Interrogating the Value of Design Research for Change

Paul A. Rodgers

Imagination, Lancaster University, Lancaster, UK

Postal address: Lancaster University, LICA building, Bailrigg, Lancaster, LA1 4W, United Kingdom; Phone: +44 (0) 1524 594520; Email: p.rodgers@lancaster.ac.uk

Paul Rodgers is Professor of Design at Imagination, Lancaster University. He is also the Arts and Humanities Research Council (AHRC) Design Leadership Fellow in the UK. He is a co-founder of the Design Disruption Group which focuses its research on making positive change in health and social care and elsewhere.

Francesco Mazzarella

Imagination, Lancaster University, Lancaster, UK

Postal address: Lancaster University, LICA building, Bailrigg, Lancaster, LA1 4W, United Kingdom; Phone: +44 (0) 7783025452; Email: f.mazzarella@lancaster.ac.uk

Francesco Mazzarella is a research associate at Imagination, Lancaster University working with the AHRC Design Leadership Fellow on 'Design Research for Change' projects. He is also a post-doctoral research fellow at the Centre for Sustainable Fashion (a University of the Arts London' research centre), exploring ways in which design activism can create counter-narratives towards sustainability in fashion.

Loura Conerney

Imagination, Lancaster University, Lancaster, UK

Postal address: Lancaster University, LICA building, Bailrigg, Lancaster, LA1 4W, United Kingdom; Phone: +44 (0) 1524 510 455; Email: l.conerney@lancaster.ac.uk

Loura Conerney is visualisations and communication officer at Imagination, Lancaster University. She is responsible for all communications and data analytics work for the AHRC Design Leadership Fellow in the UK and is funded under the AHRC's Design Priority Area Leadership Fellowship scheme (Award Ref: AH/P013619/1).

Interrogating the Value of Design Research for Change

This paper examines different types of value created by design research in the UK. Given the significant economic, social and environmental challenges we currently face, funding bodies and governments are increasingly concerned with assessing the value and impact of design research. The value generated by design research is not always clearly articulated by the academic community and understood by the public. With this in mind, this paper examines a sample of 67 projects that traverse conceptual, disciplinary and methodological boundaries representing the spread of contemporary design research in the UK. The paper presents an innovative 4-leaf value model that integrates different value theories from economics, sustainable development, and the social sciences. The paper highlights that design research plays a significant role in generating social, cultural, economic and environmental change, outlines synergies between the different types of value produced, and identifies gaps for design researchers to focus on in future years.

Keywords: Design value; Design research; Change; Arts and Humanities Research Council (AHRC)

Introduction

Researchers and practitioners in design – thanks to their skills in creative thinking, analysis, synthesis, and visualisation – are well equipped to tackle the complex environmental, economic, social, and cultural challenges of the present and future world (Nesta, 2017). Through their design interventions (i.e. new products, services, systems, and environments), researchers and practitioners make a significant contribution to a nation's economy. Furthermore, design research contributes to other disciplines in and beyond the creative industries and supports industrial competitiveness, innovation, knowledge, skills, and social policy (Press, 2011). For example, many forms of contemporary design research in the UK focus on activating change in social, cultural, economic, and environmental contexts. Design research projects contribute new and

useful knowledge and understanding in a range of contexts. For example, the contribution that design research projects make in improving health and wellbeing has been extensively studied and includes the design of better healthcare environments and designed interventions to enhance social inclusion. All of this knowledge and understanding benefits design researchers and others through the development of more effective research methodologies and tools that enrich people living and working in the UK and elsewhere (Crossick and Kaszynska, 2016; Rodgers, 2018a). Furthermore, new frameworks for collaboration are encouraging designers to work as cultural intermediaries between researchers and practitioners in different fields, cutting across disciplinary and methodological boundaries (Sanders, 2006). Whilst interdisciplinarity is highly valued and common amongst design practice and research as is the innovative way in which designers work with other researchers in different disciplines – such as scientists, ergonomists, psychologists, sociologists, to name but a few – the question of how design research draws value from other subject areas whilst also generating value of its own remains a critical issue of debate for the academic design community (Borja de Mozota *et al*., 2016). Given the rapidly changing context in which design operates, it has become increasingly difficult to clearly assess and articulate the multi-faceted value that design research can generate. Furthermore, although the value of design has been object of several studies (Danish Design Centre, 2001; Rae, 2013; Westcott *et al*., 2013; Cooper *et al*., 2016; Design Council, 2007; 2018), such research mostly focuses on the strategic role of design in managing businesses and organisations, and in this context the term 'value' is used mostly in quantitative terms in relation to economic competitiveness. Rather than focusing solely on economic aspects of design, this paper adopts a more holistic approach and aims at interrogating the different types (*i.e.* social,

cultural, economic, and environmental) of value that design research can create towards enacting positive change.

Design Research in the UK

The foundation of the Design Research Society in the 1960s marked the beginning of formal research pursuits in the UK by the likes of Bruce Archer, John Chris Jones and others. It is only in the last decade and a half, however, that significant opportunities to fund and develop design research have become more widespread. The establishment of the Research Assessment Exercise – RAE (later replaced by the Research Excellence Framework – REF) in 1986 and the creation of the Arts and Humanities Research Council (AHRC) in 2005 has opened up considerable funding opportunities for design research.

On the other hand, in the current climate where governments are applying strict austerity measures in relation to public funding, it is becoming increasingly relevant for them to reconsider what sectors are 'worth' investing public money in. In the UK, the 'Report of the Machinery of Government Committee' – also known as the 'Haldane Report' published by the Ministry of Reconstruction (1918) in the aftermath of the Great War – set out a series of principles for evidence-based policy making. Just over a century later, the Haldane Report offers us an excellent opportunity to reflect and make comparisons with how research funding has been utilised over the last century. The Haldane Report set out a number of principles to ensure that excellence is the main criterion for investing in research conducted in the best interests of the country with decisions on which research projects to fund made by experts. Over 100 years later, the Haldane Report is still relevant today due to the complex economic, social, and political challenges we currently face, and given that such funding bodies are increasingly concerned with measuring the impact and value of research. For instance, the results of

the REF are used every year to allocate around £1.6 billion to higher education research institutes in the UK (Higher Education Funding Council for England, 2015). Given that 20% of this funding is allocated on the basis of impact, there is a need for robust, fair and transparent assessment processes (Policy Institute at King's, 2016).

In the current climate of austerity, there are pressures for governments to prioritise what are deemed to be essential components of a functioning society, such as the national health service, national defence against terrorism attacks, advanced research into non-carbon resources, infrastructures for public transport, affordable housing, and general education. Given these priority areas, Bate (2011) shows that governments' funding for research in art and design is decreasing, since the 'value for money' or 'public benefit' of such research has been difficult to demonstrate. It is generally easier for the public to grasp the value of scientific research (in sectors such as medicine, biochemistry, and others) whose aim may be to find treatments for certain diseases or develop new materials and techniques for solving environmental issues. On the other hand, the value of design research can be difficult to articulate because it often entails intangible outcomes which are difficult to measure in quantitative terms, and whose impacts often take a long time to become manifest. Furthermore, the design processes undertaken to develop innovative products and services often involve a multitude of actors and hence it becomes difficult to isolate design as a function and clearly define all the contributors and beneficiaries from this type of work. With this in mind, while governments are obviously accountable for how taxpayers' money is spent, Bate (2011, p. 6) argues for the need to adopt alternative ways of assessing the value of research in the arts and humanities. Indeed, quantitative measures in economic terms are often inappropriate to capture the "…messy, debatable and unquantifiable but essentially human dimensions of life, such as history, beauty, imagination, faith, truth,

goodness, justice and freedom". To address the challenge of identifying appropriate methodologies and evidence methods for assessing the value of arts and culture to individuals and society, Crossick and Kaszynska (2016) have clearly articulated the need for using a wide range of both qualitative and quantitative methods, drawn from social sciences, economics, as well as medicine, and adopting multi-criteria analyses that span the depth and breadth of multi-faceted areas of research, such as design.

A Review of the Concept of 'Value'

In the current design literature, it is difficult to find an agreed definition of the concept of 'value' (Borja de Mozota *et al*. 2016). Moreover, there are different types of value depending on the context one is studying. In dictionary terms, for example, the word 'value' has its origins in the old French term 'valoir', meaning 'be worth', deriving from the Latin 'valere'. According to the Oxford English Dictionary, 'value' is defined as "the regard that something is held to deserve; the importance, worth, or usefulness of something", "the material or monetary worth of something", as well as "the worth of something compared to the price paid or asked for it". These definitions show that value is generally conceived from an economic perspective, like in the expression "value for money", which is used in relation to commodities, to indicate something quantifiable that can be exchanged in the market, and assessed in terms of 'economic impact'. Another definition considers value as "principles or standards of behaviour; one's judgement of what is important in life". From this perspective, more aligned with the social sciences and philosophy, the term is generally used in its plural form, as in the case of the values that people internalise from their parents or members of the groups they belong to. The term 'value' is also used in other subject areas, such as Maths (to mean "the numerical amount denoted by an algebraic term, a magnitude, quantity, or number"), Music (to denote "the relative duration of the sound signified by a note"),

and Linguistics (to define “the meaning of a word or other linguistic unit”, “the quality or tone of a spoken sound” as well as “the sound represented by a letter”). Furthermore, as a verb, ‘to value’ is used to “estimate the monetary worth of” something, to “consider (someone or something) to be important or beneficial” and to “have a high opinion of” someone.

Building on these general definitions of the term ‘value’, we have reviewed different value theories from the disciplinary areas of economics, sustainable development and social sciences, and articulated the different types (i.e. social, cultural, economic, and environmental) of value that design research can generate, as described in the following sections.

Social Value

According to Judge and Kammeyer-Mueller (2011), ‘social value’ refers to the contribution to the individual and collective happiness and wellbeing of a well-functioning society. Social value can be defined as improvement to the quality of life, especially for marginal groups of people who aspire for “longer-term, humanistic, and more sustainable ways of living” (Sanders and Simons, 2009, p. 1). This type of value can be created through collaborative design processes (for instance, co-creation workshops where people make things together) aimed at enabling social interactions, integration, and empowerment (Hirscher *et al*., 2019). On the other hand, Sanders and Simons (2009) highlight that engaging people in such social value co-creation processes is challenging as it requires face-to-face participation, real-time interaction, and alignment towards a common goal. Within the scope of this journal article, we refer to social value not only as the individual value gained by a single person (*e.g.* a researcher) to develop skills and knowledge or enhance his/her personal fulfilment through academic career development, but also as the collective knowledge or value generated

by members of a community to benefit the community itself (*e.g.* the academy, the design research community, etc.). In this regard, we also refer to the ability to develop 'social impact' across diverse groups of people (*e.g.* project participants, funders, users, clients, and other stakeholders) involved in the research.

Cultural Value

'Cultural value' refers to the worth attributed to activities involving design, arts and culture, and their contribution to individuals, groups of people, and local, regional, national and international audiences. The concept of cultural value has been the subject of several studies including the AHRC-funded 'Cultural Value Project' (Crossick and Kaszynska, 2016), which has expanded the definition of the term to consider a wide range of cultural practices, including not only the subsidised cultural sector, but also commercial, amateur and participatory practices which provide most people with cultural engagement. The 'Cultural Value Project' has demonstrated that cultural engagement through arts and design research contributes to a greater shaping of reflective individuals, enhanced citizen engagement, and building peace and reconciliation after wars and conflicts. Another important element of cultural value is the knowledge generated through design research and practice, for instance "the tacit knowledge embodied in social processes" (Ardvidsson, 2009, p. 17) as well as the intangible assets of a company, such as patents and intellectual property rights. Design research can also create cultural value through participatory learning experiences that enhance individuals' abilities to gain skills, knowledge and awareness. In this regard, design education plays a crucial role in nurturing "creativity, inventiveness, problem solving and practical intelligence" (Mazzarella, 2018, p. 18) as well as shaping conscious citizens of the world we live in and change-makers towards future prosperity. Moreover, Fletcher and Grose (2012) recommend that designers should also trigger

systemic cultural change, shifting our worldviews from a culture focused on quantity towards one grounded on quality as a catalyst for sustainable consumption.

Economic Value

The term 'economic value' is mainly used in the economic literature to indicate the value generated through monetary exchange. Economic value also refers to the business opportunities or new business models that (design) research can generate, for example through practices of knowledge exchange with industries and organisations (Research England, 2019). According to Rae (2013), design can generate economic value in terms of brand expression, solving unmet user needs, developing better customer experiences, rethinking strategies, expanding markets through personal development and user understanding, as well as cost reduction. Several studies (Design Council 2007; 2018) have also investigated how businesses use and understand design and have assessed the economic value added through design in terms of improving sales, profits, turnover and growth. For example, the DMI Design Value Scorecard (Westcott *et al*., 2013) has been developed by the Design Management Institute and Motiv Strategies as a market index to track the performance of design-focused companies in relation to the Standard & Poor's (S&P) 500 over time. Another framework to assess the economic value of design is the Design Value System (DVS), which comprises the Design Value Index (used to communicate the value of investment in design), the Design Maturity Matrix (aimed at evaluating the maturity of design organisations), and the Design Value Map (used to benchmark the areas in which design adds value). However, within the scope of this journal article framed around design research for change, we consider also alternative forms of economic exchange – of time, skills, knowledge – which relate to the 'ethical economy' (Arvidsson, 2009) as well as 'transitional and alternative exchange economies' (Hirscher and Fuad-Luke, 2013).

Environmental Value

'Environmental value' refers to the contribution to protecting biodiversity and ecological systems, considering the negative impacts on human wellbeing and the sustainable use of resources (Paehike, 2000). The principles of environmental value are grounded on the notion of sustainable development, as defined in the Brundtland Report as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p. 44). Sustainability principles are the foundation for the current global framework for international cooperation, driven by the 2030 Agenda for Sustainable Development and the UN 17 Sustainable Development Goals (SDGs), which are a call for action for all countries towards ecological, social, cultural, and economic flourishing (United Nations, 2016). With these global challenges in mind, design research is increasingly concerned with addressing issues related to clean water and sanitation, affordable and clean energy, climate change, life on land and below water, to name but a few SDGs (ibid.). Consequently, design research is shifting its focus from technology, products and processes, towards large-scale system level change (Ceschin and Gaziulusoy, 2016). For instance, an increasing number of design research projects is aimed at creating environmental value through fostering responsible production and consumption, building resilient infrastructures, promoting inclusive and sustainable industrialisation and innovation, and shaping thriving communities and cities.

Design Research Value Model

Based on the above definitions, we have developed a Design Research Value Model that enables design scholars and practitioners – as well as funding bodies and the general public – to identify and describe the different types of value (*i.e.* social,

environmental, economic, and cultural) generated in a range of design research project, as shown in Figure 1.

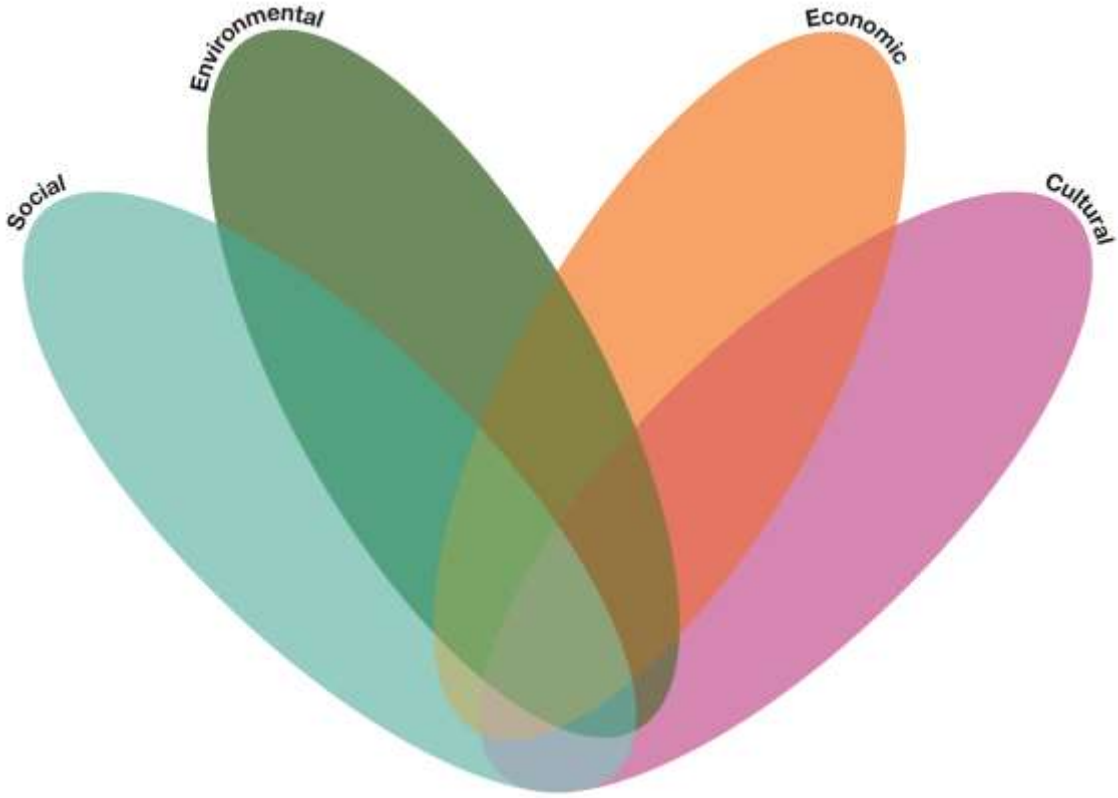

Figure 1. Design Research 4-Leaf Value Model that enables the plotting of different design research projects in relation to the types of value they create.

The Value of Design Research

In recent years, in the academy we have gathered substantial evidence of the value generated by design research in areas such as declining crime statistics, sustainable urban planning, cutting-edge healthcare and manufacturing technologies, showcasing historical artefacts and opening up new markets through the development of commercial products (Press, 2011). Design research can make a significant contribution to improving health and wellbeing, generating sustainable cities and communities, as well as producing economic impact through collaboration with a complex ecology of talented people working in the creative industries. As Press suggests (2011, p. 170),

"…in their pursuit of a more beautiful, useable and understandable world, art and design researchers provide essential pathways to a better and more economically sustainable future".

Segapeli (2014) has clearly articulated how design research brings value and meaning to society, through technology, context, uncertainty, synthesis, and co-creation. In particular, Norman (2010), argues that human needs arise from the integration of technologies into people's lives, and product innovation is driven by technology. Besides Norman's (2010) emphasis on the value of technology, Press (2011) argues for the importance of also looking backward to rescue traditional, and often forgotten, processes and techniques, which may enrich technological innovations. Instead, Thackara (2005) critically questions the value that technology adds to our daily lives; he challenges our technology-centred economic system and argues for the need to design a people-centred world, a lighter one in which we rely more on people and less on stuff. According to Kolko (2011), the value of design research also lies in the process of synthesis, which aims at making sense of the insights gathered through ethnographic research into human behaviours. The process of synthesis links the problem finding phase with the design process in order to solve problems through innovations that add value to society. Moreover, Sanders and Simons (2009) emphasise the value of co-creation for driving social change by providing people (those who will directly benefit from the results) with tools for communication and creativity. From this perspective, social value co-creation implies the designer – playing the role of a facilitator – to be empathic towards those affected by any change, and to acknowledge that everyone is creative and has the ability to solve issues, especially those directly affecting them. Although there is widespread recognition of the value of design, research (Cooper *et al*., 2016) has shown that companies locate the value in different steps of the innovation

ladder (from non-design, design as styling, design as process through to design as strategy). In this regard, it seems that companies find it somehow difficult to measure the return on investment made on design due to the conceptual and practical issue of discerning design from other factors contributing to innovation.

Methodology: 67 Case Studies of UK Design Research Projects

In order to unpack the different types of value generated by design research, we analysed 67 case studies of UK design research projects based on a dataset held in the UKRI Gateway to Research (GtR) repository, developed as part of the Innovation and Research Strategy of the UK Government's Department for Business, Innovation and Skills (BIS). To collect data, we undertook desk-based research on GtR, which returned over 20,000 research projects featuring the word 'design' in their title and/or abstract. To refine the sample to a more accurate and manageable dataset, we considered also how each principal investigator has self-classified his/her project using the word 'design' as research subject and/or topic.

This more precise search reduced the number of AHRC-funded research projects to 359, covering the period from 2007 to 2021. All of these 359 AHRC-funded design research projects were peer reviewed by experienced UK-based design researchers who then selected 67 of these projects to be exhibited as part of the 'Design Research for Change' Showcase at the London Design Fair 2008 (Rodgers, 2018b). Given the space limitations of this paper, here we only focus on these 67 AHRC-funded design research projects which span disciplinary, conceptual, geographical, and methodological boundaries and were deemed by the showcase peer review panel as a good representative sample of the breadth and depth of the contemporary design research landscape in the UK.

Project Title	Economic	Social	Cultural	Environmental

The Welcoming Workplace: Rethinking office design to enable growing numbers of older people to participate in the 21st century knowledge economy	**X**	**X**		
Living Design: The effective use of design for sustainability in maker enterprises	**X**			**X**
Virtual Reality of Medieval Culture: Collaborative Network for Cultural-Feed Virtual Heritage (CfVH) platforms of medieval Cairo			**X**	
Guernica Remakings, South Africa, research into the practice of cross-cultural translation through making		**X**		
Design to Manufacture: Realising the creative and commercial potential of a unique aesthetic 'Eco-material'	**X**			**X**
Brief Encounters Network: Exploring New Forms of Online Collaborative Design		**X**		
Creative Temporal Costings	**X**	**X**		
The Life of Buildings			**X**	
Woven Communities: the warp and the weft of Scottish vernacular basketry		**X**	**X**	

Table 1. Content Analysis Sample – Assigning Different Types of Value to the 67 Design Research projects.

Based on this dataset, we undertook a process of content analysis aimed at drawing meanings from the description of the research projects (Hsieh and Shannon, 2005). In particular, we reviewed the abstracts of each of the 67 projects as submitted by their principal investigator and reported on GtR. We deduced from the 67 abstracts the themes of social, cultural, economic, and environmental value derived from theory (as defined in Sections 2.1 to 2.4) and used as initial *a priori* codes. Hence, we assigned one or more of the four codes (*i.e.* social, cultural, economic, and environmental value) to each of the 67 design research projects, based on the type of value they generated (Table 1). Afterwards, adopting a content analysis approach, we derived from the textual abstracts of the projects' different sub-themes in relation to each of the four types of value (Table 2).

Project Title	Economic	Social	Cultural	Environmental
The Welcoming Workplace: Rethinking office design to enable growing numbers of older people to participate in the 21st century knowledge economy	***Knowledge work***	***Ageing***		
Living Design: The effective use of design for sustainability in maker enterprises	***Maker enterprises***			***Sustainability***
Virtual Reality of Medieval Culture: Collaborative Network for Cultural-Feed Virtual Heritage (CfVH) platforms of medieval Cairo			***Virtual heritage***	
Guernica Remakings, South Africa, research into the practice of cross-cultural translation through making		***Solidarity***		
Design to Manufacture: Realising the creative and commercial potential of a unique aesthetic 'Eco-material'	***Employment & manufacturing***			***Eco-material***
Brief Encounters Network: Exploring New Forms of Online Collaborative Design		***Communication tools***		
Creative Temporal Costings	***Time-banking***	***Collaborative exchange***		
The Life of Buildings			***Digital preservation***	
Woven Communities: the warp and the weft of Scottish vernacular basketry		***Ageing & dementia***	***Vernacular craft***	

Table 2. Assigning Sub-themes Derived from the Content Analysis of the 67 Design Research Projects.

Results: The Value of Design Research for Change

From the 67 AHRC-funded design research projects we analysed, it is clear that design thought and action play significant roles in generating social, economic, cultural, and environmental change, as discussed further in the following sections of this journal article.

The Value of Design Research for Social Change

The majority of change (37%) in the 67 design research projects analysed here lies within social contexts. This social change covers areas such as empowering people – especially disadvantaged groups – to gain agency, improving the quality of their lives, and contributing to social wellbeing through fostering social interactions. At a further content analysis of the abstract of the 67 design research projects as reported on GtR, we derived a range of sub-themes in relation to the social type of value and we generated the word cloud in Figure 2 to visualise them; in this, the larger size of font was used to represent the most recurring sub-themes.

Figure 2. Word Cloud showing the Social Value Sub-themes from the Content Analysis of the 67 Design Research Projects.

It is evident that social design research is shifting its focus from individual users towards communities (defined by interest, practice, place, or other criteria) in order to generate collective value, addressing social issues while also fostering new social relationships. The increasing interest of public bodies in supporting communities in playing a more active role in society is clearly exemplified by the ‘Leapfrog:

Transforming Public Service Consultation by Design' project. The project team involved hard to engage communities in co-design processes resulting in a range of new consultations tools, designed to be directly used by communities, who were encouraged to appropriate and adapt the tools to fit their own needs (Figure 3 - left).

Figure 3. Examples of social design projects: (Left) 'Leapfrog: Transforming Public Service Consultation'; (Middle) 'Co-designing an Evaluation Framework for Designing in the Context of Policy' with illustration by Holly Macdonald; (Right) Ludic Artefacts: Using Gesture and Haptics (LAUGH) to Support Subjective Wellbeing of People with Dementia'.

Moreover, within the context of design for social change, policy-making is becoming a growing area of focus. In this regard, the 'Co-designing an Evaluation Framework for Designing in the Context of Policy' project was developed as part of an AHRC-funded research fellowship at the Policy Lab, that is a team of civil servants in the Cabinet Office of the UK government (Figure 3 - middle). The project brought new perspectives from design to the Policy Lab's team to help them critically assess their practice and clearly articulate their contributions to policy issues and policy development processes. Another emerging area of research is focused on the growing ageing population and contributes to developing design interventions to tackle health and wellbeing issues. For

instance, the ‘Ludic Artefacts: Using Gesture and Haptics (LAUGH) to Support Subjective Wellbeing of People with Dementia’ project investigated handcraft and playfulness in relation to dementia (Figure 3 - right). As one of the outcomes of the project, ludic artefacts (*i.e.* age appropriate toys, integrating smart materials and digital technologies) were developed to support the wellbeing of people living with dementia.

The Value of Design Research for Cultural Change

From the analysis of the 67 AHRC-funded design research projects, it emerged that a large part (27%) of the sample generates cultural value, meaning the worth contributed to individuals and societies by artistic and cultural practices such as sound art, performance, and storytelling, to name but a few. As shown in Figure 4, within the scope of the 67 projects analysed here, cultural value refers mainly to heritage as an asset which is getting lost in contemporary culture and that design research is increasingly concerned with preserving and revitalizing.

Figure 4. Word Cloud showing the Cultural Value Sub-themes from the Content Analysis of the 67 Design Research Projects.

For example, cultural value is created by the ‘Hidden Florence: Geo-Located Historical Walks in a Context-Aware Environment’ project through the innovative medium of audio-walks delivered on site through smartphone apps that enhance the lived experience and material culture of historic public spaces (Figure 5 - left). Moreover, a large part of the 67 design research projects generating cultural value use archival studies as research method in a wide range of contexts. For instance, the ‘Armenian Alphabet: Research into Historical Types and the Development of New Digital Typefaces’ project proposes an investigation into the traditional Armenian alphabet, which is fundamental to Armenian language, literature, religion and culture (Figure 5 - middle). At the current times in which Armenians live in different parts of the world, they are struggling to keep their language and culture alive in their international communities, therefore the project looked at preserving, digitalizing and revitalizing the unique Armenian alphabet.

Figure 5. Examples of design research projects generating cultural value: (Left) ‘Hidden Florence: Geo-Located Historical Walks in a Context-Aware Environment’; (Middle) Armenian Alphabet: Research into Historical Types and the Development of New Digital Typefaces’; (Right) ‘VisitorBox: A Toolkit to Support Ideation of Novel Visiting Experiences’.

Other recurring sub-themes that emerged from the content analysis of the abstracts of the 67 design research projects analysed here are related to user experience and access

to traditional knowledge. For instance, the 'VisitorBox: A Toolkit to Support Ideation of Novel Visiting Experiences' project tackled the challenge heritage organisations face in accessing digital technologies (Figure 5 - right). As one of its outcomes, the project contributed a toolkit that combines physical ideation cards with a mobile app and web-based idea repository to enable heritage organisations to rapidly generate and share ideas for new visitor experiences.

The Value of Design Research for Economic Change

A relatively small portion (21%) of the sample of 67 design research projects analysed here generates economic value, for instance through the creation of new business opportunities or new business models that emerge from knowledge exchange between academic research teams and industries or other types of organisations. Through the process of content analysis of the abstracts of the 67 design research projects reported in GtR, a range of sub-themes emerged in relation to the economic type of value generated.

Figure 6. Word Cloud showing the Economic Value Sub-themes from the Content Analysis of the 67 Design Research Projects.

The word cloud in Figure 6 shows that economic value in the context of the 67 AHRC-funded projects analysed here refers mostly to employment opportunities in the creative economy. This is clearly exemplified by the 'Design Futures: Exploring Internationally Comparative Product Design Methods to Meet Material Need, Facilitate Entrepreneurship and Create Employment' project that is concerned with the lack of appropriate design training and education in Official Development Assistance (ODA) recipient countries (Figure 7 - left). Integrating arts and humanities research methods in product design, the project proposes novel ways to build on local crafts and design expertise to contribute to emerging creative economies and provide employment opportunities to tackle poverty.

Figure 7. Examples of design research projects creating economic value: (Left) 'Design Futures: Exploring Internationally Comparative Product Design Methods to Meet Material Need, Facilitate Entrepreneurship and Create Employment'; (Middle) 'FIREup: Fashion Innovation Research and Enterprise' with design by Michelle Lowe-Holder and photograph by Polly Penrose; (Right) 'Extending the Potential for the Digitally Printed Ceramic Surface'.

Another significant type of economic value generated from the design research projects analysed here is related to developing technological innovations within enterprises. In this regard, the 'FIREup: Fashion Innovation Research and Enterprise' project activated four collaborations between academics and micro design-led businesses in the field of fashion to integrate research methodologies and innovation beyond the next season's

collection (Figure 7 - middle). For example, virtual design and 3D printing were incorporated into the process of small batch design and production. Moreover, from the process of content analysis conducted in relation to the economic type of value, it resulted that manufacturing and construction processes are a significant area of focus within the sample of the 67 AHRC-funded design research projects. For example, the 'Extending the Potential for the Digitally Printed Ceramic Surface' project was aimed at revitalizing the UK ceramic industry and support regeneration in locations where ceramic manufacturing is active (Figure 7 - right). By exploring the use of new materials, methods and economics within a commercial context, the project contributed to extending the use of digital laser printed transfer systems in large-scale manufacturing.

The Value of Design Research for Environmental Change

A somewhat surprising finding from the analysis of the 67 AHRC-funded design research projects here presented is that only one of these projects (*i.e.* 1.5% of our sample) was deemed to generate environmental value. Within the context of these projects, environmental value refers to making sustainable use of resources, contributing to protecting biodiversity and ecological systems (such as bees), involving manufacturing processes (for instance in the fashion industry) that reduce the negative impacts of human activity on the wellbeing of society and the environment, as represented in the word cloud in Figure 8.

Figure 8. Word Cloud showing the Environmental Value Sub-themes from the Content Analysis of the 67 Design Research Projects.

The 'SmART Cities and Waste: Developing an Arts-Led Interdisciplinary Network for Waste Management and Treatment Innovation' project tackled the increasingly important issues related to waste management that our rapidly urbanizing world face (Figure 9). Through an international network of academics, artists, scientists, practitioners, stakeholders, and end-users, the project contributed to the sharing of good practice amongst different disciplinary fields and to the identification of particular types of waste and intervention points suitable for creative interdisciplinary solutions in response to waste management.

Figure 9. Example of design research project generating environmental value: 'SmART Cities and Waste: Developing an Arts-Led Interdisciplinary Network for Waste Management and Treatment Innovation'.

Given the shortage of AHRC-funded projects generating environmental value within the sample analysed here, we argue that design research needs to concentrate and work much harder on the complex environmental challenges of today's and tomorrow's world.

Synergistic Values Created by Design Research for Change

After examining the different types (*i.e.* social, cultural, economic, and environmental) of value generated by the sample of 67 AHRC-funded design research projects, we used the Design Research Value Model presented in Figure 1, to analyse the correlations between different kinds of value and identify eventual gaps. In this regard, Figure 10 shows that, beyond the creation of discreet types of value, design research generates an

interesting mixture of more than one kind of value, with a majority of the 67 projects generating socio-cultural value (12%).

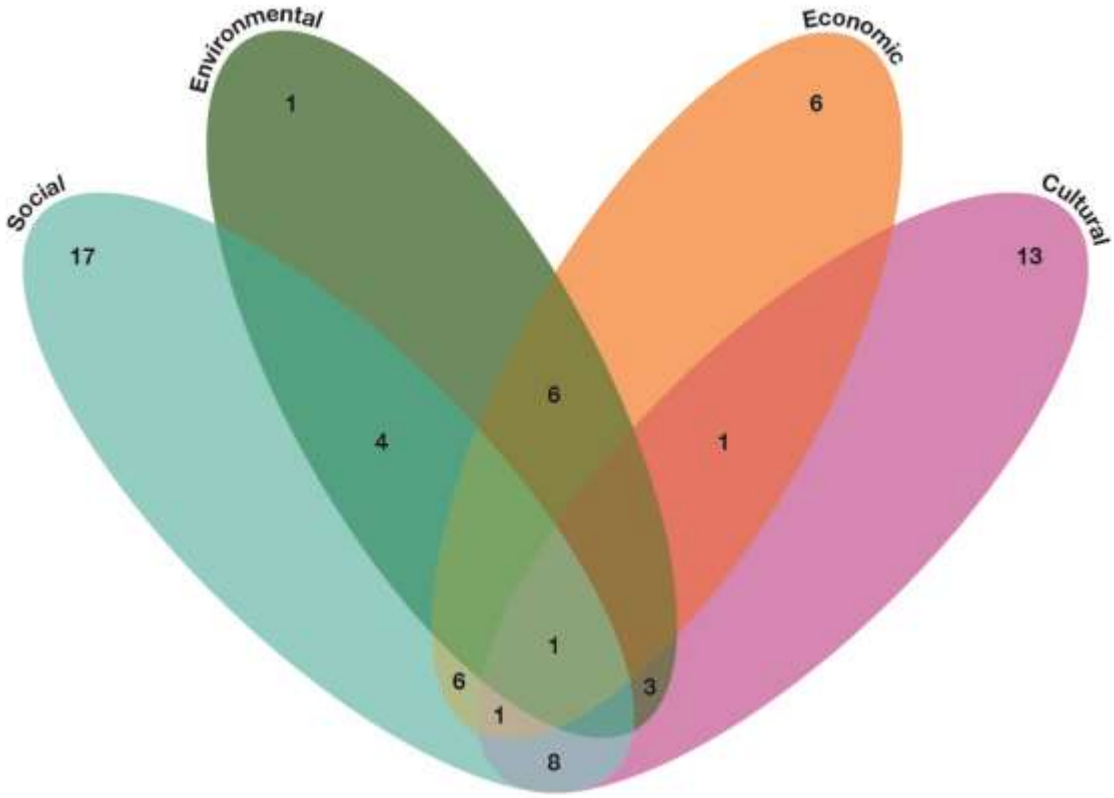

Figure 10. The 67 Design Research Projects Plotted against the 4 Different Types of Value.

For example, the 'Woven Communities: The Warp and the Weft of Scottish Vernacular Basketry' project drew on heritage basketry making activities to elicit social memories and enhance the wellbeing of people with dementia; the project also contributed a policy document for craft and design education that highlights the value of handwork for design thinking. Smaller numbers of projects contribute also socio-economic value (9%), economic-environmental value (9%), socio-environmental value (6%) and cultural-environmental value (4%). Among the projects that generate cultural-environmental value, 'Telling the Bees' – as well as its follow-on project 'Hacking the Bees' – tackled environmental issues of global climate change and the progressive loss of traditional knowledge such as that of beekeeping. Using making and drama, the

project team developed a range of interactive artefacts to engage children and adults in drawing on the past, gaining new perspectives on the present environment and creating new narratives of a sustainable future. From the analysis of the sample of 67 design research projects, it resulted also that one project (*i.e.* 'Culshaw and Sumners: A Victorian Architectural Practice and Its Impact on Liverpool's Built Environment') contributes value to culture (through rescuing archival knowledge), society (in terms of urban growth), and economy (through the development of new construction technologies). Moreover, one design research project (that is 'Community-led Heritage Regeneration in India') collectively generates all the four types of value, *i.e.* social (in terms of enhancing community life), cultural (through heritage regeneration), economic (in terms of urban growth) and environmental (contributing to urban ecology). Instead, none of the projects we analysed resulted to generate value at the intersection between the social, economic and cultural type, neither at the intersection between the economic, cultural and environmental kind of value.

Overall, our analysis shows that the value generated from our sample of 67 design research projects is greater than the sum of all its parts. In fact, most of the projects synergistically create more than one type of value, and a total of 100 value contributions emerged from the 67 projects we analysed here.

Conclusions

Design researchers and practitioners contribute to a nation's economy, support industrial competitiveness, innovation, knowledge, skills, and social policy. Through collaboration with researchers and practitioners across disciplinary fields, designers generate knowledge which is applied also in other sectors, for instance in healthcare, urban planning, engineering, computing, and business, to name but a few. On the other hand, how design research draws value from other disciplinary fields and at the same

time creates value of its own is a critical topic of debate within the academic design community. Furthermore, governments and funding bodies are increasingly concerned with measuring the impact of design research, posing the need for fair, robust and transparent processes for assessing the value of design research. It is often challenging to measure the intangible outcomes of design research in quantitative terms, even because impacts often take a long time to become manifest and may be generated by a multitude of actors.

With these challenges in mind, building on different value theories for economics, sustainable development and social sciences, we have contributed an original Design Research Value Model, which enables design researchers, funding bodies and the general public to identify and articulate the significant roles that design research plays in generating social, cultural, economic and environmental value. For the purpose of this journal article, we have applied this 4-leaf model to review a sample of 67 AHRC-funded design research projects that transverse conceptual, disciplinary and methodological boundaries and that represent the breadth and depth of contemporary design research in the UK.

The article has revealed that the majority (37%) of the sample of design research projects analysed here contributes to creating social change. Within this context, this means empowering people (especially disadvantaged groups) to gain agency, enhancing the quality of their lives, and improving social wellbeing through better social interactions. Furthermore, it is clear that recent forms of social design research have shifted the focus from individual users towards communities with the aim to generate collective value, fulfil social needs while also triggering new social relationships.

In terms of cultural value, 27% of the sample of design research projects contribute to individuals and societies through artistic and cultural practices such as

sound art, performance, storytelling, and others. Within the scope of the 67 design research projects analysed here, cultural value refers mainly to heritage as an asset that is getting lost in contemporary culture, and that design research is increasingly concerned with preserving and revitalizing, for instance through undertaking archival studies and developing digital innovations.

Over one in five of the 67 design research projects analysed here generates economic value, in terms of employment opportunities in the creative economy, and embedding technological innovations within enterprises and manufacturing businesses. For example, new business opportunities or new business models are generated through knowledge exchange between academic researchers and industries or other types of organisations.

Surprisingly, only one of the 67 AHRC-funded design research projects analysed in this journal article is deemed to create environmental value, which here refers to making sustainable use of resources, protecting biodiversity and ecosystems, and adopting production processes that reduce the negative impacts of human activity on the wellbeing of society and the environment. This is a result that design research needs to improve upon quickly and substantially in order to tackle the complex challenges of today's and tomorrow's world.

Finally, the article has highlighted that most of the design research projects synergistically create more than one type of value – generating an interesting mix of social, cultural, economic, and environmental value – and has identified lacunae for the design research community to focus on in future years.

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References

Arvidsson, A. 2009. The Ethical Economy: Towards a Post-Capitalist Theory of Value. *Capital & Class*, 33: 13-30.

Bate, J. (ed.). 2011. *The Public Value of the Humanities*. London, UK: Bloomsbury.

Borja de Mozota, B. *et al*. 2016. The Value of Design Research, *The Design Journal*, 19 (2), pp. 187-193.

Ceschin, F. and I. Gaziulusoy. 2016. Evolution of Design for Sustainability: From Product Design to Design for Systems Innovations and Transitions. *Design Studies*, 47, pp. 118-163.

Cooper, R. *et al*. 2016. *Design Value: The Role of Design in Innovation*. Lancaster, UK: Lancaster University.

Crossick, G. and P. Kaszynska. 2016. *Understanding the Value of Arts & Culture: The AHRC Cultural Value Project.* Swindon, UK: Arts and Humanities Research Council.

Danish Design Centre. 2001. *The Design Ladder*. Copenhagen, Denmark: Danish Design Centre.

Design Council. 2007. *The Value of Design Factfinder*. London, UK: Design Council.

Design Council. 2018. *The Design Economy 2018: The State of Design in the UK.* London, UK: Design Council. https://www.designcouncil.org.uk/sites/default/files/asset/document/Design_Economy_2018_exec_summary.pdf Accessed 7 January 2019.

Fletcher, K. and L. Grose. 2012. *Fashion & Sustainability: Design for Change*. London, UK: Laurence King Publishing Ltd.

Higher Education Funding Council for England. 2015. *Research Excellence Framework 2014: The Results*. https://www.ref.ac.uk/ Accessed 8 January 2019.

Hirscher, A-L. and A. Fuad-Luke. 2013. Open Participatory Designing for an Alternative Fashion Economy. In Niinimäki, K. (ed.). *Sustainable Fashion: New Approaches.* Helsinki, Finland: Aalto ARTS Books.

Hirscher, A-L. *et al*. 2019. Socialising Value Creation Through Practices of Making Clothing Differently: A Case Study of a Makershop With Diverse Locals. *Fashion Practice: The Journal of Design, Creative Process & the Fashion Industry*, 11 (1), pp. 53-80.

Hsieh, H-F. and S. E. Shannon. 2005. Three Approaches to Qualitative Content Analysis. *Qualitative Health Research*, 15 (9), pp. 1277-1288.

Judge, T. A. and J. D. Kammeyer-Mueller. 2011. Happiness as a Societal Value. *Academy of Management Perspectives*, 25: 30-41.

Kolko, J. 2011. *Exposing the Magic of Design.* New York, NY: Oxford University Press.

Mazzarella, F. 2018. *Crafting Situated Services: Meaningful Design for Social Innovation with Textile Artisan Communities*. PhD diss., Loughborough Design School.

Ministry of Reconstruction. 1918. *Report of the Machinery of Government Committee*. London, UK: His Majesty's Stationery Office.

Nesta. 2017. *The Future of Skills: Employment in 2030.* https://www.nesta.org.uk/report/the-future-of-skills-employment-in-2030/ Accessed 7 January 2019.

Norman, D. 2010. Technology First, Needs Last: The Research-Product Gulf. *Interactions*, 17 (2), pp. 38-42.

Paehike, R. C. 2000. Environmental Values and Public Policy. In Vig, N.J. & Kraft, M.E. (eds.) *Environmental Policy: New Directions for the Twenty-First Century* (4th ed.). Washington, DC: CQ Press, 77-97.

Policy Institute at King's. 2016. *Exploring the Value of Research Through the Eyes of Researchers and the Public.* London, UK: King's College London.

Press, M. 2011. All This 'Useless Beauty': The Hidden Value of Research in Art and Design. In Bate, K. (ed.) *The Public Value of the Humanities.* London, UK: Bloomsbury.

Rae, J. 2013. What is the Real Value of Design? *Design Management Institute Journal*, Winter 2013, pp. 30-37.

Research England. 2019. Knowledge Exchange. https://re.ukri.org/knowledge-exchange/ Accessed 21 January 2019.

Rodgers, P. A. (ed.) 2018a. *Design Research for Change.* Lancaster, UK: Lancaster University.

Rodgers, P. A. 2018b. Design Research for Change: A UK Perspective, *Diseña*, 13, pp. 110-139.

Sanders, E. B. N. 2006. Design Research in 2006. *Design Research Quarterly*, 1 (1), pp. 1-8.

Sanders, E. B. N. and G. Simons. 2009. A Social Vision for Value Co-creation in Design. *Open Source Business Resource* (December 2009). https://timreview.ca/article/310 Accessed 8 January 2019.

Segapeli, L. 2014. *The Value of Design Research to Make Meaning in Society*. http://www.ac4d.com/2014/09/the-value-of-design-research-to-make-meaning-in-society/ Accessed 8 January 2019.

Thackara, J. 2005. *In the Bubble: Designing in a Complex World*. Cambridge, MA: MIT Press.

United Nations. 2016. Sustainable Development Goals. https://www.un.org/sustainabledevelopment/sustainable-development-goals/ Accessed 21 January 2019.

Westcott, M. *et al*. 2013. The DMI Design Value Scorecard: A New Design Measurement and Management Model. *Design Management Institute Journal*. Winter 2013, pp. 10-16.

World Commission on Environment and Development. 1987. *Our Common Future.* Oxford, UK: Oxford University Press.