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Uncovering Human Needs through Visual Research Methods: Two Commercial Case Studies

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Abstract

This paper presents two respective case studies which demonstrate how visual research methods can elicit a deep understanding of the needs of potential end users and drive product and service development at a strategic business level.

The engagement of users in the development of products, services and systems has been explored by a number of design disciplines in the last few decades including but not limited to product design, human-computer interaction, systems design and service design. Each has recognised the importance of understanding the humans who will potentially be using their design outcome. Notable research methods include ethnographic inspired research, in-context and lab-based observations, interviews and the user trial of prototypes. However, these approaches also have their critics and limitations ranging from the need for incremental adjustment rather than radical design, being time-consuming and costly processes, and the large volume of 'messy data' being collected contributing to the complexities of 'wicked problems'.

In response to some of these limitations, a number of research methods have emerged which are more arts-based in nature i.e. the act of creating allows the researcher to extract 'deeper' human needs (tacit and latent needs) in a drastically shorter timescale. To fully utilise such approaches it is essential that a study be designed which amalgamates diverse research methods.

The two case studies presented in this paper employ a variety of traditional and generative design research methods in live commercial projects. The specific project outcomes are retained under Intellectual Property and, as such, this paper critically focuses on the value of the process and methods utilised, their relationship to the wider concept of arts-based research, and discusses issues related to their application in commercial work.

Keywords

Human centred design, service design, design research methods, design thinking, arts-informed research, wicked problems, commercial design

Introduction

Business managers and policy-makers are operating within increasingly complex environments that cannot easily be managed using traditional strategic-planning and policy-making processes (Camillus, 2008) (Head, 2008). In the view of Pina and Viera da Cunha (2006), the secret of success in these contexts "*at the edge of chaos*", is to develop strategic approaches that balance consistency and flexibility. This requires new and different approaches to understanding problems and conceptualising solutions (Battistella, Biotto, & De Toni, 2012). In contrast to traditional problem-solving methods that focus on planning for the avoidance of undesirable states, design methods seek to identify actions that can lead to a desirable outcome (Nelson & Stolterman, 2003). As such, the application of design and in particular human-centred design methods in setting public and business policy has gained traction in recent years. Selecting the appropriate methods can support organisations in identifying and/or engaging stakeholders, conceptualising the current and future systems, developing an understanding of user needs and integrating analysis, prototyping, testing and implementation (Van der Bijl-Brouwer & Dorst, 2017); (Design Council, 2013); (Battistella, Biotto, & De Toni, 2012).

Traditional human-centred methods aim to gather first-hand knowledge directly from the user through interview and observation-based research methods in order to understand their needs. However, these approaches have their limitations when considering their practical implementation into business and policy domains, particularly with regard to their financial and time cost implications (see, for example, Rudd, Stern & Isensee (1996); Kujala (2003)), and their ability to contribute to radical innovation (Sanders & Stappers, 2012), (Norman & Verganti, 2014).

More recently human-centred research methods have been proposed that go some way to addressing these issues. The methods are more art-based in nature, and within them, the act of creating allows the researcher to extract deeper tacit and latent human needs in a drastically shorter timescale. Effective use of these methods requires careful study design.

This paper presents two case studies in which traditional and generative HCD approaches have been combined in commercial projects to address very different problem contexts. Similarities between HCD and broader arts-informed methods are identified and the application of these approaches in commercial projects is discussed contributing to research on how generative and traditional HCD methods may be combined at the strategic business level. We propose that there is a need to acknowledge the unique skills the designer brings to a project and similarly there are unique skills for arts-based researchers to consider when looking to apply their methods to business focused projects.

Overview of the literature

Over the last decade, there has been an upsurge of interest in the application of human-centred 'design thinking' to support innovation in the public and private sector (Bason, 2010) (Brown, 2009) (Whicher, 2017). It has been argued that design thinking methods increase the potential to create value through innovation by helping organisations to understand the real needs of their users (Brassett, 2015) (Nussbaum, 2013).

Human-centred design (HCD) can be framed in relation to four different levels of user-based knowledge as proposed by Sanders (2002); those which are *explicit* and may be learned by listening to the user; those that are *observable*, learned by watching the user; those which are *tacit* and cannot easily be expressed; and those which are *latent* and will only emerge in the future. Traditional HCD has focused on explicit and observable needs, using methods adopted from the social sciences such as ethnographic-inspired research, in-context and lab-based observations, interviews, self-reporting and user trials of prototypes (Saffer, 2010). However, scholars have raised a number of methodological concerns with traditional HCD, both at application level and with regard to the broader research philosophy. At the application level, articulating need presupposes that the user is aware of what those needs are and is willing to speak about them (van Kleef, van Trijp, & Lunning, 2005). As Cooper (Cooper, 2004, p. 123) explains: "*...merely being the victim of a particular problem doesn't automatically bestow on one the power to see its solution".* As such, interviews and self-reporting methods may not produce helpful results, particularly when explicit needs are in conflict with deeper set values and aspirations (Blackler, 2008). Further, the methods are usually applied to a small number of users, leading Stewart and Williams (2005) to caution that placing too much emphasis on the explicit needs of the few may lead to niche levels of customisation. Laboratory observations may not provide suitable estimates of behaviour in use (Van der Bijl-Brouwer & Dorst, 2017), whilst moving towards ethnographic methods that study use in context is time-consuming and generates large volumes of 'messy data' that can require particular research skills to analyse, and do not make use of the innate creative skills of designers (Norman, 2010); (Kujala, 2003). As a result, these 'traditional' approaches are often viewed by commercial designers as a 'luxury' - nice to have, but ultimately unnecessary (Wetter-Edman & Malmberg, 2016); (Mulgan, 2014); (Blyth & Kimbell, 2011); (Holtzblatt, Wendell, & Wood, 2004); (Grudin, 1991).

Further, and potentially of greater concern, the traditional philosophical HCD approach is an iterative 'ideate-prototype-evaluate' cycle that builds on previous understanding (Norman & Draper, 1986). As such, Norman and Verganti (2014) argue that, in the same way as the mathematical concept of hill-climbing, traditional HCD approaches "*get trapped in local maxima*". Describing incremental innovation as "*reaching the highest point on the current hill*" (p. 129) versus radical innovation as a process that "*seeks the biggest hill*" (p.129), they therefore argue that traditional HCD is only suited to incremental innovation. Sanders & Stappers (2012) further question whether the methods are able to effectively address complex 'wicked problems', problems that are ill-formulated, information is confusing and stakeholders have conflicting values (Rittel & Webber, 1973), in essence the problems that design seeks to address. These 'wicked problems' are often more influenced by tacit and latent needs than objective, scientific data.

If HCD is to overcome these larger philosophical issues, it is clear that methods are needed that can help designers to uncover tacit and latent needs and, at the same time, drastically shorten and simplify data collection. Sanders & Stappers (2012) argue that such needs can only be accessed "*at the deepest levels of ... expression"* (p. 4) and, as such, creative tools are key to unlocking these hidden desires and aspirations. Generative HCD promotes tools that generate new knowledge about potential users without the need for a concept to test or a context to observe (Sanders & Stappers, 2012). As described by Van der Bijl-Brouwer & Dorst (2017), these tools can take several forms. Here we will focus on two broad categories of generative HCD tools: those in which designers initially work remotely from users and apply their creativity to developing visions of the future use of products, services and policies and then test these ideas with potential users using traditional HCD methods; and those which aim to bring designer and user together in empathic co-creation.

More active than traditional research methods, the focus of these generative methods is on understanding not only what users 'say' or 'do', but also how they feel and what they value. This allows the designer to use their creativity to project outcomes against possible future scenarios. As such, by combining generative and traditional methods, HCD may be elevated to a process that can be applied to the design of complex technological and social systems to understand *experience* of use, rather than focusing on the design of individual elements (be it product, service or policy). In essence, the whole becomes more than the sum of the parts to address a more holistic user experience.

A further benefit of generative methods is their ability to support collaboration between different stakeholders by providing a common, easily accessible language for framing problems. This has brought design and the ubiquitous 'design thinking' to the attention of public sector organisations, where solutions typically cross agency and organisational boundaries (Van der Bijl-Brouwer & Dorst, 2017), (Sangiorgi, 2015). But there are difficulties related to the use of design consultancies in the public sector, including high costs and lack of continuity in implementation and subsequent design projects (Wetter-Edman & Malmberg, 2016). Many public sector bodies have therefore identified the need to embed design thinking capability within the organisation (Van der Bijl-Brouwer, 2016).

There are currently a very limited number of examples that showcase how generative and traditional HCD methods may be combined at the strategic level, and this may limit uptake and reduce effectiveness (Van der Bijl-Brouwer & Dorst, 2017); (Van der Bijl-Brouwer, 2016). Case studies of design projects that focus on method selection and combination to achieve strategic goals can go some way to overcoming this issue. The case studies presented here explore method selection for two commercial projects - one private and one public sector - undertaken by PDR, a world leading design consultancy and applied research facility based at Cardiff Metropolitan University.

Methods

Over the last twenty years, PDR has successfully undertaken hundreds of commercial and academic design projects requiring the development and appropriate application of HCD methods. This section presents two projects of particular relevance to this special issue; the first selected specifically to demonstrate the potential impact of the methods at strategic level, and the second for its value in describing how they engage 'non-designers' in the creative process. Each case study describes the aim of the project and research methods employed without disclosing results (which remain retained under client IP). We then discuss the rationale behind the study structure for each case study relative to recent literature in the HCD and arts-based research fields.

Case Study 1: 'The connected kitchen'

In 2013, PDR were approached by a large UK provider of traditional kitchen top appliances to explore how they might integrate 'connected technologies' into their appliances. The Research and Development Manager was becoming increasingly concerned that without sufficient consideration of connectivity and the Internet of Things, the company's products would face stiff competition from large technology companies as new entrants to the market. The R&D manager perceived two potential long-term threats: firstly, that without 'smart' capabilities the company's products would fail to meet future user needs; and secondly, that technology companies might generate IP protection that hinders such 'smart' product development in the future. To address these issues, PDR designers proposed a six month long collaborative project with the company to explore current and future user needs and identify opportunities for future connected kitchen appliances with the intention that the outcomes would be used to inform future product strategy.

The company already had a very strong brand and a good understanding of their existing market, so it was very important to them that the project did not only focus on what is technologically important, but took into account what may be necessary *and* desirable for their future users, whilst being coherent with the company's values and maintaining the existing customer base. The R&D manager and design team worked together to refine the following objectives:

- To gather information on new and emerging technologies relevant to intelligent kitchen appliance development
- To conduct HCD research focused on gaining insight into user requirements for, and in acceptance of, connected technologies in the home
- To provide guidance for the company that could support the development of a shared vision of the 'Connected Kitchen', and a strategy for future NPD activity
- To advise the company on how to embed HCD activities in future product and technology development

Study design

Stage 1: Foundation research

The foundation research stage informed the selection and development of generative research methods. A literature review of academic and trade journals and conferences, professional articles, technology blogs, social media and trend reports was conducted identifying twenty-four significant trends influencing the future adoption of connected devices. These were synthesised into seven themes addressing a wide range of issues including trends in living environments, developments in health and wellbeing and legislative issues.

Stage 2: HCD research

HCD studies were undertaken with two user groups:

1. Existing customers - aged 35-55, 3:1 female:male with an interest in cooking, baking and their home environment. This group was selected to inform the short-term strategy for the company.
2. Millennials - aged 18-25, a technology-savvy user group, with experience of connected technologies and different understanding and expectation of its future adoption. Findings from the user group would help to inform the long-term strategy and manage the transition period.

The research team selected a combination of traditional and generative research methods (summarised in Figure 1) to explore tacit and latent needs, multiple activities took place within one study. This allowed the project to be conducted at a cost and within a six-month timeframe that was appropriate for the company.

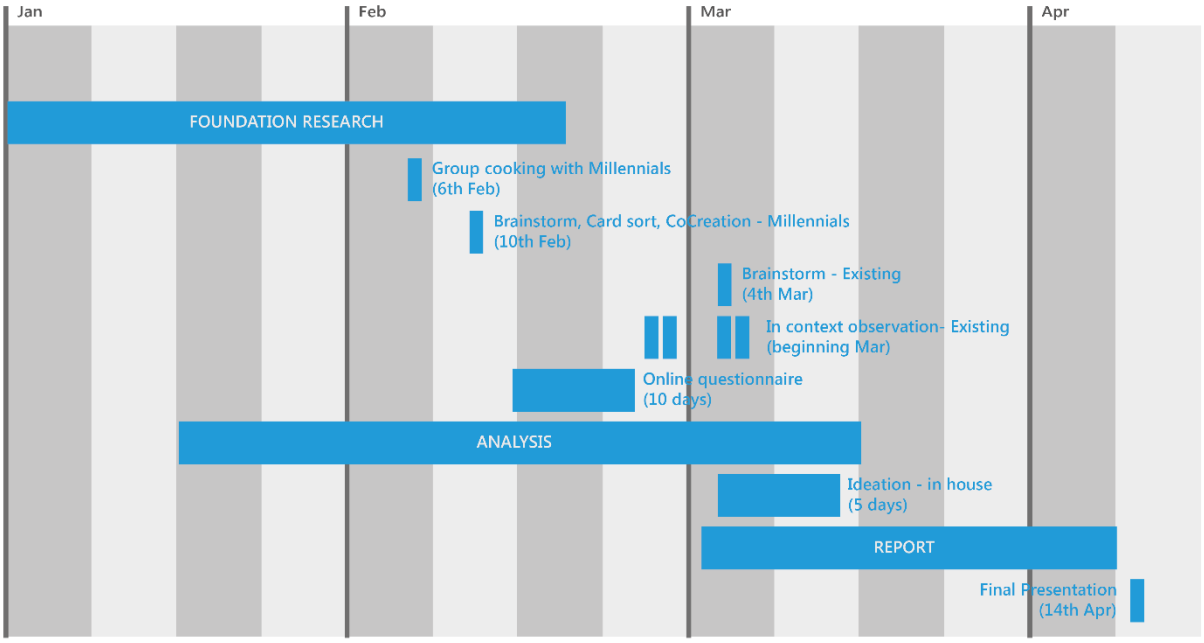

Figure 1 timeline of research methods

A total of five studies were undertaken within the following timetable:

1. A half a day Workshop (9 participants) - with millennials including: 2x brainstorm (anxieties & sensors); card sort; and PACT. This was conducted first as it was relatively quick to organise and provided rapid data for analysis.
2. A one hour workshop (9 participants) - with existing users including 2 x brainstorm (anxieties & sensors). This was conducted second as the recruitment of existing users was a more complex process than recruitment of millennials.
3. A questionnaire (182 respondents) - this was informed by the foundation research and the brainstorms. It was then left open for the duration of the study to maximise returns.
4. An ethnographic style observation (7 participants) - observing a group of millennials cooking.
5. 1:1 observations (4 participants) - in participants homes, scenario driven and incorporating the 'desk tours' to explore existing levels of connectedness. This was conducted last so that planning could run concurrently with other activities.

The methods used are described in detail below:

Brainstorming activities were conducted with both user groups independently. This allowed the researchers to identify similarities and differences in responses for the two groups. Two different brainstorms were conducted: the first namely 'anxieties', asked participants to document their explicit anxieties related to

preparing meals at home; the second, 'sensors', was a generative activity which asked participants to propose technology-enabled solutions to address kitchen anxieties.

The **card sort** was used to understand the values and expectations millennials have in relation to the themes identified within the foundation research.

Task one, entitled "Values", was conducted as an independent activity. Participants were asked to rank the seven predefined themes in order of impact and timeline based on how and when these themes will impact their own personal lives.

Task two, entitled "Expectations", was conducted as a group activity. Participants were asked to discuss and rank the 24 trends within the themes in order of impact and timeline based on how and when they expect these themes to impact the average household in the UK.

PACT - future scenario idea generation, conducted as a co-creation activity with the millennial user group and was intended to explore the expectations of millennials with regard to future kitchen technology from a technology-driven perspective. Benyon, Turner & Turner (2005) proposed the PACT framework based on the premise that a Person performs an Action, within a certain Context, using a particular Technology (thus PACT). PACT can be used to analyse what, with whom, and where a user interacts with a user interface, interpreted for our study as any object that a user interacts with (and therefore not limited to digital technology). Three **P**ersonas (Cooper (2004), p. 124) were created from the foundation research and each was assigned a recipe to cook (the **A**ctivity), and a **C**ontext for cooking. The participants were then asked to propose Technologies (either existing or imaginary) that could support the persona in their task.

The PACT activity was designed to be analysed alongside the Anxieties and Sensors brainstorm, highlighting repeated themes and identifying new ones.

The intention of the **observational ethnography** was to identify the explicit and tacit needs of Millennials in relation to cooking. Seven members of the user group participated in a group cooking activity run by an external facilitator. The research team observed the cooking activity, making field notes throughout.

Context-driven observation to uncover explicit and tacit needs, wants and desires amongst the existing user group, with regard to emerging contexts for cooking identified through the foundation research and brainstorming. The context-driven observation was conducted with four participants, who were visited by two PDR researchers in their home and asked to undertake a series of activities:

- *Technology desk tour:* To understand the extent to which users were already adopting connected technologies within their domestic life.
- *Kitchen desk tour:* To give an insight into buying preferences and favoured kitchen aids.
- *Scenario-based cooking activity*: Four scenarios were prepared by the research team, emerging primarily from the outcomes of the card sort activities and the 'anxieties' brainstorm which were

then presented to the participants. Each participant was assigned a scenario, based on the research team's knowledge of their personal cooking preferences. The participants took part in a pre-cook interview in which they were asked to discuss their anxieties related to the scenario, planning activities and recipe selection rationale. They then undertook the task, during which participants were encouraged to explain every decision and action by the observing researcher, who recorded the activity with field notes and photographs. Finally, a post-cook interview was also conducted in which participants were asked to reflect on their feelings related to the task and outcome.

Stage 3: Collation, translation and insight formation

Each research study was analysed separately, and then cross-referenced to other methods for triangulation (Figure 2). The translation process was two-fold: a formal report provided recommendations and opportunities for the company; and illustrative concepts were realised through an in-house ideation session.

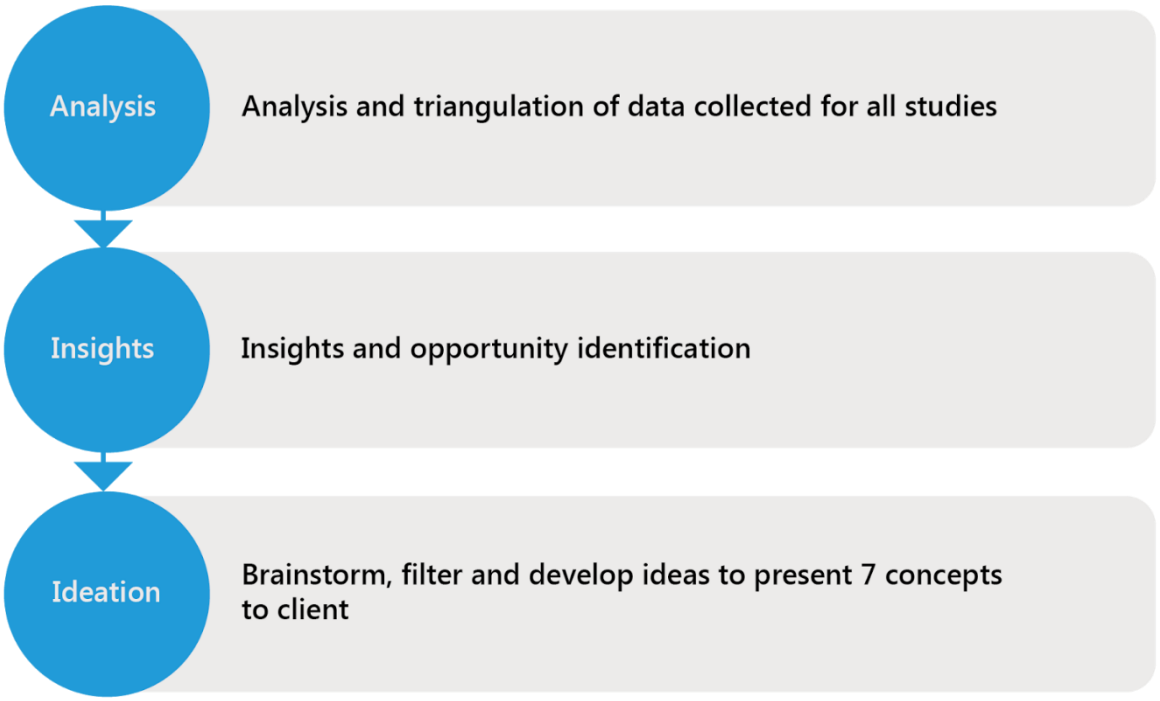

Figure 2 Collation, translation and insight formation approach

Case Study 2: 'Building capacity for design thinking in a UK county council'

In 2016 PDR were commissioned to deliver task-based training in design thinking methodologies to senior policy advisors and service managers within a UK County Council. The Council was actively looking for, and testing, innovative ways to work smarter, pursue new opportunities and deliver solutions that best meet the needs of local residents. The council had recently developed a new strategic document that committed them to putting residents at the heart of decision-making and to work collaboratively with all stakeholders in order to co-produce desirable, effective and easy to use solutions.

There were two objectives of the project; the first to deliver design consultancy addressing existing real-world challenges and needs the council are facing. The second to provide training on HCD approaches and methods to begin implementing recent amendments to their strategy documentation to better align council decision making with resident's needs.

The council staff undertaking the training were likely to hold a great deal of tacit and implicit knowledge on the local town where the challenge was based. Existing data revealed that the town was underperforming with regard to a number of economic, health, safety and wellbeing indicators. The data also concernedly indicated that the town had higher than average levels of obesity and lower levels of physical activity, particularly amongst the youth demographic.

The training was therefore structured with the aim of increasing the physical activity levels of the younger demographic residents of a local town. Four workshops were created:

> **'Greenhouse'** - An introduction to the research approach and hands on use of methods aimed at capturing participants existing knowledge and putting themselves in the position of local residents.
>
> '**Deep-dive'** - Describing methods in more detail and including target residents with which to perform the methods.
>
> **Co-Creation workshop** - Using the ideation techniques introduced in session 1 with target user groups
>
> **Prototyping Workshop** - Using prototyping and Service Blueprint methods to visualise service concepts.

The workshops were structured around an Explore - Elaborate - Execute design process created by PDR at this time (Figure 3).

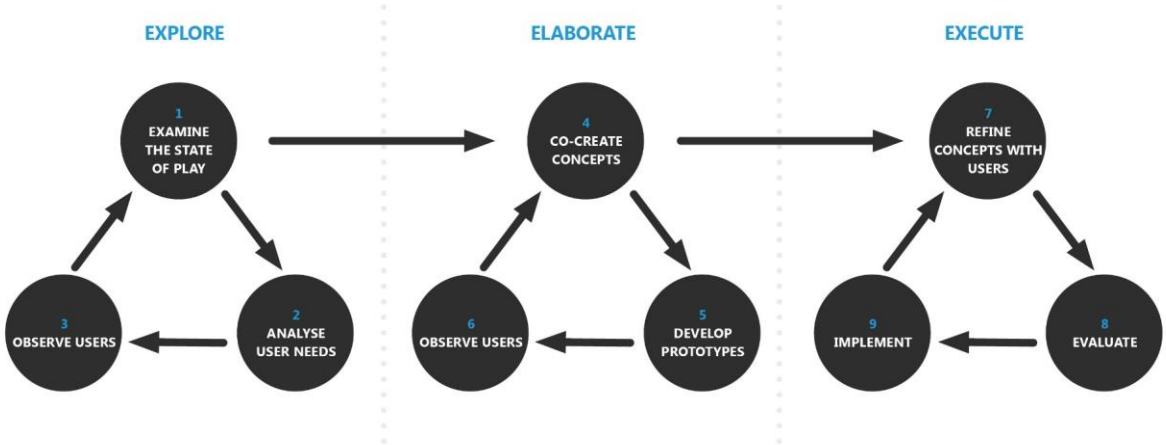

Figure 3 PDR HCD process

Study design

Stage 1: Exploration

The first 'Greenhouse' was a 1 day workshop which introduced research methods aimed at increasing the team's awareness of the needs of the local residents through building empathy. 'Immersive' techniques were used to help the team get into a user-centred mind-set. The methods were:

1. **'Through the eyes of...'**. An exercise to develop a 'HCD mindset'. First a video is played (e.g. walking down a street) and the team makes notes, the team then watches the video again through the eyes of a persona (e.g. someone recently retired). Many more aspects of the scene are observed when viewing it from another person's perspective.
2. **Persona** creation. Cooper (2004, p. 124) explains: "*Personas are not real people, but they represent them throughout the design process. They are hypothetical archetypes of actual users. Although they are imaginary, they are defined with significant rigour and precision".*
3. **Customer Journey Mapping** (CJM). CJM captures how a customer relates to a business, brand or product over time. It is a visual document including images, sketches and visual representations of emotion and rating scales.
4. **Ideation** techniques. Three techniques were introduced to the team; classic brainstorming (Osborn, 1963), 6-3-5 brain writing (VanGundy, 1984), and brand-led ideation which asks the team to approach the problem from the perspective of various brands.
5. **Prototyping**. Creation of 'quick and dirty' (Schrage, 1999) physical representations of an idea to try it out with the team and users.
6. **Service Blueprint**. Planning tool outlining target operating model of a service/policy, showing in detail all the elements and channels from a user experience perspective.

The second 'deep dive' was a 1 day session consisting of two workshops with two separate user groups; a year 7 group and a year 6 group, to gather user perspectives on the data from the first session. The 'User Research Planning Tool' was used to prepare for interviewing the user groups using the 'Day in the Life of' tool. A broad set of insights was generated, grouped thematically, discussed and refined.

Stage 2: Elaborate and experiment: co-create, prototype and observe

The third session was a 'co-creation workshop' with years 8 and 9. At the beginning of the workshop a 'vox-pop' video was shown capturing the opinions of parents, teachers and young people. This summarized the insights from the previous session and set the scene for ideas generation. The 'Carlsberg' ideation technique was used to co-create ideas. Firstly, favourite brands were identified (thereby capturing the qualities that appeal to young people) and subsequently using these brands and their characteristics to collaboratively create sets of ideas based on how those brands might deliver the service. After the workshops the team combined and refined the ideas into service concepts. Using storyboards, the service concepts were

consolidated and visualised to build a common understanding of the key features of each idea and see how they will work in a specific context.

Post session, the PDR design team took the rough sketches developed in the workshops by the participants and illustrated them into full storyboards. Five of these storyboards were subsequently presented to the project team at the start of the final 'prototyping' workshop. Three concepts were voted in for development in the session using the service blueprint tool. The team identified the individual stages of the proposed service to plan resources and the specific actions required to implement the ideas. The workshop concluded with a group planning exercise in which key touch-points were identified and a set of prototyping activities were planned and evaluated. The concluding session also encouraged participants to share lessons learned and once they agreed upon which ideas they would like to take forward, three actions were proposed for each concept, leading onto the 'execute' stage of the PDR design process which was not covered within this training.

Discussion

The selection, combination and implementation of diverse design research methods into the structured approaches detailed within the two case studies presented in this paper was undertaken by a team of experienced commercial designers rather than an academic team. The two methodological structures were formulated through a combination of the designers' experience, intuition and dialogue with the clients. During this dialogue the design team were required to provide the rationale for their choice of methods and the impact of these on project costs to their respective clients. This section reflects upon relevant literature in the field by connecting it with the choices and combination of the methods employed and identifying elements of literature which support or conflict with the case studies approaches.

Reflection on Case Study 1

Post-evaluation of 'The Connected Kitchen' revealed three main factors influencing its research structure. Firstly, there was a need to engage with two distinct user groups to inform both the long-term strategy and the transition period. Millennials are a distinctly different group because they have had a lifetime of internet use making them an informed population, open minded and socially responsible (Barton, Fromm, & Egan, 2012). Secondly, some methods work better on a 1:1 basis and some in groups, informed by the choice of methods and experience. Finally, there was a need to plan and design a study that could be conducted within the confines of a commercial project; for example, easier methods to implement (such as brainstorming) were conducted concurrent with the planning for more complex *in situ* studies.

The choice of methods relates well to levels of user-based knowledge (Sanders, 2002). For example, the 'anxieties' brainstorm captured *explicit* needs. In-context and observation activities with millennial and

existing users allowed researchers to observe *tacit* needs; and participatory design methods explored *latent* needs.

The various methods allowed the designers to explore multiple perspective and triangulate the results to validate emerging themes. For example, the 'anxieties' brainstorm captured explicit needs, i.e. those that are relatively easy for a participant to describe. The 'sensors' brainstorm captured those same needs from a solution focussed perspective. And finally, PACT provided another method to assess expectations in this area, this time driven by technology, particularly sensor technology and the Internet of Things (IoT).

The importance of method selection is highlighted by Sanders and Stappers (2012, p. 204), who adapt the DIKW hierarchy (Ackoff, 1989) to explain the HCD process (see Figure 4). The multiple research methods employed within this project generated data from several *phenomena*, viewed from different perspectives. This was translated into a usable form to provide and share *information*, and synthesise new viewpoints, scenarios and concepts. In essence the 'sensors' brainstorm and PACT method captured what Sanders and Stappers term 'little ideas'. The skill of the designer comes in the triangulation and interpretation of these ideas into *knowledge* and therefore 'big ideas', and applying judgement to whether those big ideas add significant value and should be developed further.

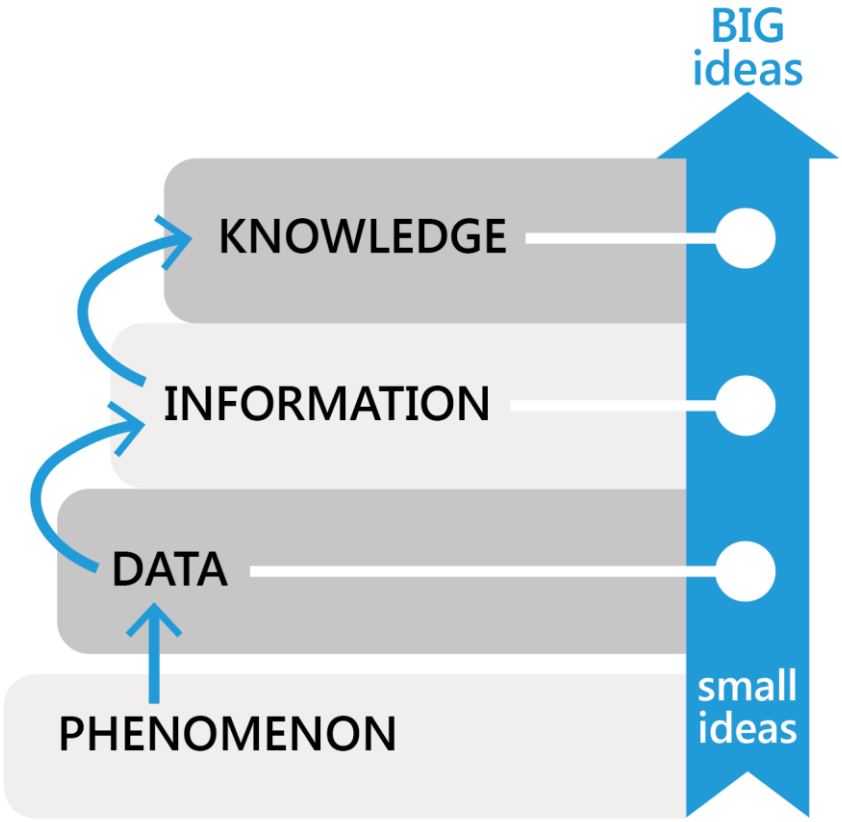

Figure 4: How HCD methods can be combined to provide strategic solutions (redrawn from Sanders & Stappers, 2012)

Reflection on Case Study 2

Within the second case study, PDR's objective was to build design thinking capacity within a public sector organisation. This required the team to provide resources that would be useful to the council in multiple projects and train participants on their application. The design team elected to provide resources in the form of a design toolkit. Such approaches are not without their problems; as Van der Bijl-Brouwer (2016, p. 2152) comments: "*The risk of providing people with random collections of methods is that it can be quite overwhelming. More importantly, the possible experienced superficiality of individual methods might distract from the real value of human-centred innovation processes".* To address this issue, PDR designers with considerable experience of working with similar public sector organisations, identified a small range of methods appropriate to projects likely to be encountered and developed an organisation-specific toolkit. This included an overview of the principles of the service and policy design processes, descriptions of the methods, guidance on the point in the service design process that the methods should be deployed and contextualised suggestions of how the data generated could be interpreted. The methods were then incorporated into learning-through-doing style tailored training sessions set in the context of a project to develop services that could increase the physical activity levels of young people in a local town. A final group discussion encouraged participants to think of how the design thinking methods might be more deeply embedded in the council's processes.

The need to showcase the methods meant that even at the beginning stages the designers controlled which methods were presented, in what order and, crucially, how they were implemented both with the stakeholders and with the user groups. This happened both at the initial planning stage and also interpreting the data to prepare for the next phase. This approach can be compared to Problem-Based Learning which Torp and Sage (2002) describe as "*focused, experiential learning organized around the investigation and resolution of messy, real-world problems"*.

The final stage of the project involved PDR designers visually developing pictorial storyboards. This begs the question of what was 'wrong' about the storyboards proposed during workshop #3. If the content is the same, is there something about the way it is visually presented that makes it look more professional or resolved? In physical and digital products fidelity has been proven not to negatively affect user feedback, a primary strength of a low-fidelity prototype is its incompleteness (Lim, Stolterman, & Tenenberg, 2008).

Conceptualising HCD as arts-based research

Arts-based research includes all practices that use artistic processes as a way of investigation and knowing (McNiff, 1998) and according to Cole & Knowles (2008, p. 59), one of the central purposes of arts-based research is to "enhance the understanding of the human condition through alternative (to conventional) processes and representative forms of inquiry". Greenwood (2012) argues that the use of arts-based

approaches to research has “grown from the desire of researchers to elicit, process and share understandings and experiences that are not readily or fully accessed through more traditional fieldwork approaches”.

The case studies presented here show how the careful combination of HCD methods can give rich insights into the multiple phenomena that influence user wants and needs, and propose intentional actions to meet these needs. When methods are combined that yield knowledge and ‘big ideas’ (Sanders & Stappers, 2012), this can support the transition from a current to desired future. Van der Bijl-Brouwer and Dorst (2017) explain that, whilst user experience may be affected in the short-term by superficial design solutions, it is underpinned by themes that are relatively constant. They argue that these themes “are the basis of long-term strategic thinking”.

Whilst traditional HCD and the social sciences appear superficially to share methods, there will often be distinct differences in their purpose and application. Haddon & Kommonen (2004) note that social science researchers may focus on a single dimension of a problem and plan a study that will allow them to thoroughly document reality. In contrast, HCD requires that multiple dimensions of a problem are explored to yield valuable insights for future actions. This forces the designer to be pragmatic about the extent to which a particular avenue can be explored, a fact that is seen even more starkly in commercial projects which are bounded by time and cost. For example, the foundation research phase of ‘The Connected Kitchen’ yielded a number of themes that required further investigation. The study design evolved throughout the project, with the design team using their intuition and experience to balance the breadth and depth of research collection for each theme. This is in keeping with arts-informed research methods, which “[rely] on common sense decision-making, intuition and a general responsiveness to the flow of events and experience” (Cole & Knowles, 2008, p. 61).

The intuitive approach is a core principle of design research. One of the key challenges shared by HCD and arts-informed research is how comfortable clients or collaborators are with the uncertainty and ambiguity inherent in the often nonlinear and tangled creative process. HCD and arts-informed methodological approaches and tools can each respectively present opportunities and barriers to dealing with such uncertainty. Competent designers help navigate this by planning and combining the right tools to reach optimum personal and group creativity when engaged in a transformative process. They may also sense and improvise based on responses and modify their approach, adjust or deviate from the direction or loosely established plan. Enabling others to embrace this ambiguity can allow for deep learning to be achieved along with invaluable opportunities for non-artists and non-designers to become involved in creative expression and new ways of accessing their own explicit, tacit or latent knowledge as well as ways to communicate and reflect on their own learning and see the value or grow the trust in these intuitive approaches. The ECC case study presented here is a capacity building project where the method itself is the focus so this was not an issue. However, notably the design team encountered some reluctance to commission projects when using

the same unstructured or fluid methods in cases where the overall value was perceived by clients to be in the end solution presented.

This suggests that it is important to articulate the role that the designer plays within the generative HCD process. Harnessing and directing the 'everyday' creativity of non-designers so that it positively contributes to the design process has led to the conception of 'designer-as-facilitator'. But, as Wetter-Edman and Malmberg (2016) explain, this is significantly different to facilitation practice in other professions such as Human Resources. In generative HCD, the designer 'frames' the problem to be interrogated, uses their experience and knowledge to evaluate the co-created solution and, if necessary, re-frames the problem from another perspective (Dorst, 2015). The creative process is also steered by the aesthetic sensibilities of the designer (Stephens & Boland, 2014). Thus, in common with arts-informed research, the instrument of research is 'researcher as artist' (Cole & Knowles, 2008).

These factors may also shed some light on why, for both case studies, the commissioned outcomes were also accompanied by concepts developed by the design team. In arts-informed research, the process of making is a mode of inquiry in itself. The designer reflects on the solution throughout the visualisation/materialisation of the solution (Schon, 1983). The signature of the researcher is evident through the project and, for many designers this signature is in the visual or physical manifestation of the designed solution. The visual output also serves to engage a broader audience with the research outcomes. For 'The Connected Kitchen', the audience was other functions within the company, particularly an internal design team set up to evolve the concept and take them to fruition; in this case, the quality of the concepts was viewed as very important, since the audience were also highly visually literate. Reflecting this importance, the design team consisted of HCD specialists and more traditional designers selected for their excellent visualisation skills. In the policy-related case study, the service concepts could be used in further co-creation activities with potential users to provoke thought and new actions in future policy concepts, fulfilling an important principle in arts-informed research, the centrality of audience engagement (Cole & Knowles, 2008). There may also be a more pragmatic reason for the inclusion of a professionally resolved visualisation. The visualisations may act as a validation both of the designer's skill, *and* that application of the strategy/policy recommendations can yield high quality results in the right hands. In using the concepts to communicate that *they* are the right hands, designers can therefore hope to win future design work from the client. Since completing 'The Connected Kitchen', the design team has presented the project to multiple internal stakeholders and undertaken subsequent projects on developing product ranges.

Thus far, we have suggested that the designer's involvement in the project is central to its success. This raises an obvious question in relation to the purpose of the capacity-building project described in the second case study. There has been some debate as to whether this type of project effectively transfers 'design thinking' skills into the target organisation. As in the case of problem-based learning activities conducted with undergraduate students, the extent to which the participants are reliant on the expert guidance from

designers will influence the long-term success of the project. As Wetter-Edman and Malmberg (2016) note, such projects rarely lead to a situation where the participants feel confident in independently conducting an HCD project. When trained designers select and apply methods, this is informed by the experience of previous projects; moreover, they intuitively redesign and augment the methods to suit the problem being explored. This immersion in a particular way of thinking is not necessarily available to people who are responsible for multiple aspects of service and policy delivery on a day-to-day basis. Whilst providing a limited set of methods from a toolkit allows a project to be developed, they may not necessarily yield the same level of insight that a project developed by experienced designers would. Irrespective of these potential challenges, HCD methods can help to encourage collaborations across 'silos' that are often present in public sector organisations (Design Council, 2013). Further, the understanding of HCD research within the organisation can help project managers to identify to what extent research can be conducted in-house and when to bring in the experts.

Conclusion

The literature review discussed the limitations and barriers with traditional Human-Centred Design approaches and how they have necessitated the development of generative approaches which we have argued are more akin to arts-based methods. HCD often encourages participatory, adaptive and collaborative methods, this relates to arts-based i.e. performance-based research to attain deeper learning, meaning or value creation to produce products and services better aligned to users' actual needs. These generative approaches are also beset with the same challenges as arts-informed research (such as uncertainty, wider scope for interpretation, greater reliance on intuition and lower trust, buy-in and understanding from clients).

The case studies aim to address the scarcity of information on how generative and traditional HCD methods may be combined at the strategic level, by interrogating mechanisms of project method selection and successes in the form of accessible research for the public domain. This paper contributes to what Van der Bijl-Brouwer and Dorst (2017) identify as "*the need to articulate clearly which methods and practices are most likely to create these strategic advantages"* in order to encourage their broader adoption across the public and private sector. We have identified that, alongside justification of methods there is a need to acknowledge and emphasise the unique skills (including and extending beyond the visual) that the designer brings to a project. As HCD can be conceptualised as a form of arts-informed research, we suggest that these are important factors for arts-based researchers in general to consider when looking to apply their methods to projects in new fields.

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