Visual Tools for Developing Cross-Disciplinary Collaboration, Innovation and Entrepreneurship Capacity

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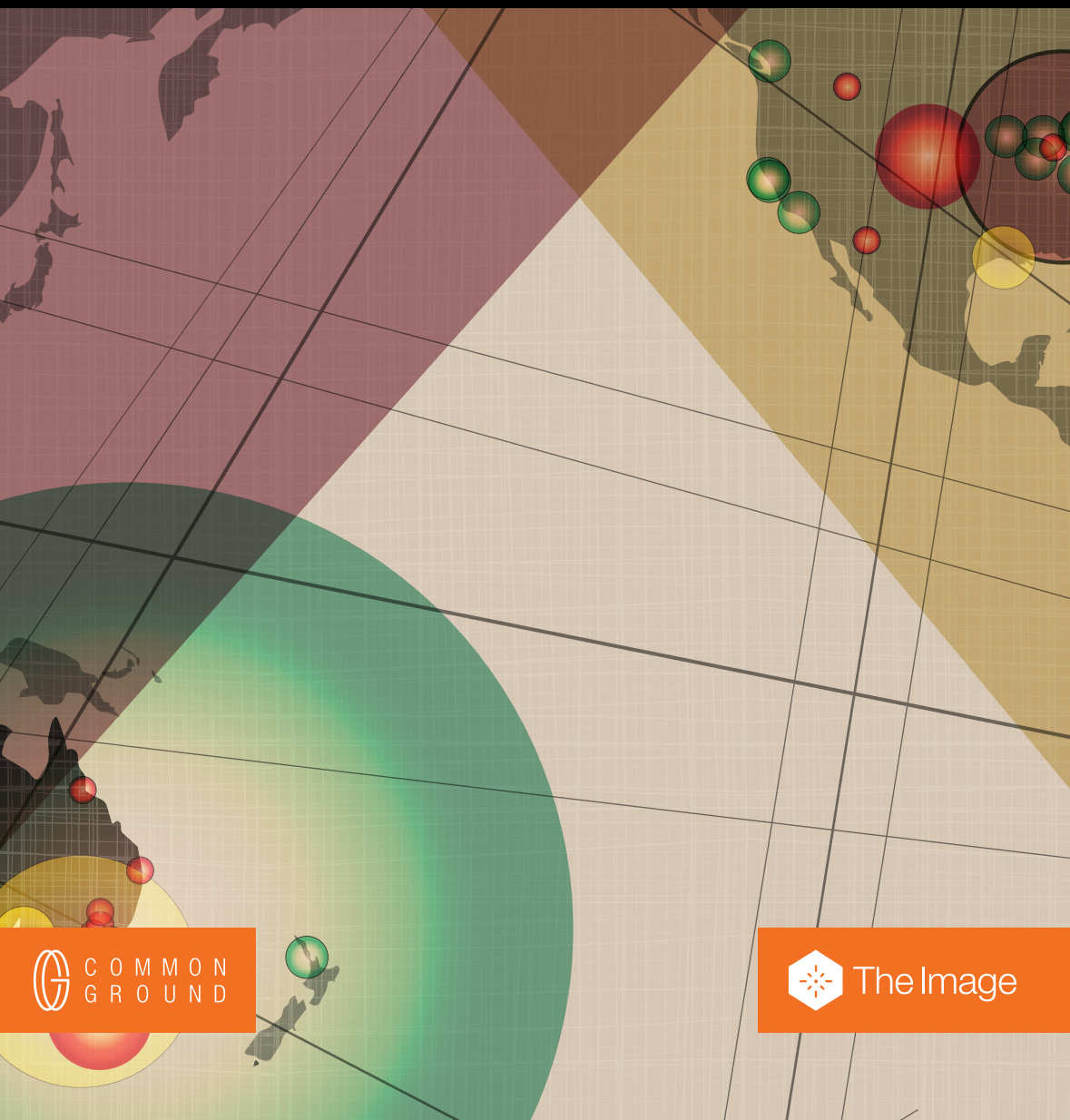

COMMON GROUND

The Image

CHAPTER 11

Scaffolding Innovation with Design Artefacts that Enable Others to Do their Work

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Organisations globally are turning to design-driven approaches to support their shift towards customer-centricity and to accomplish their innovation objectives. Design approaches are now applied within wicked and diverse domains such as health, government, sustainability, planning, social innovation and business. Irrespective of its domain, innovation occurs within complex social environments. Visual design artefacts provide valuable inputs into innovation processes providing instruments that support the social and interlinked demands of innovation. Especially in complex environments, designers need to consider how to best steward their designs towards implementation. Results from the collective work of many, requiring collaboration and broad sense making, often over long periods of time. Consideration of the social context empowers designers to provide organisations with useful visual tools that support innovation processes. There is a significant opportunity for designers to support innovation and it is therefore critical that today's graduates understand the important mediatory and enabling possibilities of well-crafted visual artefacts. In this chapter current practices and roles of design artefacts within innovation contexts are explored. Some specific examples of design artefacts that are being used in the innovation practices of design professionals are presented, and a pedagogical framework that helps designers consider the social context of innovation initiatives is introduced, enabling them to deliver useful visual tools that scaffold innovation through supporting others to do their work. Well-crafted design artefacts, can support innovation processes, by helping organisational members to do their work of facilitating innovation outcomes. Like scaffolding supports construction workers, design artefacts are enabling tools to deliver collective outcomes.

INTRODUCTION

Innovation is as old as humanity, because it is about changing the way that we do things. Its requirement for implementation is what distinguishes it from both invention (Schumpeter 1989) and design. The differences between innovation and design include; (1) *innovation is broader in scope than design.* Design may form part of

innovation, but innovation includes much more, such as the management of regulatory issues. (2) *Innovation is seen as an economic activity whose basic unit of analysis is the innovation system.* Management sees design as a part of the innovation system. (3) *Innovation can include initiatives that are technology-led rather than design-led* i.e. when a new technology leads to an innovation rather than the identification of a gap which leads to a solution (Ulrich, 2011). While the process of design can stop with the delivery of ideas and specifications, innovation requires implementation and adoption.

Within design discourse, there is much enthusiasm for the value of design approaches within innovation; however, the majority of texts focus on the role of design at the beginning phases of the innovation life cycle (Kelley *et al*. 2001, Brown 2009), rather than the role of supporting design tools such as design artefacts within innovation processes. Innovation is a collective outcome, often requiring change to processes, products, services, culture, and organisational structure. On a fundamental level, artefacts can enable organisational members to think and (hopefully) act in a more person-centred way. This role within human-centred design is well established. However, the reuse of these design artefacts outside the bounds of the design project less so. In this chapter we argue that there is a significant opportunity for design (artefacts) to support innovation and its associated processes.

Design artefacts are created as both outcomes of as well as inputs into the design process. We are not concerned about the role of design artefacts as outcomes (e.g. products and services) but rather the role of design artefacts (e.g. sketches, personas, visualisations, and specifications) that inform the design and delivery of services or things, such as web-sites, buildings, products, and government services. Artefacts, quite simply help people get things done; they mediate work activities, facilitating conversation, collaboration, sense-making, knowledge transfer, documentation, alignment, co-operation, co-ordination and communication. In these ways, artefacts play significant mediatory and enabling roles within organisations. Innovation demands cross-disciplinary collaboration, communication and knowledge building. Artefacts play significant roles as cross-disciplinary mediators within organisations. Some example artefacts used within organisational activities include GANTT charts, spreadsheets, presentations, texts, documents, visual representations and drawings. Design artefacts refer to those that have a visual component, including animations, videos, sketches, drawings, and info-graphics.

LITERATURE

The enabling role of artefacts within collaborative work is widely discussed within the organisational literature (e.g. Knorr & Cetina 1997; Wagner, 2000; Carlile, 2002; 2004; Ewenstein & Whyte, 2007, 2009; Pratt & Rafaeli, 2006). Two of the most useful constructs put forward for this discussion are *boundary objects* (Star & Griesemer 1989) and *mediating artefacts*/Activity Theory (Engeström, 1999).

In studying collaborative work practices, Star & Griesemer (1989) defined 'boundary objects' as tools which organisational members act with and towards. Boundary objects provide organisational members with flexible frameworks,

facilitating both local meaning within distinct organisational communities as well as shared meanings between organisational communities. Boundary objects establish a shared language for individuals to represent their knowledge and provide a concrete means for individuals to specify and learn about differences, dependencies and what is new across a given boundary. Twenty years after coining the term, Star (2010) clarifies that 'boundary objects' offer more than interpretive flexibility. They are active tools, which she describes as "the stuff of action" (p.10).

Engeström studies artefacts as input devices, active languages, processes and frameworks that individuals and groups themselves utilise and adapt to affect collective outcomes (1999, 2005, 2006a). Engeström in his work on Activity Theory (1999) (See Figure 11.1) stresses the mediatory nature of artefacts and their significance for achieving collective outcomes. Where objects are the focus of subjects' activity, activity is influenced by mediating artefacts and social factors, such as division of labour, community or other actors and social rules. Organisational outcomes result from the combined activities of many working on different 'objects'. Engeström, in his notion of 'expansive design' (2006), discusses the notion of 'mediating artefacts' as 'tool-constellations' and 'instrumentalities' (2006, 2006a, 2007) that facilitate knowledge sharing and learning. In light of the social nature of design practice, design is a boundary spanning profession (Engeström, 2006a).

Innovation requires people to work on inter-related components and to collaborate across organisational boundaries. Design artefacts might be considered a type of boundary object for innovation, if their role is to assist organisational members to cooperate and facilitate a collective innovation outcome.

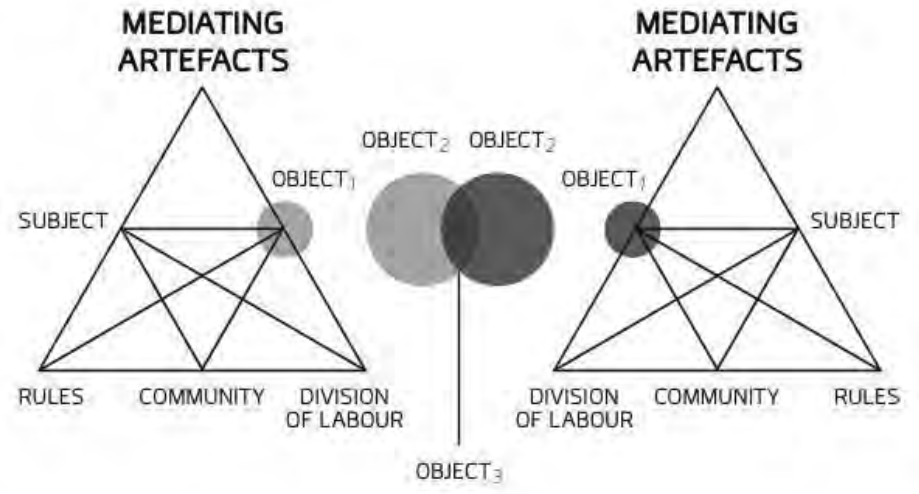

Figure 11.1: Third generation of Activity Theory (Engeström, 1999).

Design artefacts contribute both outcomes of, as well as inputs into, design processes. They are constructed in and through the process of design. Design practice necessitates the transformation of artefacts (sketches and prototypes) that capture and

represent, embody ideas, inspire, communicate, shape and that define and refine iteratively. Designers rely on artefacts to transform and externalise their thinking, making their mental representations available to others (Schön, 1983, Bucciarelli, 1988, 1994). Schön (1983) describes this internal process as 'reflection-in action', constituting a process of iterative back talk between designers and their representations. For example, sketches provide designers with things to think and talk with throughout the design process (Arnheim, 1993; Goldschmidt, 2003; Buxton 2007).

Artefacts are central to designers' 'reframing' processes (Dorst, 2011; 2015). They provide frameworks in collaborative contexts, mediating thinking about complex problems in new ways, in order to innovate (Bucciarelli, 1994). Considering the social nature of design practice, design artefacts function as both tangible representatives of the evolving object of design and at the same time as objects supporting communication and participation (Henderson, 1995; Bechky 2003). To examine artefacts' roles, consideration of their social practice context is hence critical.

Within design practice specifically, many artefact roles have been identified. For example, their roles as prototypes and visualisations assisting to transform abstract concepts understood by few to more tangible models available to many (Schrage 2006, 2013, Oster 2009), as mechanisms for knowledge sharing and transformation (Zimmerman et al. 2004, Dasgupta & Gupta, 2009), as facilitators of empathy and customer-centric thinking (Junginger 2007; McGinley & Dong 2011), as probes for innovation and idea generation (Gaver et al. 1999; Kelley et al. 2001) as well as conversation and collaboration enablers (Perry & Sanderson 1998, Brandt 2007). The role of artefacts varies throughout the design process (Carlile 2004; Ewenstein & Whyte 2009) and this dynamic nature is pronounced within innovation contexts, where artefacts perform flexible roles for numerous stakeholders during both design and implementation phases (Oster 2009; Nicolini et al. 2012). Despite their central role in design, the translation of the role of design artefacts into business and organisational contexts is still poorly understood.

If innovation is essentially about improving products, services and/or processes in organisations, what role might artefacts have as enabling instruments for shaping innovation goals and cooperative integration? The instrumentality of an artefact refers to the level to which the artefact supports or impedes the execution of individual or organisational goals (Pratt & Rafaeli, 2006). As innovation necessitates organisational transformation including changes to culture, structure and processes what role do design artefacts play in facilitating change? What role do they play once they are released from the designer into the company? How does the social context affect the role of artefacts within design-based innovation processes? These are some questions that motivate the thinking behind this chapter.

Artefact Examples, Contexts, and Roles

As has been discussed, design artefacts can play mediatory and enabling roles within innovation contexts, supporting organisational members to work together and get things done. In this section, some examples of design artefacts from the professional

practice of the author are discussed. Information about the context in which these artefacts have been used is described in support of the premise that design artefacts scaffold innovation by supporting organisational members to do their work. By no means is this list of artefacts exhaustive, there are plenty of other types of design artefacts that are used within human-centred design and design-led innovation contexts.

Research Reports

Research reports are artefacts that are commonly delivered at the end of design research projects. These reports are usually delivered in PDF format which makes them easily printable and sharable. They can function to communicate the key insights about research conducted about specific stakeholder groups mapped to associated findings and recommendations. Insights consist of broad generalisations. Findings provide evidence for the insights and have more specific information and recommendations that contribute suggestions of things to change or do to address the insights and findings. These documents commonly communicate the research process and describe the sample of people included in the research. Within projects, these reports can function to document the findings and to substantiate design recommendations, providing evidence for design recommendations in a format common to many organisations. Research reports can help to persuade that there is a need for change. They commonly function as communicators of knowledge about various customer/stakeholder groups supporting organisational learning and can include data visualisation.

Research Videos

Research videos are short videos that communicate information from qualitative research conducted as part of a human-centred design process. They can function to create empathy for customers/service recipients, and communicate issues encountered when using existing or associated services simply and persuasively. They can communicate that current processes and systems need to be updated, providing evidence for the need for change in compelling and sharable ways. Video artefacts are accessible to broad groups of internal stakeholders as limited domain knowledge is required to understand human experience. It is easy for broad audiences to relate to stories about experiences. The image below (Figure 11.2) shows a quote from a project conducted with a government agency considering barriers to adoption of online government services. This video artefact was used to substantiate and share some of the comments that citizens had about digital transactions and barriers to adoption.

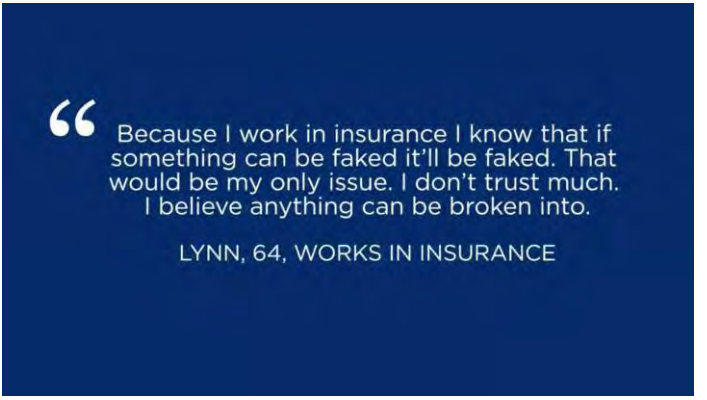

Figure 11.2: A frame from a research video.

Within another project for a large telecommunications company, research videos were used to persuade the senior executive team that there was a need for change substantiating the need for the recommended costly IT upgrades. Within these videos, verbatim quotes from customers and organisational members establishing that the current service was extremely onerous to use, and was leading to lack of efficiency and profit loss. This organisation did not have a very collaborative culture and the design team were having problems getting some teams to participate in their workshops. These videos were additionally used to persuade managers that the design initiative was important, so that they would mandate that their busy staff participated in the project workshops. The same videos were shown to call centre staff so that they had a greater understanding of the customers on the other end of the phone, as well as to staff who work with this customer group in a national road show. Within this project it was interesting to see that staff re-used the video for their own purposes, pointing to the supporting role design artefacts can play. Research videos can provide persuasive, accessible and sharable objects that can be used to create empathy, encourage participation in programs of work, and persuade change. They can function to communicate knowledge about the customer, supporting customer-centred organisational learning, empathy and change.

Journey Maps

Journey maps (Shostack 1984; Wechsler 2012) are visual representations of the various interactions a customer has with an organisation through various touch-points. They are commonly used within human-centred design practices, providing useful frameworks for understanding and discussing customer experiences. Journey maps always communicate the journey a customer has with an organisation over time, yet what is included depends on its use context. They can include direct customer interactions as well as interactions that organisational members conduct in support of these customer interactions. An example of a journey map's components includes; tasks, artefacts, systems and tools used, customer needs, pain-points/challenges and opportunities mapped long the different stages of the customer journey. For example,

if the journey map was exploring the ordering and activation of a mobile phone service, the journey stages might be awareness, research, purchase, activate, contract expiry, and renewal. Journey maps provide useful frameworks for organisational members to re-consider processes and systems with. They provide a unitary referent, the journey of the customer, as a framework for different teams to consider their work in relation to each other with. They help organisational members and partners understand how their work contributes to the holistic experience of the customer (Wechsler, 2012).

The journey map below (Figure: 11.3) visually depicts the experience of a research student getting a higher research degree (Masters or PhD) with an education provider. The students tasks (what they are doing) during the different phases of the journey (i.e. considering a research degree, researching options, applying, being accepted, writing a thesis, submitting progress reports, attending conferences, undergoing thesis examination, graduation and being an alumni), what they are asking (i.e. the information they want at different stages of their journey), their pain-points (i.e. things they found challenging during the different phases), and improvement opportunities, mapped along the different phases of the customer journey. Within this project, a few different maps were created for different student pathways. They were printed out and stuck to the wall within co-design workshops with internal staff to help them conceptualise how to improve their service for the different student cohorts. The maps invite different stakeholders to consider their work in relation to each other and in relation to the experience of the student. They help staff see what needs to change. Additional maps were also provided to communicate internal staff processes in service of the different student pathways and scenarios (such as gaining approval for new courses etc.).

Figure 11.3: Example of a journey map visually depicting the journey of a research student working toward a higher research degree (e.g. PhD).

Journey maps can be used in flexible ways. Another map was created by the author for a government agency exploring how they could better support people involved in the child protection system (i.e. children/young people who were in foster care, workers, carers, families, teachers etc.). A series of maps were initially created, looking at the different scenarios and interactions that government and non-government case managers had in relation to their work protecting children and young people. These maps, however, did not communicate children's experience of the system. Out of this program a series of requirements for new IT tools to support children/young people, workers, carers and families were delivered. These

requirements went out to IT vendors who tendered to develop the IT tools. The IT vendors would be unfamiliar with the child protection context and another journey map was developed to communicate the child experience so that they could understand the context in which the services would exist. A 'child journey map' was created from qualitative research conducted with children/young people and case workers involved in the child protection system. Figure 11.4 shows part of this map depicting the experience of children/young people being assessed to determine whether they need to be removed from their birth families (i.e. this phase was known as 'assessment'). The map was printed and used within various co-design workshops so that participants could understand the perspective of young people during the different phases of their journey within child protection (e.g. early intervention, assessment, intake, placement, adoption, leaving care etc.). Its primary role was as an empathy enabler and an educational tool, enabling different project stakeholders to have a greater understanding of the experiences of children/young people within the system.

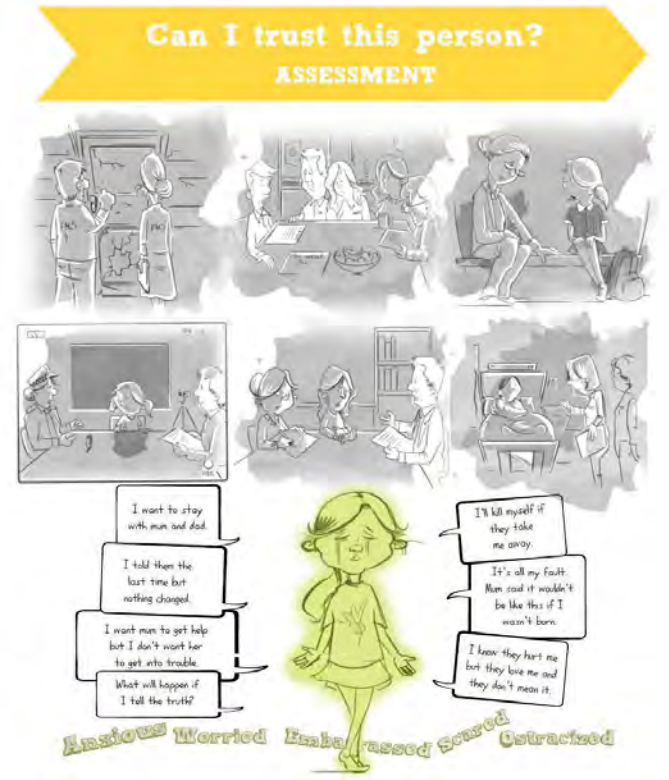

Figure 11.4: A part of a larger journey map used to communicate the child experience of the child protection system.

Personas

A persona (Cooper, 1999) communicates the goals, needs and behaviours of a hypothesised group of service recipients. Personas should synthesise and represent data collected from actual interviews with people. Usually a few different personas are delivered to communicate the differing needs of different service users, representing differing customer segments. Personas bring research to life and provide useful tools to help organisations design services that align to the needs, behaviours and expectations of service users. They can be used as an educational device, educating staff about the different needs of service recipients. They help design teams design services by supporting them to consider how different people may want to interact with a product or service in different ways. Personas should represent real people having names, using verbatim quotes and photographs. Figure 11.5 shows a persona delivered to a medical organisation who were designing an app to help support health related behaviour change for patients who have had a cardiovascular episode (heart attack) or are at risk of having one. Within personas, it can be useful to create little info-graphic objects to highlight the key differences in user behaviour. For example, within the medical project it was evident that there were two key criteria that influenced people's motivation to use a health app; (1) technical literacy, and (2) their motivation to improve their health. These two criteria would influence their adoption of the app and we needed to consider both factors. The persona helped to communicate knowledge about different user needs and contexts to inform design of the app so that it would be usable for different groups.

Another example of a persona delivered to support a government project looking at supporting young people with disabilities to leave the child protection system when they turn 18 can be seen in Figure 11.6. This persona includes a high-level journey map to illustrate the young person's experience over a few years before her 18th birthday, when she needs to leave care. Personas can be derived from synthesised data from lots of data sources, but this particular artefact was used to communicate the actual experience of a specific young person and her journey preparing to leave the child protection system. This story provided a valuable example of how things can go terribly wrong. Three related personas were delivered to illustrate the experiences of the young person, her primary carer and her case manager. These three inter-linked stories showed the different experiences and needs of these three people, explaining how things can go wrong. These artefacts were designed to be persuasive tools to show that there is a need for change. They provided interesting and accessible objects which were shared with senior management to convey stories of real experience. Personas can function as objects to communicate information about specific user groups and the need for change. They can provide useful 'boundary objects' (Star & Griesemer 1989) to foster collaboration and conversation between different organisational groups and create shared understanding of customers/service recipient needs and life contexts.

Figure 11.5: Example persona from a project looking at health-related behaviour change to inform the design of a mobile phone app.

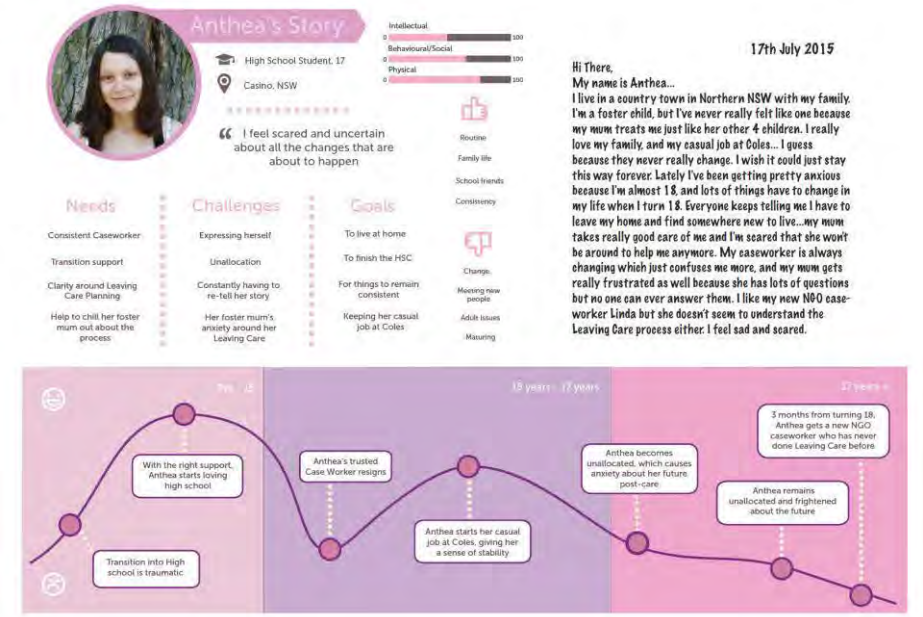

Figure 11.6: Example of a persona used on a government project looking at the experience of young people with disabilities who are in foster care preparing to leave care (i.e. becoming independent adults).

Info-graphics

Info-graphics visually translate complex quantitative data to broad audience groups in an accessible way. An example info-graphic delivered to a telecommunications organisation who were looking at improving the experience for customers ordering their products, included the number of incoming support calls to the call-centre in service of these customers, information about the revenue this group brought into the organisation per product and the number of members of this customer group per state (Figure 11.7 shows an element of this artefact). This artefact visually illustrated statistics showing 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 in relation to call-centre calls and subsequently increased net revenue. This artefact illustrated the potential value of investing in a revised online ordering service in an accessible way. It was used as a persuasive artefact as it showed that investment in services that support this customer group would yield increased profit for the organisation. It also provided an educational tool as it communicated information about the customer group such as their number and in what state they work from. It was reported that this artefact was shared broadly internally as it looked good and the content was related to the work of many different staff.

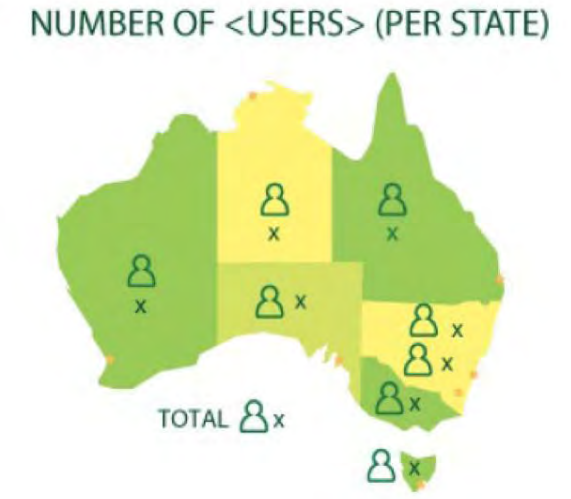

Figure 11.7: Example component of an info-graphic artefact.

Functional Overview

A functional overview is a summary of the functions for a recommended service. It can correlate with opportunities identified in journey maps. It can give an easily digestible overview of a proposed service's capabilities. It provides a short, sharp elevator pitch that describes what a proposed service does at a high level. As it is a high-level description of service capabilities it provides accessible understanding of the proposed service, helping to facilitate a shared vision of the future.

Wireframes

Wireframes communicate how online services work in more detail. They are sometimes clickable prototypes and other times static screens. The static version often includes descriptions about how the screens behave. An example wireframe for an online service for a courier company is included in Figure 11.8. This wireframe depicts a screen within the ordering process. These artefacts are very common when designing online services. They are useful for communicating how a proposed service should work and are used by graphic designers and developers when developing and designing the proposed service. They are usually provided in black and white and shades of grey as they need to go to a visual designer to be designed. They function as objects that mediate conversation and collaboration between different job functions. Wireframes communicate specifications and create alignment by facilitating a shared vision of a proposed future state. Not everyone is good at reading wireframes which is why it is useful to have additional artefacts that communicate visions of the proposed product or service.

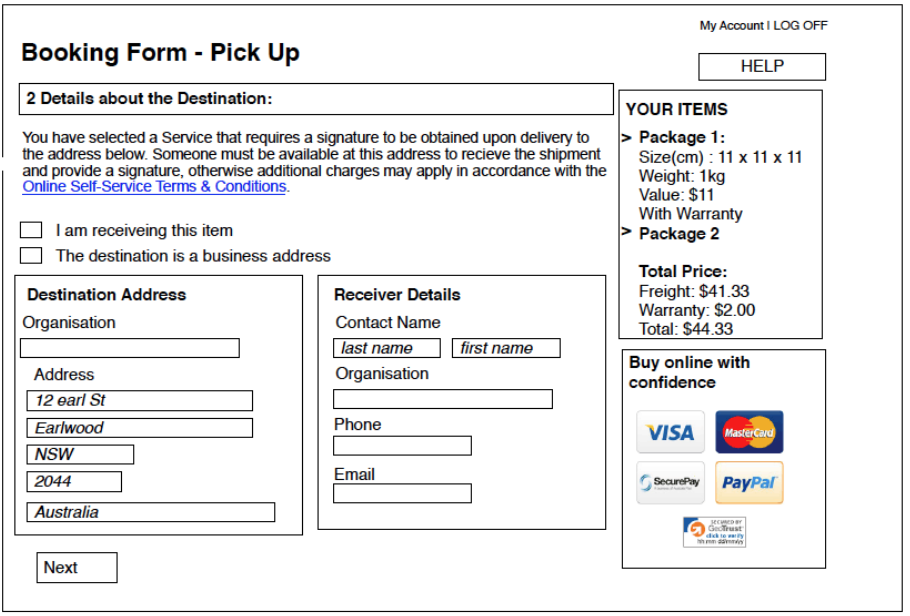

Figure 11.8: Example of a wireframe showing a screen from a booking form for a courier service.

Video Prototypes

Video prototypes can be used to communicate design solutions in easily understandable ways. Not everyone understands wireframes or specification documents and video can be used to bring service ideas to life. An example video prototype delivered to a corporate client is one where a fictitious customer (Simone) talks the audience through an animation of wire-frames for a proposed online service, describing the online service in terms of its benefits. These discussed benefits addressed many of the pain-points expressed by other artefacts, for example research reports, research videos, journey maps and personas. Video can be used to communicate designs in accessible ways appropriate for a broad group of stakeholders. The artefact mentioned above was shown to the CEO and executive team when pitching for funding for the proposed service. They function as communication objects helping to bring understanding about a future state supporting a shared vision for the future for diverse audiences.

User Stories

Services can be specified using agile user stories (e.g. as a <user type> I can < do something> so that <benefit>). They should correspond with the features in the wireframes, explaining how the system needs to support the design. User stories function to communicate the scope of the design and required technical integration

effort, enabling communication of the proposed scope of work to development and project management staff. They provide boundary objects that facilitate collaboration and conversation, as well as shared understanding of a proposed future state.

Quick Wins

During the research process when customers are consulted about their interactions with an organisation, what is not working will become clear. It's a good idea to deliver clients an account of things that they can do quickly and easily that will result in an improved experience for the customer. Quick wins communicate what could be executed immediately without funding. They can be delivered in a spreadsheet or a report.

Future Storyboards

Future storyboards depict possible future scenarios in use (Carroll 1995). Figure 11.9 shows use of a tracking feature and mobile ordering function using a tablet. These artefacts facilitate the communication of service concepts in relation to their use context. They are easy to create and are easy to understand. These artefacts are useful to communicate a proposed service concept and provide a vision of a possible future service. They function as communication devices, communicating easily actionable recommendations for implementation.

Figure 11.9: Example future-story storyboard artefact.

Summary of Artefact Roles

Different examples of design artefacts that support others to do their work, scaffolding innovation have been described above. Discussion of the roles they played within the different project contexts has been included. The following six roles for design artefacts within human-centred innovation contexts have been derived from the author's practice, and can be seen in the examples provided;

- Customer empathy enablers
- Persuasive and political tools
- Sense-making tools
- Collaboration and conversation enablers
- Communication devices (supporting organisational learning)
- Communication devices (shared visions for the future and implementation).

These roles are helpful when considering how to support organisations to deliver on their designs, and what tools to deliver to scaffold human-centred innovation within organisations.

The following section describes a pedagogical framework that can be used to create design artefacts that scaffold innovation, supporting diverse organisational members to enact collective innovation outcomes.

A Pedagogical Framework for Designing Innovation Scaffolds (Mediatory and Enabling Design Artefacts)

As design becomes more strategic and designers more distanced from the execution of their designs, there is an opportunity for designers to help organisations deliver on their design recommendations and support its associated initiatives and processes. The following framework is intended to assist designers to consider the social context of the innovation initiative so that they can deliver those involved with useful tools to do their work. It can help designers and design managers to deliver useful and usable design artefacts that scaffold innovation and its associated processes. In this way designers can support the innovation processes and activities that fall out of the conceptual design phase. The framework is detailed below using the case project as an example.

This framework provides a pedagogical tool as it helps designers and design managers to understand the organisational context surrounding innovation initiatives and how design artefacts can function to support both innovation design and implementation. The framework can be used in educational contexts to teach design students and practitioners about the important social context and organisational processes surrounding innovation design and implementation. The framework prompts designers to consider: What activities relate to the initiative? Who is involved? How are they involved? What artefacts could mediate understanding, conversation and collaboration between these stakeholders? Essentially, what

artefacts can designers craft to support the organisation to reach the collective innovation outcome? Where innovation relies on a variety of inter-linked activities and deliverables produced by various actors, what artefacts could enable this work? What tools can support the associated actors to do their work?

Using the Framework

The framework illustrated below (Figure 11.10) has five components; (1) What: the innovation outcome, (2) With: components and dependencies, (3) Who: people who can affect or are affected by the initiative, (4) Considerations: risks, potential hurdles and barriers, and (5) Innovation scaffolds: Artefacts/tools that enable others to do their work (i.e. what, who might use them and why). It can be completed in any order, but it is useful to make sure that step 1 is completed first. The framework provides a thinking tool that can be used and added to throughout the project as understanding of the project context deepens. It can contribute to understanding of the social context surrounding design projects, and is useful for designers, design managers and design educators. It provides educators with a pedagogical tool that supports design students to consider the social context of innovation projects, training them to support organisations to deliver on their designs, supporting innovation implementation.

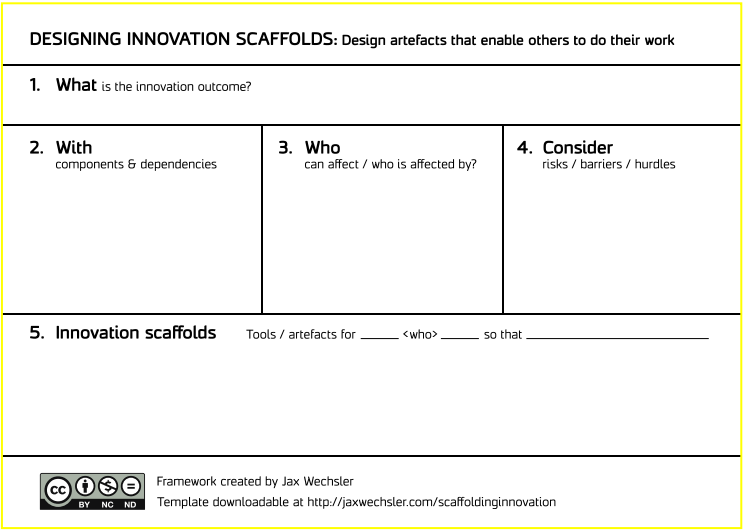

Figure 11.10: Pedagogical framework for understanding the innovation context, to inform design artefact creation.

The framework is described in the step-by-step guide below (Table 11.1) using examples from a project looking at how a telecommunications organisation may improve ordering capability of a specific suite of products by third party resellers. There is a cheat sheet (Table 11.2) articulating different roles for design artefacts,

which may be useful during Step 5. First use the step-by-step guide to think through the different parts of the framework and then consolidate this data by completing the template (Figure 11.2). You can use butchers paper and PostIt notes to complete the template. As your understanding of the organisation and initiative changes, so will your ability to complete the template. Remember, this is a working tool that can be revisited at different phases of your project.

Table 11.1: Step by step guide to using the framework (including example data from the case).

DESIGN ARTEFACT CREATION GUIDE	
Step 1	**WHAT: What is the outcome you are working on?** "Improve the ordering capability of CustomerX reselling CompanyX products."
Step 2	**WITH: Identify the innovation components and dependencies at a high level. What needs to happen to get there? What needs to be created to support getting to this innovation outcome?** For this project, these include: (1) business case to support next phases of the program (2) detailed design including wire-frames and technical specifications (3) the development and deployment of a new online service (4) integration of technical legacy solutions (5) modified processes for ordering (6) education/training about the new service and processes
Step 3	**WHO: Who needs to be involved? Who can affect or can be affected by this innovation outcome? Consider how?** For the case project, these include: (1) **The IT team:** Need to build and deploy the new solution. They are also responsible for adapting legacy systems. (2) **Product teams:** The teams responsible for the different products CompanyX sell will need to feed into this program for the design team to understand the current state and design an improved ordering process and system. (3) **Contact centre:** They are a wealth of knowledge about current challenges. They will also need to support customers to move over to the new service. (4) **Executive leadership team:** Will need to be persuaded to fund the next stages and delivery of the proposed service. (5) **Detailed design team** including user experience designers, business analysts and development/technical staff. These teams need to understand the intent of the designed service. They may need tools to persuade to retain functionality that delights the customer. They need to understand the design recommendations as well as rationale for the design decisions made. (6) **CustomerX (Third party resellers):** will get a better experience of CompanyX as the ordering process will be easier and more streamlined. A better service will hopefully yield greater efficiency and profits.

Step 4	**CONSIDERATIONS: What are the potential risks, hurdles and barriers?** For this project, these may include: The executive team do not fund the next stage of the initiative. The platform and associated changes to legacy systems are deemed too expensive, the value proposition and return on investment is not understood. Features that are important for the customer are not included in what is delivered yielding a system that does not meet customer needs.
Step 5	**INNOVATION SCAFFOLDS: What innovation scaffolds (design artefacts) can be delivered to support these stakeholders do their work? Use the cheat sheet for inspiration.** Persuasive and political tools - To support next stage funding, we need to show that the current state needs improvement in ways that is understandable by diverse audiences with different technical understanding. Also, in order to understand the current state, different internal stakeholders will need to be consulted. It will be important to activate their participation in the initiative. Example artefacts include videos showing that the current state is onerous and journey maps depicting the frustrating existing process. Communication devices - Artefacts outlining the capabilities of the proposed service. There will need to be artefacts to communicate the capabilities of the proposed design and its benefits to stakeholders with diverse technical understanding. To determine the scope of work for development of the idea, some artefacts will be needed to inform specifications. The organisation will need to be able to quantify the scope of this project to inform next phase funding. For example, concept videos discuss the different features in relation to benefits, providing rationale for the design as well as an artefact that is easy to understand for non-technical audiences. User stories and feature overview could fulfil this communication need for those tasks with next stage design and development. Sense-making tools - New processes will need to be created, and legacy systems will need to be updated/replaced. Artefacts communicating the current state can help the organisation understand what legacy systems may need to be amended. A journey map showing all the systems and artefacts customers currently use to order and activate products, and pain-points and opportunities would provide a useful artefact for others to use. Further such an artefact could also support the design of new processes. Additional sense-making artefacts such as personas can provide thinking frameworks to communicate customer research. Customer empathy enablers – These can potentially help the organisation understand the needs and current challenges of the customer group. Info-graphics can show the economic value of this group and the return on investment on service updates. Research videos can communicate that current processes are arduous and there is a need for change. Think about what tools you will provide. Who are their audiences and what is their purpose? Your answers will change as you learn more about the project.
Step 6	Look through your responses and complete the map (Figure 12). You can use butchers paper and PostIt notes to do this. Remember that this framework is a map you can revisit throughout your project. It should evolve over time as your understanding of the project context deepens.

Table 11.2: Cheat sheet for inspiration when designing artefacts (Step 5 of Table 11.2). Download at http://jaxwechsler.com/scaffoldinginnovation.

CHEAT SHEET
Inspiration for crafting scaffolding artefacts (step 4)

Customer empathy enablers: What did you learn that may help teams gain a better understanding of customer needs and their life context. Is there an opportunity to educate staff about the stakeholders you have researched? For example, new call centre staff may benefit from a better understanding of customer challenges.

Persuasive and political tools: Consider who might need to be persuaded to support the initiative. Do people need to make changes to their work behaviours? How could they be persuaded to change? Who do you need to persuade to collaborate with you on this initiative?

Sense-making tools: Design artefacts can support innovation processes by making the abstract more concrete, assisting communication and knowledge building, assisting staff to make sense of complexity and the non-tangible. What artefacts may your team need to make sense of the problem and the research? What related activities could these sense-making tools support? Visual frameworks such as personas and journey maps can support non-design staff with models for thinking about the customer and the problem space.

Collaboration and conversation enablers: Innovation often requires cross-functional teams to work together. What artefacts can support groups from different teams to talk and collaborate? Are there groups that are hard to engage? How can you sell in this work to activate their participation?

Communication devices (supporting organisational learning): Design artefacts support collaboration and knowledge building, facilitating a customer-centric perspective amongst diverse staff. What have you learnt that could be useful for others in the organisation working with these same customers? Who could benefit from greater empathy?

Communication devices (shared visions for the future and implementation): A shared vision is vital for innovation. Artefacts can provide staff with things to talk through, with and about. Who needs to be involved with the implementation of this innovation? What can you provide that can help them carry out related work? Think about who needs to be informed about this initiative. What is the best way to communicate with these different groups?

DISCUSSION

For design practices and, by extension, design artefacts, to effectively support innovation within the organisation, it needs to be recognised by other core functions and advocated by senior leadership (Aftab, 2012; Aftab et al. 2013). Executive support for the use of design artefacts supports their widespread use and impact (Bailey 2012). Following, for design artefacts to have maximum impact, organisations need to move to not only become human-centred or customer-centric, but also design-led. If this is achieved, design artefacts can have more impact on the culture and innovation capability of the organisation. There is opportunity for customer-centric design artefacts to provide useful tools for staff working on innovation-related work

activities, improving organisational human-centred innovation capability; however, organisations need to build capability around the use of design artefacts as mediatory and enabling tools. Further, there is an opportunity for engaging customer-centric design artefacts to support an organisations' movement towards customer-centric organisational change.

There are some other critical affective factors influencing the mediatory potential for design artefacts, such as organisational knowledge management capabilities, organisational culture and the absorptive capacity of the organisation (Cohen & Levinthal, 1990). For design artefacts to be used by staff to mediate work activities, they must be easy to share and find. An effective knowledge management approach would assist to prevent loss of knowledge between projects (du Plessis 2007, Quintane *et al.* 2011). This would enable improved absorption and the sustained currency of customer-centric knowledge and mediating artefacts. There is reason to suggest that customer-centric design artefacts can affect organisational culture; however, for design artefacts to be effectively shared, a sharing and participatory culture is required (Hargadon & Sutton, 2000; Rezgui, 2007).

CONCLUSION

The chapter argues that design artefacts can play valuable enabling roles within innovation contexts, providing organisations with things to think, talk and persuade with. A pedagogical framework is provided to help designers and design managers to consider the social context, risks and dependencies that can influence innovation implementation, enabling designers to think about their artefacts as being potentially useful outside the bounds of their design projects. In an educational context, this pedagogical tool can support students to become aware of the social context of innovation programs and the breadth of its associated activities. The idea of design artefacts enabling others to do their work and the notion of 'scaffolding artefacts' is an instructive construct for design practitioners and organisations as it broadens the applicability of design tools.

The research points to the strategic relevance of design practice within contemporary organisations and their important role as change-agents and enablers. Through the provision of useful and usable tools that augment the activities of staff and mediate the social context of human-centred innovation, designers and design artefacts can have more innovation impact, scaffolding human-centred innovation within the organisation. It is hoped that the pedagogical framework supports both educators and practitioners to consider the social contexts surrounding innovation initiatives, guiding the crafting of useful artefacts that scaffold innovation and enable others to do their work. Through the delivery of well-crafted design artefacts, design practitioners are well placed to empower organisations to implement their designs.

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