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Interdisciplinary Research

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This article considers the increased focus on interdisciplinary research to solve major social problems through game changing solutions. It discusses research in the arts and humanities within the context of interdisciplinary research and within the broader academy. In particular, it distinguishes between research in the arts, and research in the humanities. More specifically, it goes on to consider an element within the arts known as design. In this context, the processes of design thinking across many disciplines are considered essential to the potential of interdisciplinary research to produce radical innovations.

The social contract for research over the last decade or so has moved away from an earlier, singular belief, that greater specialization is the key to successful research. Accordingly, interdisciplinary approaches to knowledge production and innovation have grown in importance. They are now perceived as being fundamental to the future research landscape.

More than this, it is generally hoped and believed that interdisciplinary research will stimulate the kinds of radical innovations that are needed to solve some of the major problems facing society. Indeed, previous forms of incremental development, that have come out of discrete knowledge domains, now seem to have proved themselves insufficient in the face of the complex social and environmental challenges that we currently face.

So it is this potential of interdisciplinary research, to deliver game-changing solutions, through radical innovations, that seems to have generated such a widespread, and considerable, investment of faith in its potential. The following paragraphs illustrate some of the reasons that the arts and design can contribute significantly to this objective.

For many of my colleagues in the life and physical sciences, the arts and humanities often seem to be a domain that either is cognate or confusing. Certainly, it is confusing for those unfamiliar with it but it is not as cognate as may at first appear.

There are considerable methodological differences between research in the humanities and research in the arts. In the humanities, I would include, for example,

History, Philosophy, Classics, Languages, Linguistics, Literature, Religion and Theology. Research in these disciplines is characterized by outputs that are, largely, text-based with traditional, and well-understood, forms of scholarly rigour.

Disciplines in the arts that I would include are Music, Theatre, Fine Arts, Textiles, Media and Design (in its many forms). In these disciplines, the research outputs are largely non-textual, being in the form of, for example, objects, events, performances or, say, systems. And, because such research outputs are non-text, they do not always communicate their research imperatives naturally. Consequently, and because these disciplines are relatively new entrants to academic research, they are working to develop new forms of scholarly rigour (appropriate to this form of research output, invariably in a non-textual format) so that the knowledge they contain can be shared.

One aspect of the author's recent experience that is relevant to this paper is that for over a decade he was involved in the UK's national assessment of research in Higher Education. This work was undertaken with a sense that research in the arts and humanities was making a major contribution to society, and also a curiosity to see if this could be both verified and recognized.

For those readers who are unfamiliar with the RAE (Research Assessment Exercise) and REF (Research Excellence Framework), they are successive national systems for the assessment of research quality and the consequent distribution of public funding against this. This funding takes the form of a block grant to each submitting institution of, say, five years before a further quality review of the research is undertaken and to which revised funding is then geared.

For five years, the author chaired the Main Panel for Arts in RAE 2008. This was one of 15 Main Panels, each representing a cognate research domain. The sub-panels for which the author was responsible in 2008 were based largely, if not exclusively, in the practice-based arts. Following this assessment, the author then chaired one of four Main Panels in REF 2014. Here, the 15 panels had been reduced to four Main Panels, each of which included a broader range of disciplines that now embraced the arts and humanities landscape in its entirety.

Although there was a considerable degree of methodological consistency between these two assessment frameworks, in 2008 and 2014, there also were innovations in the time between them.

First, the introduction of research impact as a formal part of the assessment framework was intended to establish a public articulation of research that could be shown to have had (and here the public definition of impact is) 'an effect upon, change or benefit to, the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia'. And here the key phrase is 'beyond academia', which makes clear that this is not intended to be the impact of academic research on other academic research but a wider range of communities outside of this.

Second, the reduction of the number of main panels from 15 to four was intended, amongst other things, to help assimilate and stimulate interdisciplinary research within, and between, larger cognate research domains.

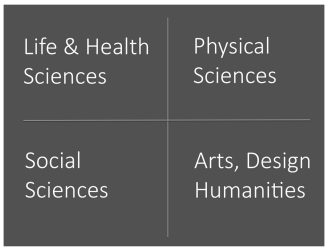

Figure 1. The four main panels in the UK Research Excellence Framework (REF) 2014.

Here, two concepts came together in response to this new social contract for research. They were that interdisciplinary approaches might deliver the radical innovations needed to benefit society and that the work of some, but not all, such research will have a positive impact in society.

The introduction of Research Impact into the assessment for 2014 was, initially, treated with considerable suspicion by the sector. By the end of the exercise it was widely lauded as a successful innovation that had helped to bring the significant public benefits of research to a wider audience and to policy makers. However, the fitness of both the RAE and REF to deliver a peer review system that could support, rather than disadvantage, interdisciplinary research remained problematic.

Despite very clear public statements that interdisciplinary research would be treated equally to all other research its peer review was and continues to be, treated by the sector with uncertainty.

In reality, analysis of the REF 2014 results indicated that, in terms of its quality assessment, interdisciplinary research did as well as all other forms of research. This in itself, however, did not stem the concerns that are still voiced about the peer review of interdisciplinary research. With this in mind, the UK Funding Councils have already started to prepare for the next Research Excellence Framework in 2021. In particular, they have placed considerable importance on the preparations for interdisciplinary research, having already convened a Panel that will advise on the submission and assessment of interdisciplinary research in 2021.

The Main Panel for arts and humanities that the author chaired in REF 2014 was one of four Main Panels (Figure 1) that were less specialized although still broadly cognate. Each was responsible for a wide range of disciplinary sub-panels that, together, embraced all research disciplines within the Academy. Indeed, the diagram shown in Figure 1, depending on how one interprets it, could reflect the theme set out for the conference at which this talk was delivered, and for the present volume in which it appears — that of CP Snow's famous Rede Lecture of 1959 describing two cultures separated by an intellectual gulf. Here, in the upper left quadrant, sit the hard sciences and, diametrically opposed in the bottom right quadrant, the soft humanities. One explores the truth of the universe and the other investigates the human condition. But such crude binary oppositions only serve to isolate discovery science

from creativity and innovation, at a time when we need greater integration of, and overlap between, these approaches.

Today, surely, we are all involved in issues concerning the truth of the universe and the human condition. Indeed, with the changing nature of the social contract for research over the last 50 years, matters are no longer served well by such binary oppositions. These four disciplinary areas, overall and together, now form a rich and dynamic research ecology that is essential to ensuring that many forms of research, including interdisciplinary research, can flourish. Indeed, it is the role and function of the academy to cultivate and stimulate this overall research ecology. And, without it, true interdisciplinary research will either struggle or flounder.

Before leaving this topic, there is a little more to be said about the place of the arts and humanities within the overall framework of the academy. The humanities have been part of the research landscape since the first universities were founded. The arts, however, have existed outside the university system from its very beginnings, with their origins being in the medieval trades and crafts guilds. In the late nineteenth century, these independent guilds were formalized into a state system of education delivered through a new breed of arts schools.

About 50 years ago in Britain, many of the independent arts schools were brought into multidisciplinary polytechnics; then, about 30 years ago, these polytechnics were transformed into modern universities. The significance here is that only from the 1990s onwards, for the very first time in their history, were the arts in the UK embedded in the university infrastructure and so able to compete against all other universities for block grant funding to support research in the arts.

This condition, though, is particularly British. In mainland Europe, the circumstances are slightly different; there still are many more independent art schools standing outside traditional university infrastructures.

However, in all parts of the world, the arts disciplines are recent entrants to academic research. This said, the arts and design have developed long traditions of working with non-academic communities – either with local communities, knowledge users or the beneficiaries of knowledge. Indeed, much work in arts and design has been specifically geared to have some impact either in society or on the environment and it has been highly interdisciplinary. Here, the impact of knowledge often tends to precede its codification and articulation as research, unlike the traditional route from lab to life.

One example from the visual arts may help to illustrate these points. It is based on visual evidence although the research outcomes also include a written text that articulates the key findings. In this example, the work is interdisciplinary in that the artist not only worked with the beneficiaries of the research but also with the research users.

The researcher is a visual artist called David Cotterrell, who produced a series of curiosity-driven installations addressing the conditions of empathy and risk between people. He devised one such installation, Mirror, to explore the anxieties and thought processes of two people involved in surgery – the patient and the surgeon. Cotterrell described the work as follows:

> The installation considered the concerns and devices by which an impending operation is … contextualized and the way the mind might wander under the … pressure of approaching professional and/or personal risk. Recorded in isolation from the context, without revealing the categorizing uniforms of scrubs or gown, the conversation offers a … portrait of both the surgeon and the patient as they prepare for surgery. The outwardly simple video projection offers a snapshot of these complex internal negotiations of vulnerability and bravado.

Building on the knowledge and experience gained through this enquiry, Cotterrell went on to collaborate with the military medical facilities of the British army in Helmand province, Afghanistan. This subsequent research was supported by a grant from the Wellcome Trust. The project resulted in an Impact Case Study entitled 'War and Medicine'. In the full Impact Case Study Cotterrell has described the effects of the research in the following way:[1]

> The research involved the first uncensored documentation of the contemporary UK military pathway and has been used internationally to raise awareness in professional participants and the general public of the ethical and practical complexities of militarised healthcare. The impact of this research was evidenced in three distinct ways:
>
> 1. Informing improvements in military and civilian training leading to the creation of standard briefing materials for British deployed forces, medics and civilians to ensure early awareness of the `care pathway';
> 2. Establishing additional reference points within contemporary art discourse and reflecting on the role of independent observers of conflict; and
> 3. Aiding patient recovery and understanding by helping individuals reconcile the profound change that they have undergone through injury and by establishing precedents for a format of comprehensive patient diaries, enabling longer-term understanding of traumatic experience.

This example helps to illustrate some of the underlying characteristics of research in the arts – specifically, the very heavy reliance on forms of visual evidence and, more importantly, the fact that this type of research is often directly engaged with the experiences of citizens or with the needs of research users. Interestingly, in Cotterrell's case, the indisciplinarity of his research was not based on partnerships between academics but in partnership with research beneficiaries and with research users.

This one example does not indicate that interdisciplinary research in the arts and humanities is conducted in a singular form – indeed, it can take many forms.

Broadly speaking, some of the characteristics that make interdisciplinary research environments so dynamic are: types of research; the cognitive distance between knowledge domains; the integration of knowledge; partnerships with stakeholders, and research design. Here there are three types of research to be considered: Problem-orientated; Challenge-driven, and Fundamental-knowledge.

The type of research undertaken by Cotterrell could reasonably be described as *Problem-orientated*. Here the problem is clearly set out and the research has been geared to provide specific solutions. It is sufficiently self-contained that groups of stakeholders (i.e. research beneficiaries and research users) can participate in the research.

In *Challenge-driven* research the work sets out to tackle broad challenges affecting society, such as clean water, digital personhood, robotic culture, tackling gun crime, etc. Here the groups of researchers may be drawn from a wide range of disciplines, include research users and beneficiaries, and the problem may be less clearly defined.

In *Fundamental-knowledge*, the questions are clearly identified but of an academic nature. Here, groups of academic researchers may collaborate to generate enhanced understandings and new knowledge of the question in hand.

Then there is the process of integrating knowledge between these various domains, whether their intellectual distance is great or small. In some instances, the approach may be *holistic* and in others it may be *multi-layered*.

In the *holistic* approach, the aim is to produce new understandings from an integration of knowledge where it would otherwise have been classified separately within each of the disciplines. In such instances new forms of scholarly language and descriptors are needed to codify the research outcomes – whether theoretical or practical – as they would be impossible to explain through the traditional descriptors of the individual disciplines.

In a *multi-layered* approach, understandings and insights are contributed by each of the participating disciplines but these retain the characteristic descriptors of those disciplines.

There is then the question of interdisciplinary partnerships, not between academic groups, but between research academics and their stakeholders (such as research users and research beneficiaries). These types of partnerships help to establish pathways to impact for the research. Essentially, there are three different ways in which stakeholders can be involved in the research.

First, as a *partner* – in the research design and process, contributing to the outcomes. Second, as an *informant* – where user-centred feedback received from stakeholders is incorporated back into the research but the stakeholders are not involved in the research design. Third, as a *receiver* – here stakeholders will receive the outcomes of the research either through publication or through a more direct engagement with the research team.

So, interdisciplinary research can take a number of forms and adopt various approaches. Overall, the ecology of interdisciplinary research is both rich and dynamic. In this respect, it needs both careful leadership and management if it is to flourish. This will not happen by itself and there is a need for enabling frameworks if this ecology is to grow and be sustainable.

Here, I would like to introduce the final theme of this paper, which is *Design*. Like interdisciplinary research, design has recently become a very fashionable and over-used term. Likewise, it has also become prone to intellectual imprecision and conceptual ambiguity.

Traditionally, design as a noun meant little in itself. Usually it had to be preceded by a qualifying adjective for it to make any sense, e.g. graphic design, industrial design, fashion design, engine design and so on. Since the late nineteenth century, design has been tied to the processes of industrial manufacture. In this context, design can be defined ‘as a plan to make an artefact’. However, in recent

years, in post-industrial society, the principles of design have been expanded and applied to things that are either invisible or intangible – the design of organizations, of systems, of economies, of identities, of biologies, or, the processes of decision-making. It seems that, today, everything can be, or is, designed.

One of the pioneers of this approach to design, as a set of universal principles, was Herbert Simon. He was based at Carnegie Mellon University in the USA. Simon was a social scientist with a primary interest in decision-making. He won major awards for this work, including a Nobel Prize. Simon began to see that design was a fundamental element in those decision-making processes that would eventually have some impact on society. In this context, Simon's often-used definition of design is that, 'To design is to devise courses of action aimed at changing existing situations into preferred ones'.

This is quite different to preceding definitions of design as a plan to make an artefact.

Here, the link between design and its impact upon society is clearly made. Furthermore, this approach is intrinsically interdisciplinary. Simon's own career ranged across political science, econometrics, sociology, psychology, computer science, artificial intelligence, cognitive science, public administration and political science – but all of this was unified by his studies of the role of design in decision-making.

In this context, design is not a subject of itself. Instead it is a framework for decision-making that is given meaning when it works as the binding agent between various disciplines and their stakeholders. When a number of expert disciplines collaborate with each other they will each bring a deep knowledge base to the table. However, these vertical academic silos will have limited experience of working with each other and with stakeholders – especially those who may benefit from the research – and will have walls that are relatively impermeable.

It is here that design as a horizontal decision-making framework helps to act as the binding agent between these disciplines and their stakeholders.

Also, because the design process is driven by an expectation that research outcomes will have beneficial effects in society, it is intrinsic that designers will work closely with stakeholders either as co-designers or as informants. Having said this, one of the key developments to have emerged in recent years is the linking of design with innovation. Here the decision-making processes of design are more than enabling frameworks – i.e. simply helping disciplines and stakeholders to engage with each other. In the process of doing this, one of the challenges of design thinking is to create synergies and linkages that will lead to new solutions that otherwise would be beyond the imagination of an individual.

So here, design is more than a simple binding agent, but a catalyst for innovation. Indeed, it is the need to go beyond incremental developments, to find those radical innovations – those game-changing insights – that will help us solve some of the major challenges facing society. It is this prospect that has caused design and interdisciplinarity to become so ubiquitous in recent times.

By way of conclusion, a short summary of the key points in this paper are as follows.

- The social contract for research has moved away from a belief that increasing specialization is the only path to great research.
- The new social contract for knowledge production hopes that interdisciplinary research will produce those game-changing radical innovations that will help to solve some of the major social and environmental issues we face.
- We need to move beyond those binary oppositions between academic disciplines that have often isolated research domains from each other.
- Universities have an obligation to foster an overall research ecology in which interdisciplinary research can flourish across all the research domains of the academy, i.e. the life sciences, physical sciences and the arts and humanities.
- In historical terms, the arts have existed outside of university infrastructures, as many continue to do in the shape of independent specialist institutions – the arts schools.
- This independence is partly because the research outcomes of arts and design are mostly non-text and so at odds with the prevailing research culture of the academy that is dominated by scholarly papers in text-based formats.
- Also, the arts tend to prioritize work with stakeholders, such as research users and research beneficiaries, with a clear aim being to create some positive benefit through the impact of their work. Here, the impact of knowledge often precedes its codification as research.
- Within this, the emergence of design and innovation as a ubiquitous element in interdisciplinary research is significant and important.
- Design is a framework for decision-making through which 'To design is to devise courses of action aimed at changing existing situations into preferred ones'.
- This is the bridge that connects interdisciplinary research to its wider impact on society and the environment.

Overall, the aim is that good design will help interdisciplinary research to produce the radical innovations, and game-changing solutions, that will help us to deal with major social challenges. Although the arts and design are, to some degree, sleeping partners in this overall research ecology, they have a significant contribution to make along with novel approaches to bring.

Reference

1. D. Cotterrell (2014) *War and Medicine: Impact Case Study* (Higher Education Funding Council for England), http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=4980 (last accessed May 2016).

About the Author

Bruce Brown is Visiting Professor at the Royal College of Art in London where he is also an Honorary Fellow. Recently he was Professor of Design at the University of Brighton and Pro-Vice-Chancellor Research. For 20 years previously he was Dean of the university's Faculty of Arts & Architecture. Recently he was appointed by the Funding Councils for England, Northern Ireland, Scotland and Wales to chair a Main Panel in the Research Excellence Framework 2014, and currently he is chair of the creative and performing arts and design panel in the Hong Kong Research Assessment Exercise 2020. He has been a member of the Advisory Board of the UK Arts and Humanities Research Council and advised international organizations including the Hong Kong Council for Academic Accreditation and the Qatar National Research Fund. He chaired the Portuguese Government's Fundação para a Ciência ea Tecnologia Research Grants Panel [Arts] and was one of four people invited by the Portuguese Government to conduct an international review entitled Reforming Arts and Culture Higher Education in Portugal. He is an Editor of *Design Issues Research Journal* (MIT) and a Life Fellow of the Royal Society of Arts, London.