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Scoping: Exploring a collective R&D process for entrepreneurs, microenterprises, and SMEs

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Over the past four-years the UK Arts and Humanities Research Council Knowledge Exchange Hub, Design in Action (DiA), has developed a model of design as a strategy for economic growth by supporting the full, staged process of design-led innovation. In this paper, the authors illustrate the initial phase of scoping which paves the way for product and service ideation. In this context, scoping is an active and open process of discovery using methods of co-operative inquiry to collectively investigate specific economic sectors. The paper demonstrates that scoping has the capacity to identify critical challenges and define new future innovation opportunities through a collective R&D process.

Keywords: Scoping; Design in Action; Knowledge Exchange; Design-led Innovation
Introduction

Granted, the concepts of design and innovation have transformed over time, design remains a central driver of innovation in the whole of the economy (Hobday, Boddington, & Grantham, 2011). Further to this, the demand for innovative products and services continues unabated, and in turn, approaches such as trend forecasting and scenario planning are high priorities for big businesses (e.g. NIKE, Google and Apple). The advantage these organisations have lies in their ability to resource R&D approaches and futures strategy, allowing thriving organisations to set the agenda and drive the marketplace.

On rare occurrences, entrepreneurs, microenterprises and SMEs develop and implement products and services that not only achieve high economic value but also disrupt markets in ways unparalleled (e.g. Facebook). For the most part, small businesses face high barriers to innovation, such as; limited access to start-up capital and research, and restricted networks and information sources (DBIS, 2014). As Drucker (1985) argues, the entrepreneurial pursuit of innovation, which tends to the challenges engendered by transformative contexts, must first be understood through multifaceted perspectives and those perspectives used to collaboratively think about the solutions. With this in mind, this paper describes a method of collaborative strategy planning called scoping which is formed and applied by the Knowledge Exchange Hub, Design in Action (Dia).

Design in Action: principles and process model

Momentum has been building for the use and application of design in management and strategy. It has been asserted that design is a powerful resource which can advance the competitive advantage of a business (Martin, 2009; Svengren Holm, 2011). Furthermore, design thinking is a fundamentally human-centric, multidisciplinary approach which is driven by a desire to search beyond what is known by the market, in terms of user wants, and to create and define user needs (Koh, 2012). Specifically within the concept development stage, design has the capacity to produce novel ideas that would not be derived from traditional market research methods (Kotler & Rath, 2011). Liedtka (2004) attributes design’s prosperity to its ability to create a ‘learning laboratory’ in which contributors can experiment with new ideas in a risk free environment (p. 194). In these situations, design thrives on disparate and diverse information, as Koh (2012) states:
Conventional problem-solving approaches often rely on a group of subject matter experts in the same domain. Design thinking, on the other hand, leverages the collective wisdom of a team with diverse expertise and experiences. By tackling the problem from different perspectives, the team is able to break away from prevailing norms to design innovative solutions. (p. 31)

These principles reflect the Design in Action (DiA) research project, which is defined as being challenge-focused, valuing human capital and co-creation, building new business ecologies through collaborative IP, and embracing experimentation and risk. The aim of the DiA research project is to demonstrate design as a strategy for economic growth within business, focusing on the activity of knowledge exchange within a design-led innovation process. Aligning the project to the Scottish Government’s Economic Strategy (2007), DiA was initially delivered across five sectors (food sport, rural ICT and wellbeing) identified as areas in the nation with high growth potential. However, the project diversified to include legal services, digital imaging, crypto-currencies and the circular economy as a response to externally commissioned partnerships and contracts.

Since DiA began in June 2012 it has involved 650 businesses in its portfolio of activity that includes; seminars, workshops, annual design summits, and fifteen residential ideation events (branded by DiA as ‘Chiasma’). In return, these events have created 15 design-led businesses (of which 3 have launched), with a collective turnover in excess of £2m, and employing over 70 individuals.

In order to articulate the process by which design as strategy is applied, the DiA Knowledge Exchange process model [see Figure 1] was developed. It demonstrates the full, staged process of new business development delivered within an academic context. The model illustrates five key stages of knowledge exchange (KE), brought about by both external and internal participation; the Knowledge Exchange Horizon Line represents the boundary between these different modes of KE. Above the horizon are the activities mediated through, broadly, processes of external engagement with an open uptake of communities, academics and businesses. Below the horizon are the internal activities which mobilize innovation through self-selected teams, and nominated individuals who contribute additional

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1 The DiA model is not intended as a prescriptive approach, but as a concept to discuss and test future iterations across academic and industry contexts.
knowledge and expertise. The DiA process moves through the following steps:

- **Scoping**: Identifies the critical challenges for near future business opportunities in specific sectors.
- **Interpretation**: Is the focus and framing of key challenge areas for an industry sector, which includes the creation of design tools.
- **Ideation**: Is the event where design facilitates and supports ideation, enabling collaboration, where ideas are tested and validated.
- **Formation**: Is the development of the business model, where user testing refines details and uncovers opportunities.
- **Evolution**: Is the launch of the product or service into market, and when the businesses evaluate targets and gather insight from customers.

![Diagram of the Design in Action Knowledge Exchange Process Model](image)

*Figure 1* The Design in Action Knowledge Exchange Process Model for design-led innovation.

During the initial phase of the research project, DiA identified a need for collective R&D to help support the challenge focus for subsequent ideation events. The decision to invest into this forerunning stage was in response to the wide remit of the sectors that the ideation events were aligned to. DiA
sought an external process underpinned by participatory engagement with the sector to collectively identify the most pertinent complex problems. From the process of piloting these engagement events, and through strong theoretical support, the phase of scoping was formed.

**Scoping: the methodological foundation**

The principles of scoping have been built on the rich methodological traditions of co-operative inquiry (Heron, 1988, 1996; Heron & Reason, 2008; Reason, 1988). A subset of participatory research, co-operative inquiry was developed on the basis that inquiry cannot be undertaken independently from the human condition; and that is only through collective inquiry that the human condition can be further understood (Heron, 1996). Moreover, Reason (1988) argues that inquiry is a pluralistic venture, and one that requires a multitude of people with various skills and diverse interests to collaborate together. Historically, the main objective in developing the methodological tradition of co-operative inquiry was to dismantle the traditional research distinctions between ‘researcher’ and ‘subject’ (Heron, 1988, p. 40). However, further developments of this methodology allowed for the definition of co-operative inquiry to evolve into its current understanding as ‘a form of second-person action research in which all participants work together in an inquiry group as co-researchers and as co-subjects – not research on people or about people, but research with people’ (Heron & Reason, 2008, p. 366).

In spite of the fact that it tends to complex and pluralistic knowledge, co-operative inquiry is a structured process that requires rigorous iterations between reflection and action, and is comprised of logical research steps inline with the collective emotional development of the co-researchers (Reason, 1988). As the co-researchers combine their efforts, data arises from the dynamic interactions and analysis by collective understanding into

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2 The origins and meaning of scope is a mid 16th century (in the sense ‘target for shooting at’): from Italian scopo ‘aim’, from Greek skopos ‘target’, from skeptesthai ‘look out’ (Oxford Dictionary, accessed: 20 April 2016). The authors draw on these definitions as a starting point and build on this, proposing that scoping in this context encompasses the identification of both the challenges (look out) and the construction of the open call (the target) for the ideation event along with the subsequent process which guides development towards the target.
patterns of behaviour and the articulation of what those developments reveal (Heron & Reason, 2008).

Certainly, there has been a steadily growing appreciation for co-operative inquiry in academic research, with some institutions referencing the works of the traditional methodology in the development of new applications. Namely, that ‘co-inquiry’ seeks to dismantle existing dualisms and achieve equality amongst participants for social justice (Durham University, 2011). Furthermore, the principles and development of co-operative inquiry are synchronous with the establishment of participatory design (also referred to a co-operative design) in Scandinavia (c.1970). More commonly referred to now as co-design, this field is based on the notion of co-creation (i.e. collective creative production) as applied throughout the full design process (Sanders & Stappers, 2008). Primarily, the term co-design is used to refer to the act of designer working with those not trained in design in the development process of design (ibid.). This is crucial as scoping facilitates co-inquiry by using human-centred design methods with a mix of participants.

With these advanced methodologies already active and placed firmly in their respective fields: what does scoping offer, in the context of the DiA process, which is different or unique from co-operative inquiry and co-design? First and foremost, it is a sectorial review that aims at identifying opportunities for innovation and economic growth potential at a grassroots level. Moreover, it adapts the methodological principles and merges co-operative inquiry with the generative design research process of co-design. It strengthens the bond between these two fields by building on the argument that the application of design in this context employs social research methods to locate undiscovered needs, forecast demand, define business opportunities, and disrupt markets for economic benefit (Koh, 2012). In this research, scoping has been found as critical in the establishment of futures thinking and foresight.

Returning to the DiA Process Model [see Figure 2]: scoping is the critical first stage of the design-led innovation process, wherein a participatory scoping exercise aims at identifying the critical challenges and the key stakeholders that may contribute to near future innovation opportunities in specific sectors. More than a traditional review, scoping is an active and open process of discovery using methods of co-operative inquiry to collectively question and position the key challenges.
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Figure 2  Scoping phase in the full design-led process model developed by DiA.

Methods

The DiA team developed methods and tools to support scoping using an iterative approach of testing and refinement. Methods employed in the scoping phase were drawn primarily from human-centric design tools, and created with the intent to challenge the participants and entice them to think differently. Each method promotes critical thinking and aims to achieve specific outcomes that intentionally move participants through the process. Furthermore, each method is used to elicit vital information regarding the industry sector under investigation and the opportunities or gaps in the market. The methods used in the scoping stage are described as follows:

Lightning talks are fast-paced presentations given by various renowned speakers from the respective field. Rapidly introducing concepts, it often provides the initial stimulus for starting the critical conversations. Lightning talks can be face-to-face, or streamed online, giving potential for world-leading contributions. Paired together, lightning talks have the capacity to rapidly communicate important information and exchange knowledge without inundating the participants (Arivananthan, 2015).

Likert scale activity has been drawn from the field of psychology and is used to measure peoples’ attitudes, usually by asking a question to which the answers are scalable (i.e. strongly agree, agree, disagree, strongly
disagree). However, DiA has developed this method further so that it stimulates debate amongst participants. This is achieved by a public display of answers to the questions, either through place cards or by physically moving to an area in the room that has been designated to an answer. Following each answer, participants are asked to explain the reasoning behind their selection which in turn goes on to shape a discussion around the question and the answers given by the group. If used, this method is conducted early in a session so it may set the tone of the event as an open and discursive space. Furthermore, as participants often know relatively little about their peers, it helps the participants to reveal and exchange worldviews early on.

Critical conversations are small discussion groups, formed with participants around a certain theme or broad challenges for a specific sector. The critical conversations are purposefully open and unformulated, to ensure conversations are exploratory: at this stage, discovering what the problem is, is of greatest importance.

Opportunity mapping is an activity undertaken either at scoping events with participants, or sometimes internally as part of a research team activity. Discussion points are captured through mapping activities, such as: writing large table sheets and demonstrating the development of discussion through tracing paper layering; engaging in ‘serious play’ (Schrage, 1999); and creative exploration and metaphor generation with Lego (Gauntlett, 2011).

Throughout the process of scoping, as well as delving deeply into the challenge, the research team seeks to build a network of experts for the designated sector through the identification of critical friends. These are experts in their respective fields, often outside of academia, who can provide essential feedback to the DiA research team once the initial sector challenges and near future innovation opportunities have been formed. This reflective review is the final system of checks and balances for shaping the output of scoping (i.e. open calls). The open calls describe the challenges and future opportunities and are circulated back into the sector for the subsequent ideation events.

To further illustrate the scoping approach, next section presents three case studies that were conducted as part of the DiA research project. Through describing these case studies and situating them in context, the paper then goes on to discuss the overarching processes and procedures in scoping, presents a series of organizational competencies for incorporating scoping into research practice.
Case Studies: Rural Scotland, Zero Waste Scotland and Technology Accelerator Chiasma

The following case studies position the economic sectors in review and the challenges and opportunities within each. It offers a summary of the structure of the scoping phase of inquiry and presents the findings from the scoping session. The analysis demonstrates how scoping influenced the call for the ideation event, and the new business ideas.

Rural Scoping

The population of rural Scotland currently sits at just over one million people; with areas accounting for over 90% of Scotland’s overall land mass. The Scottish Government defines ‘rural’ as the remote areas with fewer than 3,000 inhabitants and that are at least one hour from a settlement of 10,000 or more. Rural Scotland is characterised by its communities of diverse people with a range of experience and skills. These areas have very high levels of self-employment, and businesses are often community-led and encompass elements of social innovation or enterprise. Some of the critical issues to the sector include: environmental quality and land use, housing and infrastructure, and human resources.

The DiA team at University of Dundee designed and delivered a scoping workshop to support the second round of ideation events for the Scottish rural economy sector.3 This event aimed at moving towards a shared goal of better understanding of opportunities for Scotland’s rural economy. The structure of the workshop included the methods of lightning talks and opportunity mapping through critical conversations with designers, academics, local and national business leaders, policy makers as well as rural agencies from across Scotland. These methods explored three predefined themes: prosperity, people, and place.

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3 The event entitled, Rural Stimulation (n=10) took place at the Dalhousie Building at the University of Dundee on 6 May 2014.
Figure 3  Prosperity: local economies and currencies, skill sharing and co-operation. A photograph of the critical conversation captured by opportunity mapping, taken at the end of the scoping session. The worksheet captures development of thinking by documenting the stages of the conversations with tracing paper. The method used flags and Lego structures to identify critical areas for creative exploitation.
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Figure 4  People: community resilience, lifelong learning, and capacity building. A participant adds an ‘opportunity flag’ to the opportunity mapping tool.

Figure 5  Place: sustainable communities, climate change, and assets. A birds-eye-view of the completed exploratory mapping tool.
Each group positioned the discussion by exploring the challenges within each predefined theme. Through critical conversations, the groups were able to identify future opportunities, these included: the design of support structures to promote ‘smart systems’ and ‘networked’ approaches to rural community development; new social spaces or ‘hubs’ which could be developed through bottom up approaches to support citizen engagement on a local scale; and the application of new technology and allotment modes into agriculture, and digital engagement and connection projects.

**Analysis and Positioning for Future Innovation Opportunities**

The research team gathered insights from the scoping session, and through further analysis and from the feedback of critical friends, developed an open call for a subsequent ideation event, *Sustaining Rural Scotland Chiasma*, which included three critical challenges and innovation opportunities:

- **Information and communications technology**: The opportunity for using data in new ways and as a tool to support the sector.
- **Community asset initiatives**: Using collective knowledge to leverage advancements in utilising natural resources and existing assets.
- **Systems and services for sharing resources**: Making the most of Scotland’s natural resources and building on sustainable practices which align with wider political legislation.

**Circular by Design**

The Scottish textile industry is one of the nations economic successes. Valued at over £838m (with exports accounting for over £350m) the country hosts over 500 businesses that employ nearly 9,000 people (Scottish Enterprise, 2016). However, Scotland is not immune to the global challenges of the textile industry, wherein the culture of ‘throwaway and replace’ that spawned from consumption behaviours in the 20th Century is now starting to take its toll on Earth’s resources. With this in mind, Zero Waste Scotland, partnered with DiA in to deliver an ideation event, *Circular by Design Chiasma*.

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* Zero Waste Scotland is a Scottish Government arms-length organization tasked to deliver the nation’s Circular Economy Strategy and other resource efficiency policies. For further information see: www.zerowastescotland.org.uk
To ensure that the ideation event was correctly positioned and the open call to participants accurately identified the challenges and opportunities to the sector, the DiA research team undertook a phase of scoping. This was achieved by delivering a scoping session during the Scottish Textile Symposium. Methods included a lightning talk followed by likert scale activity, in which five provocations were asked of the participants as a means to grasp the industries understanding and adequacy with the notion of the ‘circular economy’. Participants (n=63) included textile and fashion designers, academics, and representatives from the sector’s businesses and policy areas.

In addition to the scoping session at the symposium, DiA hosted a TwitterHour as part of the scoping phase to widen the reach of engagement through social media. Under the hashtag ‘CircularByDesign’ participants (n=32) engaged in around 200 tweets, using the same provocations as during the symposium.

The data gathered from both methods revealed several significant insights. Those working in the sector were familiar with the concept of the circular economy.

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5 The Scottish Textile Symposium event took place at The Lighthouse in Glasgow, Scotland on the 20th November 2014.
circular economy, however, many noted reservations in applying the concept due to a lack of confidence, limited practical tools, and the notion that many sustainable design strategies can only be applied at a small scale (Ballie & Woods, 2015).

Further to the scoping methods above a Circular by Design Canvas tool was developed through interviews with SMEs who were asked to think strategically about the application of circular approaches to their business (Ballie & Woods, 2015). The tool was delivered in the subsequent Circular by Design Chiasma event.

![Circular by Design Canvas](image)

Figure 7  Circular by Design Canvas (Ballie & Woods, 2015): An image of the final version after interview scoping allowed the research team to develop the tool, which was used in the subsequent ideation event to develop new business ideas.

**Analysis and Position for Future Innovation Opportunities**

The insights gathered from the methods described identified critical challenges and articulated innovation opportunities, which were:
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- **Smart innovation:** The technological integration between textiles and data systems that develop along open data platforms with the potential to harness demand driven services.
- **Material efficiency:** Approaches to maximise natural and synthetic material efficacy through new manufacturing techniques.
- **Collaborative consumption:** Strategic design innovation applied to steer values away from a disposable material culture and toward a ‘custodial’ use of things.
- **Making it meaningful:** Alternative fashion and textile systems are emerging in response to globalisation, economic recession and generational shifts that bring new perspectives to textiles.

**Technology Accelerator Chiasma**

Recently, the application of Digital Imaging (DI) has grown exponentially in use and has been commended for its value on critical societal concerns, such as; forensic identification, early disease detection and climate change visualisation. DI has been characterised as an enabling technology and it is predicted that by 2019 the market size for medical imaging equipment will rise to $35.5bn, from its $24bn position captured in 2013. Further to this, it has been noted that DI not only has high economic growth potential, but due to its capacity as an enabling technology, the sector has the potential for high intangible value as well.

Acknowledging the potential of this sector, the University of Dundee’s Research and Innovation Services (RIS) commissioned DiA to develop a design-led innovation event to explore the innovation potential of DI. The initial scoping session was devised to better understand the critical challenges of this sector by tapping into the wealth of knowledge the University of Dundee academic community has in the field. As a ‘commissioned event’ the selection of the participants for the scoping session were negotiated between RIS and DiA. The scoping session was by invite only but was inclusive, with a wide identification of DI disciplines and application areas.

A ‘working lunch’ format was applied to account for competing work commitments of the participants and due to time restrictions, this scoping event aimed at extracting as much information about the research activity

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of the University as possible within the limited time frame. Methods were
designed for knowledge exchange, to capture a picture of the research being
undertaken at the University, and identification of near future
opportunities. Participants were invited to share the research their
departments or specific teams were conducting and the subsequent
discussions probed the opportunities for innovation and exploitation of this
leading research. The exchanges proved crucial, and this sharing of research
from the University’s community of experts formed a series of impromptu
lightning talks from the participants themselves. The process identified gaps
and opportunities for the interdisciplinary research and academic-industry
projects. Furthermore, the applied method of opportunity mapping
underlined the general challenges and opportunities for spinout of DI
research. This was followed by the identification of assets, which banked
the knowledge of assets in DI within the University and wider Scottish remit.

Analysis and Positioning for Future Innovation Opportunities
The research team gathered insights from the scoping session and
developed the first iteration of the open call, which was then given over to
the critical friends to feedback on, and the comments were then used to
finalize the call. The call was able to highlight critical issues and the near
future innovation opportunities:

- **Making visualisation technology small, smart and portable**: Cost
efficient, and open to enable widespread adoption.
- **DI for decision-making and action**: Communication in contexts that
have critical consequences.
- **Connected intelligence and intelligent interfaces**: Moving DI
beyond the screen.

Discussion
The above case studies provide insight into the execution and testing of
scoping which was conducted as part of the DiA research project. Further to
the assessment of each case, the studies were then subject to a comparative
analysis. It is important to note that due to the nature of scoping and the
project partners, the comparative analysis was limited by the varied and
diverse variables of each case (e.g. time, environment, structure and
participants). For instance, Rural Scotland scoping was full day event which
allocated time for several lightning talks, more in-depth engagement with
the sector issues, and networking opportunities for the participants.
Whereas, the Circular by Design scoping session was conducted with a larger group during textiles symposium; the participant numbers, time scale and layout of the room meant the DiA research team were restricted to certain methods and ways to which they could apply those methods. For instance, the likert scale activity, which usually has participants actively move around to different areas of the room according to their selection to engage them, was instead conducted using answers on cards held aloft from the round tables where the delegates were seated.

Nevertheless, the purpose of the comparative analysis was to draw out the commonalities and to recognise what scoping involves in terms of overarching processes and procedures. To illustrate, the identification of critical friends was crucial; they were not responsible for the articulation of the open calls, however, they assisted in critiquing the proposed foresight agenda, and conversely benefitted from receiving early insights from the event and sector. Having participants and external experts in this role was, over time, deemed essential and was recognised by the wider project as an example of best practice.

Figure 8  Scoping in Detail. This diagram demonstrates the flow of knowledge and information as it enters the scoping phase from the sector through the methods, it is exchanged between participants to form sector specific, co-created knowledge. This information is analysed with input from the critical friends, the final outcome of scoping is the formulation of the call.
Coming out of the scoping phase are the outcomes that benefit the sector but do not form the next phase of the DiA KE process.

From this analysis, the research team was able to form a sense of the shape of scoping [see Figure 8]. Further reflection revealed the overarching commonalities of the process, which are; joined-up innovation, impact, guiding principles, and organisational competencies, and are discussed below.

**Joined-up Innovation**

Scoping employs the strategic use of design is through a ‘systems approach’ which is a broader more holistic way of considering problems, and how they interact with the other constituents in the system (Cross, 2011). As entrepreneurs, microenterprises and SMEs often lack in time or resources to develop strategic thinking with their businesses, this way of discovering economic opportunities has the potential to identify and support joined-up innovation and is particularly relevant to the ecosystem of sector values and where the interdependencies lay between economic growth, wellbeing and environmental qualities.

The term ‘systemic innovation’ defines an interconnected set of interactions, where each influences the other within a wider system. However, systemic innovation is much harder to orchestrate for small-scale businesses than large-scale organisations that have the resources to implement ideas and often work with policy officials to set the agenda for innovation and mechanisms of public support. To support sustainability more broadly there are new economic models, such the circular and sharing economies as well as interesting concepts for a fairer society such as the foundational economy, are relevant to systems thinking.

**Impact: expected and unexpected**

There are two variable types of impact that have been recorded from the scoping processes, the expected impact that the DiA project was built on, namely, the creation of economic value through the creation of new businesses. Specifically focussing on the ideation events which had forerunning scoping sessions, three businesses were launched, these were:

- **WoodWorks**: An initiative that encourages young people to create new products and processes using only natural and renewable
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resources. WoodWorks has created 5 jobs and raised £4.4k (Dot Rural) and £49.6k (Heritage Lottery Fund) of additional funding.

- **Sien**: Using traditional design methods with innovative technology, Sien creates sustainable garments without compromising on aesthetics. Sien has created 3 jobs and has received £5k from the Enterprise Campus in Aberdeen.

- **Tusi**: A user-centred text input interface, designed specifically for the wearable device market. Tusi has created 8 jobs and won £10k Scottish Wild Card Edge funding as well as £5k support from Scottish Enterprise.

On reflection, the unexpected impact of scoping was revealed in new research directions and collaborations for DiA researchers. For instance, as a direct result of the focus on blockchain the co-investigator at University of Edinburgh has secured the following grants from EPSRC Digital Economy, ‘Ox-Chain’ Ref: EP/N028198/1. Total value: £1,238,245. ‘PACTMAN’ Ref: EP/N028228/1. Total value: £1,262,703. ‘Cyber Security of the Internet of Things’. Ref: EP/N02334X/1. Total value: £4,559,841. ‘ESRC After Money’. ESRC Ref: ES/N007018/1. Total Value £250,000. Similarly as a direct result of scoping for rural sustainability the Co-Investigator at The University of Dundee has secured H2020 ‘The GROW Observatory’ Ref: 690199. Total Value Euro 5,777,597,50 Highlighting these research grants points to greater value for use of scoping with a certain type of research.

**Five guiding methodological principles**

The capture and analysis of the scoping activities conducted as part of the DiA project brought to light five guiding principles that can be carried forward to new projects that encompass scoping.

*Knowledge Exchange* is the co-creation of new knowledge facilitated by design through the interaction of academics, business, individuals and communities; it is achieved when value is manifest (Woods, Marra, & Coulson, 2015). KE is more diverse than a two-way reciprocal exchange of knowledge; it is multifaceted exchange of skills and information that is improved through diversity. It nurtures new networks and is the initial point in forming budding professional bonds, which are reinforced through its multidimensional nature. With its ability to tend to complexity and pluralism KE is considered the lifeblood of the full DiA innovation process, specifically that of scoping.

*Co-creation* is the activity of collaborative creativity. Whether that is the collective process in the production of tangible outcomes such as, new
products and services, or rather the non-physical creation of new ideas, collective awareness, and critical challenges for the next phase of ideation: co-creation is the manifestation of knowledge exchange. It provides the participants with an enhanced understanding of the sector in which they operate, it builds on their networks and makes the essential connections for further development and opportunities in their professional endeavours.

Equality is the recognition that everyone has an equal contribution to make in the scoping process. Each participant plays a part in the development of new ideas or outcomes, and equality is about valuing each individual for what they bring to scoping, what they give over in regards to new knowledge and resources, and what they help construct. Equality means that everyone feels included in the process. The intention of this principle is that the participants understand and feel as though they have an invested share in the outcomes of scoping.

Engagement is the active participation of everyone involved. It is imperative to the scoping process that the activities inspire participants and elicit their desire to be actively involved in the process. Providing engaging scoping activities that enliven the participants is an ongoing imperative for further scoping research. Furthermore, engagement is perceived as not only the connection between the participants during scoping but in addition it is how participants are further connected within the sector or industry in which scoping is conducted.

Impact is the all-encompassing outcome of scoping. Recognising that impact comes in many forms and can be the outcomes from the many different participants, it can also be realised at different times during and after the scoping phase. This can range from the success of a newly formed business, as in the case of three new businesses that were created as part of the subsequent ideation events to the identification and successful funding for further research. Understanding the various forms of impact is integral to the evaluation process and means to which the value of scoping can be communicated to diverse communities and new potential stakeholders.

Organizational competencies
Further to the guiding principles, the research team also identified four organizational competencies that were essential for the facilitation of the scoping case studies.

Managing expectations is the ability to assess and adapt to the needs and demands of the project stakeholders. This is both in the preparations for the scoping events and during. For DiA, there were several project
partners for the scoping events and subsequent ideation events, and it was necessary for the success of scoping that these partners needs were identified at the start and were embedded into the scoping activities. Further to this, scoping is an open process and therefore participants come to events from various backgrounds with differing expectations. Therefore, intentions and general aims should be presented at the start of any scoping activity. The facilitation of scoping must manage those expectations throughout the scoping activities.

*Effective communication* is critical to the success of scoping. From the start, when scoping is first marketed to prospective participants all the way through to the defining the challenges, effective communication is essential. During the scoping events, the ability to ensure there is a collective a clear understanding is facilitated through which ideas and the process of the scoping activity is communicated at the start. This critical interpersonal skill further enables the guiding principles of scoping.

*Agility* is the ability to adapt to the situation as and when it evolves. The indeterminate nature of scoping means that the reaction and outcomes of the activities through the process are unknown until present. It is important that those facilitating scoping are constantly aware and are in the position to adapt to the fluctuations of the environment and the dispositions of the participants. Understanding the impact of time, environment, and participants are key to being agile in scoping. It is an awareness of the overall aims and objectives of scoping but the realization that these can be achieved through various nuanced methods and techniques.

*Identifying mutuality* and helping others acknowledge and act on it. KE is enabled through the recognition of a mutual interest in a specific subject or pairing of interdisciplinary information. It is within the remit of the facilitators to be constantly scanning the group for overlaps in interests and common goals. It is a skill to be able to draw logical inferences which connect ideas and then act upon them, as the participants may be too caught up in the activities to see the potential of what they are contributing, therefore it is important that scoping facilitators to help build and signpost these bridges.

**Conclusion**

This paper has brought to scholarly attention scoping: a method of collective R&D, which unites those with skills and knowledge from specific sectors to collectively build industry foresight and identify economic
opportunity. Founded on the principles of design and led by robust and adaptable methodological structures, scoping for DiA has been a crucial, unanticipated outcome of the research project.

Through the analysis of the scoping which has been conducted to date, this paper proposes that scoping gives further evidence to the argument that the value of design as strategy is not just one intended for economic benefits, it can bring long term change (Borja de Mozota, 2011). The paper’s authors have articulated the guiding principles; knowledge exchange, co-creation, equality, engagement, and impact which are the conceptual foundations of scoping. Further to this, this paper outlines the organization competencies; managing expectations, effective communication, agility, and identifying mutuality, which are crucial in the delivery of scoping. Development into the scoping process could lay the groundwork for potentially positive economic or other value based outcomes, however further research must be conducted to qualify this new vista of design research.

More broadly, this paper demonstrates a possible new direction for research in Britain and Europe, which uses design to bridge a gap between academia and industry during the initial critical phases of concept development. Scoping in DiA has proven to enhance the relationship between academia and industry allowing for design researchers to examine existing economic sectors, which has resulted in the creation of new business but also a portfolio of emerging interdisciplinary knowledge and skills across Scotland. It has been recognized as a new approach for research institutions to not only assist the development process of businesses, as the recent proliferation of university incubator projects demonstrates, but to facilitate a collective method of agenda setting and defining new markets with diverse and interdisciplinary participants. Furthermore, scoping has established ideas and relationship between academia and industry for further research projects, and has leveraged a significant amount of RCUK and European research funding to Scottish institutions.

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References


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