Scaffolding Innovation through Human-Centred Design

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Abstract

Businesses and governments globally are turning to design as a way to facilitate sustainable economic, social and environmental innovation. Strategic design consultancies are popping up all over the world to help organisations innovate through design and the popular business press is reflecting this trend with an increasing number of related publications. There is a growing demand for design professionals to fulfil an increasing number of emergent design roles such as the service designer, the design strategist and the experience designer to cater for the demand for strategic design capability. Many of these emergent design disciplines use a human-centred design approach to enable incremental innovation through the design and delivery of improved services to recipients. The creation and use of design representations or artefacts are essential within this process. Using examples from a recent design project, this paper will describe how some specific design artefacts were used to scaffold innovation within a large commercial organisation within a human-centred design project. It will discuss the rationale for the creation of the artefacts by the designer as well as how they were received by members of the organisation. It is hoped that this paper will inspire design practitioners to consider their deliverables as a mechanism to support innovation projects within the organisation.

KEYWORDS: innovation, human-centred design, HCD, artefacts, design management

1.0 Introduction

Innovation is a powerful shaping force for both the history and the future of human-kind. In 1969 Simon put forward the notion that design is a process of transforming actual situations into preferred ones; and innovation, or rather the generation of novelty, is considered an inherent aspect of the profession of design (Lawson, 2006). There is a large body of literature on the subject of innovation in reference to a variety of domains including business (e.g. Whylant 2008),

health (e.g. West & Wallace 2006), the social sector (e.g. Mulgan 2006), government (e.g. Bason 2012) and the environment (e.g. Manzini 2009, Thackara 2005). Essentially, innovation is concerned with change and in our current economic and environmental landscape many are putting forward the notion that, to borrow Tim Brown's words, we need "change by design" (Brown 2009). There is evidence to show that design-driven companies are more innovative than others (e.g. European Commission 2009), which is why many organisations are turning to design to spark innovation initiatives. In 2011 the European Commission launched the European Design Innovation Initiative (EDII) to exploit the full potential of design for innovation. The European Commission envisions that "by 2020, design is a fully acknowledged, well-known, well-recognised element of innovation policy across Europe" (Peter Droll, European Commission, speaking at the SEE conference, 29 March 2011). This goal of increasing design-led innovation capability is shared by a growing number of governments throughout the world including that of Helsinki, Singapore, China, the United Kingdom, and more recently Australia.

Innovation is concerned with continuous change and requires conversation and collaboration between multiple people with divergent perspectives, view-points, motivations and affiliations. The designer can help to scaffold innovation through mediating cross-disciplinary conversation through the provision of well designed representations or design artefacts. A 'scaffold' can be defined as:

> *"A temporary platform, either supported from below or suspended from above, on which workers sit or stand when performing tasks at heights above the ground."*
> *(The American Heritage Dictionary of the English Language, 2000)*

The term 'scaffolding' is used here as it refers to organisational members being enabled to undertake work related tasks in order to create tangible structures. Innovation initiatives require collaboration between people. There is extensive literature about the use of artefacts for mediation between organisational groups within collaborative work (e.g. Star & Greismeyer 1998 on 'boundary objects', Engestrom 1999 on Activity Theory). This paper will put forward the view that designers can help to scaffold innovation through the delivery of consciously crafted design representations which can be used by staff members to enable and facilitate service improvement initiatives. Where 'incremental innovation' can be defined as the improvement of existing services this paper illustrates how some specific artefacts were used within a project by the researcher (and project lead designer) in order to support a commercial design-led innovation initiative. Her creation and use of design representations in response to the specific social and collaborative requirements of this project is the primary focus of this case-study.

1.1 Todays' Designer

Within literature there is also broad sentiment that due to the fact that the 'objects of design' (Dorst 2008) are changing, so is the role of the designer. Buchanan (2007), in his 'four orders of design' model, illustrates how the scope of design is changing from the design of words and symbols (graphic design), to the design of objects (industrial design), to the design of interactions (interaction design), to the design of organisations, environments and systems which will be refered to as strategic design. Manzini reflects on the new role for the designer as that of;

> *"…connectors and facilitators, as quality producers, as visualisers and visionaries, as future builders (or co-producers). Designers as promoters of new business models. Designers as catalysers of change"*
> *(Manzini, 2009, p. 11).*

Design is increasingly becoming a major capability at the heart of an organisation's ability to create new solutions (e.g. Bason 2012). Consequently, the designer is no longer seen as the lone genius working in isolation or the person that puts the lipstick on the pig. Designers are increasingly being considered as valuable team players, visionaries, facilitators, strategists and provocateurs, playing important roles within innovation initiatives (e.g. Tann 2012, Roth 1999).

Design is a social practice which can be considered as an individual activity that takes place within a social context (e.g. Bucchiarelli 1994). Where designers act as facilitators within the context of design-led innovation initiatives the social dimensions of design practice become extremely important to consider. Margolin (2002) advises that as designers we are always obliged to consider the conditions in which design occurs. Manzini notes that within this changing scope of design practice, new types of 'design knowledge' needs to be generated:

> *"to stimulate and steer strategic discussions, to be applied in a variety of specific projects, to help understand what we are doing or could do. This knowledge has to be explicit (to be clearly expressed by whoever produces it), discussable (to permit the exchange of opinions among many interested interlocutors), transferrable (to be applicable by other designers) and possible to accumulate (to form a reservoir of design knowledge that could be the starting point for producing further knowledge by other researchers)."*
> *(Manzini 2009, p.12)*

Artefacts can play an important role in communicating design knowledge and helping to enable collaboration across organisational disciplines, which is extremely important given the notion that innovation stems from collaboration and knowledge sharing across organisational boundaries (Fagerberg, Mowery, & Nelson, 2005).

The creation of artefacts is central to the practice of all design. Krippendorff talks about the practice of design as making sense of things and the role of artefacts is important within this process (1989), particularly when it is a collaborative one. In relationship to strategic and interaction design, artefacts can help to make information about the intangible, such as knowledge relating to systems and processes, more tangible through visualisation. They can provide effective ways to facilitate conversation about the intangible which is increasingly at the core of design and can help to mediate complexity within organisational settings. Senge (1990) maintains that innovation stems from the 'creative tension' between current realities and future possibilities. For innovation to occur, future possibilities which compliment the values of its participants (i.e. both internal staff as well as customers) need to be defined, articulated, and communicated. Artefacts are extremely important for communicating a vision for a future service, product or process. As will be shown, within an organisational context artefacts can also be very useful for gaining executive support for innovation initiatives. Where organisations tend to consider, design and deliver services in relation to their own internal processes and organisational structures, designers can bring the perspective of the *service recipients* into the organisation through research activities and artefacts, enabling organisations to effectively "design from the outside in" (Schapiro 2002). Human-centred design approaches and its artefacts can be used to shift the organisational perspective.

Human-centred design practices are used extensively by design professionals involved in strategic and interaction design, for example within service design and user experience design. Human-centred design is a broad term used to describe a design approach where the needs of the

potential recipients of a product or service are considered within its design. The approach requires some research with related stakeholders including both potential users and organisational members, whereby the findings are incorporated into the design solution. It also involves an iterative design process where designs are refined over time and often tested with actual users. This practice relies heavily on design artefacts such as personas (e.g. Cooper 1999), customer journey maps (inspired by the work of Shostack 1984) and the use of proto-types of varying fidelity (e.g. Ehn & Kyng 1991, Kelly et al 2001). Designers use these and other artefacts to facilitate cross-disciplinary collaboration, for gaining consensus amongst diverse stakeholder groups, and also for bringing the perspective of the service recipients into the organisation.

Norman and Verganti (2012) make a distinction between 'radical innovation' and 'incremental innovation'. Incremental innovation they define as "improvements within a given frame of solutions" and radical innovation as "a change of frame ('doing what we did not do before')" (p. 5). They maintain that human-centred design is extremely beneficial for incremental innovation, but not for radical innovation as people get too influenced by the present paradigm to come up with anything radically new. Whilst many businesses strive for radical innovation, according to Larry Keeley, President of the Doblin Group, 96% of radical innovation initiatives fail (cited by Norman & Verganti 2011, p. 6). Therefore, striving for incremental innovation may be a more realistic goal for most organisations. Within the context of enabling incremental innovation, design research and human-centred design approaches can be used to enable a more *customer-centred perspective* within the organisation in order to help facilitate service improvement and assist to support incremental innovation.

1.2 The Research

The approach to the design of the project artefacts stemmed from the researchers' consideration of the following question:

> *Can we as designers help to scaffold the innovation process by representing 'design knowledge' (in Manzini's (2009) sense of the term) through artefacts that can help mediate between organisational groups and facilitate collaboration and conversation?*

A series of artefacts were created by the human-centred design leader on this case-study project. The leader was acutely aware of the contextual factors that influence both her own professional design practice as well as the success of commercial innovation initiatives within organisational settings. Within professional design practice, design representations emerge in response to contextual factors such as the communication needs of a project. It therefore becomes important for academic researchers to investigate the professional use of artefacts by designers undertaking multi-disciplinary design.

Within a larger research project the contextual factors which affected the leader's design practice and the reception of the artefacts by the organisations' members were explored and studied. Using the theoretical framework of Activity Theory (Engestrom 1999, fig.1), the social factors influencing this project were also considered, as well as the role the delivered artefacts played as 'mediating artefacts' within the associated work activities of the recipients.
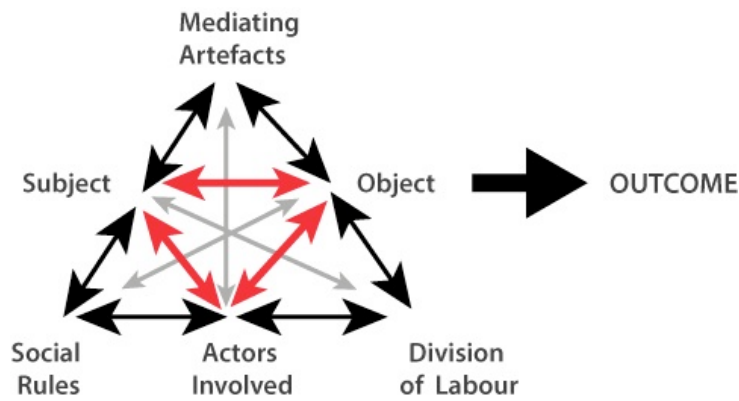
Figure 1. Model of an Activity System (adapted from Engestrom's model in Engestrom, Y. 1999, *Perspectives on Activity Theory*, p.30)

Due to constraints associated with the undertaking of academic research within a commercial organisation the sample size for interviews was limited and the sampling method opportunistic. However as a participant researcher, the researcher was able to gain a deep understanding of the qualitative research. This data was triangulated with participant-researcher observations, her limited field notes, sketches and email communications used throughout the project, as well as secondary data including intranet documents and documentation from other projects. The following eleven respondents were interviewed using the Activity Theory framework as a basis for semi-structured interviews.

Title	Team	Interviews
User Experience Staff	Researchers' user experience team	3
User Experience Staff	Another user experience team	1
Process Specialist	Process Improvement Teams (2 different teams)	2
Program Manager	Online team	1
Manager of sales made by customer group being researched within the project.	Sales Team	1
Solution Architect	IT Team	1
Call Centre Manager	Customer Service Team	2
TOTAL		11

Table 1. Staff interviewed

2.0 Case-Study

Details about the case-study are outlined below.

2.1 About the Organisation

The organisation where the project took place is located in Australia and has approximately 40,000 employees, the majority of which are located within capital cities. They have a broad portfolio of technology products and services which they provide to a large number of consumers and businesses. Within the organisation, teams are often co-located and staff are required to collaborate with other staff located in different places. Due to it's large size and geographical structure the organisation has complex social characteristics and could provide an extreme case to research collaborative design practice.

A few years ago, the organisation appointed a new CEO who was committed to building a customer-centric culture. Since his appointment a multitude of customer service initiatives have been launched. Over the past two years, a series of new teams have formed within the organisation to assist with the development of a more holistic and consistent customer experience. The company's mission statement supports this goal in its assertion that the company "strives to serve and know its customers". Further, within their public-facing web-site they define their company culture as both "customer-driven" and "collaborative and innovative". Becoming more customer-centred is a popular goal within this organisation, and this focus was mentioned in almost every interview held with its members. Due to the fact that the artefacts delivered to the organisation aimed to provide some tools to help its members better understand a specific customer group and more effectively design services for them, the aim of this project work was aligned with a strategic goal of the organisation.

2.2 The Project

The project brief was to come up with a conceptual design for an improved online ordering system for a particular customer group using a human-centred design approach (e.g. Guliksen et al 2003). The schema below (fig.2) outlines the different activities that made up the research and design components of the project work.
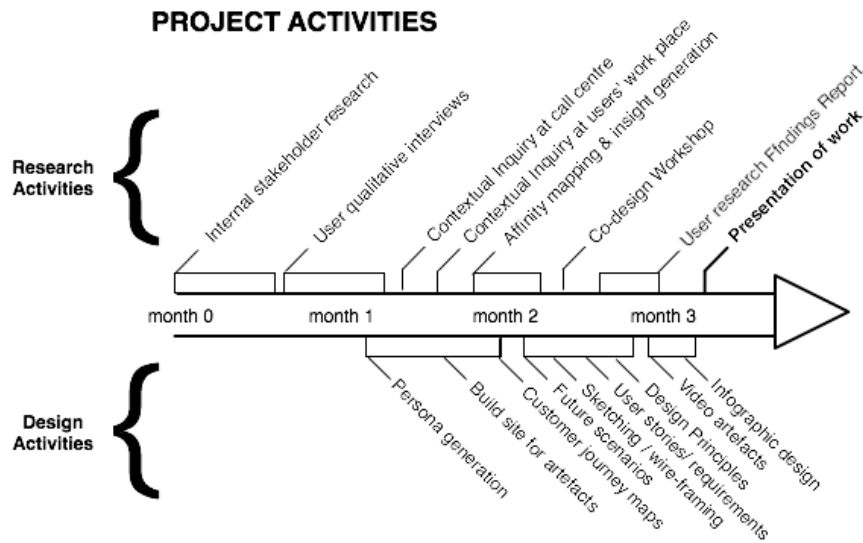
PROJECT ACTIVITIES

Figure 2. Project design and research activities

From these activities, a series of artefacts were created and subsequently delivered to the organisation. It is these artefacts which are the focus of this paper.

2.3 Project Deliverables / Artefacts

The artefacts delivered were hosted on a password protected web-site. Reasons for this decision were that video content could be easily displayed without maximising staffs email storage limits as well as the fact that it is relatively easy to share a URL with colleagues. It was hoped that this work would be seen by a large number of staff in different locations. The table below describes the different sections of this site and the different artefacts.

Page Name	Description on the page	Contents
About	Learn about the different activities for this project	Text
Meet Some <users>	Personas for the different types of <users>	3 personas as PDF files (e.g. Cooper 1999)
<User> Journeys	Step through the journey the different <user> types take when ordering and activating different products	3 customer journey map PDFs (e.g. Shostack 1984)
Some Facts	An info-graphic displaying some surprising quantitative statistics about <users>.	PDF info-graphic (e.g. Tufte 1986)

Research	Research insights, artefacts from a <user> co-design workshop and videos with excerpts from <user> and internal staff interviews about the ordering experience.	2 research videos and 1 video showing design principles for the proposed ordering portal, PowerPoint file with key research insights, and some PDFs with representations from the co-design workshop (e.g. Sanders 2005. Ehn & Kyng 1991).
Designs	Some opportunities, design principles, future scenarios illustrating how a portal can fit into the daily experience of <users>, high level capabilities for a <user> portal, wire-frames and a list of associated user stories (outlining functionality for an ordering portal).	Wire-frames, requirements in the form of agile user stories and a proto-type video illustrating the proposed design in use. A quick wins spread sheet showed actions that could be done immediately which would benefit this customer group.

Table 2. Descriptions for different sections of the site and notes about provided artefacts.

A few of these components will be discussed below.

2.3.1 Artefact 1: Research Videos

Videos were created from research data from interviews with members of the customer group and staff members who support these customers, e.g. staff representatives who field enquiries at the organisations call centres. The videos were approximately 1.5 minutes long and showed approximately 8-10 verbatim quotes from various research participants. They clearly showed that the current process and tools used for ordering products by these users were extremely onerous.
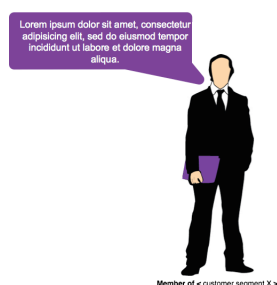

Figure 3. Representative image from the video where the problems encountered by the customer group with the existing services were expressed through first person verbatim quotes.

2.3.2 Artefact 2: Customer Journey Maps

A number of customer journey maps were delivered depicting the process that members of the customer group currently took to order different products from the organisation. These showed the interactions customers had over various touch-points (e.g. web, phone, in-store etc.) over time. The maps also showed what tools and service evidence, such as bills and contracts, were utilised within the process, their different needs at the different stages of ordering (e.g. integration with their own internal CRM systems), their pain-points and opportunities for improvements (in fig 4).
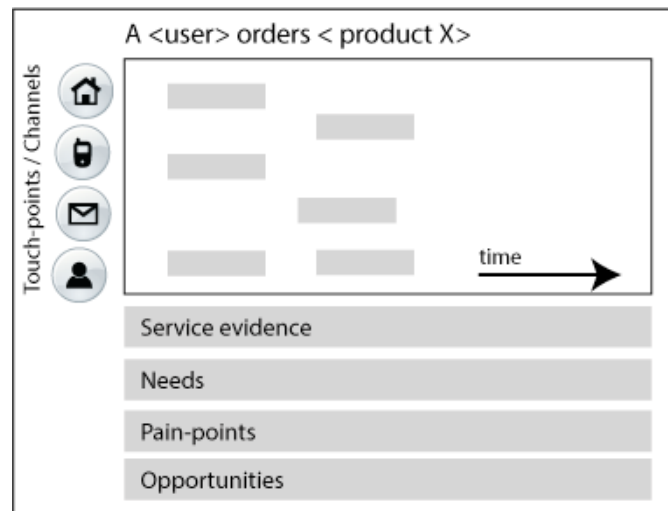

Figure 4. Schema for the customer journey maps.

2.3.3 Artefact 3: Video Prototype

At the completion of the project, some conceptual designs represented as wire-frames were produced for a proposed online ordering portal. A video was created where a user called 'Janine' talked the audience through an animation of the wire-frames where she described the proposed system in terms of the benefits it provided her. These benefits addressed a lot of the pain-points expressed by other customer research artefacts within the site, for e.g. the customer journey maps. It is not always easy for stakeholders to understand static wire-frames and this format allowed the wire-frames to be seen in sequence making the design understandable for stakeholders.

2.3.4 Artefact 4: Personas

Three personas were delivered reflecting the different types of users in the customer group. These were constructed from a series of qualitative interviews with customers. The personas documented; demographics, goals, needs, work responsibilities, employer information, pain-points, channels used for different stages of the ordering process, verbatim quotes, as well as how the organisation could support them better.

2.3.5 Artefact 5: Info-graphic

An info-graphic is a graphic representation of data, for example a sub-way map. Tuftes illustrated book the *Visual Display of Quantitative Information* has some beautiful examples. A part of this artefact can be seen in figure 5. The info-graphic translated complex information to a broad audience group in a simple way. It showed that the customer group a) contributed a significant amount of revenue to the organisation, and b) if the organisation could improve their ordering services, there would be significant efficiencies gained and subsequently increased net revenue. The information represented in this artefact included:

» the number of in-coming support calls that came to the call centre that serviced these customers,
» information about the financial revenue this group brought into the organisation per product, and the number of members of this group per state.
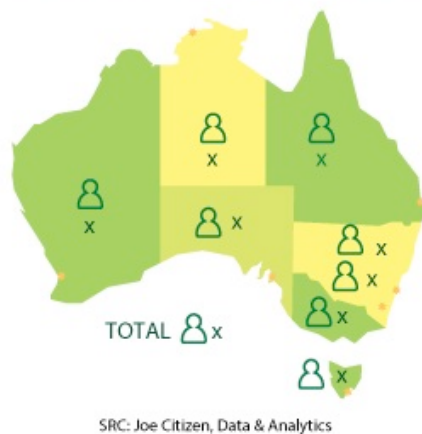
NUMBER OF <USERS> (PER STATE)

SRC: Joe Citizen, Data & Analytics

Figure 5 Example element within the info-graphic.

2.4 Contextual Factors

Design artefacts are usually crafted in response to associated contextual factors. The intended qualities for the delivered artefacts and the associated contextual factors are noted below.

2.4.1.Persuasive

The project was a research-led (Sanders 2006) explorative project with no established project team, allocated budget, or position on the company's project roadmap for its delivery. It consequently had an implicit task that required a new vision for an online service to be sold into the organisation in order to persuade its senior stakeholders to unlock the resources needed to execute on the design recommendations.

2.4.2. Communicative

The designer was working at the organisation for a limited time and would not have contact with the team who would be tasked with the detailed design and development of the proposed online services. She wanted to deliver artefacts that translated the user research findings and design recommendations effectively. Additionally, she wanted to ensure that the artefacts still had a life after her contract had expired and would not be lost in people's hard drives or buried on the shelf. Consequently, she believed that the artefacts delivered needed to be: easily shareable, memorable, and effectively communicate design knowledge to a broad audience group with varied design literacy, varying informational requirements and from different disciplinary backgrounds and functional business units.

2.4.3. Engaging & Conscripting

From the outset of the project, it was very difficult for the designer to get meetings and engagement with members of the organisation. This was partly due to the fact that she was a contractor and without her own internal network or influence, the large size of the organisation, staff already having very full days, and the fact that there were similar initiatives being done by other groups within the organisation. After being approached, stakeholders were asking themselves whether this particular initiative was worth them spending their time on. The designer soon realised that it would be useful to get senior stakeholders to advocate this project. She needed to create artefacts which were understandable by a broad internal audience group to gain interest and buy-in. She wondered whether these artefacts could be used to unlock funding for initiatives aimed at this customer group by various staff both now and in the future.

2.4.4. Educate and Encourage Empathy

From the beginning of the project it was clear that the customer group was not well understood or regarded by members of the organisation. This customer group were responsible for on-selling products to customers that the organisation did not service directly. Whilst they brought in significant revenue and helped to provide products to a broader customer base, there was an evident cultural perception that this group were less partners and more competitors. There was an opportunity for the designer to produce artefacts which could be used by various staff to increase the understanding of this particular customer group and the value they provided to the organisation.

3.0 Research Findings

The following section documents findings from the qualitative interviews with some recipients of the artefacts. Informed by Activity Theory, the recipients were asked to recall the artefacts delivered and were questioned about their job role and work activities, who they work with in the organisation, how work is delegated and associated social rules, how they learnt about the

artefacts, how they used them, who they shared them with and why, what they thought about them etc.

3.1 The Artefacts in General

The format of the artefacts and the fact that they were not delivered as a PowerPoint file was mentioned by almost every respondent. They were also described as effectively reflecting the customers' perspective and being a way to increase empathy for customers by staff.

> *"Customer research generally comes back in the form of a pretty dry spread sheet or a PowerPoint pack with a list of findings or something like that. So they're pretty standard, and do not very often come from the view of the actual person. "*

> *"I think, sometimes it's hard to flick on a Power Point pack with a lot of detailed information, finding the time to go through it quickly, versus getting a simple one page [info-graphic] or watching a video and saying, okay, I really get what they're saying now."*

Further, all recipients noted the push by management for the organisation to be customer-centred within their interviews;

> *"Using these kinds of artefacts and frameworks could possibly help keep the customers and the users front of mind…"*

> *"It's almost viral in a sense because you have a snack sized asset [i.e. videos & info-graphic] you can pass around to people. So in terms of changing the culture that's a very nice way to do it."*

The artefacts were described as "succinct", "visually memorable", "fresh and accessible" and were noted by a few that they could be "used by any stakeholder at any level". Also the requirement for internal buy-in for innovation initiatives was stressed by many;

> *"Because we are such a big organisation, if you don't have the right kind of people to support you then your idea may not get anywhere…"*

> *"We do an analysis to work out which senior stakeholders would be more interested and influential …because you need to get them to champion your cause…[to combat] resistance from other stakeholders that may be out there."*

3.2 Research Videos

When asked about the project deliverables 80% of respondents mentioned the videos. The videos were also described as being easy to understand and were discussed as having played an important role in gaining executive support and interest for the project. They were viewed as persuasive evidence to substantiate the claim that the way the system currently works is simply not working which "helps to bring not only awareness but it creates interest and it may help to influence stakeholders in the right way."

3.3 Personas

Most of the respondents said that they would be likely to use the personas in their work activities. They were seen as an educational tool which they could use to teach different members of the organisation about the specificities of this customer group as well as tools in decision making and technology design. They were cited as being particular useful for educating new staff about these customers and were included in an induction pack for new call centre staff as they were seen to be able to "help our consultants understand the people who are on the other end of the phone much better". Where personas are becoming a common component within the organisations innovation projects, it is understandable that these artefacts were seen as useful. The IT manager stressed that the use of personas was helping to inspire user-centred thinking within the organisation helping to; " hammer home a bit more specifically that these are people that have specific roles and need specific things and they vary and they're different…. ".

3.4 Info-graphic

The info-graphic deliverable was mentioned unprompted by more than half of the respondents. It was considered to be aesthetically pleasing, "interesting" as well as informative; "it really tells the story in one page". This artefact was widely reported to have been emailed (and forwarded) to others in the business in its PDF format.

3.5 Customer-Journey Maps

These were used mostly by roles who worked in operational type capacity as a starting point for conversation. They were reported to have been used to kick-off cross-disciplinary conversations about related service improvements.

4.0 Discussion

According to literature, design artefacts can fulfil the following functions in order to help scaffold innovation within organisational contexts;

» **Collaboration:** Artefacts can help to provide a 'design language' (e.g. Sanders 1999) within collaborative activities and assist in mediating divergent viewpoints and needs.
» **Communication:** Artefacts can embody design knowledge, such as findings from user research, as well as ideas and concepts, making abstract concepts and designs understandable and actionable.
» **Probes:** Artefacts can be used as prototypes and can act as probes within ideation and stakeholder research and provide objects to both think and talk with (e.g. Goldschmidt 2003).
» **Conscription & Persuasion devices**: Artefacts can be used to get people involved and interested in innovation initiatives (e.g. Henderson 1999).

In light of the contextual factors detailed above and the designers' intention for the artefacts to assist to scaffold innovation within the organisation, the following broad qualities of the artefacts have been highlighted:

» *Useful* – They could be re-used by various members of the organisation for their own work activities relating to this user group.
» *Accessible* – Staff members did not require specific domain knowledge to understand them.
» *Shareable* – It would be easy for staff to share the artefacts with their colleagues and access the work on an on-going basis providing an enduring set of tools.
» *Relevant* – Relevant to a broad audience group, re-framing the design problem using various lenses.
» *Communicative* – They expressed a picture of the current services as well as painting a vision for a possible future service through a design concept understandable to a broad audience.
» *Persuasive* – They could be used to enlist participation, generate interest in the project and persuade the executive team to fund the implementation of the design recommendations.

Through embodying these qualities the delivered artefacts could assist to scaffold incremental innovation within the organisation.

5.0 Conclusion

Designers can use consciously crafted artefacts to help facilitate incremental innovation within organisational settings. Design artefacts should be considered as mediating objects that can inform innovation initiatives in various ways. These include; the provision of models and frameworks for collaboration and conversation between members of different functional groups; as mechanisms to bring the perspective of the customer into the organisation; as well as the provision of visualisations that make complex non-tangible systems and services seem more tangible. By considering the environment in which a design artefact functions, artefacts can be crafted by designers to support and scaffold the innovation efforts of individuals and groups within organisational settings. A real opportunity exists for designers to help facilitate and support innovation within organisational contexts through the delivery of consciously crafted design artefacts.

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