIT Institute International Innovation Benchmarking Project' Working Paper MIT-IPC-06-009.
- Crossick, G. (2006) *Knowledge transfer without widgets: the challenge of the creative economy*, lecture to the Royal Society of Arts in Leeds on 31 May 2006. London: Goldsmiths, University of London
- Dasgupta P. and David P. A. (1994) 'Toward a new economics of science', *Research Policy*, 23(5), 487-521.
- Daston, L. and Galison, P. (2007) *Objectivity*. New York: Zone Books
- Department for Culture, Media and Sport (2008) *McMaster Review: Supporting excellence in the arts – from measurement to judgement*. London: DCMS
- Department for Innovation, Universities and Skills (2008) *Innovation Nation*. London: DIUS
- Dill, D. (2008) 'Capacity building as an instrument of institutional reform: Improving the quality of higher education through academic audits in the UK, New Zealand, Sweden, and Hong Kong.' *Journal of Comparative Policy Analysis: Research and Practice*, 2/2, 211-234
- Dodgson, M., Gann, D. and Salter A. (2005) *Think, Play, Do: Innovation, Technology and Organization*. Oxford: Oxford University Press
- Dworkin, R. (1986) *Law's Empire*. London: Fontana
- Etzkowitz, H. (2008) *The Triple Helix: University-Industry-Government Innovation in Action*. New York & London: Routledge
- Fleischacker, S. (2005) *A Short History of Distributive Justice*. Cambridge, Mass: Harvard University Press
- Foray, D. and Hargreaves D. (2003) 'The Production of Knowledge in Different Sectors: a model and some hypotheses' *London Review of Education* 1.1, 7-19
- Frey, B. S. and Jegen, R. (2001) 'Motivation crowding theory: A survey of empirical evidence' *Journal of Economic Surveys*, 15(5), 589-611.
- Furman, J. and Stern, S. (2004) 'Climbing Atop the Shoulders of Giants: The Impact of Institutions on Cumulative Research' *NBER Working Papers* 12523
- Galenson, D. W. (2005) 'The Greatest Artists of the Twentieth Century' *NBER Working Papers* 11899
- Gamman, L. and Pascoe, T. (2004) 'Design Out Crime? Using Practice-based Models of the Design Process', *Crime Prevention and Community Safety: An International Journal*, 6 (4), 9-18
- Garfield, E. (1980) 'Is information retrieval in the arts and humanities inherently different from that in science? The effect that ISI's citation index for the arts and humanities is expected to have on future scholarship,' *Library Quarterly*, 50, 40-57.
- Georghiou, L. (2007) *Demanding innovation: lead markets, public procurement and innovation*, London: NESTA
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (1994) *The New Production of Knowledge: The Dynamics of Science and Research in Cotemporary Societies*. London: Sage
- Habermas, J. (2003) *The Future of Human Nature*, Cambridge: Polity
- Hamalainen, T. J. and Heiskala, R. (2007) *Social Innovations, Institutional Change and Economic Performance: Making Sense of Structural Adjustment Processes in Industrial Sectors, Regions and Societies*, Chetenham: Edward Elgar
- Hargrave, T. and Van de Ven, A. H. (2006) 'A collective action model of institutional change', *Academy of Management Review*, 31(4), 864-888.
- Harris, J., Bortolotti, J. and Irving, L. (2005) 'An Ethical Framework for Stem Cell Research in the European Union', *Health Care Analysis*, 13/3, 157-162
- Heath, M., Jubb, M. and Robey, D. (2008) 'E-Publication and Open Access in the Arts and Humanities in the UK', *Ariadne*, 54. Available at: www.ariadne.ac.uk/issue54/heath-et-al/ [accessed 23 June 2008]

- Herbert, J. (2008) *Creating the AHRC: An Arts and Humanities Research Council for the United Kingdom in the Twenty-first Century*. Oxford: Oxford University Press/The British Academy
- HM Treasury (2002) *SET for success: The supply of people with science, technology, engineering and mathematics skills. The report of Sir Gareth Roberts' Review*. London: HM Treasury.
- HM Treasury (2003) *Lambert Review of Business-University Collaboration*. London: HM Treasury
- HM Treasury (2005) *Cox Review of Creativity in Business: building on the UK's strengths*. London: HM Treasury
- HM Treasury (2007) *The Race to the Top: A Review of Government's Science and Innovation Policies* by Lord Sainsbury. London: HM Treasury
- Howells, J. (2006) 'Intermediation and the role of intermediaries in innovation', *Research Policy*, 35, 715-728
- Hussler, C. and Rondé, P. (2007) 'The impact of cognitive communities on the diffusion of academic knowledge: Evidence from the networks of inventors of a French university.' *Research Policy*, 36, 288-302
- Johnson, B., Lorenz, E. and Lundvall, B-Å. (2002) 'Why all this fuss about codified and tacit knowledge?' *Industrial and Corporate Change*, 11/2, 245-262
- Kaufman, A. and Tödtling, F. (2001) 'Science-industry interaction in the process of innovation: the importance of boundary-crossing between systems', *Research Policy*, 30, 791-804
- Kelly, M., Arnold, D., Brooksbank-Jones, A., Hudswell, E., Quince, E., and Wood, R. (2007) *Research Review in Modern Languages*. Bristol: AHRC.
- Kenway, J., Bullen, E. and Robb, S. (2004) 'Global Knowledge Politics and "Exploitable Knowledge"' in Kenway, J., Bullen, E. and Robb, S. eds. *Innovation and tradition: the arts, humanities and the knowledge economy*. New York: Peter Lang
- Kline, S. (1995) *Conceptual Foundations of Multidisciplinary Thinking*, Palo Alto: Stanford University Press
- Lakoff, G. and Johnson, M. (2003) *Metaphors we live by*. 2nd edition. Chicago: University of Chicago Press
- Lerner, J. and Tirole J. (2002) 'Some simple economics of open source,' *Journal of Industrial Economics*, 50(2), 197-234.
- Lester, R. and Piore M. (2005) *Innovation: The Missing Dimension*, Cambridge Mass: Harvard University Press
- Lucas, R.E. (1988) 'On the Mechanics of Development', *Journal of Monetary Economics*, 22, 3-42
- Lundvall, B-Å. ed. (1992) *National Innovation Systems: Towards a Theory of Innovation and Interactive Learning*. London: Pinter
- Lundvall, B-Å., Johnson, B., Anderson, E. S. and Dalum, B. (2002) 'National systems of production, innovation and competence building', *Research Policy*, 31, 213-231
- Miles, I. and Green, L. (2008) *Hidden Innovation in the Creative Industries*. London: NESTA
- Nederhof, A. (2006) 'Bibliometric monitoring of research performance in the Social Sciences and the Humanities: A review' *Scientometrics, and Springer, Dordrecht Vol. 66(1)*, 81-100
- Nelson, R. (2005) *Technology, Institutions and Economic Growth*. Cambridge, Mass: Harvard University Press
- Nooteboom, B., Van Haverbeke, W., Duysters, G., Gilsing, V. and van der Oord, A. (2007) 'Optimal cognitive distance and absorptive capacity', *Research Policy*, 36, 1016-1034
- Oakley, K., Sperry, B. and Pratt, A. (2008) *The art of innovation: How fine arts graduates contribute to innovation*. London: NESTA
- Organisation for Economic Co-operation and Development (2007) *Innovation and Growth: Rationale for an Innovation Strategy*. Paris: OECD
- Oxford Economics (2008), 'The economic contribution of the UK Games Development Industry'. Available at www.oef.com/free/pdfs/gamesimpact.pdf [accessed 31 October 2008]
- Page, S. E. (2007) *The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies*. Princeton: Princeton University Press
- Pierson, P. (2004) *Politics in Time: History, Institutions, and Social Analysis*. Princeton: Princeton University Press
- Plomer, A. (2005) *The Law and Ethics of Medical Research: International Bioethics and Human Rights*. London: Cavendish
- Research Councils UK (2006) *Increasing the economic impact of Research Councils*. Swindon: RCUK
- Research Councils UK (2008) *RCUK Expectation for Societal and Economic Impact*. Available at www.rcuk.ac.uk/cmsweb/downloads/rcuk/innovation/expectationssei.pdf
- Rogers, E. M. (1995) *Diffusion of innovations: 4th edition*. New York: Free Press
- Romer, P. (1986) 'Increasing Returns and Long Run Growth' *Journal of Political Economy*, 94, 1002-37
- Romer, P. (1990) 'Endogenous Technological Change' *Journal of Political Economy*, 98, 71-102
- Rust, C., Mottram, J. and Till, J. (2007) *Practice-led Research in Art, Design and Architecture*. Bristol: AHRC
- Savulescu, J. (2006) 'Genetic Interventions and the Ethics of Enhancement of Human Beings' in Steinbock, B. ed. *The Oxford Handbook on Bioethics*. Oxford: Oxford University Press
- Shapiro, C. and Varian, H. (1999), *Information Rules: A Strategic Guide to the Network Economy*. Boston: Harvard Business School Press
- Sharif, N (2006), 'Emergence and development of the National Innovation Systems concept', *Research Policy* 35: 5, 745-766
- Smits, R. and Kuhlmann, S. (2004) 'The rise of systemic instruments in innovation policy', *International Journal of Foresight and Innovation Policy*, 1, 1/2, 4-32
- Stein, J. (2007) 'Conversations Among Competitors', *NBER Working Paper No. W13370*
- Stoneman, P. (2007) *An Introduction to the Definition and Measurement of Soft Innovation*. London: NESTA
- Sunstein, C. (2001) 'Academic Fads and Fashions (With Special Reference to Law)' *John M. Olin Law & Economics working paper*
- Sunstein, C. (2006) *Infotopia: How Many Minds Produce Knowledge*. Oxford: Oxford University Press
- Thackara, J (2005) *In the Bubble – Designing in a Complex World*. Cambridge, Mass: MIT Press
- Yusuf, S. and Nabeshima, K. eds. (2007) *How Universities Promote Economic Growth*. Washington, DC: World Bank
- Zahra, S. A. and George, G. (2002) 'Absorptive Capacity: A Review, Reconceptualization, and Extension,' *Academy of Management Review* 27:2, 185-203.
- Zaltman, G. (2003) *How Customers Think: Essential Insights into the Mind of the Market*. Boston: Harvard Business School Press
- Ziman, J. ed. (2000) *Technological Change as an Evolutionary Process*. Cambridge: Cambridge University Press



Arts & Humanities
Research Council

Whitefriars
Lewins Mead
Bristol
BS1 2AE

Tel: 0117 987 6543
Fax: 0117 987 6544

www.ahrc.ac.uk

