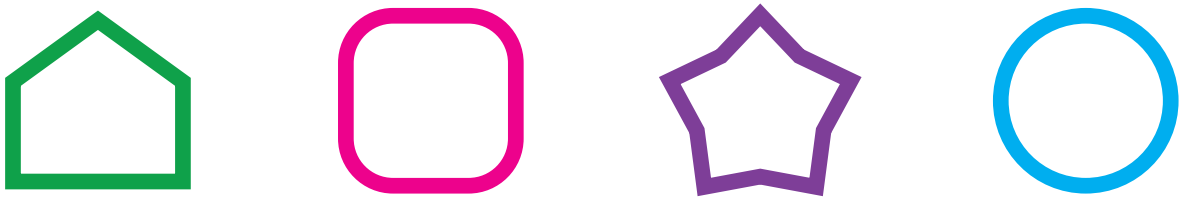
mapping design things

making design explicit in the discourse of change



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Institute of Design Innovation
The Glasgow School of Art

DESIGN ACTION

PREFACE

Academic Declaration of Authorship

I, **Michael Pierre Johnson,** declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

Mapping Design Things: making design explicit in the discourse of change

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at Glasgow School of Art;

2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;

3. Where I have consulted the published work of others, this is always clearly attributed;

4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;

5. I have acknowledged all main sources of help;

6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;

7. Either none of this work has been published before submission, or parts of this work have been published.

Signed: .....

Date: .....

Acknowledgements

This thesis has been supported on so many levels it feels truly daunting to acknowledge everyone and fully represent their contribution. At every stage, every part of this thesis has gained guidance, new perspectives, challenges, inspiration and a lot of much appreciated faith. On a personal note to all involved, this has been an amazing and wholly emboldening period that has changed my world view, not just on design, but on how we live and work as a society, instilling me with ambitions I expect will define my career.

Firstly, I must thank my supervisors, Lynn, Irene and Tom, who pushed me, protected me, grounded me and showed great levels of patience and faith in me. A special mention must go to Lynn who held my hand through all the challenges and set much of the stage that has allowed me to perform with any confidence. Additional thanks also goes to Gordon, without whom I would never have taken this path.

A special thank you also goes to all my peers and colleagues at the Institute of Design Innovation (InDI). Marianne, Mafalda, Angela and Angharad, sharing our PhD experience together has possibly been as vital as anything else, helping to bring (therapeutic) joy into the pressure, guilt and sheer confusion of it all. Carolyn, your friendly patience and administrative support has known no bounds. Brian and Cara, your time and wisdom has been humbling and inspiring. Emma, your support in later stages, including my mock VIVA, has given me a professional maturity to almost seem credible. To all others at InDI I've shared my work with, please forgive that I can only acknowledge you by name: Jeni, John, Robbie, Joe, Paul, Madeline, Tara, Gemma, Jeroen, Nicholas, Sneha, Cate, Ree, Don, Donald and Catherine.

Another special thank you goes to peers and colleagues within Design in Action (DiA), and the Arts and Humanities Research Council, without whose funding and direction this thesis would not have been possible. As we are a diverse team spread over six institutions, please forgive that I cannot name you all. To all the Co-Investigators, it is an honour to have worked with such diverse and influential figures, with a special mention to Chris for his support for my mock VIVA. To all the Post-docs, you have truly been the pillars on which the DiA project has been built and I hope to work with you all in future. To all the fellow PhDs, we have pushed and pulled each other through this project and can consider ourselves as one the its greatest achievements. To all at DiA's hub, you have kept us focused and together throughout this project, delivering high class events that I expect to continue an important legacy.

A thank you must go to Nicky, Phyllis, Thea and Laura at the research office of Glasgow School of Art. You have made this journey much more seamless than it deserved to be due to your unwavering support.

A final thank you goes to my partner, Christopher. Your support, humour, encouragement, and often sheer bafflement at what I've been doing has been the main reason I even engaged and dedicated myself to such a challenging project. I only hope I offer a fraction of the support to your life and work.

There are other peers, colleagues, PhDs, participants, conversations, friends and others I have missed, but please know that I am thankful for all I've experienced on the way.

Thank you all. Michael

Extended Abstract

From innovation-driven cultures (Neumeier, 2009; Kelly, 2010) to democratic, participatory approaches (Sanders and Stappers, 2008; Binder, De Michelis, Ehn, Jaccuci, Linde and Wagner, 2011), engagement with increasingly complex disciplinary situations means that design is becoming "a more integrated activity involving collaboration among many different professions" (Cross, 2011:91). For designers, this emerging notion of design has resulted in an expansive array of approaches, co-design tools, activities, data gathering techniques and visualisations. In addition, one could argue that there is now a requirement for designers to acquire communication and facilitation skills to demonstrate and share how such methods can shape new ways of working. The meaning of these *design things* (Binder et al., 2011) in practice can't be taken for granted as 'matters of fact' (Latour, 2005), which raises a key challenge for design. As Bruno Latour puts it: 'where are the visualisation tools that allow the contradictory and controversial nature of *matters of concern* to be represented?' (Latour, 2008:9)

This thesis investigation addresses Latour's call to design for organisational change within collaborative ways of working. Focusing on the role of design things in *organisational discourse*, an emerging rhetoric for design is critiqued that has driven the rise of design-led innovation in disciplines such as User-Centred Design, Design Management and Participatory Design. An exploration of the existing models and management literature for implementing change, alongside shifting representations of design knowledge, is explored to discern the ways in which organisational discourse, manifested in the power-broking devices that shape ways of working, could become an object of design. Reflective practice is explored as a mode of inquiry to position an approach to design-led innovation that is both object-oriented and reflexive, shifting the thesis towards a performative case for inquiry.

The author's approach has been to develop a visual method of mapping translated from actor-network theory (ANT). Foregrounding ANT's focus on observation and description, the approach was applied as a frame (Callon, 1986) for representing the performative agency of design things across three case studies of design-led innovation. In case study one, designers and entrepreneurs were brought together and funded by Design in Action to develop business ideas tackling type 2 diabetes, allowing the first iteration of actor-network mapping to represent the role of design things in its development. In case study two, a design intervention with an SME textiles manufacturer in Scotland aimed to develop a sustainable culture of innovation, allowing exploration of the impact of design things using actor-network mapping and situational analysis (Clarke, 2005), applied as interpretative overlays. In case study three, experience-focused design labs aimed to innovate digital, product and service solutions in the context of health, allowing for live iterations of actor-network mapping with design participants, and their emergent articulations of matters of concern. Across all three case studies, grounded theory analysis (Charmaz, 2006) was performed on the participant interviews and mapping discussions to reveal core categories tracing the performative agency of design things as matters of concern.

Actor-network mapping seeks to bring the matters of concern affecting the organisation of such work into focus as an object of design by facilitating reflexive, participatory dialogue between designers and the actors they collaborate with. The suggestion is that any notions of strategic value, of engendering meaningful change, of making things *better by design*, through design work, should be grounded in the reflexive interpretations of matters of concern that emerge. The contribution to knowledge, therefore, is a theory/methods package framing design as a performative act that reflexively explicates design in practice, as well as the wider discursive boundaries of design-led innovation.

Thesis Format

The original thesis submitted for examination used a non-traditional, A3 format due to the desire to present aspects of the actor-network maps as figures in the case study chapters. This allowed for greater legibility of all the elements and an easier format to lay out spreads of the text with the relevant tables, images and maps presented in this thesis. However, it was recommended following examination to change the format to the more traditional A4 format to allow for archiving within the British Library. As a result, some images, models and maps are presented within this thesis at a smaller scale than originally intended, including the appendices at the end of this thesis.

Appendices

There was long deliberation over what to provide as appendices, as any PhD would wish to represent all their work. The decision was for the appendices to focus only on providing the final actor-network maps as reference for interpreting the case studies, including images capturing their final presentation as an exhibition.

Appendix A presents the final series of nine maps from case study one.

Appendix B presents the final series of nine maps from case study two.

Appendix C presents digised visuals of the final physical maps co-created in case study three.

Appendix D presents the reflective accounts, alongside images of the exhibited actor-network maps and interpretative overlays, presented at the exhibition of maps from the portfolio submission at the viva examination.

Glossary of Terms

actants: the people or things that take on meaningful form or agency in the course of action.

agency: the capacity or power to influence courses of action within a paricular situation.

design things [also design artefacts]: the sketches, tools, visualisations, activities and methods, created through design work, which constitute the object of design in a design situation.

design-led innovation: the emerging practices of design and research that apply design approaches to complex, multi-disciplinary contexts to facilitate positive change by creating value (e.g. competitive advantage).

explicitation: the process of making complex social and material enrionmental factors more explicit to the consideration of human action.

matters of concern: a sociological concept from Bruno Latour that objects should be seen as controversial and contradictory *things* that are disputed in the present, as opposed to taking objects for granted as matters of fact.

object-oriented: exploring the constitutive qualities of objects and the complex relationships and networks that emerge between objects.

organisational discourse: the ways of speaking in an organisation through both the processes of talking, conversations and social interactions of workers, management and leaders, as well as the material representations, texts and devices that mediate and record social practices.

performativity: the capacity of performing work and language to engender actors in processes, structures, roles and artefacts that are perceived to stabilise a network of action.

reflective practice: the process of reflecting on action from multiple perspectives, through disciplinary practice and experience, which can generate theories in action to support continuous learning.

reflexivity: refers to the circular relationship between cause and effect in knowledge construction, and entails the researcher/practitioner being aware of the wider effects of the processes and outcomes in their work; where interpretation can bend back on itself, through discourse, to critically evaluate findings and their implications.

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INTRODUCTION

chapter 1

From innovation-driven cultures (Neumeier, 2009; Kelly, 2010) to democratic, participatory approaches (Sanders and Stappers, 2008; Binder, De Michelis, Ehn, Jaccuci, Linde and Wagner, 2011), engagement with increasingly complex disciplinary situations means that design is becoming "a more integrated activity involving collaboration among many different professions" (Cross, 2011:91). For designers, this emerging notion of design has resulted in an expansive array of approaches, co-design tools, activities, data gathering techniques and visualisations. In addition, one could argue that there is now a requirement for designers to acquire communication and facilitation skills in order to demonstrate and share how such methods can shape new ways of working. The meaning of these *design things* (Binder et al., 2011) in practice can't be taken for granted as 'matters of fact' (Latour, 2005a), which raises a key challenge for design. As Latour puts it: 'where are the visualization tools that allow the contradictory and controversial nature of *matters of concern* to be represented?' (Latour, 2008:9 [emphasis added])

This thesis is primarily concerned with the rising tide of design-led innovation, contributing to a growing trend in design research that seeks a clearer and more accessible discourse to consolidate such expansion (Carlgren, Elmquist and Rauth, 2013; Verganti, 2013; Yee, White and Lennon, 2015) both for designers and the complex situations design engages. As Thackara explains, 'complex systems are shaped by all the people who use them, and in this new era of collaborative innovation, designers are having to evolve from being the individual authors of objects, or buildings, to being the facilitators of change among large groups of people.' (Thackara, 2005:7). This expansion also means engaging with a wide range of expertise (McAra-McWilliam, 2014), from users as the experts of their experience, to managers as experts of organisation, to academics, practitioners and technicians as experts of their social and technical contexts. They are not just the informants and participants in the process of facilitating change, but they are the actors who will go on to perform and experience these future conditions of change. The sustainability and preferability of such change depends, in part, on the approaches deployed through design-led innovation to enact them. This thesis critiques how design discourse purports to affect innovation, while lacking the authoritative discourse to account for the situational controversies that can be encountered.

This methodological investigation explores how such a discourse can be formed through an *object-oriented* approach, developing a mapping technique based upon actor-network theory (ANT) through three case studies. Such an approach seeks to make the *matters of concern* affecting collaborators, participants, stakeholders and designers themselves in design-led innovation projects more explicit. Subsequently, this provides a reflexive and participatory space for the role and value of design-led innovation within complex cross-disciplinary situations around design things.

Having provided a broad overview to contextualise the gap this investigation contributes to, this introduction begins with a reflective summary addressing the transformation in the author during the thesis from his original pursuit of *design for preferable futures,* to one of understanding *design things* as *matters of concern*. The research question is then presented followed by the aims and objectives with a brief introduction of the case studies and how they are structured to meet these objectives. Key concepts are then introduced alongside the *Scope of Context Model*, to elucidate the association of the thesis with an *object-oriented discourse*. Finally, the present research is introduced through an overview of the methodological model and case studies, establishing how an object-oriented approach informed the final theory/methods package as the core contribution to knowledge.

Reflective Summary

Prior to this study, the author was Research Director of a small design thinking consultancy and experienced significant challenges to developing his practice in the contexts of business strategy and service design towards social innovation. Time and time again, after highly constructive conversations and proposals with potential clients and collaborators, the speculative and intangible nature of applying design-led innovation approaches resulted in polite gratitude, but no formalised commitments. An inability to provide measurable or tangible outcomes for potential projects meant that investment was seen as too risky. The author's strong commitment to qualitative, participatory, visual methods led to reflections on design's authority in such spaces: Do design-led innovation approaches lack the rigour to sustainably influence management, organisational culture and decision-making? Are design values around social innovation incompatible with business values around innovation? This led directly to the author embracing this PhD opportunity.

This methodological inquiry primarily started as a project to articulate the role of design within the context of designing for *preferable futures* (McAra-McWilliam, 2014). The notion of preferable futures is taken from the futurist framework, tasked by Ilkka Niiniluoto (2001), 'as defining alternative scenarios, which we might want to realize or avoid': i) construct alternative possible futures, ii) assess the probability of these alternative futures, and iii) evaluate the preferability of alternative futures (Niiniluoto, 2001:373). The author's design practice is predominantly positioned in the business of task iii). As Niiniluoto acknowledges through Herbert Simon (1981), design doesn't tell how things *are*, or *could be*, but how they *ought to be* (Niiniluoto, 2001:375). Such a context of design aimed to find methods of structuring the expansive application of creative approaches to produce a consistent design language around preferable futures. The author entered the thesis with a strong interest in Bruno Latour and Actor-network theory (ANT), so sought to investigate how such an approach could inform such a structuring of design language.

As the case studies came forward and the thesis progressed, the pretext of designing for preferable futures grew problematic as the notion of what was preferable was difficult to identify, let alone trace within each case study. Through ANT, a focus on *design things* and *organisational discourse* became prominent, leading the inquiry to pursue an *object-oriented discourse*. There were plenty of instances revealing contrasting and controversial stances within the design situation, which aligned with Latour's notion of *matters of concern* (Latour, 2005a). These emerging controversies began to move the inquiry away from simply providing a method in practice for designers to structure design language. The methodological contribution would be the visual representation of design things as an analytical model towards shaping an object-oriented discourse for design-led innovation. The use of grounded theory allowed a continuing scope of context around emerging notions of reflexivity and performative agency and relate these to the observations and analysis of design things, which in turn began to gather the sampling of the theory of design as a *performative act*.

This thesis represents the transformation of the author from a practitioner of design-led innovation, to a design researcher committed towards theorising design-led innovation. From being bound by notions of preferable futures, to being emboldened by the rich observations of design things. From questioning the authority of design, to seeing the ubiquity of design.

Research Questions

The following lead question directs the present research:

Q. How can actor-network mapping represent design things as matters of concern in organisational discourse?

This shall be supported through three case studies steered by three sub-questions addressing key objectives for this investigation:

1. How can an actor-network theory articulation of design things be translated as a visual representation (actor-network mapping)?
2. How can the actor-network mapping of design things reveal matters of concern as a potential for change?
3. How can the actor-network mapping of design things support reflexivity around matters of concern in organisational discourse?

Aims and Objectives

The three case studies presented in this thesis have been identified to sequentially iterate and develop each stage of the methodological approach taken in this investigation. Each is identified to represent a case of design-led innovation, while also providing contrasting situations in an effort to consolidate the methods of representation and analysis suitability across design contexts. The cases, and their reasons for selection, are introduced in greater detail within the methodology chapter, *Mapping the Role of Design Things*, but are briefly presented here to show how they address the key objectives above.

The first case study is an early-stage, design-led, business development project called Know Sugar funded through Design in Action's Wellbeing Chiasma (Kearney and McHattie, 2014) tackling type 2 diabetes. As an Arts and Humanities Research Council (AHRC) funded doctoral thesis within the knowledge exchange hub, Design in Action (DiA), this case study sits as a condition of funding within the hubs over-arching investigation of design as a strategy for economic growth (Follett and Marra, 2013). To achieve key initial objectives, it provided a suitable case to explore an ANT articulation of design things and develop the first iteration of *actor-network mapping*.

The second case study is a research-led design intervention with Moorbrook Ltd., an small and medium-sized enterprise (SME) textiles manufacturer in Peebles, Scotland, led by the Creating Cultures of Innovation (CCoI) project of the Institute of Design Innovation (InDI); initiated by Prof. Irene McAra-McWilliam, led by Joe Lockwood and evaluated by Madeline Smith (Lockwood, Smith and McAra-McWilliam, 2011). The proximity, contextual and longitudinal nature of this case (nine design innovation workshops delivered over nine months) were seen to align with the key objectives of refining the mapping technique further, and developing a method of interpreting these maps with design participants.

The third case study is a series of four research-led Experience Labs delivered by the Digital Health Institute (DHI), which supports the development of digital design solutions in the context of health and wellbeing. The intensive nature of each lab over one or two-day formats was seen as a suitable way to iterate a live prototype of the mapping technique in context. Working with the same group of designers allowed familiarity with complex terms and processes, while the context of health and wellbeing aided clearer interpretations of matters of concern.

Structuring the investigation around these three case studies, the overall aim of this investigation is to explore ANT as an object-oriented approach to representing the role of design things in complex, multi-disciplinary situations and, in so doing, develop a methodology towards supporting reflexive discourse between designers and collaborators. Grounded theory, as the mode of analysis in this inquiry, provides the internal validity on the data collected, that each case represents the phenomenon and context of inquiry, and to provide external validity by grounding the sampling of theory in existing literature. The contribution to knowledge is a theory/methods package framing design as a performative act, explicating design things as matters of concern in contexts of design-led innovation, as well as identifying wider discursive boundaries towards future theory generation.

Concepts Towards an Object-Oriented Discourse

Fig. 1A, *Scope of Context Model*, (Johnson, 2016)

This investigation speaks to distinctive practices and research that have taken design into new spaces and new ways of working in response to complex, collaborative situations, which this thesis broadly labels *design-led innovation*: Design Management, User-Centred Design and Participatory Design. However, the key areas of focus for scoping the context of this investigation emerged through an evolving model that sought to trace the overlaps in the current literature in design theory, management theory, sociology, and beyond. The model presented here (see fig. 1A) is a simplified overview that identifies three broad contextual areas of interest: *design things*, informing the phenomenon of inquiry; *organisational discourse*, informing the context of inquiry; and *reflective practice*, as informing the mode of inquiry. Three overlapping themes – *design rhetoric*, *design knowledge*, and *preferable futures* – constitute the contextual areas of relevance as theoretical connections emerged. At the centre, *object-oriented discourse*, constitutes the key areas of literature with which this thesis positions itself and where there is perceived to be a gap in design research and practice. A more in-depth model, mapping key literary references, is presented at the start of the scope of context chapter, *Design in the Discourse of Change*.

The notion of an object-oriented discourse is derived from Science and Technology Studies (STS) research exploring object-oriented ontologies (OOO) (Morton, 2011), which seeks to understand the complex connections and networks that emerge between objects, or as Latour termed them, non-human *actants* (Latour, 2005b). Actor-network theory (ANT) emerged from STS as an approach to observing and describing the associations between human and non-human actants that produce the *effects* of agency we observe around us (Latour, 2005b). All effects of agency are phenomena often assumed as facts – such as a newspaper, an industrial sector, or perhaps the discipline of Design Management – and all can be thought of as actor-networks arising from the work of people and things that become visible or perceptual when performed.

The focus of attention in ANT then is on the 'work of people and things which perform' the reality of organisation 'into being' (Mewburn, 2010:365). As emphasised by Latour (2005a), it's the work, and the movement, and the flow, and the changes that should be stressed. Herein lies the association of this thesis with *performativity*. Butler (1990) associates the performative with a normalising power. The repetitive nature of work and language engenders actors in processes, structures, roles and artefacts that are perceived to stabilise the network. Performativity, therefore, represents a particular articulation of the phenomena producing the effects of agency; 'pointing to the very world-making – that is performative – effects of hybrid, heterogeneous, multi-agent practices such as designing,' (Holert, 2011:28) that this thesis proposes to make more explicit within organisational discourse.

Design things draws on the position of Binder et al. (2011) that 'what designers deliver is not an object, but just its embodiment – what they deliver is a *thing*' (Binder et al., 2011:77). The *design Thing* is explored through various representations to engage with the design problem, what they refer to as 'constituents of the object of design' (Binder et al., 2011:59). These constituents 'are not the object the [designers] are designing, but each of them allows them [...] to interact with the object and to discuss its different features' (Binder et al., 2011:59). In this scenario, the various sketches, drawings, maps, diagrams, blueprints, storyboards, models and prototypes, are *constitutive* of the 'object of design'. Binder et al. refer to these constituents as *design artefacts*, but for the purposes of clear communication and in recognition of the more intangible nature of design-led innovation, these methods of representation have been labelled *design things* within a *design situation* for this investigation.

Latour argues that through our will to modernise technologically, scientifically and economically, 'we rendered more and more *explicit* the fragility of the life support systems that make our 'spheres of existence' possible' (Latour, 2007); what Sloterdijk (2004) called, *explicitation*. In other words, what earlier was taken for granted has now become explicit *matters of concern*. It is from this concept of explicitation that design is positioned to be able to pursue a *reflexive* discourse. To paraphrase Bucholtz's (2004) assessment of reflexivity in discourse analysis, the reflexive examination of design calls for us to consider not only the multiple meanings of design things in organisations but also the ways that discourse circulates within design practice and design research. As such, actor-network theory is identified and explored as a visual method of mapping that can bring the contradictory and controversial nature of matters of concern affecting the organisation of design-led innovation into focus as part of the object of design. The suggestion is that any notions of strategic value, of engendering meaningful change, of making things *better by design*, through *design things*, should be grounded in the reflexive interpretations of matters of concern that emerge.

Methodological Model

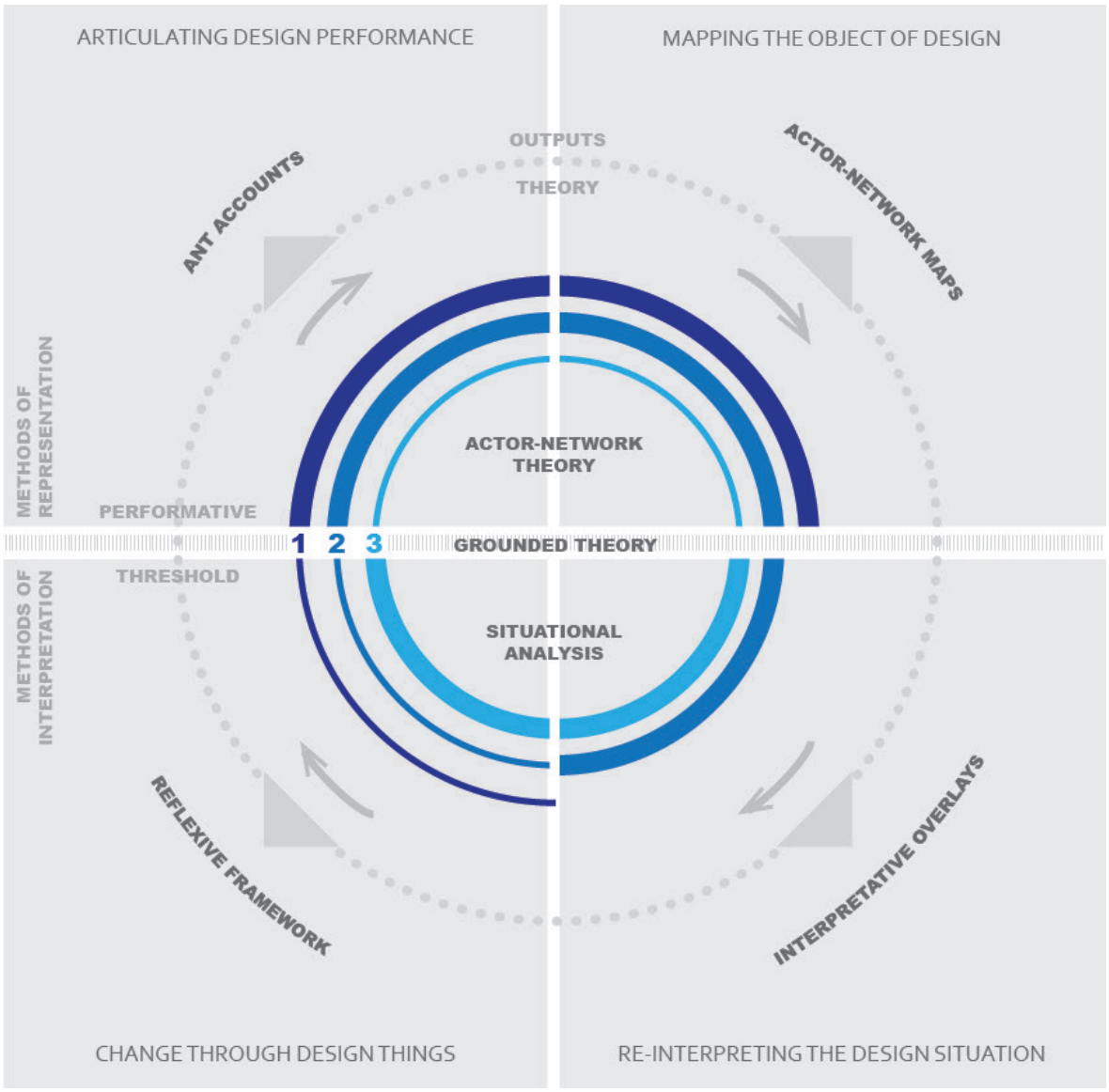

Fig. 1B, *Methodological Model*, (Johnson, 2016)

The methodological model for this research developed as a clearer understanding of an object-oriented approach developed during the investigation. The model presented here (see fig. 1B) is simpified without constitutive methods to focus on the overall structure that emerged. The methodology chapter, *Mapping the Role of Design Things*, articulates the evolution of this model, which takes a cyclical form through four sections: *Articulating Design Performance, Mapping the Object of Design, Re-interpreting the Design Situation* and *Change through Design Things*. The chapter follows these four sections in order to set out the arguments for the methodological approach developed: the methods used in each of the three case-studies, how they contributed to each section of the model, and how these answer each sub-question framing the over-arching question of this investigation. At this point, the overall form of the model is explained and used to summarise the methodological position that has been taken.

The model follows the essential separation understood in design practice between action (representation) and reflection (interpretation), as proposed by Schön (1983) in *The Reflective Practitioner*. The *performative threshold* provides a kind of waterline, above which methods of representation are situated, associated in this thesis with actor-network theory, and below which methods of interpretation come into play, associated with situational analysis. The threshold itself is associated with grounded theory as it runs as a mode of analysis across the investigation, drawing on data generated through both ANT and situational analysis from all three case studies.

The performative threshold marks the philosophical distinction between object-oriented ontologies and phenomenology, as pursued in grounded theory, which are largely seen as contradictory methodologically. Here they are necessarily placed in parallel for the purposes of this methodological thesis. This is expanded upon in the sections relative to each method but, in short, ANT is positioned as a method to best represent the work performed by design things within each case study, but it is argued to not go far enough to reveal some of the more subjective experiences and attitudes within the design situation. Situational analysis is used as a line of inquiry and, ultimately, as a visual method in practice, to draw out reflective accounts about the *perceived* effects of design things, to explicate them as matters of concern for design to take into account. Aspects of grounded theory methods emerged as the overarching mode of analysis to categorise and theorise how these methods framed and articulated design work as performative acts, and how this supported reflexivity in later cases.

The model's circular structure is also informed by the iterative cycle of Schön's reflection in action, reminiscent of the hermeneutic cycle, where the process of moving through each stage of the methodology can return to the same point of origin, able to repeat the cycle anew. Where this circular model differs from that of reflection in action is that it is also used here as a membrane between internal methods engaging empirical data and external methods as forms of practice. This internal/external arrangement illustrates the relation between the methods developed in practice through the three case studies, with the insights generated to inform theory at each stage. This is emphasised by the model incorporating the case studies alongside the key methods of inquiry they progressed.

It should be stated at this point that early on in the investigation an Action Research approach was considered for the development of the actor-network mapping technique. However, as the investigation progressed away from notions of preferable futures, the differing contexts between each case study, along with circumstantial delays affecting the iterative development of the mapping technique, negated the the value of using an Action Research approach. The author's role in each of the case studies is not trying to solve an immediate social situation, nor committed to longitudinal testing of particular methods, as is implied within Action Research (Brydon-Miller, Greenwood, and Maguire, 2003). The investigation, instead, focuses on developing a theory/methods package around the emergent matters of concern of design things; one that both describes a process towards making explicit the potential for changing ways of working,through design-led innovation, as well as theorising the performance and distribution of knowledge in that process.

Presentation of Research

The presentation of research for this thesis takes three forms. Firstly, the case studies are presented as individual chapters within this thesis according to their constituent outputs, as represented in the methodological model (i.e. actor-network theory accounts, actor-network mapping and interpretive overlays). Each case is supported with selected visuals to illustrate the design work under investigation and key findings from the data collected and the development of the methods themselves.

Secondly, the penultimate chapter presents the grounded theory analysis conducted sequentially from case study one to case study three. It should be emphasised that this is not a pure grounded theory investigation, but that each case underwent different, cumulative stages of grounded theory methods as a mode of analysis. The open coding, axial coding and subsumption of categories advances from the first case study to the last, but uses constant comparison with data from the previous cases to help both consolidate categories and determine anomalies circumstantial to each case.

Thirdly, the portfolio of practice for this investigation presented the methodological outputs produced across all three case studies in an exhibition format during the final viva examination (see appendices A, B, C, and D). The exhibition presented the actor-network maps chronologically through each case study alongside the interpretative overlays, developed from situational analysis applied in case studies two and three, with a black line placed horizontally along the wall to distinguish the performative threshold between 'methods of representation' from 'methods of interpretation'. The methodological model and reflexive framework developed from the grounded theory analysis were provided as a hand-out to relate them to the materials, while the written case studies within the thesis would act as a guiding reference to ground the maps.

In the concluding chapter, a review of the thesis assesses the delivery of the research according to the research questions, aims and objectives, as well as the overall contribution to knowledge with regard to the proposed theory/methods package, the reflexive framework developed and the treatment of Latour's concept of matters of concern. Reflections on the limitations of research and progression of the methods applied to each case study are presented in relation to the overall methodological model in order to ground the particular examples of situated practice and the challenges they incurred. Before possibilities for further research opened up by this investigation are then described, outlining how all the propositions within this introduction have been performed and providing a final argument for the nature of contribution made to the fields of design research and practice in design-led innovation.

SCOPE OF CONTEXT
DESIGN IN THE DISCOURSE OF CHANGE

chapter 2

The scope of context for this investigation has taken a continuous, iterative approach, gathering literature around three primary areas of interest: *design things*, *organisational discourse* and *reflective practice*. The four sections set out in this chapter outline the themes that emerged through this evolving model, tracing the overlaps towards evidencing the gaps in knowledge that would shape a response to Latour's call for design to better represent matters of concern, particularly within design-led innovation. A more detailed mapping of the scope of context is presented (see fig. 2A) by overlaying key literary references into the themes they have supported. This is not an exhaustive mapping, but intends to reveal the journey from primary areas of interest to the conception of an *object-oriented discourse*.

The first section, *A Rhetorical Positioning of Design Things*, details the influences in core design literature and the approaches towards shaping new ways of working through emerging forms of *design rhetoric*. The research problem of design-led innovation is examined through a critique of contemporary Design Thinking, which positions designers as creative leaders within managerial practice in contrast to constructivist disciplines of design-led innovation. This sets out the research problem of design's disciplinary challenge to meet the promise of design-led innovation, presenting this as the area in need of exploration for which Latour's conception of *matters of concern* is argued to offer scope to do so.

The second section, *Discourse in the Management of Change*, gathers theory and models regarding organisational change and change management, identifying the wider context of practice that design-led innovation has sought to engage. This leads to *organisational discourse*, and Foucauldian notions of power, being identified as the most suitable line of inquiry for tracing the influence of management models, and other discursive devices, on strategic decision-making. This is contrasted throughout with how such devices could constitute the object of design in contexts of design-led innovation.

The third section, *Articulating Design Knowledge around the Object*, explores the debate on what forms design knowledge is argued to take and how this has been expressed in terms of the designer as *maker*, as *thinker* and in terms of *interpreting* the object of design. This section assesses the impact of design discourses on research approaches around the object to emphasise the contemporary challenges and proposals for the articulation of *design knowledge*. This connects notions of reflective practice with design experience and narrative as beginning to shape the methodological approach taken.

The fourth and final section, *Object-Oriented Discourse as a Performative Case for Inquiry*, reiterates the arguments and position laid out through the previous sections in order to explicate the overlaps that have emerged. Actor-network theory is identified and presented as an object-oriented approach that can bring the contradictory and controversial nature of matters of concern affecting the organisation of design-led innovation into focus as an object of design. This, in turn, identifies the emergent theoretical concepts of reflexivity and performativity that this thesis seeks to bring together methodologically into design discourse as its core contribution.

The themes explored in this chapter necessarily move outside recognised design contexts as this scoping sought to contrast design theory and design approaches with the established disciplinary discourses they encounter. As a result, this scope of context should be read as a gathering of cross-disciplinary concepts aiming to establish a more consistent theoretical grounding of design-led innovation that this thesis explores methodologically.

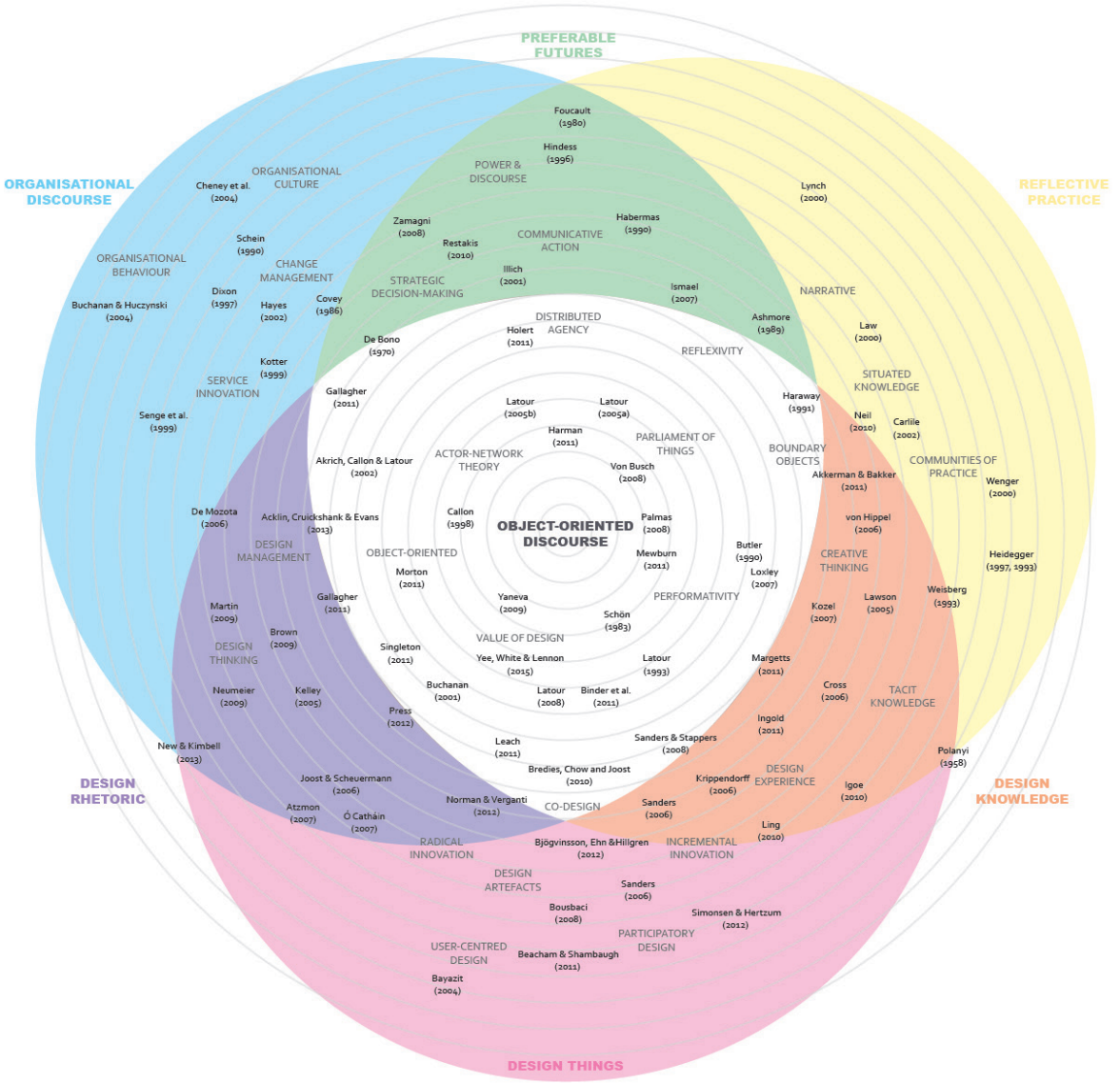

Fig. 2A, *Scope of Context Model, Literature Mapping* (Johnson, 2016)

The structure of this model is designed to communicate the relationship between the key themes and how they coalesce towards the core argument for an object-oriented discourse. An overlay of the key references explored in the scope of context are notionally positioned according to how they relate to this core argument. The use of a venn diagram format aims to show, within the themes, the areas where literature shared common ground, and the areas in which literature sat indepedent within a theme, but still contributed to the scope of context.

The Rhetorical Positioning of Design Things

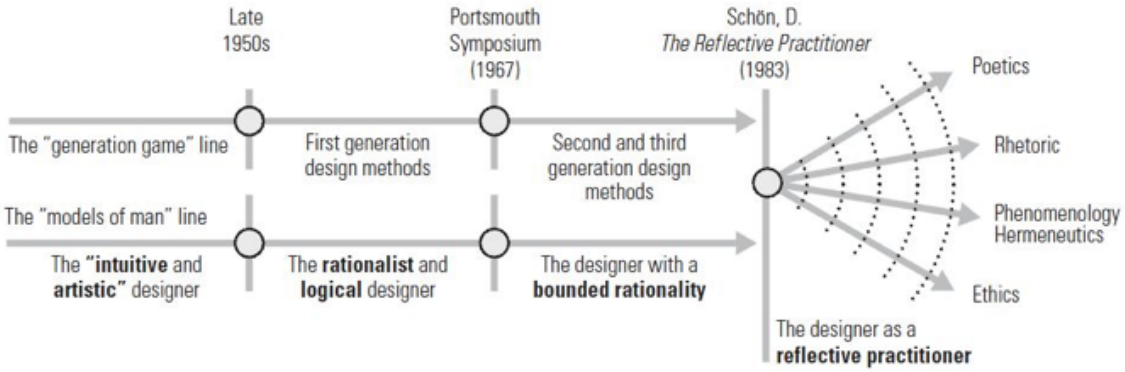

Fig. 2B, *Some landmarks in the evolution of design thinking*, (Bousbaci, 2008:38)

An Emerging Rhetoric for Design

Design is being performed on an ever-increasing spectrum of complex practices arising in response to developing markets and technologies, co-design, digital interaction, service design and cultures of innovation. Design itself is under constant disruption. This expansion is no longer restricted to objects but encompasses how designers participate in the distribution of production (Atkinson, 2006), mediate social change (Papanek, 1983; Saul, 2011) and innovate organisational processes (Brown, 2009; Martin, 2008; Neumeier, 2008). As a result there is demand on the management and articulation of design's application across disciplinary boundaries, which has led to many layers of abstraction in the communication and practice of design. As design has become increasingly multi-disciplinary the scrutiny of design from management theory has dominated the subject of delivering innovative change.

An initial parallel to draw between the development of management theory and design theory is the shift in thinking influencing both disciplines during the rise of postmodernism in the 1970s and 1980s. As Buchanan and Huczynski (2004) summarise in their retrospective on organisational behaviour, there was a shift for the organisation from the modernist, technically rational, deterministic and hierarchical to the post-modernist, flexible, fragmentary and response- or action-oriented. Postmodernism removed any sense of certainty and order 'by removing fixed reference points'. Postmodernism demonstrated that what we thought was 'solid' or 'fixed' or 'real' is a socially constructed product; 'we are instead invited to see transience, fragmentation, ephemera' (Buchanan and Huczynski, 2004:55-60).

Beacham and Shambaugh (2011) identify four levels of concern emerging from design theory during a similar period: design and society, organisations, education and the designer. Along with Rabah Bousbaci (2008), they trace how design thinking and design methods saw a shift across generations from the rationalist and logical designer (Broadbent and Ward, 1969; Simon, 1996), to the designer focused on participatory processes (Cross, 1972), as well as the designer's thinking process (Rowe, 1987), to the designer as reflective practitioner (Cross, 1981; Schön, 1983). Bousbaci focuses on the second and third generations of designers, whom he designates with Herbert Simon's concept of 'bounded rationality', where they maintain design as a problem solving process but began to recognise the complexity of representing a problem. Bousbaci

highlights some of the key concepts that emerged and their contribution to design methods bridging the transition between rational positivism and post-modernism: 'concepts such as "wicked problems" by Rittel and Webber; "solution-focused strategy" design by Lawson; design "conjectures" by Hillier, Musgrove and O'Sullivan; design "primary generator" by Darke; and, finally, even though they were not considered as members of the entire movement of design methods, Simon's concept of "ill-structured problems", Newell and Simon's concepts of "problem space" and "generative processes"' (Bousbaci, 2008:41).

Such concepts led to deeper examinations of design knowledge around representing the problem culminating in what Bousbaci refers to as the 'reflective turn' (*see fig. 2B*). This is described as influential as it opened out a space for design research to explore and trace an epistemology of design practice 'unbounded' by the scientific dominance of technical rationality that prevailed in positivism. Bousbaci summarises this trans-positioning of design thinking, identifying 'what really bounds rationality in human action is nothing more than all the other parts which comprise the human existence as a whole: poetics, rhetoric, hermeneutics and ethics' (Bousbaci, 2008:50).

Donald Schön's *The Reflective Practitioner* (1983) emphasised how a greater acknowledgement of complex problems could be realised in practice, for both management and design. He argued that professional work in design and management is characterized by uncertainty, complexity, instability, uniqueness and value conflicts. Good practice is a kind of 'artistry', a kind of 'tacit knowing', a capacity for 'intuitive and spontaneous performance', which develops over a period spent doing professional work when presented with complex problems (Schön, 1983: 21). The theory of reflective practice also acknowledges the role materiality plays in the development of professional artistry. Tacit knowing is not just in the head; it is built into the knowing manipulation of the tools of practice. Representations, such as drawings and models, are ways for the design scenario to 'talk back' and help the designer decide on the next steps to take. Schön calls this process of interaction with the tools of practice 'reflection-in-action' (Schön, 1983).

In his influential book *Designerly Ways of Knowing* (2006), Nigel Cross expands on his articles through the 1980s and recognises that design abilities exist in everyone and that design should be part of general education. These 'core features of design ability include: an ability to resolve ill-defined problems; adopt solution-focusing strategies; employ abductive, productive, appositional thinking; and ability to use non-verbal, graphic and spatial modelling media' (Cross, 2006:63). Lawson (2005) builds on Cross's arguments that design is a form of thinking, and thinking is a skill that can be acquired (Lawson 2005:303). The notion that 'everyone can be a designer' has both driven participatory design processes and, it shall be argued, undermined the authority of the design practitioner.

Richard Buchanan (2001) articulated design's ever-expanding integrative role through parallels of design practice and Aristotlean *rhetoric theory*, arguing that 'the idea or thought that organizes a system or environment is the focus of design attention'. This idea 'is not a given fact, it is a thesis', formed in the collaborative processes with stakeholders or participants in the outcome. Indeed, one may argue that they are participating in 'the creation of a new form of dialectic, shaped by rhetorical means but directed toward general questions of value and principle.' (Buchanan, 2001:202). Buchanan sought to position design methods, discourse and processes to include this more discursive perspective, outside of the traditional design context, and take a lead on a more rhetorical evaluation of complex problems.

Rhetoric has been constructively viewed as a comprehensive tool for evaluating design processes (Ó Catháin, 2007), design artefacts (Atzmon, 2007) and design communication (Joost & Scheuermann, 2006). While these remain peripheral approaches, design disciplines have been influenced by this line of thinking, and few demonstrate the utility of rhetoric as contemporary design thinking has.

The Selling Rhetoric of Design Thinking

Design thinking professes to take shape as an attitude, as a methodology and as a philosophy that can bring customers and clients into the design process (Beacham and Shambaugh, 2011). The success of design thinking is interpreted by Press (2012) as 'a strategy for [design consultancies] to be taken more seriously by the business community and by government.' There is a conscious attempt in the literature to 'distance itself from the analytical and quantitative, to the intuitive and qualitative,' while still being 'framed in business-speak' (Press, 2012). The designer is more an expert in a process rather than in a specific problem (New and Kimbell, 2013). Its increasing adoption within Design Management suggests the message is getting through, helping to diversify and strengthen the markets of the design industry. The concern is the nature of its study and practice, which Lawson acknowledges is still in its earliest stages (2005).

Tim Brown's (2009), *Change by Design*, positions design thinking as a vehicle for change, writing that it 'uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity' (Brown, 2009:18). This aims to position designers as empathic leaders, delivering *creativity* within strategic decision-making and to 'bring design into the boardroom' (Brown, 2009:37), allowing greater influence to use design methods to implement change. Roger Martin (2009) presents design thinking as a term used to define a way of thinking that produces transformative innovation. Martin attributes its popularity in making it easier for those outside the design industry to focus the idea of design as a way of thinking about solving problems; a way of creating strategy by experiencing it rather than keeping it an intellectual exercise, and a way of creating and capturing value (Martin, 2009). According to Martin, 'the design thinking organisation applies the designer's most crucial tool to the problems of business. That tool is abductive reasoning' (Martin, 2009). This is not specifically expressed in terms of looking to designers to meet these problems, but their methods and processes proliferated throughout an organisation, expressed as building a *culture of innovation* (Brown, 2009; Neumeier, 2009; Martin, 2009; Kelley, 2005 and others). A problem arises therefore in that the designer no longer embodies value, but the tools and process an organisation is told it can acquire, as though the designer and the methods were distinct from each other.

Norman and Verganti (2012) represent the *incremental* innovation of the social sciences-influenced research work of human-centred design (Bayazit, 2004) through an analogy of hill-climbing, in order to contrast it with genuinely radical innovations:

> 'Incremental innovation attempts to reach the highest point on the current hill. Radical innovation seeks the highest hill. The implication for design is clear: because human-centered design is a form of hill climbing, it is only suited for incremental innovation. [...] Every radical innovation he investigated was done without design research, without careful analysis of a person's or even a society's needs.' (Norman and Verganti, 2012:3)

From this analogy, Verganti emphasises design research having more potential to influence

radical innovation by focusing research methodologies towards *meaning*-driven rather than technology- driven innovation, as he claims currently happens through human-centred design (Norman and Verganti, 2012:16). This propagates the notion that to influence *radical* change is what will make other disciplines and organisations strategically engage with design more readily, and points towards a dynamic role for designers dismissive of incrementally gaining knowledge. Although this thesis agrees in identifying meaning-change to inform design-led innovation, there is a lack of depth on such a re-positioning as the indicators for what is incremental or what is radical seem largely notional and speculative.

The purposeful adoption of these *rhetorical* devices – that it is *human-centred*, uses *abductive thinking*, delivers *creativity*, and can lead to *radical innovation* – position the design process as complex problem solving seemingly without disciplinary limitation and marks one of its inherent tensions. There has been resistance by many traditional design disciplines in accepting such a 'packaged', 'process-focused' doctrine and 'repeatable' formula to represent design creativity for organisations (Ling, 2010). Creativity through design thinking is almost placed on a pedestal as a matter of fact, something the process inherently does, rather than understand the situational and unpredictable ways of working developed in and through the innovation of design practice.

User-centred methods were used to validate rather than predict, with multiple methods proving ripe for failure. Even Bruce Nussbaum, an original proponent of design thinking, has moved to claim it has failed: 'in order to appeal to the business culture of process, [design] was denuded of the mess, the conflict, failure, emotions, and looping circularity that is part and parcel of the creative process' (Nussbaum, 2011). And so today design thinking is criticised to come too close to 'business thinking', streamlined into a rhetorical process that only a dedicated few can do well, while others that have not been classically trained in design practice will likely not realise that 'great innovative solutions don't come at the end of the process; they come from any part of the process' (Ling, 2010). This scope of context therefore moves to ask: what is it that design work does that would allow innovation to take hold?

A Constructive Rhetoric of Design

Sanders (2006) highlights the mutual influences of the American-led Human-Centred Design, from which design thinking emerged, and the European-led Participatory Design, which have shaped contemporary notions of design-led innovation. The debate in the changing role of designers and their methods in a co-design process (Brandt, Binder and Sanders, 2012; Atkinson, 2006) pivots around design as a leader of innovation (Verganti, 2011) or design as the democratisation of innovation (von Hippel, 2006). With Participatory Design in particular, this has been influenced by methods of integrating new technologies and systems development within organisations, showing greater emphasis on designers and the tools and techniques they use.

Participatory Design as a discipline developed across Northern Europe in the 1970s, largely in distinct parallel from User-Centred Design and Design Management. It took a different approach to the user, engaging the situated expertise of workers in the development of systems in the workplace (Sanders and Stappers, 2008). Simonsen and Hertzum (2012) tell how 'Participatory Design started from the simple standpoint that those affected by a design should have a say in the design process,' and that such a process was strategically guided by 'the consideration of conditions that enable proper and legitimate user participation' as well as 'making the participants tacit knowledge come into play in the design process' (Simonsen and Hertzum,

2012:103). So the process of constructing the problem with participants is as important as the production of an artefact (Bredies, Chow and Joost, 2010:164). Such 'democratisation' of the design process has only recently been folded into the wider discourse of co-design as its principles sat in contrast to the 'existing power structures' of most organisations, 'the expert mind-set', and seems antithetical to the consumerism that has shaped organisational culture (Sanders and Stappers, 2008).

Björgvinsson, Ehn and Hillgren (2012) refer to this process of creating democratic conditions for Participatory Design as the 'staging' and 'infrastructuring' of *design Things* (2012:103). They recognise parallels in the appealing rhetoric of design thinking with many of the concepts explored in Participatory Design, but distinguish their approach to innovation through engagement with the socio-material, as opposed to fluid notions of design intuition. In *Design Things*, Binder, De Michelis, Ehn, Jaccuci, Linde and Wagner (2011) elaborate on this process, positing that the 'design Thing' is explored through various representations to engage with the design problem, 'constituents of the object of design', or *design artefacts* (Binder et al. 2011, 59). Drawing on Buchanan, they hold that for design artefacts to have value and significance, they have to become part of the living experience of human beings in the way these afford, invite, and oblige interactions. the process of constructing the problem with participants is as important as the production of an artefact (Bredies, Chow and Joost, 2010:164). Such 'democratisation' of the design process has only recently been folded into the wider discourse of co-design as its principles sat in contrast to the 'existing power structures' of most organisations, 'the expert mind-set', and seems antithetical to the consumerism that has shaped organisational culture (Sanders and Stappers, 2008).

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Bredies, Chow and Joost (2010) compare Participatory Design alongside Human-Centred Design, Critical Design and Non-Intentional Design as *constructivist* design approaches (*see fig. 2C*); investigating assumptions in the construction of meaning. In order to do so, they distinguish them in practice according to two movements: 'anticipating use during design', which situates

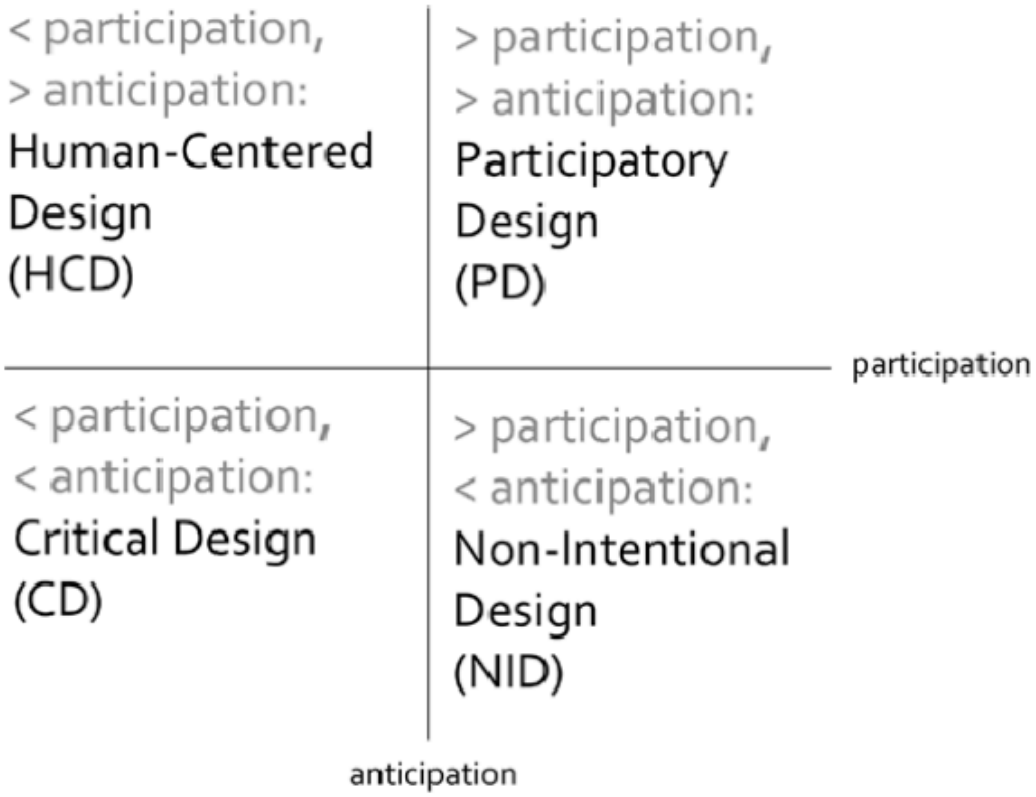


Fig. 2C, *Matrix with constructivist design approaches*, (Bredies, Chow and Joost, 2010:163)

the new artefact into its prospective environment, against the 'participation of users' during design, to ensure a good transition of habits and meanings. In doing so, they highlight the differing approaches for involving interpretations of use within each design process. In mediating the creative process 'designers often impose their methods for expression' on the participants (Bredies, Chow and Joost, 2010: 168). It is seen as a continuing issue how designers interpret other people's professional practice when representing them through design artefacts. Through such approaches to design work, the notion that 'everybody is a designer' can only go so far as participants are constrained by their very discipline.

Sanders and Stappers (2008) summarise the mixing of roles in co-design providing an indication of the blurring disciplinary boundaries in the design process:

> '... the person who will eventually be served through the design process is given the position of 'expert of his/her experience', and plays a large role in knowledge development, idea generation and concept development. In generating insights, the researcher supports the 'expert of his/her experience' by providing tools for ideation and expression. The designer and the researcher collaborate on the tools for ideation because design skills are very important in the development of the tools. (Sanders and Stappers, 2008:6).

Sanders and Stappers recognise the designer as able to occupy tvhe researcher role in a co-design process, but also identify the rising challenge for design's relevance as a profession by emphasising the wider skills future designers will need to adopt, such as conducting creative processes relevant at larger levels of complexity; using generative design thinking to address change in the future; maintaining expert knowledge on emerging technologies, production processes and business contexts; while maintaining recognised specialisations in product, interaction and communication design (Sanders and Stappers, 2008:15). There is a sense of a gamble for designers in the increasingly complex combinations of skills they will be expected

to employ that are less and less rooted in design alone. This is a potential detour designers risk continuing to follow without some way of making design's contribution more explicit across the disciplinary boundaries they encounter.

It is for this reason this thesis has positioned itself as a response to Latour's call for design to develop ways of representing 'the controversial and contradictory nature of matters of concern' (Latour, 2008:9). In his paper for the Design History Society's, *Networks of Design* conference, Latour acknowledged the expansion of design as a term in 'comprehension' – 'it has eaten up more and more of what a thing is' – and 'extension' – 'design is applicable to ever larger assemblages of production.' (Latour, 2008:2). In his view, the more objects are turned into things, that is – the more matters of facts are turned into matters of concern – the more they are turned into objects of design through and through. He identifies five connotations of design that place it at the heart of a 'sea change in our collective definition of action' (Latour, 2008:3), which this thesis tentatively attributes with design-led innovation:

First, humility, the acknowledgement that most things need redesigned due to various ecological, technical and social issues. Second, attention to detail, the nature of craft and skill that implies things to be designed carefully; easy to apply to tangible artefacts, more challenging to assume in organisational contexts. Third, meaning, wherever you think of something being designed there are tools, skills and a craft of interpretation to the analysis of that thing. True for things traditional to design, but much more dispersed among disciplines outside traditional design. Fourth, it is remedial, it is never a process beginning from scratch but establishes a brief with which to improve a situation. This acknowledges that there is a pre-existing situation which design enters into, though doesn't acknowledge the blend of interests entering into it. Fifth, morality, you are forced to ask whether something has been well or badly designed, generating arguably the most basic form of design discourse; a connotation that perhaps increases with design-led innovation's expanding multi-disciplinarity. These five connotations of design point in some way to how design can better reflect on its practice, without taking itself for granted in a given context.

Latour nominates Peter Sloterdijk as the designer's philosopher and his concept of 'explicitation' as what may 'bring together the two alternative great narratives of modernity – the one of emancipation (the official story) and the one of attachment (the hidden one)' (Latour, 2008:6). *Emancipation* parallels the notions of radical innovation, those rhetorical leaps of faith that have driven design thinking; while *attachment* parallels the notions of incremental innovation, grounded in the experiences and environments of the design thing. For Latour, explicitation is a consequence of 'envelopes':

> 'To try to philosophise about what it is to be "thrown into the world" without defining more precisely, more literally [...] the sort of envelopes humans are thrown into, would be like trying to kick a cosmonaut into outer space without a space suit. Naked humans are as rare as naked cosmonauts. To define humans is to define the envelopes...' (Latour, 2008:6)

When Sloterdijk adds materiality to a site, he renders 'another fragile envelope into which we are even more entangled, explicit.' (Latour, 2008:7) For this purpose, Latour positions design as a 'precautionary Prometheus', and asks how design can find a more considered approach to be 'carefully radical, or radically careful' (Latour, 2008:5). In the context of this thesis, design-led innovation becoming more explicit in how it enables change to ways of working, the scoping moves to the examination of what currently defines these envelopes.

Discourse in the Management of Change

Existing Models for Change

There is extensive management literature on shaping the ways of working in organisations, so this section touches on some of the existing models that influence how change can be implemented within organisations. This is done to reveal how discourse emerges as a crucial context to organisational change and its implications for design-led innovation. For design to succeed as a strategic approach, it must coordinate with management. It is managers who absorb, translate and disseminate much of the ideas, artefacts and practices of design in a strategic capacity. If they do not perform or influence managerial practice, then they cannot seek to gain significant strategic influence for an organisation. As Schön (1983) analogises, 'a manager's profession is wholly concerned with an organisation, which is both the stage for his activity and the object of his inquiry.' Management is directly concerned with the performance of work, the recognition of technique and experience, motivation towards mission and identity, the actioning of strategic decisions; collectively, 'the phenomena of organisational life' (Schön 1983, 242). Opening out such a practice to design interpretation, process, artefacts and methods demands an efficient articulation of their value and relevance.

Design Management positions itself to proclaim the benefits of design as a strategic resource in the increasingly complex demand for innovation capacity in organisations. Design Management 'facilitates the absorption of new design resources and leverages design knowledge to achieve competitive advantage.' (Acklin, Cruickshank & Evans, 2013:6). Models emerge to help articulate the ways in which design can add value to organisations, such as De Mozota's *four powers of design,* which channels design towards providing competitive advantage (De Mozota, 2006:45); or Acklin's Design Management Absorption Model (DMAM), which aims to address the limited adoption of design within small and medium-sized enterprises (SMEs) (Acklin, 2013). Design continues to undergo a perpetual struggle to define itself (Press and Cooper, 2003), and it is important to recognise that innovation means different things to different organisations. While the design industry goes to great lengths to demonstrate the value design can provide for innovation in businesses (see, in the UK for example, Cox, (2005); Design Council And DBA (2005); Design Council (2008a; 2008b; 2010), the emphasis is still on design distinguishing its approaches, knowledge and values from those of management.

Any organisation can be described in terms of its import-transformation-export process; a constant series of exchanges with suppliers, customers, regulatory agencies and other stakeholders mediated by various tools, systems, interactions, processes and relations (Buchanan and Huczynski, 2004:35). A lot of the internal complexities within an organisation are influenced by the external complexities that affect its survival. An organisation which is 'out of fit' with its environment (still providing an outdated service) has to change, or go out of business. As the complexity and pace of environmental change seem to have increased, organisations able to adapt quickly to new pressures and opportunities are likely to be more effective than those slower to respond. Buchanan and Huczynski (2004) reveal a whole series of recommendations for organisations to successfully adapt to the contemporary environment: decentralization replacing top-down decision making; empowerment replacing micromanagement; teamwork as more effective than individual performance. The role of management is positioned 'to support and facilitate, not to direct and control'. Customers and clients are recognised as the main drivers behind decisions and not senior management (Buchanan and Huczynski, 2004:41).

John Hayes (2002) provides an extensive overview of the various established approaches and concepts applied through Change Management. He describes the practice as 'about modifying or transforming organisations in order to maintain or improve their effectiveness' and associates this to the responsibility of managers 'to know what constitutes effective performance and have some means of assessment' (Hayes, 2002,11). He continues that effectiveness can be assessed at a whole organisation level, unit or department level, down to each individual employee, and emphasises the '*linkages* between the different elements of the organisation' as well as the constraining or enabling factors 'relative to other comparable organisations' (Hayes, 2002:12-13).

Hayes summarises two types of change predominant in management theory: *incremental change*, associated with periods of external equilibrium where the focus is on continuous improvement; and *discontinuous change,* occurring in periods of disequilibrium and involves a break from the past based on new relationships and questions the very purpose of the enterprise (Hayes, 2002:7-8). Note a parallel with Norman and Verganti's (2012) distinctions of *incremental* and *radical innovation,* though here the distinction is more clearly derived from environmental factors. A telling commonality that Hayes points out in the methods and concepts for Change Management is that they all approach change by developing models to simplify the complex phenomenon of organisational behaviour at all its different levels. These focus on '*key elements* that are seen to offer a good representation of the real world', 'the ways these elements interact with each other' and 'the *outputs* produced by these interactions' (Hayes, 2002:71). These models, whether they be Nadler and Tushman's (1982) *open systems model*, Strebel's (1996) *cycle of competitive behaviour*, Kotter's (1980) *integrative model of organisational dynamics* or many more; all try to summarise an understanding of the cultural factors within an organisation in order to maximise the capacity for innovation. The context of this capacity, however, has a limited scope towards effective performance determined by the relationships each model has identified. Representation of the chosen context is left very much to the key actors and culture involved, which is skewed towards the expertise and models they associate with.

Schien (1990) defines culture as (a) the pattern of basic assumptions, (b) invented, discovered or developed by a group, (c) as it learns to cope with its problems of external adaptation and internal integration, (d) that have worked well enough in the past to be considered valid and, therefore (e) are taught to new members as the (f) correct way to perceive, think, and feel in relation to these problems (Schien, 1990). Each sub-section of this definition (a-f) is intended to identify the opportunities for intervention, the indicators to assess performance and provide diagnosis on what needs change. A common thread across all these indicators relates to the communication and discourse, or *ways of speaking*, disseminated within the organisation. At each point a notion of shared knowledge, or at least shared meanings, needs to have occurred and this largely happens due to congruence in dialogue. As Dixon (1997) argues, shared meaning is constructed in the dialogue between organisational members. In the process of articulating one's own meanings and comprehending the meanings others have constructed, people alter the meanings they hold. In her opinion, this joint construction of meaning is the essence of how an organisation can learn new ways of working (Dixon, 1997). The co-creation of shared meaning and discourse is recognised in emerging disciplines, such as Service Science (Spohrer and Maglio, 2008), while in design these have recently entailed adopting design attitudes (Stang Våland and George, 2014; Michlewski, 2015), organisational culture as making (Juninger and Rind Christensen, 2013), or co-designing organisational artefacts (Murphy and MacLean, 2015). This thesis collectively distinguishes these interactions of co-constructed meaning as *organisational discourse*, and provides the context of inquiry for this investigation.

The Power of Discourse for Change

An important distinction that emerged within Change Management was between the role of managers and the role of leaders in affecting change. Kotter's (1999) influential text, *What Leaders Really Do*, argues that both managers and leaders have to attend to three functions: 'deciding what needs to be done', 'developing the capacity to do it', and 'ensuring that it is done'. Kotter distinguishes a marked difference in the way that managers and leaders attend to these functions: managers focus on a process of goal setting, whereas leaders focus on setting a direction; managers develop capacity by organising and staffing, leaders focus on aligning and empowering people to make the vision happen; managers ensure accomplishment by controlling and problem-solving, leaders are concerned with motivation (Kotter, 1999). Kotter believes leaders can overcome the inevitable barriers to change that they will encounter as the initiative unfolds by articulating the vision, involving people in decisions, supporting others' efforts, and recognition and reward (Kotter, 1999). The influence on Design Management's approach to organisational change, for design to take a lead in innovation, becomes apparent and perhaps outlines the importance of rhetoric in leading a process of transformation. When articulating a vision for change a rhetorical proficiency seems a necessary skill, but how does this reflect on design knowledge?

Cheney, Thøger, Conrad and Lair (2004) categorise the 'application of rhetoric in organizational contexts' along three dimensions, each assorted along dialectical pairs. Firstly, 'the specific form of rhetoric' concerning 'texts/artefacts' versus 'discourse/fragments'; secondly, 'its general direction' concerning 'internal' versus 'external' forms; and thirdly, 'the role of strategy' concerning 'strategic versus non-strategic understandings' of those involved (Cheney et al., 2004:82). A significant opportunity identified in this thesis for design is to articulate its value in innovation along similar dimensions, as *things* representative of discourse, or Latour's *matters of concern*. To paraphrase Kotter's recommendations for leadership: 1) *things* that carry or contain the vision of the organisation, 2) *things* that help involve people in decisions, 3) *things* that support each other's efforts and 4) *things* that recognise and reward. By making such things the concern of design you make them visual, you make them experiential, you make the constituents of the object of organisation become constituents of the object of design. In short, you make them *design things* for the translation of value across leadership, management and all members of an organisation. As Gallagher (2011) points out, in both design and rhetoric a positive communal experience of discourse is seen as good where a congruence of values is achieved (Gallagher, 2011:30).

Pursuing organisational discourse as the context of inquiry brings the Foucauldian relation of discourse to power into the development of such discursive design things. Foucault (1980) presents power as 'the total structure of actions' bearing on the actions of individuals who are free (Foucault, 1980:220). Hindess (1996) interprets this freedom as 'those individuals whose own behaviour is not wholly determined by physical constraints [...] those who are in a position to choose, and [exercising this power] aims to influence what their choices will be' (Hindess, 1996:99). Foucault relates the exercise of power to 'the instruments, techniques and procedures that may be brought to bear on the actions of others' (Foucault, 1980). Hindess suggests that 'the forms of power may be remarkably heterogeneous', with some concentrated and hierarchically organised while others are socially dispersed (Hindess, 1996:100). From this perspective, 'power is everywhere and it is available to anyone' and as a result 'its use may be analysed in terms of the most varied instrumental and evaluative considerations' (Hindess, 1996:100).

From the perspective of organisation, part of the 'instrumental and evaluative considerations' is through the things representative of discourse used to enact the will of the hierarchy of an organisation. For managers, usually these are implemented for the purpose of achieving tasks or controlling worker behaviours. For leaders, this focuses on the capacity to motivate action in alignment with a wider strategic plan. Discourse represents the instruments or procedures as *ways of speaking*, proliferated and repeated across an organisation to bring about action, which inform the models by which we work and become *ways of influencing*. As Hayes describes, we develop our own conceptual models about how organisations function, and use these models to guide us, interpret what we see, and decide how to act (Hayes, 2002:72). This extends to how we naturally construct an internal model in the mind of any environment 'and let it act as an implicit definition of its components [...] to represent their relata under the best-fitting interpretation' (Ismael, 2007:24). Among all the information we perceive and take in from our environment, discourse proves a powerful instrument in shaping the actions, associations and models that assemble our ways of working.

When discourse turns towards decision making and enacting change, Habermas (1990) recognises that the nature of that discourse is prejudiced and rhetorically over-determined by the contexts of the actors involved. Illich (2001) observes how the current economic ideology of a free market determines individual motivation:

> 'Most people have staked their self-images in the present structure and are unwilling to lose their ground. [...] They feel compelled to push the illusion of progress on which they are hooked. They long for and expect increased satisfaction, with less input of human energy and with more division of competence. They value handicraft and personal care as luxuries, but the ideal of a more labour intensive, yet modern, production process seems to them quixotic and anachronistic.' (Illich, 2001:44)

Restakis (2010) describes a free market in the proper sense means essentially three things: 'a division of labour, the accumulation of wealth through economic development and the freedom of enterprise' (Restakis, 2010:22). Zamagni (2008) idealises that *division of labour* enables everyone, even those less gifted, to contribute to the work of society, obliges people to recognise their reciprocal ties as an economic value and makes explicit the interdependence of specialised forms of work as components of a production process. *Development* means the accumulation of wealth as a social good, not as a private end, but as a responsibility for future generations. *Freedom of enterprise*, means 'those endowed with creativity, a good propensity for risk and the ability to coordinate the work of many others [...] must be left free to undertake initiatives.' (Zamagni, 2008:27) These do not entail the notion that an entrepreneur, or a business, may do what they please regardless of the effect on others (Restakis, 2010).

From the author's early notions of preferable futures, these are important themes in understanding what motivations for change might mean for all concerned. This chapter has so far positioned design-led innovation as advancing each of these aspects: most notably for creativity and entrepreneurship, partly for economic development as a democratic, social good, and arguably for division of labour through inclusive, co-creative activities. When considering Latour's call for design to represent matters of concern, the implication of these being translated into ways of working should consider how far the empowerment of workers is itself a matter of concern. Empowerment is not a uniform feature; it is disputable and entirely dependent on the situation of context. As a result, this chapter now moves to explore whether such notions of power are beyond the authority of design knowledge, in theory, despite design-led innovation currently advancing the capacity in practice to innovate ways of working.

Articulating Design Knowledge Around the Object

Designer as Maker

This section begins by tracing the recognition of designer as maker, and how this has translated into contemporary practice addressing socio-cultural processes. *The Power of Making* (2011) is a collection of essays that offers an insight into the tacit knowledge embedded in the minds and objects of design, particularly in the act of making, drawing on a connection between action and reflection. Martina Margetts' describes making as 'not only a fulfilment of needs, but of desires – a process whereby mind, body and imagination are integrated in the practice of thought through action.' (Margetts, 2011:39) A seemingly under represented origin of the designer in design thinking is that of a relationship with the *object* of production. In the context of organisational discourse, the outputs and mediums with which designers engage with are less tangible. There is a much less palpable idea of what the object in question is for each design situation. The experiential domain of tacit knowing in action is much more tangible in craft-based disciplines, as Margetts highlights through Gardner's commentary on knowledge formation:

> '[Gardner critiqued] the sharp distinction between the "reflective" and the "active"', a 'divorce between the "mental" and the "physical"' so detrimental to societal progress and well-being: 'Only if we expand and reformulate our view of what counts as human intellect will we be able to devise more appropriate ways of assessing it and more effective ways of educating it.'" (Margetts, 2011:39)

Here the notion of human intellect spanning a much greater spectrum than currently appreciated raises the fundamental challenge for many design disciplines today: how to articulate the knowledge, skills and expertise they embody in a way that will disseminate a congruence of value, and a societal demand to achieve greater exposure of such a congruence of value.

Elaine Igoe (2011) draws on recent discourse among figures such as Albers and Dormer regarding the 'internality of knowledge' in many design disciplines verified through artistic or well-crafted outcomes. These outcomes are 'difficult to articulate but can be demonstrated' with a possibility for it to be judged. She warns against 'the reliance of tacit knowledge' to demonstrate design knowledge; and that the importance of questioning it 'requires the ability to objectify, articulate and challenge assumptions' (Igoe, 2011:2). The challenge for design, then, is to understand what it means to articulate design knowledge, to objectify knowledge in a way that is meaningful; or perhaps more importantly, *translatable*.

Margetts argues that the object itself can be considered a form of knowledge. Inherent within it is a language of manufacture, craft technique, detail and functionality that can be best understood and translated by other designers or makers (Margetts, 2011:42). Certain understanding of a crafted object is dependent on experience using materials and making techniques; on exposure to the variety of ways such objects can be made; even on the narrative such objects may represent. This echoes Cross's (2009) proposition of design knowledge residing firstly in *people,* 'in designers especially, but also in everyone to some extent'; secondly in *processes,* 'in the tactics and strategies of designing'; and thirdly in *products*, 'in the forms, the materials and finishes that embody design attributes.' (Cross, 2009:100-101) This is framed in the context of how design research can begin to investigate (and subsequently articulate) design knowledge to distinguish it from the more established history, scholarship and research cultures of art and science.

If the knowledge of the designer resides in the people, processes and products (or things), then it becomes pertinent to explore where a designer's authority lies within organisational discourse. In

the earlier sections we identified discursive artefacts of the organisation representing the things in less tangible situations where a codified knowledge could reside. How does design demonstrate the value of their knowledge and expertise around such objects; objects that may speak to multiple disciplines? A developing understanding has come through the concept of boundary objects, objects as a means of representing, learning about, and transforming knowledge to resolve the consequences that exist at a given boundary (Carlile, 2002). Wenger (2000) extends that boundary objects serve as a constitutive element in organisations as social learning systems, particularly between and within communities of practice. This denotes objects that are not the exclusive concern of design, but between disciplines, and indicates something that would constitute the design thing as a dialogical phenomena (Akkerman and Bakker, 2011).

Classic examples of boundary objects in design practice have focused on articulating the design *process* and how it engages with complex situations, such as the Design Council's *double diamond* (see fig. 2D), which attempts to represent the divergent and convergent processes in a linear model. Other manifestations from User-Centred Design emphasise a circular process of research and design that iteratively engages the design problem, reminiscent of Schön's cycle of *action* and *reflection* (see fig. 2E). Others still combine both, reflecting how the process can move back and forth between stages. Such models of the design process are symptomatic of an ongoing professionalisation of design, with various design practices modelling their own design process, and have been useful for engaging organisations. However, they can conceal the many micro-processes that can emerge in each design scenario and how these can deviate drastically. As observed by Dorst and Cross (2001), there is typically a co-evolution of the design problem and design solution until a bridge or connection can be framed by the designer. Linear models are attractive to business as they communicate a time frame and notional boundaries of work, but they can commit design work to pre-determined outcomes that stifles creative exploration. Circular models attempt to provide greater space for creative exploration, but being detached from any timeline makes the committed culture of planning and task management uneasy. Such models can largely only act as references to illustrate the type of process intended; otherwise they can become determinate instruments admonishing design contribution at a strategic level.

Designer as Thinker

At this point, revisiting design theory's correlation to problem solving shall explore whether such a position represents design's 'object of inquiry'. Habermas (1998) highlights the traditional approach for 'when an issue becomes highly controversial – when it is surrounded by uncertainties and conflicting values [...] it is no longer easy to legitimate the experts' and so 'at best, we may convert the controversy into an adversary proceeding' (Habermas, 1998:97). Such an approach is used in law, between defense and prosecution, or politics, between opposing parties or political views.

An alternative approach, drawn from social science, is to study controversies more objectively in order to understand the controversy at hand. A controversy can be understood as a state of affairs where matters surrounding an issue are not yet settled: where competing technologies, scientific claims or policy issues are open to scrutiny, questioning and counter claims. For designers controversies offer a number of opportunities. According to Latour (1993), controversies provide topical issues of significance; expose the emergence of new technologies, users, socio-technical practices and undefined ethical contexts; and reveal how our futures are not as yet locked down, but are instead being contested in the present (Latour, 1993).

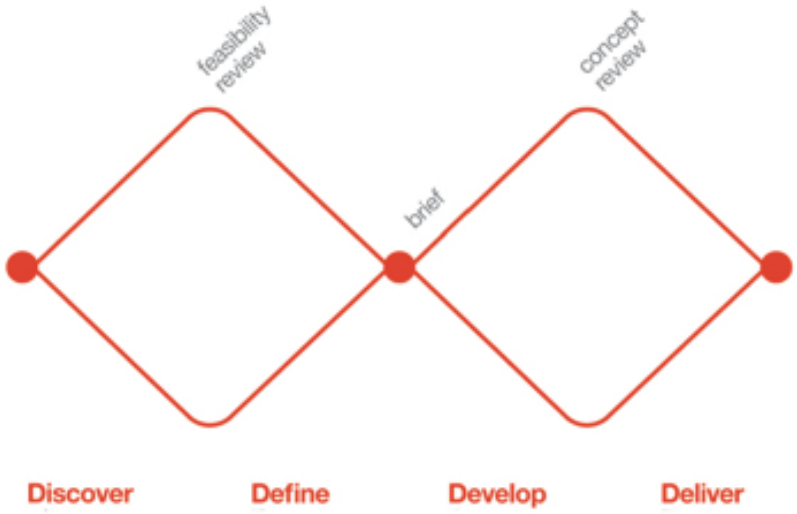


Fig. 2D, *The double diamond design process*, (Design Council, 2005)

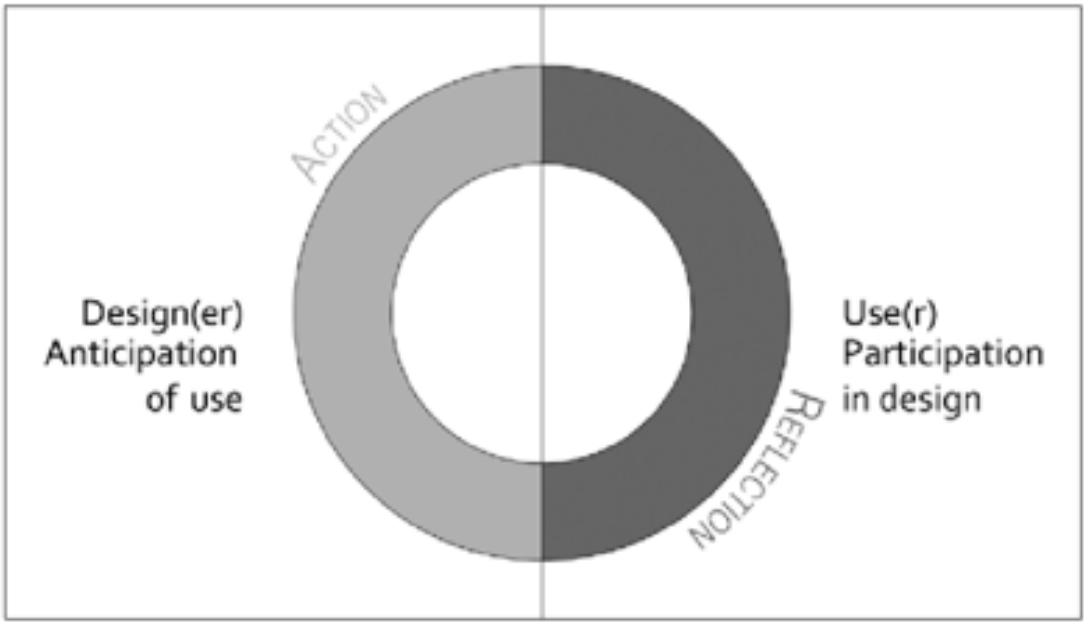


Fig. 2E, *The action-reflection cycle in design* (Bredies, Chow and Joost, 2010:160)

Another approach emergent from management literature in contrast to adversarial procedures, and has since been an adopted part of design theory, is 'lateral thinking', (De Bono, 1970) or 'divergent thinking' (Guilford, 1955). Linked to earlier references of constructing mental models, such an approach is 'concerned not with playing with the existing pieces but with seeking to change those very pieces' (De Bono, 1970). In other words, actively changing our models of perception in the activity of understanding an issue. This has been used to earmark a crucial aspect of the value design processes can apply in changing ways of working; that part of the designer's creativity and knowledge around the design process can use alternative perspectives to provide a greater variety of ideas. But creativity in relation to knowledge is a much more complex phenomenon and should not be defined so readily. Cognitive psychologist, Robert Weisberg, has been one of the more vocal critics of 'lateral thinking', claiming that there is actually very little evidence for this kind of thinking in the work of great creators:

> 'A number of detailed reports of scientific discovery, artistic creativity, and invention are available, including Darwin's notebooks on the development of his theory of evolution, Watson's report of the discovery of the structure of the DNA molecule, Picassos preliminary sketches for several of his most famous paintings, and Edison's notebooks on the invention of the kinetoscope [...] thus, although it seems reasonable to Guilford that producing many and varied ideas through "divergent" or "lateral" thinking ought to be a cornerstone of creative thinking, this idea does not seem to be correct. (Weisberg, 1993)

The key argument falls on whether overcoming old habits, or a narrow, specialised perspective, through 'laterally' taking in multiple perspectives is the crux of creative thinking. Weisberg argues that creativity is possible, and indeed necessary, whether it is siloed within a specialised discipline or not. De Bono did develop aspects of his theories on lateral thinking to also establish 'parallel thinking' (De Bono, 1994), a much starker dichotomy to adversarial thinking that extended the notion of debating multiple ideas as a constructive exercise translated into a mapping of the knowledge and views of participants.

This focus on various ways of thinking about a problem aims to highlight how design itself does not ascribe to a singular process. Design thinking, in the most general sense, uses all of these approaches, but can lay exclusive claim to none of them. Much of the methods and theory used within strategic engagement with organisations has focused on articulating knowledge of *people* and *processes* rather than articulating knowledge of the *products* in such contexts, in the nature of *things.* Many of the traditional and craft-based design disciplines have begun to develop a body of literature that aims to articulate this knowledge, but translating this to the more intangible, complex context of *things* that come to form organisational discourse provides the methodological gap this thesis aims to address.

Designer as Interpreter

Returning to the notion of reflection in action, Schön argued, 'we can recognise and describe deviations from a norm very much more clearly than we can describe the norm itself' (Schön, 1983:53). This can relate to processes of working, services, products, technology and much more. When things go wrong, we can recognise almost immediately that they are not performing to the expectations. 'Positive and negative results come to be taken not as signs of success or failure in action but as information relevant to a theory'. Authors 'observe and describe theories in action' which the 'participants themselves cannot describe' (Schön, 1983:59). In other words, reflective practice aims to establish an understanding theory that informs and refines continuing practice. Here, Schön lays out a pathway for design to develop an approach to documenting and

articulating practice as part of refining and embedding design processes in organisational discourse. He calls for design research to theorise and describe the actions within the activities and situations designers contribute to in order to refine the authority and voice they embody. A question arises, then, around how to interpret and describe the 'theories in action' of designers.

John Law (2000) analyses the use of narrative and warns of the role of 'the personal' in telling such stories in his article, *On the Subject of the Object*. This is explored in relation to Haraway's (1991) notion of objective knowledge being situated, embodied and local and that when we tell stories these are performative (Haraway, 1991). Law claims that such a notion goes radically further, that 'effective stories perform themselves into the material world.' (Law, 2000:2) For Law, distinctions are made of the person as 'a subject-position constituted in the ruthless logic of a discourse' and knowledge as 'another set of positions that stand in relation to and perform that person'. These 'enabling logics of discourse [...] run through, permeate, and perform the materials of the social. They go everywhere, into our bodies, our practices, our texts, our knowledges, our town plans, our buildings, and all the rest' (Law, 2000:13). Law explores embodiment through Althusser's sense of *interpellation*, how the situation always precedes the subject, and we are 'interpellated as knowing subjects precisely because we *are* embodiments' (Law, 2000:15). This notion of *interpellation* echoes Sloterdijk's notion of *explicitation*, where humans are described through the things that *envelope* them. Law recognises the material, *things*, as being a story, a narrative unrestricted to words that can perform itself into the world. The question arises about how this can be done with regard to design knowledge through design things, alongside all other knowledges within situations of design-led innovation? Law concludes that there is room for 'the personal' in stories if 'it may be understood and performed as a location of narrative overlap, of multiplicity, of patterns, of patterns of narrative interference' but telling these stories as we perform our situated knowledges will depend on what we are trying to achieve (Law, 2000:28).

For design-led innovation, the designer is often entering into a situation for which they have little direct expertise or experience (new technology, established organisations, socio-cultural issues); yet, are able to engage with the contextual design problem with a variety of actors, collaborators and participants, through various methods using and producing design things. This highlights the opportunity space this thesis has labelled as methodologically establishing an *object-oriented discourse.* A process of reflective practice, focused around generating accounts of the work performed through design things within organisational discourse, in order to make situated knowledge within design-led innovation more explicit.

There is emerging design literature that goes some way towards such a process of explicitation of design. In *The Semantic Turn* (2006), Krippendorff presents a comprehensive interpretation of constructivism for design and proposes a set of methods for design analysis and projection. Krippendorff's basic assumption is that people, in perceiving artefacts, construct and coordinate meanings by assuming a mutual understanding, so designers should employ this 'second-order understanding' if the artefacts are to be useful, usable and understandable. Bredies, Chow and Joost (2010) suggest that the less familiar a new artefact is, the more its meaning has to be coordinated anew, the more uncertain second-order understanding becomes. For them, it means that the more a design artefact deviates from the norm, understanding it (in terms of use) becomes increasingly similar to designing (Bredies, Chow and Joost, 2010:159). In design-led innovation, the success of a new design thing cannot necessarily be deduced from existing meanings, as it requires a re-coordination of those meanings. It must be performed within a new context, and this is what an object-oriented discourse seeks to explore.

Object-Oriented Discourse as a Performative Case for Inquiry

A Reflexive, Object-Oriented Discourse

This chapter began by examining design-led innovation in relation to rhetoric and design things, critiquing design thinking as offering little grounding for design knowledge while acknowledging contructivist approaches, such as Participatory Design, naturally restricted itself to the design thing as object. The research problem highlighted was that designers are compelled to absorb wider skill-sets, but this expansion of skills on a professional level strains the consistency and explicit nature of design practice. The following section explored different management models for organisational change and how they were consistently applied through the assessment of interactions within organisations. As a result, organisational discourse was presented as the context of inquiry for this thesis, where the co-construction of meaning in discursive interactions, through design things, has emerging potential for design-led innovation towards new ways of working. This led to a section exploring design knowledge in relation to the object as a process of thought and interpretation. The opportunity was therefore presented as reflectively capturing the narratives performed through design things by methodologically establishing an *object-oriented discourse*.

Latour has been a clear influence in the directions pursued in this thesis, so it now comes to explore how his work with actor-network theory (ANT) fits into the aims set within this inquiry. ANT was briefly presented in the *Introduction* as emerging from Science and Technology Studies (STS) research exploring object-oriented ontologies (OOO) (Morton, 2011), as an approach to observing and articulating the associations between human and non-human actants that produce the *effects* of agency we observe around us. As a body of theory, ANT attempts to overcome the old sociological dilemma of structure and agency by positing that structure and agency arise together and are co-implicated in each other's production. An actor-network is an assembly of human *actors* and non-human *actants*, connected through traceable *associations* brought about by the work performed through various actors. The aim of an ANT investigation is to explore what work, by human and non-human actants, produces what effects and is key to this investigation due to the *agency* it permits within objects, or *things*. All effects of agency are phenomena often assumed as facts and all can be thought of as actor-networks arising from the work of people and things, which become visible or perceptual when performed. As a result, all objects 'are actors, or more precisely, participants in the course of action waiting to be given figuration.' (Latour, 2005b; Mewburn, 2011). Design is seen as rooted within ANT, as it is implicit within the networks of objects and how they perform and mediate 'the social' (Latour, 2005; Yaneva, 2009).

Latour extends his theories of ANT to reframe how we can look at complex issues, politically, through a reinterpretation of objects and how they mediate any matter of concern. He draws on Heidegger's recollection that a "*dinc" (thing)* was the governing assembly in ancient Germanic societies, made up of the freemen of the community and presided over by speakers fluent in the law. He claims that:

> 'Objects – taken as so many issues – bind all of us in ways that map out a public space profoundly different from what is usually recognised under the label of "the political"... [the existing mantra of politics], realism, implies that the same degree of attention be given to the two aspects of what it is to represent an issue. The first question draws a sort of place, sometimes a circle, which might be called an assembly, a gathering, a meeting, a council; the second question brings into this newly created locus a topic, a concern, an issue, a topos.' (Latour, 2005a:16)

Latour's argues for an 'object-oriented democracy [...] concerned as much by the procedure

to detect the relevant parties as to the methods to bring into the debate [...] what is at stake' (Latour, 2005a:18). Design carries significant potential towards meeting this form of challenge, with a practice that can engage the object, unpack its various *envelopes* and make them an *explicit* part of understanding, debate and decision-making. Of core interest for this thesis is when objects, matters of fact constitutive of the design context, become *things*, matters of concern, 'a contested gathering of many conflicting demands; a disputed assemblage that will divide and congregate and will engage new assemblies of humans and non-humans' (Yaneva 2009, 284). When the knowledge across collaborators in the design situation needs to be gathered and represented, through design things, a congruence of meaning becomes strained along the associations and implications made.

Understanding the strategic role of design alongside multiple disciplines comes down, in part, to how design *things* recognise and overcome such moments of conflict and brings them into a more coherent form. How design things can enrol other disciplines to participate in the object of organisation as the object of design. The representation of the context for design is paramount and is a constant process open to and enabling scrutiny from participating disciplines.

> 'In this situation, we can witness how a thing or a design project can modify all the elements that try to contextualize it, triggering contextual mutations. In this sense, a design project or a disputed design thing resembles more a complex ecology than it does a static object [...] following an ANT perspective we should consider context as variable, that is as something moving, evolving and changing along with the various design objects themselves; context is made of the many dimensions that impinge at every stage on the development of a project. (Yaneva, 2009: 284)

This is where this investigation positions design-led innovation to explore a *reflexive* dimension, which is observed as inherent to enhancing a critical disposition in creative practice (Neil, 2010). Ashmore (1989) describes three types of reflexivity: reflexivity as self-reference, 'where discourse is implicitly self-referential'; reflexivity as self-awareness, a '"benign introspection' to think more deeply about what we do'; and reflexivity as the constitutive circularity of accounts; an ethnomethodology term referring 'to the general and universal feature of accounting procedures.' (Ashmore, 1989:32) Reflexivity as self-reference points towards the process of knowledge creation from the position of a single discipline, whereas reflexivity as the circularity of accounts points towards the above mentioned immersion into external contexts to produce new knowledge. Both of these definitions are implicated in the approach for this thesis. Reflexivity as self-awareness is seen to simply open out the time and space for reflection, a feature that cannot be taken for granted and, contextually, can be hard to achieve.

Lynch (2000) critiques the nature of reflexivity in knowledge creation, observing how 'the 'effects' of any reflexive project are contingent, as they depend on its execution and communal reception.' For Lynch, the projected enlightenment on the account of reflexive inquiry 'is not a constant source of illumination.' (Lynch, 2000:47). This is possibly true of the literary inquiry implicit within social sciences, but this thesis explores reflexivity in practice, through the self-reference of design things in the design situation. As a result, the problem supporting a reflexive discourse is less to do with being a 'constant source of illumination', but a momentary one 'contingent on its execution and communal reception' among collaborative disciplines. Latour's *DingPolitik* (2005a) observes the gathering of actors around 'representing what is at stake' (Latour 2005b) must also account for what stake those actors hold. As Holert (2011) concurs, 'the right to participate cannot be taken for granted by the designer', and that 'the communities addressed by designers should be conceived as assemblies... whose readiness and willingness to become subjects of interpellations to *participate* may differ dramatically' (Holert 2011, 55).

A Performative Case for Inquiry

A further exploration of reflexivity is here left until the analysis chapter, *Design Things as Matters of Concern*, in order to relate any further notion of reflexivity to the findings emerging from this investigation. This final section addresses the notion of the performative, which was a core concept that emerged in the course of performing this inquiry, and how this comes to frame an object-oriented discourse.

Butler (1990) associates the performative with a normalising power. The repetitive nature of work and language engenders actors in processes, structures, roles and artefacts that are perceived to stabilise the network. The force Butler associates with the performative is 'partly a normalising power that constitutes by exclusion: in producing the normal, it also produces the abnormal, that which falls outside the realm of a 'proper' identity' (Loxley, 2007:123). Within organisational discourse this can be interpreted within the positivistic movements of centralised rhetoric disseminated internally and externally through repeatable messages, models and processes. This can be both productive in affording an efficiency to organisational discourse, but can also limit the adaptability of the organisation to on-going and sometimes massive change to the external environment, as mentioned in previous sections. Butler posits that 'there always remains a chance within performativity of identity for dissonant or disruptive gestures by that which such performativity produces as its outside' (Loxley, 2007:123). Butler's analyses draw on 'an emphasis of the repetitive structure of performatives':

> '... precisely because the ideal is never accomplished, it must always be attempted again. This focus on repetition further permits the suggestion that the norms thus repeated and recited themselves become vulnerable in their repetition. They are in the end nothing but their repetition, they exist as norms only on that temporal basis, and they do not and cannot programme or determine everything that is possible. They are not, therefore, a law that we are simply condemned to obey; they become law-like only through being repeated, re-enacted, and the spell could be broken.' (Loxley 2007, 124)

Yee, White and Lennon (2015) examined the value of design-led approaches in public and third sector organisations; how they enabled participants to 'value a new approach', 'challenge preconceptions' and 'feel comfortable with complexity'. These are acknowledged as rather generic understandings of how design-led approaches can disrupt normalised ways of working, but interestingly found an enhanced appreciation of value from stakeholders was supported by the space for reflection afforded through questioning. They call for ways to value outcomes of design-led approaches as well as the more immediate, tangible outputs. This thesis argues that, by drawing on the repeated elements of discourse within organisation and social contexts, a space begins to open out for questioning how design-led innovations co-create a strategic discourse through the actors and artefacts that represent it. What is repeated? What is not? How are they interpreted? How are they experienced? How do they influence action? These are the questions that inquiring into performativity can reveal, if not direct answers, then the elements from which an explicit understanding could emerge.

Callon (1998), another actor-network theorist, viewed economic actors, or economists, much like scientists who develop theories of the world, use these theories when interacting with the world, thereby shaping it according to their theories. In this way they perform the economy, making the real more like the theories of it (Callon, 1998:30). In relation to design and the organisation, it raises the question of how much the discourse articulated through models, artefacts and other representations of the organisation relate to the reality of lived experience. Aspers (2007)

critiques that, although markets are social constructions, they may not be performed. It is often better to say that some markets are modelled on other markets; 'early economists [...] did not "invent" the market theory that Callon refers to; they developed it in close relation to real markets' (Aspers 2007, 391). In other words, through observing how real markets were already performing, market theory developed that attempted to theorise and predict elements of it, which may have gone on to influence aspects of how some markets perform, but not exclusively. In this respect, design things have the potential to bring more of a lived experience of the organisation to bear on the models that come to define organisational discourse. Performance therefore signifies action that the emergent knowledge of participants can apply outside normative practice.

Binder et al. (2011) implicates performance, methodologically, with the 'uniqueness and contingencies of "happenings",' (Binder et al. 2011:126) which sits in stark contrast to the appeal of repeatable methods and techniques encouraged within traditional organisational structures. Kozel (2007) expresses performance, from a phenomenological perspective, as about being in an emergent state; 'not just acting differently, but being different,' where the performative detachment between representations of things and the reality of what is experienced become deeply entwined (Kozel, 2007:66). Such examples of performance as a method for producing an emergent state, an emergent language or articulation of the objects and work that is, or can be, performed, opens out the opportunity to emphasise the performative nature of things from other disciplines and how they can participate in the re-interpretation of the situation. By analysing design work performatively, it brings into focus a certain level of 'tacit knowledge' as 'performance signifies action, and its results and its approaches to knowing insist on immediacy and involvement' (Binder et al. 2011, 127). But this needs to be grounded in the context of their practice and participants within an organisation, so the framing of such performativity should be defined by the scenario it is observed within. Performativity is traced in the social relations, actions and discourse performed by the actors within an organisation. To paraphrase Yaneva's (2009) ANT-based observation of his working environment: some of the ways of working, which are also ways of thinking *afforded* by organisational discourse, acquire, *as a result of repetition*, a sort of consistency and reliability that precipitates them, so to speak, and isolates them from the particular events in which they are embodied.' (Yaneva 2009, 282) Exposing that repetitive element of performative agency aims to make explicit how design-led innovation (design things, designers and design work) emerges in relation to wider organisational discourse.

This chapter has scoped the key themes and areas of literature articulating the research problem of an expansion and inconsistency in design discourse within design-led innovation. *Design things* was presented as the focus of inquiry, as a constructive means of tracing design-led innovation approaches. *Organisational discourse* was presented as the context of inquiry, where ways of working are shaped and influenced by managers and leaders through value-laden interactions. R*eflective practice* was presented as informing the mode of inquiry, where forms of design knowledge were explored in terms of the designer as *maker*, as *thinker* and in terms of *interpreting* the object of design. These informed identification of potential approaches informing an *object-oriented discourse* to emphasise the contemporary challenges and proposals for the *explicitation* of design-led innovation. Following this line of inquiry, reflexivity and performativity were identified as essential concepts within the scope of the investigation, identifying actor-network theory as an object-oriented approach that can bring the contradictory and controversial nature of matters of concern of design-led innovation into focus as an object of design, which this thesis brings methodologically together in the next chapter.

METHODOLOGY
MAPPING THE ROLE OF DESIGN THINGS

chapter 3

This third chapter presents the methodology that developed to establish an *object-oriented discourse* around design things as matters of concern. The methodology evolved as an understanding of how actor-network theory (ANT), representing an object-oriented approach, could be applied visually across three case studies, which culminated in the sampling of theory towards a reflexive framework for design-led innovation. This chapter explains the evolution of the methodological model by describing the methods of data gathering deployed, the development of actor-network mapping as a method, the modes of analysis applied in each of the three case studies, and how they contribute to a theory/methods package, as core contribution.

The methodological model is re-introduced here to reiterate and expand on its cyclical form through four stages (see fig. 3A): *Articulating Design Performance, Mapping the Object of Design, Re-interpreting the Design Situation* and *Change through Design Things*. The model includes the methods that individually constituted each stage of the methodology. This chapter presents these four stages in detail to describe the methods deployed and lay out the arguments for the methodological approach taken. A preceding section expands on the pursuit of the case study method by introducing the three case studies selected for this investigation and how they correspond to the inquiry. How the methodological approach manifested itself in each case is described in each stage's corresponding section.

Articulating Design Performance presents the first stage, which expands on the purpose of using an ANT approach to describe and assess the work performed in cases of design-led innovation. The methods of interviewing, observation and participation towards producing an ANT account, as initial method towards a theory/methods package, are described in relation to each case study, as well as the mode of analysing performative agency translating ANT accounts into a script to populate visual maps, described in the following section.

Mapping the Object of Design, details the evolving method of actor-network mapping during the investigation. The process and iterative refinement of the visual elements are described, demonstrating how the ANT accounts were translated into visual maps in each case study. This section also explains how these developed as a representation of the object of design for reflective discussion with participants in the last two case studies.

Re-interpreting the Design Situation, describes how aspects of situational analysis were deployed to produce visual, interpretative overlays of the relationships between design things and elements within the wider actor-networks mapped. This visual, co-analysis with participants is validated to examine the agency of design things within the situation of inquiry: how they relate to the situation, they're interpreted effects and how they articulated *matters of concern*. As a supportive method towards grounded theory, situational analysis is described as providing a necessary translation of an ANT approach towards grounded theory analysis.

Change through Design Things, describes how grounded theory is applied as a mode of analysis for coding the interviews and discussions within all three case studies. The core categories emergent from the grounded theory analysis are grounded in an object-oriented approach through a constant comparison with the ANT accounts and actor-network mapping, shaping the theory informing an object-oriented discourse. The section concludes how re-interpretations of the matters of concern, articulated through design artefacts, were explicated from the methodological model into a theory framing design as a performative act.

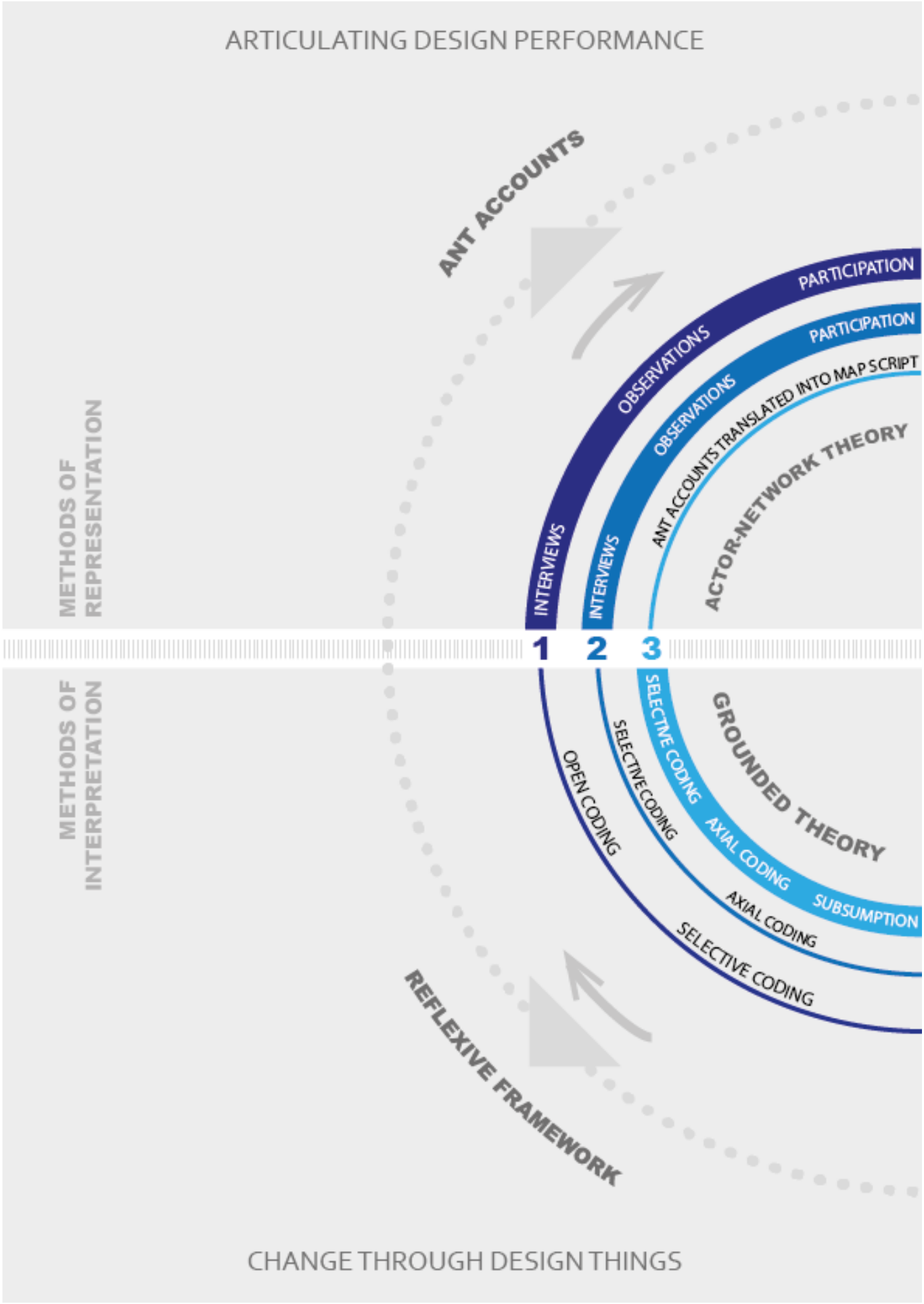
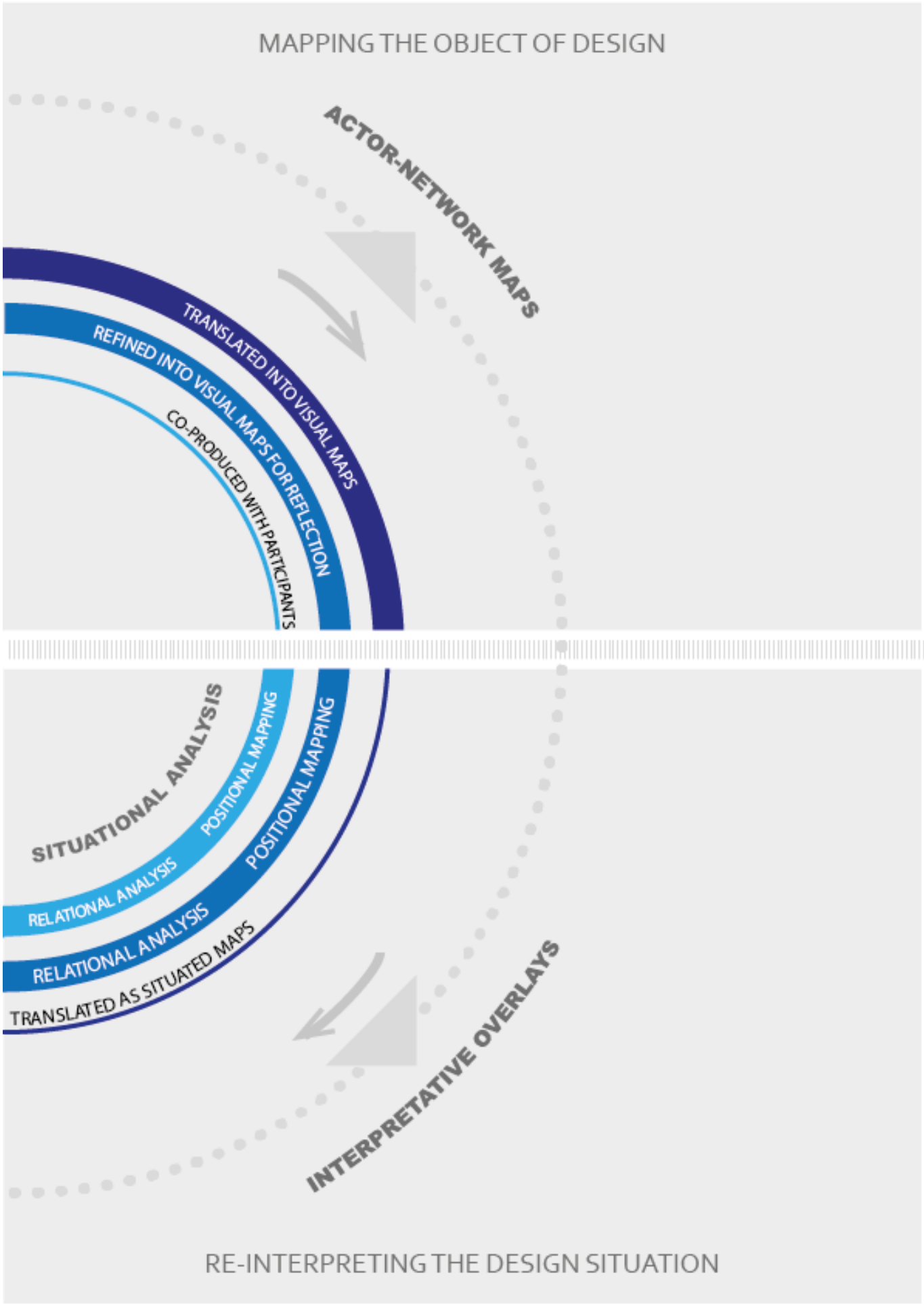


Fig. 3A, *Methodological Model, Incorporating Methods*, (Johnson, 2016)


MAPPING THE OBJECT OF DESIGN
ACTOR-NETWORK MAPS
TRANSLATED INTO VISUAL MAPS
REFINED INTO VISUAL MAPS FOR REFLECTION
CO-PRODUCED WITH PARTICIPANTS
SITUATIONAL ANALYSIS
POSITIONAL MAPPING
RELATIONAL ANALYSIS
POSITIONAL MAPPING
RELATIONAL ANALYSIS
TRANSLATED AS SITUATED MAPS
INTERPRETATIVE OVERLAYS
RE-INTERPRETING THE DESIGN SITUATION

Case Study Method

This first section presents the case study method as appropriate for applying and developing the methodological model for this thesis. The three case studies identified are presented sequentially explaining their selection, how they correspond to the three sub-questions informing the overall thesis, and how the methodological approach manifested itself in each case. Finally, the case study method is argued to have provided the best approach for producing theory through grounded theory analysis across all three cases.

Case Study as Method

For the purposes of this inquiry, case studies are understood as a key method of empirical inquiry that 'investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident' (Yin, 2009:18). One of the conditions for each of the case studies is that participants are in a process of forming a new network around ways of working as an object of design, or design-led innovation. In such cases, the phenomenon and context are highly complex, specialised and uncertain, aligning assiduously with Yin's conditions for case study research.

The approach taken in this thesis has been to explore the phenomenon as the performative agency, or role performed, through design things in the context of organisational discourse across multiple cases; what Stake (1995) identifies as the *collective case*. This is as opposed to the *intrinsic case*, following a particular situation in a particular context. The reason for using the collective case method is that the creation and deployment of design things is highly variable across design practice, as will be shown across the three case studies. Following the thesis aim to methodologically articulate design things as matters of concern, it is necessary to develop such methodology across variable contexts to respectably validate such an approach. As a result, the approach also follows what Stake (1995) called the *instrumental case*, using cases to learn about something else; in this instance, how ANT could be applied as a method in practice. As a methodological, practice-based thesis developing a design method, actor-network mapping, grounded in empirical research of the context, it is argued such an investigation represents an instrumental case by definition.

The strengths of using the case study method recognised in this thesis are that the 'phenomenon can be studied in its natural setting and meaningful, relevant theory generated from the understanding gained through actual practice,' allowing the inquiry to be answered 'with a relatively full understanding of the nature and complexity of the complete phenomenon' (Meredith, 1998). The investigation adopts a combination of worldviews, as described by Cresswell (2008:6-11): through *Pragmatism*, as an inquiry into actions, situations and consequences, particularly in exploring design things; and through *Constructivism*, as an inquiry into the constructed meaning of collaborators in design-led innovation; particularly towards theory-generation within this thesis. The combination of these two worldviews through the case study method has helped to shape the methodological model around actor-network theory, situational analysis and grounded theory. These are all qualitative strategies of inquiry applied in this thesis to explore 'in depth a program [of design work] bound by time and activity' (Stake, 1995) 'in a natural setting through observation and interview data' (LeCouple & Schensel, 1999) 'deriving a general abstract theory of a process, action or interaction grounded in the views of participants' (Charmaz, 2006). The details of how these methods have been brought together across the three case studies are explained in the later sections of this chapter. At this point the methodology shall introduce the selection and context of the three case studies for this inquiry.

Selection of Case Studies

In order for the case studies to represent the context of inquiry (organisational discourse) and the phenomenon of inquiry (design things), set out in *Chapter 2* in the wider context of design-led innovation, three key criteria were initially identified:

1. Designers need to be positioned as leading, or co-leading, the course of work.

This essential critieria alone ensures the context of design-led innovation. Designers leading the course of work extends to being the creative lead or strategic partner on product, service or organisational development, and is open to design-led research inquiries. This does not mean designers simply being in a position of leadership is enough, but that they bring their design skills and methods into the course of work.

2. Designers need to be collaborating with non-design disciplines as contextual experts.

This second criteria ensures the context of organisational discourse being represented. It is through collaborative working that design-led innovation is positioned as offering a valuable strategic, creative and practical resource. It also represents the research problem of articulating design's contribution in complex situations with actors relevant through context, experience or expertise.

3. Novel design things need to be co-developed in these collaborations.

This third criteria ensures the phenomenon of inquiry is present within each case study. In its simplest conception, this looks for traditional design artefacts, such as pre-existing tools, visual sketches or models, produced to support work and discourse with collaborators. In its most complex form, this represents improvisational or emergent design things manifested through activities of shared meaning, traceable only through observation and/or reflective interrogation.

The application of these three criteria is described for each case study in the next sub-section, with bracketed numbers denoting the relevant criteria, however there were two further categories that developed in the course of the investigation:

4. There needs to be a clear context for exposing matters of concern.

This was not an explicit criteria at the start of the investigation. Latour's writing on actor-network theory articulates repeatedly for objects not to simply be considered matters of fact, but to be considered as more controversial and contradictory matters of concern. However, it was only recognised as an explicit aim by the author during his scope of context, validated through experiences in the field of research. As a result, moments of contradictory interpretations from participants became explicit sites of interest for this inquiry.

5. There needs to be reasonable access to participants and designers to perform the methodology.

This criteria emphasises the circumstantial nature of case study selection. Each case study represents pre-existing research projects operating within the author's research institute. As a result, complex processes of establishing the projects were avoided or simplified, while in-depth access to participants and designers was more readily agreed or negotiated.

Case Study 1: New Networks with Design

The first case study follows a business start up, Know Sugar, led by a service design agency funded from an initial event delivered by the knowledge exchange hub Design in Action (DiA). DiA's key focus investigated design as a strategy for business growth in Scotland and explored this topic by developing the Chiasma method. Chiasma are a sandpit-style event bringing designers, academics and entrepreneurs together to develop ideas tackling societal issues. At these two to three day events, participants form teams around the ideas, develop them for presentation, and apply for funding of up to £20,000 to prototype and take the idea to market. The author participated in designing and delivering the first of these Chiasma events in Glasgow, February 2013, which targeted the wellbeing sector and focused on the topic of type 2 diabetes. Two multi-disciplinary teams from this Chiasma secured initial funding to develop their ideas and the author was tasked with following the projects (5); one of which halted part-way through development, leaving the single project presented in this thesis. This project was followed until August 2014, when a first, prototype was delivered with members of the public.

Know Sugar was chosen for initially exploring an ANT approach to articulating the work performed by designers through design things in collaboration with other contextual disciplines. As a newly created, multi-disciplinary team led by designers vying to develop a business concept for market (1, 2 & 3), the context was seen as ideal for exploring the role designers and design things played in establishing ways of working during concept development and their influence on non-design participants. While this is not a case of an established organisation undergoing change in its ways of working, it is a case of design things being co-developed as a way of working towards business development in a health and wellbeing context (4). As such, the phenomenon and context of inquiry are highly prominent and provides rich insight towards developing the actor-network mapping technique. The semi-structured interviews with participants also provided rich groundwork for initiating the wider grounded theory analysis across all three cases.

Case Study 2: New Ways of Working with Design

The second case study follows a design research project working with Moorbrook Ltd., an SME textiles manufacturer of high-quality, woollen fabrics for apparel and transport markets based in Peebles, Scotland. The project was led and delivered by the Institute of Design Innovation as part of their Creating Cultures of Innovation (CCoI) programme. CCoI is a unique design intervention project that works with Scottish SMEs to explore how to apply design approaches (2) to transform in-house innovation capacity, boost employees' use of skills (3), increase motivation and productivity and provide creative leadership to support collective solution generation (1). The CCoI hypothesis asks whether design can act as a vehicle to enhance and embed sustainable, innovative capability in SMEs. The above SME agreed to undergo such a design intervention in response to internal and external concerns to their survival as a business (4). The design intervention took place over nine one-day sessions, one session delivered per month between October 2013 and July 2014. The intervention involved a cross-diagonal slice of twelve of the company's personnel, from management to the factory floor, referred to as the *slice*, to adopt and proliferate methods throughout the company. Two design practitioners delivered the sessions, with the author as an embedded researcher within the sessions to observae through note taking, photography and conversations with all participants. The sessions also included a Change Management consultant and academic, who supported the delivery and reflections throughout the intervention.

The project was chosen to consolidate an ANT approach to visually represent the work performed by designers through design things in collaboration with other organisational disciplines. It also represented a direct example of design trying to implement change to the ways of working within an organisation, the explicit context of this inquiry. As a project delivered by the author's home institution, it presented persistent access to the project and the designer's delivering the project (5), which ensured comprehensive data collection. As a case study developing on the methods explored from the first case study, it was a suitable opportunity to introduce actor-network mapping and initial iterations of situational analysis as interpretative overlays. As a project delivered in regular intervals over a lengthy timeframe, it was also an ideal case for directly looking at how design things changed the ways of working within the organisation over time.

Case Study 3: New Ways of Performing Design

The third and final case study is practice-led, deploying the actor-network mapping technique and interpretative overlay in a series of four user-centred design research projects, known as Experience Labs. Experience Labs explore experiences of health and wellbeing contexts and services, and potential digital design solutions towards them. The project is delivered by The Digital Health Institute (DHI), an initiative between the author's home institution (5), the Glasgow School of Art, University of Edinburgh and NHS 24, to bring together health, care and third sector professionals, academics and industry partners to find new ways of innovating for societal benefit with economic advantage. Experience Labs represent concentrated stages of design research and development with potential users as participants (1), in varying project contexts, in collaboration with multidisciplinary healthcare professionals and organisations (3). The author observed each one- to two-day lab, then facilitated reflective sessions with the designers and key participants in co-producing actor-network maps, and interpretive overlays, of the design work performed. Discussions during each of the four reflective sessions were audio-recorded providing the data sets for grounded theory analysis, alongside the actor-network maps and interpretative overlays as evidence for articulating the role of design things as matters of concern.

The project was chosen to iteratively deliver the actor-network mapping technique in a live context of design work performed in a new multi-disciplinary network. Again, design things are a prominent and consistent factor in the interventions, as well as moving across purposes of ethnographic data collection, visual representations and mock role-play environments (2). This variable application of design things provided a suitable testing site for the visual methods developed. The health and wellbeing context consistent across each Experience Lab allows a more explicit relation to matters of concern, expressed by DHI as 'societal benefit with economic advantage' (4). While there is no case of an established organisation undergoing change in its ways of working, it is a case of design applying new ways of working with various established organisations. As such, the context of inquiry is highly prominent in the discussions recorded and provides rich insight towards confirming the core categories under scrutiny in grounded theory analysis.

As mentioned previously, the selection of these case studies was not only driven by their representation of design-led innovation, but also due to their proximity and flexible conditions for exploring an object-oriented approach. By aligning with research projects already delivered by major institutions, this provided conditions of ethics that were already in place and agreed with participants, as well as essential access to the designers, researchers and collaborators on each project.

Articulating Design Performance

In this section, actor-network theory (ANT) is presented as the selected approach for articulating the role, or performative agency, of design things. The methods of deploying ANT are described in relation to each of the three case studies, explaining the data management in each case, and how they came to produce ANT accounts. This is followed by how the ANT accounts underwent analysis, assisted by the actor-network mapping presented in the following section, towards an evaluation of how ANT begins to expose design things as matters of concern, and how this furthers the wider investigation of a reflexive, object-oriented discourse.

Actor-Network Theory

The aim of this initial section of the methodological model is to provide the groundwork for exploring an object-oriented approach articulating the performative agency of design things. ANT is foregrounded as the core method of representation because it situates design things in the organisational work being performed. Here it should be repeated that ANT is a sociological body of theory that 'attempts to overcome the old sociological dilemma of structure and agency by positing that structure and agency arise together' (Mewburn 2010, 365). It is this implication that the structure of an organisation is co-determined by the agency of its actors, both human and non-human, which this thesis wishes to address through design things. When design work, whether led through designers, a design process or design methods, is an influencing factor in forming or changing an organisation, what is it that design things do in such a situation? What effect do they have for different actors? ANT accounts of the actor-networks between design and organisation seeks to provide an articulation of the work performed through design things and how they mediate, facilitate and translate changes in the ways of working across multiple disciplines.

Undertaking an ANT approach uses ethnographic methods such as observation of the work being performed and interviews with the actors within the network (Mewburn, 2010) to tell 'stories of how things, objects, actors, come to be how they are [...] through a process of interaction with other actors.' How interaction 'changes actors' and 'translates actors' (Kraal, 2007:6). These stories, in ANT, are traditionally, purely textual accounts with the main tenet being 'that actors themselves make everything, including their own frames, their own theories, their own contexts, their own metaphysics, even their own ontologies' (Latour, 2005b: 150). This dedicated objective approach to describing the network, including allowing human actors to inform what work they do in their own words, is not to say that they are describing the network for you, but in the process of interview and observation they help to describe what work they are doing, for what reasons, in response to, or association with, which non-human actants.

Michel Callon (1986) provides a four step research frame for assembling actor-networks: *interessement, enrollment, point of passage* and *trial of strength*. One of the conditions across each of the case studies is that participants are in a process of forming a new network around an intangible object of design. Therefore, Callon's research frame was seen as a suitable starting point for the assembly of ANT accounts to best articulate the formation of these new networks. Kraal (2007), following Akrich (1992), neatly outlines how these steps go toward assembling the actor-network necessary. In the (1) *interessement* step the relevant actors 'are made interested in joining an actor-network' in a way that 'is unique to the particular actor-network.' In the (2) *enrollment* step, 'actors agree to play a role in the network, they are translated [...] into the network and are inscribed [...] with a program of action.' The (3) *point of passage* is the 'one or more actors [...] who assigns roles [...] or acts as spokesperson for the other actors in the network.' In the (4) *trial of strength* 'it is seen whether the actors adopt the roles assigned to them' (Akrich, 1992). For Kraal, the most important concepts in this framework intimately tied to design are *inscription* and *translation* (Kraal, 2007:4). These come to inform part of the performative indicators identified that shall be expanded upon in the next stage of the methodology, *Mapping the Object of Design*.

ANT has its critics, most notably as neglecting political bias or morality and reducing the primacy of human intentionality alongside non-human objects (Walshman, 1997). The author concurs

with Bijker (2012) that morality and intentionality are only reduced in ANT if you choose to reduce them in your observations (Bijker, Hughes, Pinch, and Douglas, 2012). The key here is that *things* are not left behind, but they are treated the same as human actants to sufficiently trace their effects of agency. Tim Ingold criticises ANT as conceiving 'the world as an assemblage of bits and pieces', and proposes the world be conceived as 'an entanglement of pathways from which action emerges' (Ingold, 2011:64). In this methodological model, ANT is only used to develop a method of representation, over which entanglements of interpretation can be drawn and analysed. The author also acknowledges other methods of representing actions between people and things, such as Systems Theory and Activity Theory, but contends that Latour's framing of things as matters of concern drives the use of ANT in this thesis. it is by addressing things more directly using ANT, that this thesis proposes the object of design in organisational discourse can become more explicit.

Describing the Methods

In each case study, observation was predominantly used to gather the data of work performed by designers and participants. This included physically sitting in on group work sessions taking written notes and photographs of materials, activity and discussion. On occasion this included actual participation by the author in activities as a recognised member of the group with design experience that could contribute to proceedings. This is recognised in the notes and data capture when it has occurred in each case. Such participation has tried to maintain a supportive, rather than proactive, position providing critical feedback in certain stages of CS1 and CS2. In CS3, this necessarily moves into providing design input when introducing actor-network mapping into the project as the author is collaboratively supporting design decisions and providing personal reflections. Observation was also achieved through gaining access to shared digital resources of files and documents produced by individual participants as part of the wider work performed in each case study. In CS1, the author had access to Basecamp, the project management software used by the participants for uploading files and documents, and Flickr, an online resource for image sharing. In CS2, a shared Dropbox folder was set up between the author and the delivery team for all files, images and documents. In CS3, a separate shared Dropbox folder was also set up for similar purposes.

Such observations provide the bulk of data in ANT but are not enough in producing detailed ANT accounts. Interviews and group discussions were also performed to allow participants to directly inform the accounts. In CS1, audio-recorded, semi-structured interviews were performed with participants to both gain their description of the work performed, with what non-human things or design things, and the decisions behind such work. In CS2, notes were made on reflective group discussions performed with participants during each workshop, as well as on preparatory and reflective meetings between the delivery team before and after each workshop. These notes provided the necessary insight behind each method deployed within the intervention and how they were received. In CS3, a similar process of group discussions with the designers and participants were performed both before and after each Experience Lab, however these were purely focused on producing the actor-network mapping technique developed through CS1 and CS2, as no ANT account was required at this stage. The written observation notes were transcribed into digital documents, allowing for expansion and refinement of descriptions based on the author's experience of the work observed where necessary. In CS1, this early iteration of the ANT account would then be expanded upon further following the interviews with each participant to ultimately describe the story of the project. While the whole interviews would be

transcribed word-for-word, only select passages or terms would be inserted into the ANT account until a full account would be achieved. In CS2, these early iterations of the ANT account needed only minor editing following discussions with the delivery team as they were already quite extensive.

ANT within the Methodological Model

The descriptive textual account produced through an ANT approach does not, on its own, satisfy this inquiry of design things, for the text in ANT is 'not a nice story,' but 'the functional equivalent of a laboratory… a place for trials, experiments, and simulations' (Latour 2005a, 149). The analogy of the laboratory is suitable for cases of disciplined social sciences towards hypothesis and theory, but for design research there is a question and a need to demonstrate the value of such an approach in practice. So this thesis has proposed to translate the textual description from an ANT account into a visual and participatory mapping technique based upon the disciplined representation of networks informed by ANT.

The purpose of developing a visual mapping technique in this way is to move representations of the actor-network from the textual analogy of the laboratory, looking to observe and test what is happening, to the more visual and experiential analogy of the studio, looking to explore what could be made to happen. This approach points towards the descriptive account of the actor-network being much more of a *performative* process. As Loxley describes, citing de Man's argument, 'the performance a text undertakes is not single or simple, but restless and multiple. The text is therefore best imagined […] as a kind of endless work [that] performs the interference between these different aspects of textuality' (Loxley, 2007:97). While a text has the capacity to produce a repeatable effect, such as the terms of a contract or individual laws that can be accepted similarly by multiple actors, a text is also susceptible to multiple perspectives in its interpretation. Perspectives that 'are incompatible, and one cannot be reduced into the other; yet there would not be what we call text or language without both of them' (Loxley, 2007:97). This notion of multiple perspectives is seen to open out a text as 'an exploding machine […] A machine for exploding, a machine that explodes' (Chase, 1986). The methods of describing and mapping the actor-network around an object of design, or *design situation*, seeks to *explode* such a machine, revealing the multiple perspectives of performative agency within each case.

It is these multiple perspectives that the production of ANT accounts and actor-network maps aims to expose (or explode) that provides an initial mode of analysis on performative agency. In CS1 and CS2, each ANT account is subjected to a process of coding, using NVivo software, to identify the key actors, artefacts, contextual influences and passages of work they have performed in relation to Callon's research frame described earlier. This process of coding forms the groundwork for visually mapping the actor-networks, which shall be expanded upon in the next section. As a mode of analysis, such coding helped identify and articulate some of the key moments of performative agency influenced by design things. Such moments are selected for presentation in the case studies later in this thesis with discussion on how they articulate performative agency and how actor-network mapping captures this agency. It now comes to describe how and why the actor-network maps were developed and deployed within the investigation.

Mapping the Object of Design

In this section, actor-network mapping is presented as the emergent visual method of practice for representing the performative agency of design things, and how this is used to reveal matters of concern around an object of design. The process of constructing actor-network maps is described in relation to each of the three case studies, followed by the principles and challenges informing the framework for selecting visual elements used and how the maps were deployed in reflective analysis. This is followed by explaining how the mapping technique evolved and informed the wider methodological model, drawing on its combination with situational analysis, and how far this represents a method towards tracing how design things influenced the ways of working through organisational discourse.

Making ANT Accounts Visual

Actor-network mapping builds on Binder et al.'s (2011) notion of the *design Thing*. In each case study, the design Thing is the object of design, made manifest by designers through various representations to engage with the design problem, 'constituents of the object of design', or *design artefacts* (Binder et al. 2011, 59). Actor-network mapping attempts to visually situate the design artefacts within the wider actor-network and, therefore, act as a reference mediating dialogue around the object of design between designers and participants. Binder et al. hold that for design artefacts to have value and significance, they have to become part of the living experience of human beings in the way these afford, invite, and oblige interactions. This process is seen to have a 'performative potential' that is sought to maximise the final thing to be delivered (Binder et al. 2011, 128). So for them, the context of the design dialogue with participants is just as important as the design artefacts themselves, but it is their setting, the way design artefacts and the design scenario are co-constructed, that distinguishes such an approach. This is a major part of where actor-network mapping seeks to contribute methodologically. For the purposes of clear communication in this investigation, and in recognition of the more intangible nature of design-led innovation, design artefacts are here-on-in referred to as *design things* within a *design situation*. This is due to the explicit reference to design things in the actor-network mapping technique presented, which was considered a clearer contrast to the reference of wider non-human actants as things. It should be noted that design things are not exclusively brought about by designers, they are often co-constructed with participants and collaborators in the design situation.

Firstly, a brief, overall description is provided of how the actor-network mapping technique was developed and tested at progressively increasing levels of collaboration. In CS1, the actor-network maps were directly translated from the descriptive textual accounts of ANT following a process of coding, as described in the previous section. This was developed solely by the author, without any influence from participants, as an initial visual translation of the ANT accounts. In CS2, the actor-network maps were similarly developed as translations from the descriptive textual accounts of ANT, however this time the designers leading the intervention co-determined what design things would be mapped. These maps would then facilitate an overlay of situational analysis, reflecting on the influence of these design things to the wider actor-network, described in the next section. In CS3, a dedicated visual mapping of the network was co-produced with participants in a studio setting, bypassing the production of full ANT accounts. This allowed reflective discussion to be facilitated with participants live during the project and provided insights on how such an approach influences and contributes to the performance of design work.

Translating an ANT account into a visual mapping technique is no simple task, especially in the participatory context pursued within this thesis, so a framework was adopted for generating reflexive accounts on the purposes of actor-network mapping and reflective accounts on the effectiveness of the design elements. Capturing and representing many layers of complexity in a network that is never stationary is dependent on the access to data that can be obtained. Lima (2011) provides exemplary insight into the perils and potential of *network visualisation* as a growing discipline of study and design practice that is 'able to translate structural complexity into perceptible visual insights aimed at clearer understanding' (Lima, 2011:79). Following an on-going programme collecting multiple projects attempting to visualise complexity online, Lima summarises a series of purposes and principles behind network visualisation that have come to influence the development of the actor-network mapping in this thesis.

The basic structure for creating any visualisation of a network is commonly 'through a set of vertices (nodes) connected by edges (links)' (Lima, 2011:79). So, equally, the fundamental structure employed for actor-network mapping in this thesis is based on drawing actors/actants (nodes) and associations (links). While this may appear relatively simple, 'network visualization extends beyond mere geometric construct'. The multiple layers of information that could saturate every node and every link means 'employing elementary design principles aimed at an efficient and comprehensive representation of the targeted system' (Lima, 2011:79). Lima lists five possible scenarios for understanding the purposes behind visualising a network: *document*, mapping a system that has never been depicted before; *clarify*, make the system more understandable; *reveal*, find hidden patterns or new insights into a system; *expand*, serve as a vehicle for other uses and set the stage for further exploration; and *abstract*, depicting a variety of intangible concepts that might not even rely on an existing data set (Lima, 2011:81-82). None of these general purposes can easily be eliminated from the purposes of performing actor-network mapping in this thesis. Instead, the purpose of actor-network mapping needed to be allowed to emerge from the dialogue and reactions around the mapping. Reflective accounts on the visual mapping from the author, alongside those captured from participants as interpreters, were generated alongside these lines of purpose and presented within each case study.

Certain design principles needed to be in place, firstly, to ensure the mapping technique pursued is a recognisable translation of an ANT account, and secondly, that the visual mapping itself is intelligible for multiple participants to engage with it quickly. Lima provides a detail overview of the eight key principles to consider in visualising complexity, essentially as a set of instructions: (1) start with a question, (2) look for relevancy, (3) enable multi-variant analysis, (4) embrace time, (5) enrich your vocabulary, (6) expose grouping, (7) maximise scaling and (8) manage intricacy (Lima, 2011:82-91). These principles, together with Callon's earlier referenced research frame for assembling actor-networks, formed the necessary framework for producing the maps. They informed prioritisation of what types and forms of information were to be represented, as well as reflective accounts from the author as designer, on the visualisations created and how well they perform for each of the principles. The reflective accounts from the author then also become data for comparative analysis with grounded theory, presented in the fourth section of the methodology, *Change through Design Things*.

Constructing Actor-Network Maps

The above principles and framework resulted in a mapping structure and key of visual symbols that proved fairly consistent across the three case studies. In CS1, an initial structure was developed upon which actor-networks would be mapped and an initial key of chosen visual elements selected to represent the actor-network mapping framework. The structure is based upon a timeline separated into individual maps of the key stages or events in the development of the project. Selection of each stage mapped was based on the intensity of activity observed by the researcher, or described by the participants. This timeline is represented by a bold grey horizontal line along the base of each individual map with a central grey circle, to designate the stage identified, and concentric, evenly distributed, semi-circular, grey lines (see fig. 3B). These lines also provide a notional timeline from left to right distinguishing earlier work performed from later work performed for each stage individually mapped. The concentric lines provide degrees of separation by which to order the identified actors and actants with high participation internal to the actor-network, to those with low participation external to the actor-network.

The key of visual elements (see fig. 3C) is translated from Callon's research framework for ANT. The actors and actants present within each actor-network were designated into four types represented as varying shaped white 'nodes' with black outlines: *Actors*, a circle with blue type; *Things*, a rounded square with pink type; *Design Things*, a five-pointed star with purple type; and *Places/Events*, a house-shaped pentagon with green type. The selection of these four categories of actants was deemed the simplest possible designation without creating too many sub-categories, while retaining the focus of inquiry on design things. The blank shapes were intentionally chosen as potentially allowing illustration of the representative actant in later, live iterations. *Actors* represent any human individuals, discernable groups or organisations. *Things* would represent any non-human artefact, document, tool, entity or recognised group thereof. *Design Things* would represent any non-human artefact, tool, visual representation or recognised output thereof that directly resulted from design work. *Places* would represent any recognised space, interior, building, event, meeting or site where work was identified to have taken place.

Fig. 3B, *Initial actor-network mapping structure*, (Johnson, 2016)

The associations between actors and actants mapped translate Callon's four step research frame for assembling actor-networks discussed in the previous section: *interessement*, *enrollment*, *points of passage* and *trial of strength*. The first two steps are drawn as organic, curved lines connecting the relevant actants. Interest (translated from *interessement* for clarity), represents work that is deemed to have made actants interested in joining an actor-network; initially drawn as a black, dashed line. Enrolment (translated from the French spelling for clarity), represents when actants are *inscribed* a role within the network; drawn with a black, solid line. The third step, points of passage, represents the actants who assign roles or act as spokesperson for other actants in the network; drawn by filling the actant with the associated colour and boldly outlining in black. As the research frame associates points of passage with inscribing roles, any actant inscribing a role to another actant has a small black triangle pointing from the relevant point of passage along the associated enrolment link. The fourth step, trial of strength, represents moments when roles assigned to particular actants undergo a challenge in adopting such a role; drawn as a yellow triangle in place of the black triangle of inscription, pointing back along the associated enrolment link. The research frame also associates the enrolment of actants with *translating* roles into the network, so any actant deemed to have been translated into the network has a small red triangle pointing from the relevant actant along the associated enrolment link.

How the actor-network mapping technique manifested and developed from the first case study to the last is presented in each respective case study chapter. However, it is necessary to expand on the highlighting of *inscription* and *translation* through coloured triangles as part of the visual frame for assembling actor-networks. In the previous section, they represented the performative indicators within ANT; those moments that traced the moments of agency in the work performed. Referred to as translations or inscriptions, they are abstract concepts to bring into a collaborative or multi-disciplinary context, as the actor-network mapping aims to do. As a result, these became key factors of interest to mediate reflective discussion with participants and left open to interpretation to reveal how, or whether, design work articulated such moments. This facilitated the adaptation of situational analysis as a visually co-produced, interpretative overlay onto the actor-network maps, which is presented in the next section.

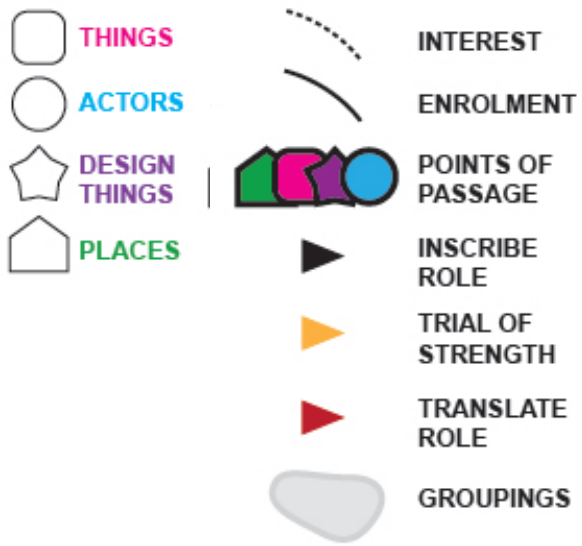


Fig. 3C, *Initial actor-network mapping key of elements*, (Johnson, 2016)

Re-Interpreting the Design Situation

In this section, situational analysis is presented as a visual method applied over the actor-network maps as an interpretative overlay, and used to facilitate participants' reflective and reflexive interpretations of the role of design things. Situational analysis is then presented as a supportive method towards grounded theory analysis, shifting the methodology from *representing* the performative agency of design things, to *interpreting* the matters of concern revealed within the design situation. The methods of performing an interpretative overlay on the actor-network maps are described in relation to CS2 and CS3. Finally, the mode of analysis explored through situational analysis is described in relation to the methods of grounded theory analysis.

Situational Mapping as Interpretative Overlay

Adele Clarke (2005) presents situational analysis as a method to push grounded theory around the postmodern turn, following the progress in recent decades in studies of difference (feminism, post-colonialism, queer theory, multiculturalism etc.) asserted through 'innovative approaches examining knowledge production' (Clarke, 2005:xxv). Clarke suggests these have 'challenged the kinds of knowledges and discourses circulating about differently situated people, things, and positions of great power, legitimacy, and/or authority.' As such, they have initiated an 'appreciation of the complexities and heterogeneities of our individual and collective situations, discourses, and [...] our knowledge production – our interpretations of those situations' (Clarke, 2005:xxv). In order to facilitate this, Clarke is committed to 'situating interpretation' by taking the analytical focus beyond "the knowing subject" and integrating aspects of Foucauldian discourse analysis (Clarke, 2005:xxx). This approach of trying to account for the various sites of discourse present in a situation is the layer of detail this thesis believes is not only missing from a dedicated ANT approach, but is the layer of insight that can help explicate the matters of concern around design things as sites of discourse.

Clarke presents different methods of mapping, the initial form of which this thesis has chosen to pursue being *situational maps*. Situational maps 'lay out the major human, non-human, discursive, and other elements in the research situation of inquiry and provoke analysis of relations among them' (Clarke, 2005:xxii). In Clarke's method of situational mapping, the questions are: 'Who and what are in this situation? Who and what matters in this situation? What elements "make a difference" in this situation?' (Clarke, 2005:86). This map initially takes the form of categories of elements being written and spread out over a large, blank space with no prior structure, but a practical spacing out of the elements ready for drawing relations between them. Of particular note is the contemplation of what elements facilitate or hinder access within the situation and representing these on the map (Clarke, 2005:87). These are questions of interpretation calling on the researcher's (or participant's) experience observing (or participating) in the situation of inquiry. These are recognised as important lines of inquiry towards identifying matters of concern, so were included within a process of relational analysis. To perform relational analysis in situational maps, Clarke suggests the analyst 'literally centre on one element and draw lines between it and others and *specify the nature of the relationship by describing the nature of that line*' (Clarke, 2005:102). This is performed systematically, one element at a time, using copies of the most complete situational map for each element undergoing relational analysis.

The actor-network maps presented above already extensively lay out the major human and non-human elements in the research situation as actants, and aspects of the cultural and discursive elements through articulating the associations between them. This thesis saw an opportunity to position actor-network maps as an expression of situational maps over which to draw the interpreted relations between selected design things that 'make a difference" in the design situation. The distinctive contrast situational maps have with actor-network maps is that there is already a structure and already a series of drawn relations between the actants; these relations being the traceable associations ascribed through ANT. Rather than being problematic for the relational analysis, this is argued to provide an essential contrast as part of informing a reflexive, object-oriented discourse. An actor-network map does not explicitly represent the cultural stuff that may matter, it does represent the work performed by design things within the situation. It is the design things, as the focus of this inquiry, over which the process of relational analysis aims to articulate such cultural stuff; expressed in this section as an *interpretative overlay*.

An alternative approach that was considered was interpretative phenomenological analysis (IPA) (Smith, Flowers and Larkin, 2009), which is an approach to qualitative analysis with a particularly psychological interest in how people make sense of their experience (Larkin and Thompson, 2012). IPA sets out similar requirements to collect detailed, reflective, first-person accounts from research participants, but was developed to investigate mental health issues, and did not translate as well to the actor-network maps around design things that were developed. The visual method of mapping intrinsic to situational analysis proved highly flexible within the case studies, while any in-depth questioning of participants is necessarily compromised.

Performing Interpretative Overlays

The performance of the interpretative overlays varied in the context and format they were delivered for each of CS2 and CS3, so the detail behind the approaches taken in each case is described here with explanations behind the choices taken. In CS2, the initial aim was to introduce actor-network maps drawn up by the researcher, from about halfway through the intervention, into each meeting with the delivery team reflecting on each workshop. This would have provided reflective discussions, facilitated through the interpretative overlays, on the last four workshops with each workshop fresh in the minds of the delivery team.

As explained in *Case Study Method*, the development of the actor-network mapping technique was delayed in its development due to delays in CS1. As a result, the choice was made for the entire CS2 intervention of nine workshops to be mapped by the researcher at the end of data collection. The actor-network maps were then printed in A3 format and used to facilitate reflective discussions on the entire intervention, with each of the three participants of the delivery team, on an individual basis. One by one, the actor-network maps of each workshop were presented by the researcher, supported by digital images capturing the activities and artefacts in each workshop, to assert the represented flow of work observed with the participant. For each workshop, selected design things would then undergo relational analysis by the participant to produce interpretative overlays on sheets of translucent A3 sketch paper placed over each actor-network map, with the map still largely visible underneath (see fig. 3D). Firstly, the selected design thing is circled in yellow. Then, every other actant that the participant felt mattered in relation to this design thing was also circled in yellow. Lines were then drawn from the design thing to each additionally circled actant in grey pen, representing the relation. Finally, on each relation, small blue circles were drawn by each additional actant to annotate the participant's interpretation of that relation. This would all be supported by the author as researcher asking questions on each relation: Why it mattered? What emerged at this point? What changed at this point? How well the design thing worked in each relation? This continued until every actor-network map of each workshop had undergone an interpretative overlay for each selected design thing. The discussions were audio recorded and transcribed according to the structure of each relation drawn by the participant on each workshop, ready for further grounded theory analysis.

In CS3, the actor-network maps of each experience lab session were co-produced with the designers and relevant participants. This was done on a scale of A0, pre-printed with the actor-network map structure and key, with circular cards pre-printed with the selection of shapes representing the various actants, and marker pens for labelling each actant and drawing in the links of association. For the interpretative overlay, each layer was constructed using large, translucent, white, satin sheets onto which each element could be drawn using fabric pens.

Similarly to CS2, selected design things were reflectively analysed in each interpretative overlay. The actor-network mapping and subsequent interpretative overlays were audio, and in one case video, recorded to capture the process and discussions. These were transcribed according to the structure of each relation drawn by the participant on each workshop, ready for further grounded theory analysis.

In each case study, a further method from situational analysis is applied to more explicitly address the context of this inquiry, organisational discourse. The relational analysis performed within the interpretative overlays only hints or suggests at the positions taken by each participant in the design situation. So, a final aspect of situational analysis applied in each case is positional mapping. According to Clarke, 'positional maps lay out most of the major positions *taken in the data* on major discursive issues therein – topics of focus, concern, and often but not always contestation' (Clarke, 2005:126). It is by applying positional maps to the situations explored that the matters of concern for the participants come into greater focus. It is also the method by which evidence of change within the positions taken by participants can be analysed through grounded theory. The goal in positional mapping is to represent the positions taken in the discourse in a more democratic representation (Clarke, 2005:126). This means 'moving with Foucault beyond "the knowing subject"' and creating an important 'space between', allowing us to articulate doubts and complexities where things had appeared unnaturally pat, sure and simple (Clarke, 2005:127); matters of concern instead of matters of fact. The positional maps for each case study were performed at the end of all the case studies as part of axial coding in grounded theory analysis. This followed a series of iterations, weaving back and forth with the data sets, to better refine the issues, axes and positions until a best representation is achieved.

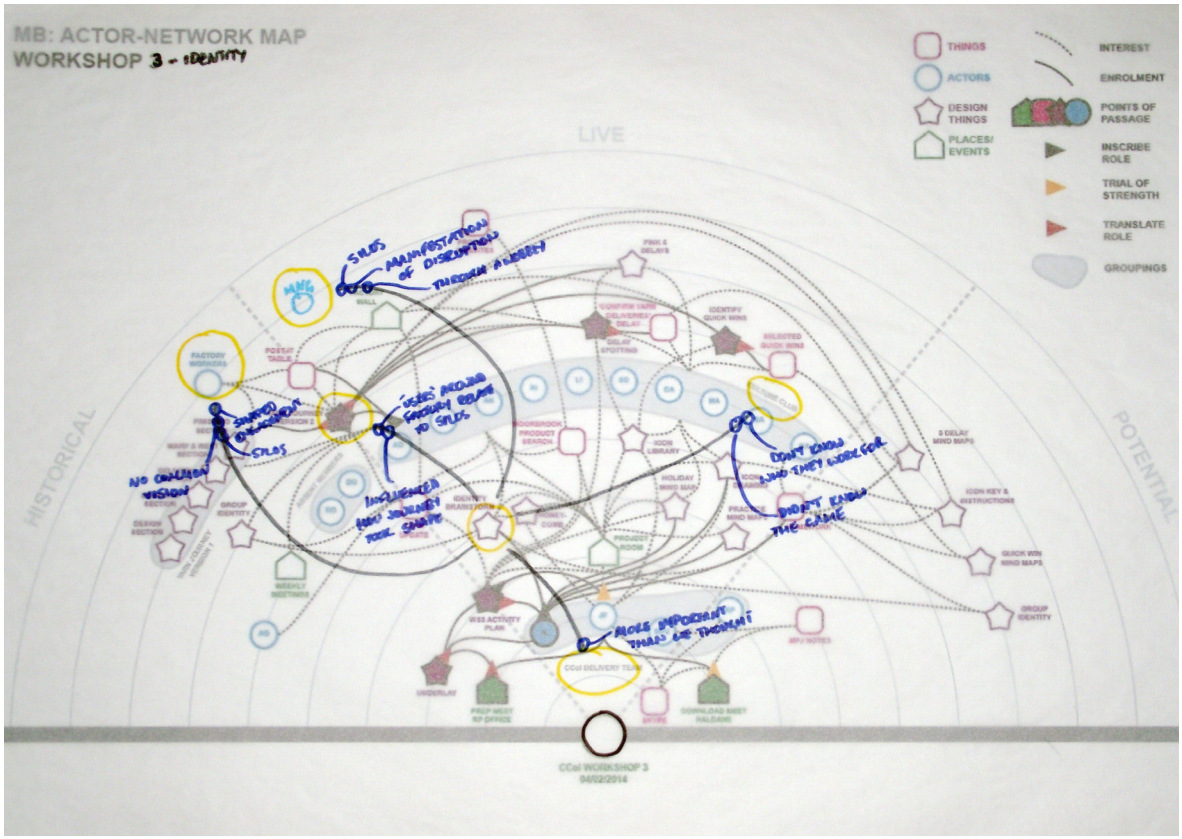


Fig. 3D, *Interpretative Overlay from Case Study 2*, (Johnson, 2016)

Change through Design Things

In this section, grounded theory methods are presented as providing the mode of analysis across all three case studies to address the over-arching investigation of actor-network theory supporting a reflexive discourse in design-led innovation. An argument for using grounded theory is made, before describing the process of performing and coding the interviews and discussions within all three case studies. This is followed by describing the identification of core categories emergent from the grounded theory analysis and how, for each case study, these are grounded in a constant comparison with the ANT accounts, actor-network mapping and situational analysis. The section concludes with how interpretations of matters of concern, through actor-network mapping and situational analysis, are captured within the grounded theory analysis towards sampling theory, framing design as a performative act.

Grounded Theory as Mode of Analysis

Grounded theory is adopted as a mode of analysis for this inquiry, partly due to its appropriateness for developing practice-based design theory, and partly due to the variable data sets resultant from aligning with an immersive, work-intensive approach such as ANT. The variable data sets involved in the observation of actor-networks and situational analysis would have been very difficult to generate into theory any other way, particularly as the analysis is applied across materials specific to each case study. A third key reason is how grounded theory positions itself so completely to understanding the very purpose of this investigation. A grounded theory study has relevance 'when you offer an incisive analytic framework that intersects what is happening and makes relationships between implicit processes and structures visible' (Charmaz, 2006:54). In this case, laying out a pathway for identifying matters of concern in the structures, relationships and positions expressed through ANT and situational analysis. Charmaz also identifies the context of this inquiry, organisational discourse, as being a key target for grounded theory analysis and associates this approach as crossing the performative divide, where 'both organizational rhetoric and reports may pale in the face of observed worlds.' (Charmaz, 2006:38)

Clarke regards grounded theory as intrinsically linked with symbolic interactionism, 'a theory/methods package' that 'focuses on the integral aspects of ontology, epistemology, and practice as these are co-constitutive' (Clarke, 2005:4). For Clarke, grounded theory is 'one method among many of "performing" interactionism' asserting Jenks' (1995:12) position that 'method, then, is not the servant of theory: method actually grounds theory'. This concept of a theory/methods package is what has come to shape the methodological model for this thesis. Exploring the integration of methods from ANT and situational analysis in practice made grounded theory an essential mode of analysis for bringing them coherently together.

Glaser (2012) and Goulding (2005) provide the core structure of grounded theory methods this thesis has undertaken. From the beginning of data collection, the researcher 'starts open coding leading to conceptualizing his/her data using the constant comparative method' (Glaser, 2012:2). Texts 'are analysed line by line, provisional themes noted, and subsequently compared with other [documents] in order to ensure consistency and to identify negative cases' (Goulding, 2005:297). The coding of transcripts was performed using NVivo, a computer software programme designed for the purposes of qualitative data coding and analysis. From this initial open coding *core categories* are discovered, which for the purposes of this thesis was applied to reveal categories related to the performative agency of design things as the focus of inquiry. Once such core categories are identified 'the selective coding starts theoretical sampling for more data to see if the core category works' (Glaser, 2012:2).

This would be repeated across various key documents and accounts of work performed to test the workings of the core categories. When there is demonstrable evidence of core categories, 'one writes memos on the workings and relevance of the emerging concepts' until there is 'theoretical saturation of categories.' Once a sufficient number of concepts about the core category develop, 'usually four to six sub concepts,' theoretical completeness can be claimed and 'in the emerging analysis of the concept memos… [analyses] get more mature and formulated in their concept integration' (Glaser, 2012:2). This represents a rigorous and pragmatic process of orientating complex data, allowing for theories to be developed and explored in the field of study. A saturation of core categories cannot be claimed to have occurred in this thesis, however, as the changing context of design-led innovation across each case study could not allow satisfactory testing of categories in the field. Instead, they are gathered as an initial sampling of theory to inform a reflexive framework to articulate matters of concern, which is presented in the analysis chapter of this thesis, *Design Things as Matters of Concern*, and was presented in the exhibition submission of practice. Any further testing in the field would be projected as part of future research.

At the same time as collecting observational data towards assembling ANT accounts in CS1 and CS2, or actor-network maps in CS3, the author also performed semi-structured interviews with key participants in CS1, and reflective discussions with participants in CS2 and CS3. The disciplinary practices observed within the ANT accounts and performative assessment made through the first two stages of the methodological model informed a line of questioning with participants during each case study. These focused on the emergent design things that were delivered during each case, their experience of working with them and the impact they felt in their way of working; as well as the impact they observed within the design situation. As described by McCracken (1988), any qualitative interview 'requires the investigator to treat the respondent's new and strange propositions as if they were simply and utterly true', letting these ideas 'live inside his or her own mind as if they were the most natural of assumptions' (McCracken 1988, 20).

It is in relation to these personal accounts that the thesis sought to draw a theoretical framework of *relevance* for design things as matters of concern. Seeking for design things and the object of design to reflexively articulate the design situation within organisational discourse; bringing design things to bear on the matters of concern that have been identified. As Kozel (2007) argues in her pursuit of phenomenology, 'effective phenomenologies open paths between hitherto unprecedented combinations of practice and theory' (Kozel 2007:55) citing that due to increasing changes in the world, 'notions of relevance, necessity, the point of something become more important… than the notion of truth' (Kozel, 2007:15). While this thesis recognises that grounded theory is predicated on phenomenology, it cannot claim to be committed to this form of inquiry. It is not through the construction of 'lifeworlds' that the phenomenon is being investigated. It is through an object-oriented approach, combined with situational analysis that necessarily leans on phenomenological lines of inquiry, with which this thesis aims to achieve similar effects to those described by Kozel. As a result, it should be stressed that this thesis does not represent a definitive grounded theory analysis, where the researcher may return to the field of context to explore, validate or saturate emerging categories. Each case study underwent and informed different stages of the analysis, sequentially and iteratively performed alongside the sequential and iterative nature of the developing method of actor-network mapping.

Performing the Analysis

In CS1, the focus for data collection was on producing the ANT accounts. As a result, grounded theory analysis only started at the end of data collection, once all the interviews were performed, the ANT accounts were produced and everything transcribed ready for analysis. The reason for starting grounded theory analysis at this later point was due to limited access and the unpredictable nature of how the projects followed would progress. However, the analysis of CS1 went as far as complete open coding, creating early descriptive categories that underwent constant comparison with all available data from this case. This led to a second iteration of coding, breaking down initial descriptive categories into an extensive array of descriptive sub-categories. These would provide the foundation of categories to inform analysis of CS2.

In CS2, while the focus was still on producing ANT accounts, there were continuous and rich reflective discussions occurring with participants and between the designers. As a result, open coding was able to begin on the workshop accounts as they occurred, however this was limited by the fact CS1 overran in timescale. The original intention was for the grounded theory analysis of CS1 to provide comparative reference towards more selective coding within the analysis of CS2. Initial iterations of grounded theory analysis for CS2, therefore, were deemed to be under-developed and caused stagnation of grounded theory analysis until it was performed on CS1. Once descriptive sub-categories were provided from CS1, selective coding was performed on the transcribed interpretative overlay mapping sessions. The descriptive categories from CS1 became scrutinised and refined alongside analysis of the data sets from CS2. This ultimately led to the subsumption of descriptive categories into a series of core categories representing the identified matters of concern. This was also assisted by constant comparison, reviewing the actor-network maps and interpretative overlays from both CS1 and CS2, as well as positional mapping to explicate the discursive positions in each case study.

In CS3, the focus was on co-producing the actor-network maps, and subsequent interpretative overlays, with the designers and willing participants. This co-production facilitated discussions on the flow of work and role of the design things deployed and their interpreted relations within the wider situation. The discussions were audio recorded for transcription alongside photography of the map production for grounded theory analysis. As with the previous two case studies, this followed a coding process, but this time there was opportunity to consolidate the axial coding of core categories that were identified from the first two case studies to test how well these categories worked. This was also assisted by positional mapping to help saturate as far as possible the relation between design things and organisational discourse.

After axial coding was applied to the core categories, it was observed that the framework applied through actor-network mapping already possessed performative dimensions. Callon's research frame for ANT describing performative agency, and the temporal dimensions of the design situation, applied in CS2 and CS3, of whether work was *historical*, *live* or articulated *potential* activity. In the process of theory sampling, it is argued that this framing of the articulations and discussions from each mapping session strengthened a reflexive interpretation of matters of concern. As a result, the author chose to develop this framework into a tool for interpreting the matters of concern across all three case studies within the final exhibition of actor-network maps, and .

Following this process of framing the design things as matters of concern, the final analysis presented draws on the literature presented in the scope of context, *Design in the Discourse of Change*, and additional material responding to the findings from grounded theory analysis. This discussion section begins to weave theory formation from the findings with the existing literature around performativity and reflexivity to discern how far the process of actor-network mapping and interpretative overlays has indeed supported reflexive discourse, or its potential to do so.

Methodology Summary

This methodological chapter of the thesis presented the methods used to represent the performative agency of design things, and their translation as matters of concern, towards supporting a reflexive discourse for design-led innovation. The chapter re-introduced the methodological model, taking a cyclical form through four sections: *Articulating Design Performance, Mapping the Object of Design, Re-interpreting the Design Situation* and *Change through Design Artefacts*. The chapter then followed these four sections in detail to describe the methods deployed and lay out the arguments for the methodological approach taken. The case study method and chosen cases were presented as the suitable structure for researching the context and phenomenon of inquiry. The first section, *Articulating Design Performance*, expanded on the purpose of using an actor-network theory approach to describe and assess the work performed in a design-led engagement for innovative ways of working. The second section, *Mapping the Object of Design*, provided accounts of the method of actor-network mapping as it evolved during the investigation. The third section, *Re-interpreting the Design Situation*, described how aspects of situational analysis were deployed to produce visual, interpretative overlays of the relationships between key design things and elements within the wider actor-networks mapped. The fourth section, *Change through Design Things*, described how grounded theory was applied as a mode of analysis across all three case studies, grounded in an object-oriented approach through a constant comparison with the ANT accounts and actor-network mapping, shaping the theory towards design as a performative act. Having provided an account of the methodological approach taken across the three case studies, the thesis shall now present these three case studies in sequence.

CASE STUDY ONE
NEW NETWORKS WITH DESIGN

chapter 4

This chapter presents the first of three case studies explored in this thesis, New Networks with Design. This case initiated the thesis investigation by exploring the question of how an actor-network theory (ANT) articulation of design things can be translated as a visual, object-oriented representation (actor-network mapping). The previous methodology chapter introduced the reasons for its selection, the background context of the chosen project in this case study, and a description of the methods deployed following the thesis methodological model. This chapter presents the outputs and insights delivered from these methods and the key findings that shaped actor-network mapping as a method to represent the performative agency of design things.

The chapter begins by expanding on the design decisions taken towards actor-network mapping from the introduction presented in the methodology section, *Mapping the Object of Design*.The case study then begins by collating passages from the original ANT accounts focused on how the project progressed, described in relation to the design things and their interaction with the wider situation of human actors and non-human actants. These passages are supported by contextual preludes describing the events leading up to the focus passage, selected images of key events and artefacts, and a brief discussion on the insights provided within an ANT approach. Alongside each passage, the chapter also presents details from the corresponding actor-network maps, translated from the complete ANT accounts of the project. These present notes and reflections on the selected design decisions implemented in constructing the actor-network maps, as well as how they articulate performative agency of design things. Following the project presentation, a brief discussion is presented on the nature of matters of concern that emerged in the case and how these impacted on the development of the methodological model.

Know Sugar: Actor-Network Theory Accounts

The following accounts trace the key stages in the development of Know Sugar, from their group formation and ideation, to the project delivering an initial live prototype. The project is referred to variably as No Sugar Shop, Lo Sugar Shop and, finally, Know Sugar to reflect the name change that occurs during its development. The following table provides a reference of participants working within the project. Names have been altered to protect their identities.

Participant Names	Background
Lisa	Service Designer and co-director of a service design agency in Glasgow
Aiden	Design Thinker and partner of an design agency in Glasgow, whom also identified as having type 2 diabetes
Edward	Has a background in engineering, runs an innovation development company and later identified his late wife had passed away in part due to diabetes
Eva	Textile design graduate in the process of setting up her own business and identified as having multiple food allergies and intolerances
Susan	Co-director with Lisa's service design agency and enters the project after it was awarded funding
Alice, Nancy & Ashley	Members of a design team brought in to help design and deliver the final prototype.

Table 4a, *CS1 Reference of Participants*

Actor-Network Mapping

The following section provides a descriptive account of the decisions made in translating the full ANT accounts from Know Sugar into a series of actor-network maps. This led to producing nine chronological maps tracing each relative stage of progress (see Appendix A), as interpreted by the author through observations and interviews with participants. The maps were presented in the final exhibition with wider reflections on their application and development.

The aim of translating these accounts into visual maps was to develop a consistent method of representing design things in order to articulate their agency: how they are enrolled into the actor-network, how they influence various actants, and how they are translated into the wider progress of work. A key consideration in designing this technique was to engage participants unfamiliar with ANT through case studies 2 and 3. As a result, judgment centred on making it simple and accessible, while not eroding the complexity of relations an ANT approach seeks to represent.

The structure chosen for the maps is based upon a timeline separated into individual maps of the key stages in the project's development. This timeline is represented by a bold grey horizontal line along the base of each map with a central grey circle to designate the stage identified (fig. 4A). Emanating from this central grey circle are concentric, evenly distributed, semi-circular, grey lines, which provide degrees of separation – from internal, high-levels of participation, to external, low-levels of participation – by which to position the actors and actants to be mapped. They also provide a notional timeline distinguishing earlier activity (to the left) from later activity (to the right) during each stage.

A key was devised to represent each of the key elements in the maps, which was presented in the methodology section, *Mapping the Object of Design*, so shall not be repeated here. However, the method for constructing the associations between actors and actants mapped shall be repeated as based upon Callon's four step research frame for assembling actor-networks (Callon, 1986): *interessement*, *enrollment*, *points of passage* and *trials of strength*. The first two steps are represented as curved lines (links) connecting the relevant actants (nodes). *Associations of interest*, dashed black lines, represented work between actants that either supported or created interest in joining the Know Sugar project. *Associations of enrolment*, bold black lines, represented work between actants that produced a program of action. *Points of passage*, actant icons filled with the associated colour (e.g. design things as a filled purple star) and outlined in bold, denoted any actant that was deemed to have progressed the Know Sugar project within each map. *Trials of strength*, yellow triangles, came to represent a descriptor for lines of enrolment, and extended into two further descriptors of *inscription*, black triangles, and *translation*, red triangles (Kraal, 1997:4). Each descriptor protrudes from each relevant actant along the direction of the relevant enrolment link. This proved a complicated feature to map accurately as each link of enrolment had a potential of multiple layers of interpretation, so the dominant factor was chosen in such occasions.

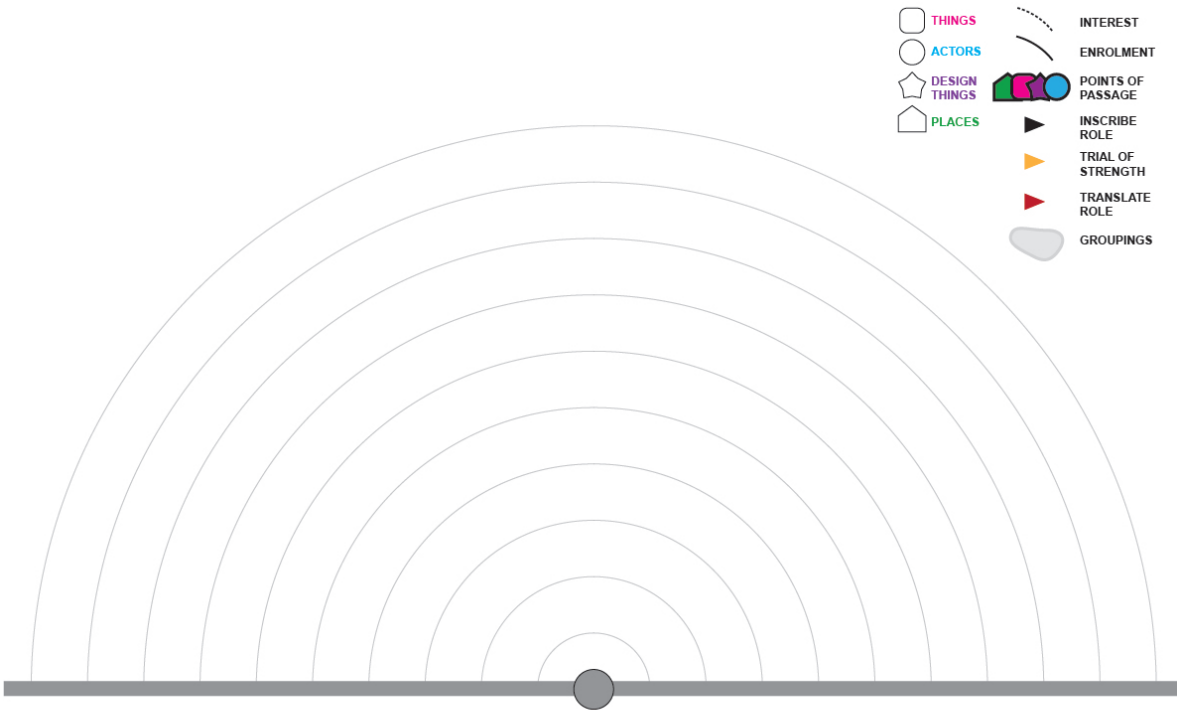


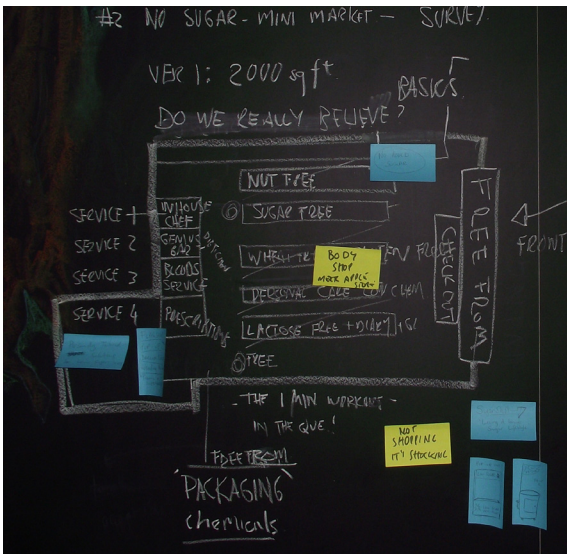
Fig. 4A, *Initial actor-network mapping structure*, (Johnson, 2016)

Chiasma Ideation

Prelude

The Wellbeing Chiasma took place at a boutique hotel in central Glasgow between 26-28 February, 2013. During the first day, design thinking activities (see fig. 4B) delivered by a team of design researchers from DiA explored opportunities addressing type 2 diabetes and culminated in the twenty participants forming groups around five emergent themes. Lisa, Aiden, Edward and Eva formed a group around the theme 'ways to de-stigmatise diabetes'. The group were placed in an individual meeting room with a blackboard wall, whiteboard wall, writing/drawing materials and a series of design/management tools, moving into developing their idea quite swiftly. The author is present as a DiA facilitator/researcher.

Fig. 4B, *Participants at the Wellbeing Chiasma*, (Design in Action, 2013)



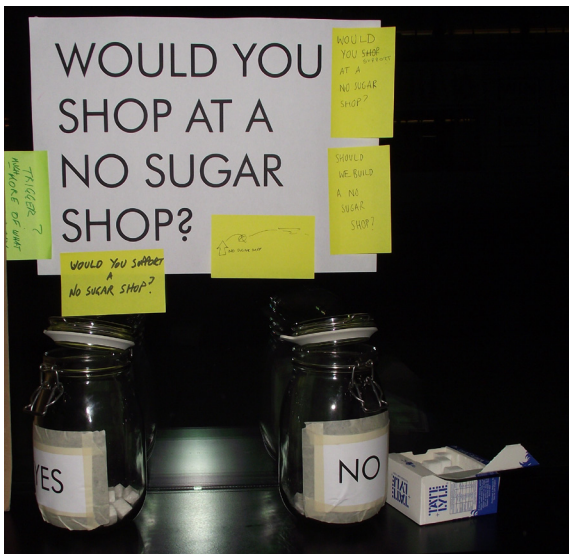


Fig. 4C & 4D, *Idea Formation for Know Sugar at Wellbeing Chiasma*, (Design in Action, 2013)

KS: ACTOR-NETWORK MAP 1
WELLBEING CHIASMA

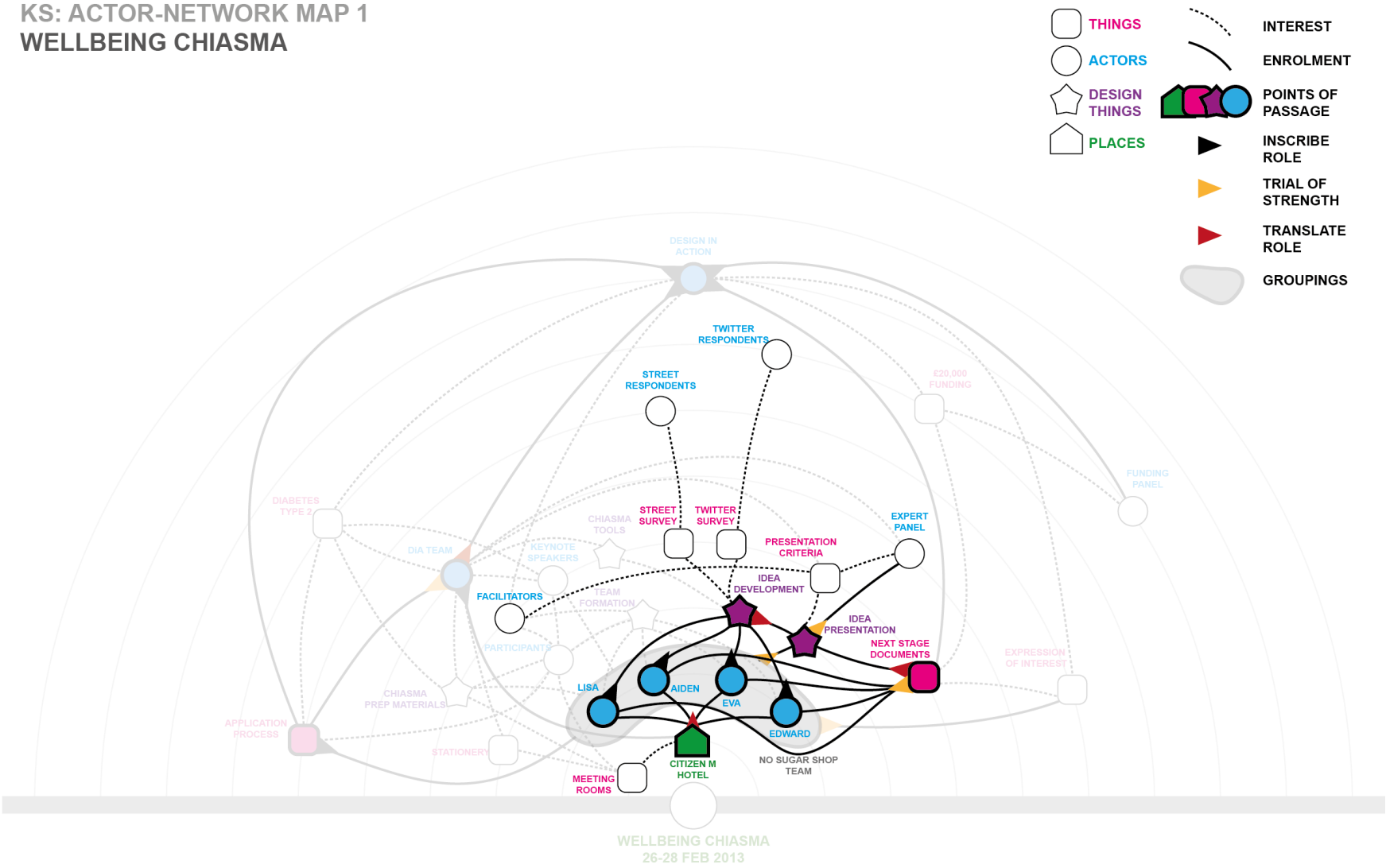


Fig. 4E, *Chiasma ideation: Know Sugar actor-network map* (Johnson, 2016)

Focus ANT Passage

Among the many materials the group produced, discussion and activity centred around a need for clearer identification of food content, and with sugar in particular. On the blackboard wall, they drew a shop floor plan with areas for various dietary requirements, responding to Eva's insights of a lack of clarity in food labelling (see fig. 4C). On this they drew annotations for possible services, a shopping high street and a shop sign, notionally described by Aiden as 'the body shop meets apple store' to associate the type of service it could resemble.

Lisa drove public consultation on their concept by setting up a poll, with Edward, asking members of the public down Buchanan St., Glasgow, whether they would shop in a 'no sugar shop'. Replies took the form of dropping a sugar cube into one of two glass jars with stickers saying 'yes' and 'no' (see fig. 4D). The poll came out 70% yes (20), 30% no (8). The question was also posed on Lisa's twitter account with a series of responses printed on A4 and posted on the window of the office.
The team were given a template by the DiA researchers to outline their idea around 'what success looks like', 'what the team bring to the idea' and 'what they need to make it work'. This informed feedback with the Chiasma facilitators towards developing the concept for presentation. Aiden drew out a Business Model Canvas, which Lisa and Edward were familiar with, on the blackboard to discuss key elements of the business idea throughout. The team all contributed to a matrix on the whiteboard wall, led by Lisa and Aiden, outlining six levels of engagement the business idea could explore with consumers (aware, join, use, leave, grow, advocate), drawing out some of the relevant or potential touch-points at each level. From these visual group methods for developing the idea, the team organised themselves towards preparing aspects of the final presentation. This combined online research and preparing slides using Adobe design programmes that would distil the various representations and discussion into the final presentation to an expert panel.

Lisa led the presentation by asking the audience, 'would you shop at a no sugar shop?' then presenting drawings of a potential shop front and expressing a target market of deprived high streets and community centres. Edward presented the concept as a pop-up shop, with some projected resources and figures that the business might seek, confronting the established labelling of food content and showing supermarkets a better way of doing it. Aiden talked through a business model that might seek to establish it as a franchise that could be set up around the country and a permanent flagship store. Eva introduced the team's appropriateness for the task in professional contexts and experience of the subject matter.

ANT Discussion

The ANT account heavily emphasises the idea development being driven through visual, design-led approaches, which the group consisting of three designers and an entrepreneur/engineer proactively and confidently pursued. The positive street poll and online comments gathered evidence of interest to validate the general concept for their final presentation. The moments of translation can be identified in the account, particularly between the visual group methods in ideation and the final presentation. In such a democratic process of ideation, multiple points of passage emerge towards the construction of No Sugar Shop as an actor-network: from the team members themselves to the concept materials and final presentation. Their assembly is described, made traceable and a potential site for reflection through the actor-network map (see fig. 4E).

Team Session Idea Development

Prelude

Following the Chiasma, the group were successfully awarded funding from DiA to deliver the 'discover' phase of their proposal plan. Lisa is named lead entity with negotiations over terms and conditions delaying the project for five months, April to September 2013, before funding for Phase 1 exploratory research was initiated. A team meeting was arranged in October 2013 at Lisa's design office to refresh and develop the concept again. In this time, each team member had performed varying levels of exploratory research, the name changes to Lo Sugar Shop and becomes a registered limited business, on recommendation from DiA, and Lisa brought an additional member into the project, Susan, who is co-director of their service design agency. They have invited the team members to their office, preparing a meeting room with print outs of their desktop research, templates for personas and ideas, as well as blank paper, post-its and a little food and drink. The author is present as an observer along with another DiA researcher.

Fig. 4F, *Know Sugar Team Session*, (Johnson, 2013)

Fig. 4G, *Know Sugar post-it blueprint*, (Johnson, 2013)

KS: ACTOR-NETWORK MAP 4
TEAM SESSION

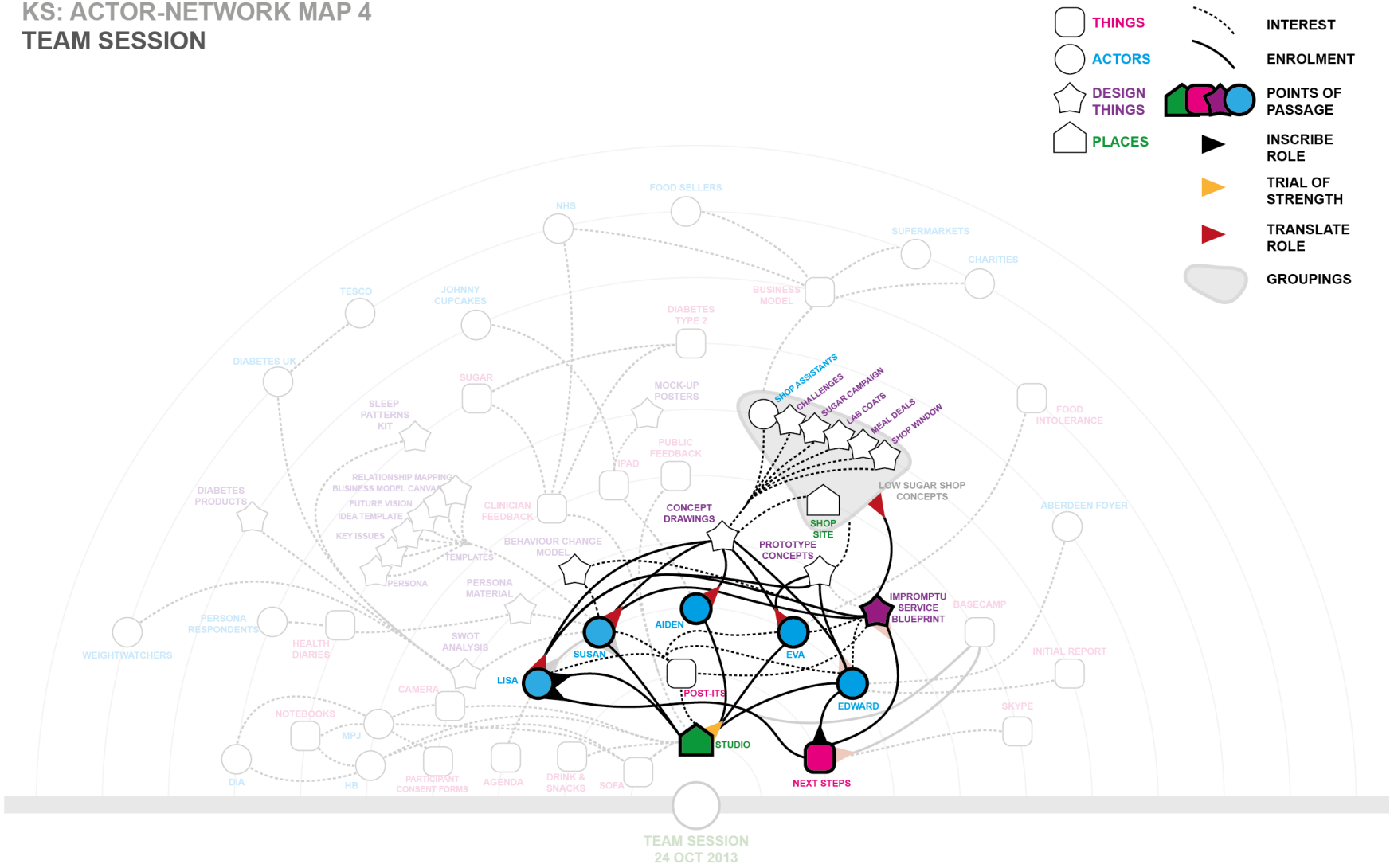


Fig. 4H, *Team Session: Know Sugar actor-network map* (Johnson, 2015)

Focus ANT Passage

In the morning session, Lisa and Susan present some of the 'discover' research they have already performed towards the type 2 diabetes market using material set up on the walls (see fig. 4F). They held focus groups, received public feedback online, built a SWOT analysis, engaged real-life people to build personas, developed early concepts and spoke to clinicians about the No Sugar Shop concept. This dominates the morning's proceedings, while each element is opened out to team members for feedback and discussion. Eva presents her prepared insights on the concept in relation to her allergies and food sensitivities. Aiden expresses his view on issues encountered in the media on type 2 diabetes, including his own experience and observations from travelling in America and Europe. He leads with the idea of a cause-based campaign that can mean products, services, and wider brand values, then presents an 'ironic' poster on his iPad. Edward responds that they mustn't threaten the position of existing stakeholders, feels the enlightened middle class is too neat a base and the way they will make their pound is on a repeatable model. He refers to the influential actors in relation to diabetes – supermarkets, charities, NHS and the smaller organisations in between – as representing a certain landscape and that they can't go against the tide. Following the morning session, Aiden has to leave due to another engagement.

In the afternoon session, Susan presents a five bar model for breaking down the factors for the concept: awareness, support, understanding, change, and manage. Susan asks all to 'pile-in on post-its' and leads the categorisation for levels of engagement in the concept: level 0, window shopping; level 1, entering the shop; level 2, buying a product; level 3, exhibition or information; and level 4, community and activities. Members are freely building on each others' suggestions for ideas, products and issues that could constitute each level of engagement by noting on multiple post-its. This touches on digital services, organisational partners at each level, the role of shop assistants throughout, moments of reward, how language can be playful and encouraging prototypes with customers at every level. The lay out of post-its from this session takes the form of a matrix reminiscent of a service blueprint, influenced by Susan's five bar model (see fig. 4G). Discussion moves on to how selected ideas within the matrix could be prototyped, with various ideas encouraged to be drawn on A4 sheets and placed on the wall. The team ended with a refined range of questions and design elements to be prototyped and tested, which Edward was asked to summarise in a Phase 1 Report to send to DiA to release the next stage of funding.

ANT Discussion

The ANT account above summarises two very different parts to the session: the morning session, focused on sharing research; and the afternoon session, focused on idea development. Lisa and Susan had advanced the research further than the other team members through a variety of methods that are visually represented in the room. The other team members contribute to discussion, but Lisa and Susan's materials are inscribed with the main role of supporting discussion. By contrast, the templates that were put on the walls were rarely, if at all, used in developing the concept. One particular activity dominated the development of the concept very efficiently, using only post-its and a simple conceptual model to produce an emergent service blueprint (see fig. 4H). A question arises around whether this efficient development could have been folded into the preparation of the session without the extensive work preparing templates. A related point of interest is how much did each member's previous exploratory research support the efficient accumulation of ideas within the post-it activity. These are matters of concern that ANT alone cannot answer satisfactorily, but could be asked reflexively from such ANT accounts.

Phase 2 Development on Basecamp

Prelude

Lisa set up a project space on Basecamp in November 2013, inviting all team members to upload their contributions to the project as they progressed. Edward summarised the exploratory research and concept development into a Phase 1 Report submitted to DiA, releasing funding towards phase 2 of the project plan. Lisa produced a phase 2 task-list on Basecamp towards the development and delivery of an initial shop prototype. During this time, November 2013 to May 2014, the team arranged a series of meetings to continue refining and developing the ideas to prototype. Text documents were uploaded onto Basecamp with meeting notes and web-links to potential partners, articles, reports and existing businesses of interest. Files also began to be uploaded onto Basecamp from members of the project (see fig. 4l). During this period, the name changes from Lo Sugar Shop to Know Sugar. The author was given access to Basecamp and able to view each uploaded contribution and performed interviews with each participant on the work they've done to date.

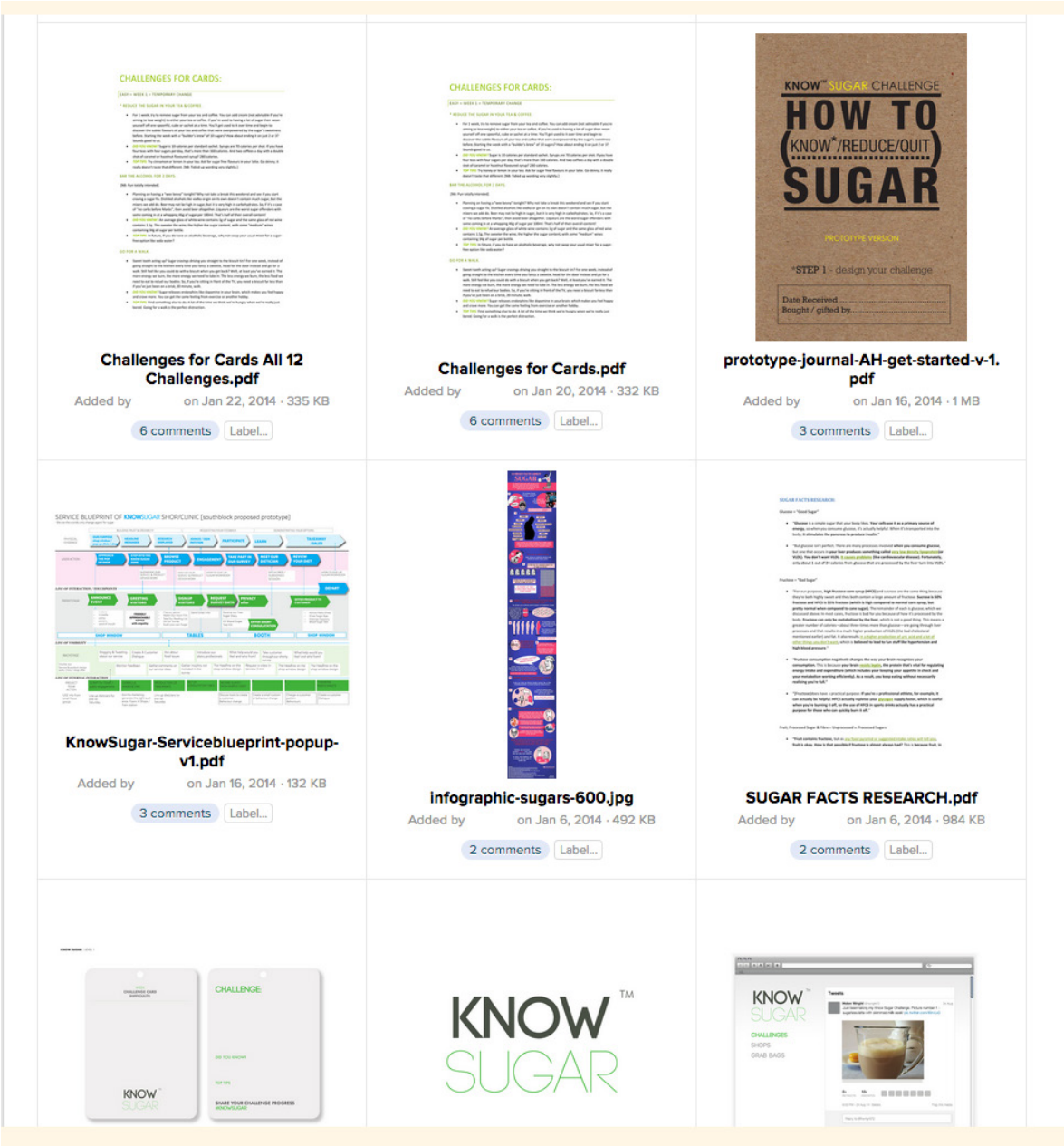


Fig. 4l, *Know Sugar Basecamp files*, (Johnson, 2013)

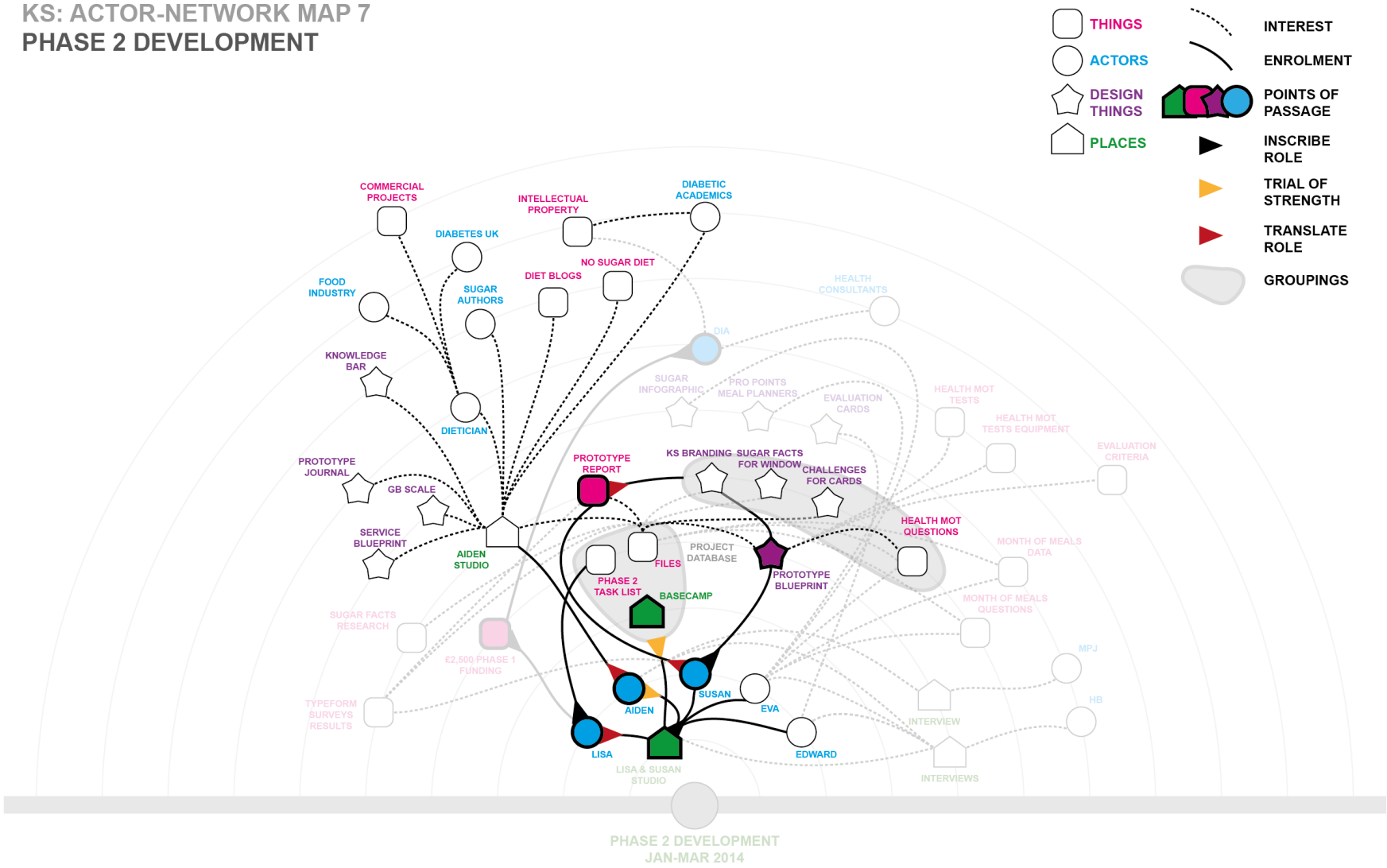


Fig. 4J, *Phase 2 Development: Know Sugar actor-network map* (Johnson, 2016)

Focus ANT Passage

Susan produced a series of files developing a visual brand as a mood board, including a logo of the refined name Know Sugar, and some of the prototypes for feedback. A visual PDF of the final prototypes was uploaded, along with the agreed questions, into a Typeform survey by Lisa and Susan. The survey was sent out to a range of participants including friends and family, online followers and targeted individuals through facebook, Instagram and twitter. Some surveys were performed face-to-face. The results were uploaded as a spread sheet into Basecamp. Eva uploaded info-graphics on sugar information from online sources, a document containing a write-up of multiple challenges and a document on possible sugar facts for display in the shop window. Aiden uploaded his own version of a possible service blueprint for Know Sugar Shop, as well as a prototype journal as a type of handbook on getting started on the Know Sugar Shop journey. Edward uploaded an example of some evaluation cards used on an outside project to inform some of the data capture performed at their prototype. Susan developed the prototype service blueprint as a latest incarnation of Know Sugar Shop from the evidence and data gathered so far.

During his interview, Aiden revealed some of the additional work and interests he had generated aside from the work that was evident through Basecamp. Aiden had produced iterations of a service blueprint and prototype journal, alongside sketches and visual documents representative of a 'knowledge bar', based upon the 'genius bar' that currently exists within the Apple stores. He also revealed a prototype idea that was not yet present within Basecamp he referred to as the Gary Barlow Scale: an empathetic scale of the journey of celebrity, Gary Barlow, in tackling his weight through diets, exercise and family support. Aiden also had a meeting with a dietician and a diabetes expert on the topic of Know Sugar and the wider issues of sugar, public health and behaviours. Finally, he mentioned looking at a variety of diabetes academic's works and questioned whether using their research as part of the message of Know Sugar Shop was also contravening their IP rights. He would reveal some of these details at the next meeting. Lisa and Susan shared frustration in their interview that Aiden had attempted a range of tasks when these tasks were already allocated. Until a shop site could be identified and confirmed at a cost within budget, Lisa and Susan didn't want to commit any more hours from the agency to designing and making the live prototypes.

ANT Discussion

The ANT account for this period of developing the concept describes the progressive nature of multiple layers of information and visual representations being produced and discussed between the whole team and some outside actors. Edward and Eva are very much working to the agenda set by Susan and Lisa as lead entity, but Aiden seems to have translated his role to produce as much material himself. This tells a story of two design agencies operating with similar methods: one trying to perform as lead entity, and the other wanting to claim some ownership by producing concepts himself. In constructing an ANT account, and subsequent map (see fig. 4J) the author recognises the work of the lead entity directly contributing to Know Sugar's business formation and Aiden's contribution holding little traction in the prototype development. At this most basic level, the ANT account attributes each item uploaded to contributing each later iteration or development, and who is behind each development. The detail of how it contributes is left undescribed as this level of detail was not pursued during observation, however this does not preclude such moments of translation being investigated further if recognised reflectively as an important moment to articulate.

Live Prototype Delivery

Prelude

Between April and June 2014, a suitable site for the prototype test is found in a large shopping centre in Dundee, which the manager agrees to provide free of charge. Susan stepped back from the project at this point and Lisa brought in a design team to deliver the prototypes laid out in Susan's service blueprint. Alice is tasked with designing the printed materials and a launch website. Nancy leads the final product and experience design for most of the stations. Ashley is an architect brought in to design the exhibition space and the co-design station for the Know Sugar kitchen prototype. During this time, Aiden focused on impact posters for the space, while Lisa recruited a host of volunteers, alongside Aiden, Edward and Eva, to help set-up and man the prototype shop. The author was present as part of this voluntary team. Lisa sent detailed briefing notes for all the team members explaining each of the stations for the prototype shop, questions to ask and reflect on each station, and sugar related facts to revise for engaging with members of the public.

Fig. 4K, 4L, 4M, 4N, *Know Sugar prototype shop*, (Snook, 2014)

KS: ACTOR-NETWORK MAP 9
PROTOTYPE DELIVERY

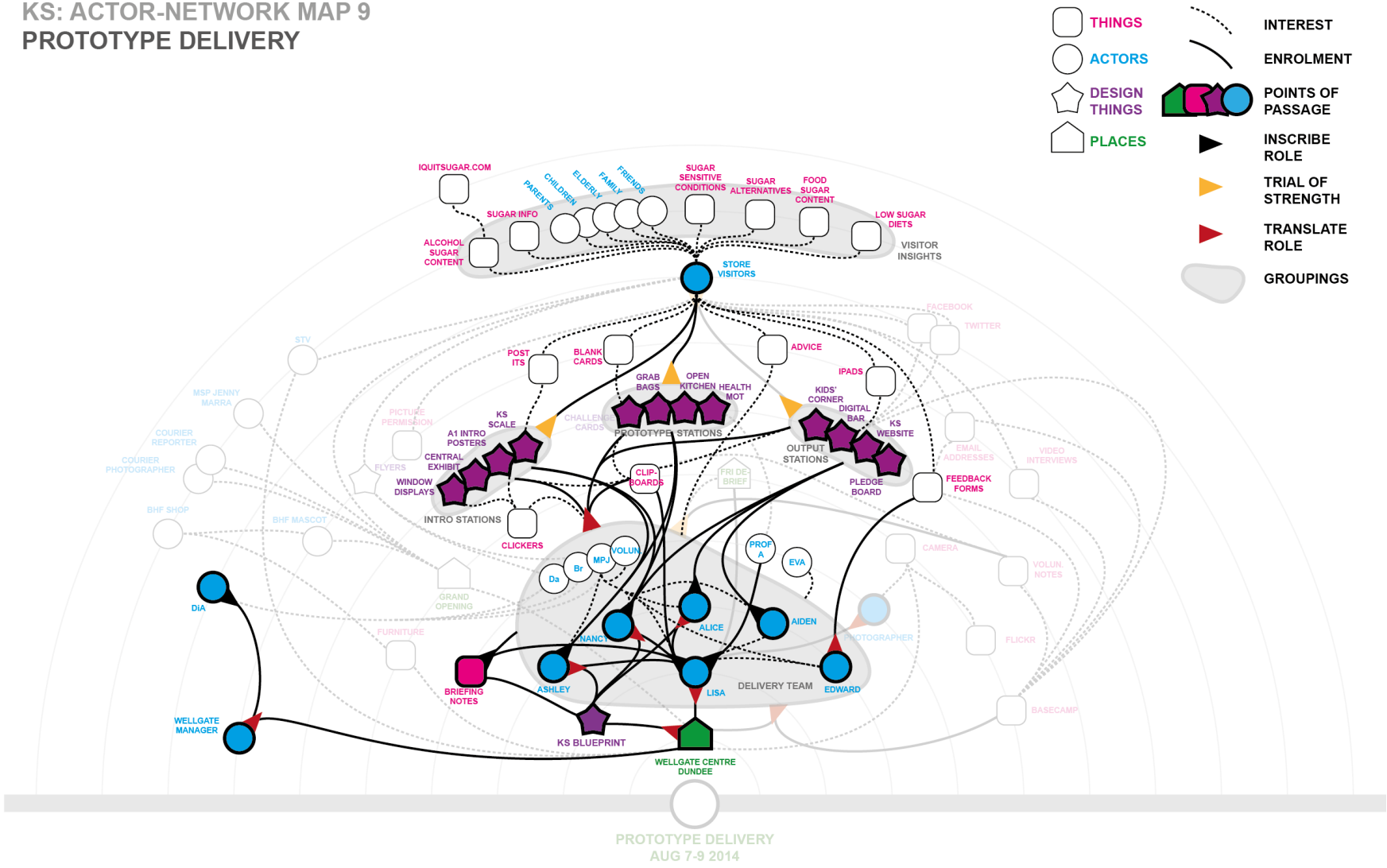


Fig. 40, *Prototype Delivery: Know Sugar actor-network map* (Johnson, 2016)

Focus ANT Passage

Over two days, the delivery team takes visitors through activities and conversations at each station, while recording data on clip boards as they went (see fig. 4K). A volunteer stayed out front with a clicker counting people who engaged with the shock tactic window displays: a mock breakfast table with bowls, jugs and cups full of sugar; and seven bottles of coke hung on string with vinyl stating 'the average UK citizen drinks 4-5 times their recommended weekly allowance of sugar'. A welcomer has a clicker counting those entering the space and passes them over to an introductory message about the project. Next, a Know Sugar Scale asked visitors to place a cut out of themselves on a scale reflecting their awareness of sugar (see fig. 4L). This opened up conversation about what sugar meant to them and how it affects their lives.

The next station included a selection of easy, medium and hard challenge cards towards a low sugar lifestyle (see fig. 4M), intended to reflect a visitors state of awareness, with info on why and how to do it. The product and service concepts follow, including a prototype grab bag alternative to ready meals featuring raw ingredients packaged for specific meals (example used is chilli chicken stir fry); volunteers ask whether people would use it and what price they'd pay. A health MOT area features a couch, tape measures and topical books where volunteers as non-experts could take measurements to provide a visitor's BMI. At one point, an expert dietician, Prof. A, staffed this station to offer full expert advice on sugar related issues. The kitchen corner represented a prototype service providing kitchen facilities for cooking on site. Acrylic, plan-view furniture and symbols were provided on a white board table for visitors to co-design and discuss what the kitchen service area could be like (see fig. 4N).

A kid's area was filled with scores of foam white cubes for playful stacking, a pretend shop was set up for kid's to attempt a healthy shop and a blackboard let them draw their favourite low sugar food. A Mac desktop was set up facing out of a bar space to showcase the website and encourage visitors to share their challenge online. There is also the opportunity to provide detailed feedback on Know Sugar alongside their email address. A large exhibit of white cardboard boxes was sculpturally arranged along the centre of the space between two pillars displaying well-known drinks alongside stacks of the equivalent amount of sugar cubes in them as another shock factor. Each product chosen contained above the recommended daily allowance. Finally, a blackboard asked visitors to note a change they will make for themselves or others.

ANT Discussion

The ANT account details the incredible variety of materials and activities constituting the Know Sugar prototype. The design of the stations in a journey format indicates consideration to ensure the maximum number of visitors engaged with each station of the prototype. The organisation around enrolling designers and volunteers to deliver the prototype, who have little to no experience of diabetes or even sugar, and positioning them as representing a service to 'know sugar', belies an incredibly dexterous handling of complex matters and demands recognition of the mediating role the design artefacts played in orchestrating this project. An ANT account traces the flow and expansion of early iterations uploaded into Basecamp to the live prototypes delivered. The levels of inscribed roles are distributed across multiple design disciplines, who in turn translate much of the earlier concept iterations to the delivered forms. The responses of visitors and methods of data capture, represented in the actor-network map, represent the key matters of concern defining the value of the whole prototype.

Key Findings & Reflections

The key objective for this case study was to translate actor-network theory, as an approach to producing descriptive accounts of design things, into a method of visual mapping. The aim for developing this method of mapping was to investigate and represent the performative agency of design things towards developing the methodological model.

The result of visualising the project in such a framework is a dynamic representation of each stage of the project, contrasting sharply between each map in terms of timeframes and detail. The scale of detail in the mapping reflects the amount of data attained for each stage. Singular events such as the original Chiasma ideation, the October team session or the ultimate prototype delivery represent highly complex events with isolated groups of actants black-boxed as summary actants. Such acts of black-boxing are not referenced visually in the maps, but are permitted as a function of the mapping to proportionally represent the important aspects of the project story. Conversely, the other actor-network maps all represent periods of weeks or months where more gradual progress was made. This meant another form of black-boxing relative to the time taken for certain tasks, or even iterative work performed on developing certain design things.

Lima's (2011:82-91) eight key principles in visualising complexity provide a useful framework for reflecting on the iteration of actor-network mapping provided for this case, how it might be read by designers and non-designers, as well as its value to the author as design researcher.

(1) *Start with a question*. The question used for the Know Sugar maps focused on what has contributed to the development of Know Sugar according to an ANT framework. This translated a necessarily historical account of what work was performed that has given shape to the project team and how this has fluctuated at each stage.

(2) *Look for relevancy.* This manifested itself in the judgments of importance and accuracy applied to each actant and link of association visualised. In particular, groupings of actants that shared similar relationships to other actants, and so a single link of association is drawn to the grouping, rather than multiple lines communicating the same association. This was essential to be opened to participants' interpretation in the case studies to follow.

(3) *Enable multi-variant analysis*. The use of an ANT framework ensures that there is a vast level of detail and meaning that lies behind each link, actant or descriptor. This detail can be extensive, depending on whose able to articulate it, and emphasises the participatory and discursive nature of interpreting the maps.

(4) *Embrace time*. This has been directly embraced in the mapping structure with a timeline connecting each map chronologically, and the concentric curves denoting an order of sequence. What is lost is the comparable nature of time between work performed through or with specific actants. This is left hidden behind each element.

(5) *Enrich your vocabulary*. For this iteration of the mapping, vocabulary is determined by the slightly obscure terms of the ANT framework. Within the wider thesis, new descriptors emerge from the participant accounts that describe what a trial of strength means in each case, or how translation is brought about.

(6) *Expose grouping*. There is direct attention to grouping actants that share roles within the key, while the identification of design things is important to represent the role elements from design are playing in the project. The nature of any grouping is again left to discursive articulation.

(7) *Maximise scaling*. The sense of scale in these maps is largely notional at this stage, but by no means missing. It is in the production of each map that a sense of appropriate scale is decided, which is permitted to vary from map to map.

(8) *Manage intricacy*. Finally, the key challenge for this map is not just how much to map, but how to allow it all to make sense together. The choice of controlled, curved lines overlapping in aesthetically appropriate ways was immensely important so that each element could be traced in relation to each other. The background structure is also key in keeping a relational clarity in the final outcome.

Lima (2011:81-82) also provides a list of five possible scenarios for visualising a network. A reflective assessment of mapping the Know Sugar project would associate potential applications in *documenting*, *revealing* and *expanding*. The potential value for documenting through such a form of mapping would be to support the funding negotiations with Design in Action, the organisation from which seed funding was provided and whom had key influence and expectations in how well the project progressed. Another potential value is for the mapping technique to reveal some of the work patterns of key members and their interactions with potential stakeholders, as the issues of project direction and resource allocation came under multiple trials of allocated work delaying progress. The third clear potential value represents the projects scoping of potential partners and expanding a support network in development. As a resource scarce project, and seemingly sensitive subject matter, strategic discussions and explorations of suitable options could be supported. Such a form of mapping could have allowed for a representation of those sensitivities and resource options.

With regard to performative agency, the actor-network maps only provide references to indicate important moments within the project. These mainly come from the actants identified as points of passage and from the triangles indicating inscription, translation, or trials of strength along links of enrolment. As summarised in the above accounts, the roles of individual actors became quite explicit within the decision-making and work performed. For Know Sugar, this revealed periods of tension between designers producing separate iterations of certain models and blueprints. It also revealed the importance of particular design things as reference points, not only in consolidating disparate elements of the wider concept, such as in the service blueprints, but in communicating and distributing the key matters of concern to be explored through further design things and wider actors. It is therefore argued that actor-network mapping did provide an initial representation of where design things would interact with matters of concern in the wider network. The next case study, therefore, explores the potential to make these matters of concern more explicit.

CASE STUDY TWO
NEW WAYS OF WORKING WITH DESIGN

chapter 5

This chapter presents the second of three case studies explored in this thesis, *New Ways of Working with Design*. This year-long case substantiated the thesis investigation by exploring how actor-network mapping of design things can reveal matters of concern as a potential for change. As with the first case study, the methodology chapter introduced the reasons for its selection, the background context of the chosen project in this case study, and a description of the methods deployed following the thesis methodological model. This chapter presents the outputs and insights delivered from these methods, the key developments in actor-network mapping as a method to represent the performative agency of design things, and key findings from interpretative overlays as a method of situational analysis to reveal matters of concern in this case.

The chapter begins by describing subtle changes to the structure and elements of actor-network mapping, with notes and reflections on the selected design decisions implemented in constructing the actor-network maps. The case study then collates passages from the original ANT accounts focused on selected design things deployed in the intervention, described in relation to their interaction with the wider human actors and non-human actants. These passages are supported by contextual preludes describing the events leading up to the focus passage, selected images of key events and artefacts, a brief discussion on the insights provided within an ANT approach, as well as actor-network maps, translated from the complete ANT accounts of the project and iterated from the visual mapping of case study one. It should be emphasised that most of the selected design things presented in this case study were present at multiple workshops, while only one supporting actor-network map is presented here to articulate their key roles. These actor-network maps were then used for situational analysis performed with each of the three members of the delivery team through a drawn overlay. These are presented and summarised to provide the key themes of performative agency emergent from the discussions. This case chapter culminates in a summary of the approach taken, the data collected and how this contributes to the final analysis within the investigation.

Moorbrook: Actor-Network Theory Accounts

The following accounts trace the key design things delivered within the Creating Cultures of Innovation (CCoI) intervention with Moorbrook. The group of employees who participated in the intervention are referred to in this case study as the slice and participants. The designers and consultants from CCoI that delivered the intervention are referred to in this case as the delivery team and informants. This is to differentiate them from the participants in the CCoI intervention, as they alone contributed to the interpretative overlays for this research with the author as embedded researcher. The following table provides a reference of names used in the ANT accounts for the delivery team, which have been altered to protect their identities.

Informant Names	Background
Julie	Lead Designer for the intervention, with previous experience of delivering CCoI interventions
James	Design Associate for the intervention, with previous experience of delivering CCoI interventions
Ryan	Academic Business Consultant, collaborating on delivery and analysis throughout the intervention

Table 5a, *CS2 Reference of Informants*

Actor-Network Mapping

The following section provides a descriptive account of translating the full ANT accounts from each workshop into a series of visual actor-network maps recounting the story of the intervention. This led to producing nine maps tracing each workshop chronologically (see Appendix B) as observed by the author as embedded researcher. The maps were presented in the final exhibition with wider reflections on their application and development.

As with case study one, the aim of translating these accounts into visual maps was to develop a consistent method of representing design things in order to articulate their agency: how they are enrolled into the actor-network, how they influence various actants, and how they are translated into the wider progress of work. A key consideration in designing these maps was their intention to be presented to the members of this case's delivery team, who were unfamiliar with ANT. As a result, adjustment centred on making it simpler and more accessible while not eroding the complexity of relations an ANT approach seeks to represent. The actor-network mapping technique has been developed from the initial iteration presented in the previous case study, so this section simply describes the changes that developed for this second full iteration of the technique.

The first development applied to the mapping technique was to provide a clearer structure for the chronology of mapping the workshops. This involved breaking down the map into three sections: historical, live and potential, which represent the activity surrounding each workshop (see fig. 5A). This emerged as the appropriate structure for mapping due to the clear distinction of live activity observed by the author within each workshop, as well as clear stages of preparation beforehand, and projected objectives afterwards.

The second key development is the actant icons adopting the colour-coding that applied only to the type headings in case study one. This made identifying between icons that much clearer, as the circle icon for actors and rounded square icon for things were too similar, especially with the type headings sometimes needing to be squeezed between elements. Otherwise, the design elements remained fairly similar to those devised in case study one, awaiting a first full presentation and testing with the delivery team. Individual actors are labelled only with the first two letters of alternate names to save space.

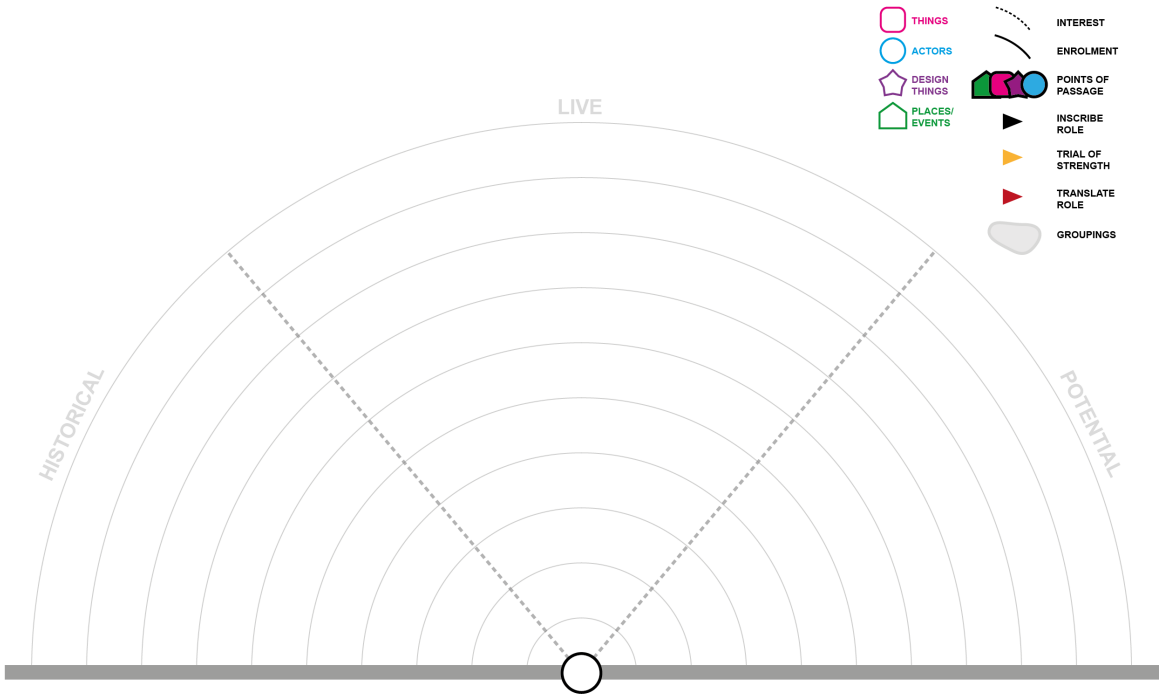


Fig. 5A, *Developed actor-network mapping structure* (Johnson, 2016)

The Underlay

Prelude

The underlay was developed as a result of conversations with the Moorbrook management as CCoI staff attended their factory during site visits prior to agreeing the intervention (see fig. 5B). Priority areas of workforce development were agreed with the Moorbrook's management through a topic of 'yarn stock'. This informed a structure for the intervention referred to as the underlay laying out ten areas of focus: handover, wake up, explore, emerge, propose, inspire, develop, test, modify and deliver. Priority areas were identified by CCoI for building capacity with a slice of the organisation by rating key areas out of three: handover (1), wake up (1), explore (2), propose (3), test (3), modify (2); all the others were left unrated. The underlay would serve as a scaffolding, or reference, when designing each session and the methods to address each area for improvement. Methods were referred to as 'beanpoles', meaning the designers would not directly implement them, but introduce them and allow the company to appropriate them as they saw fit.

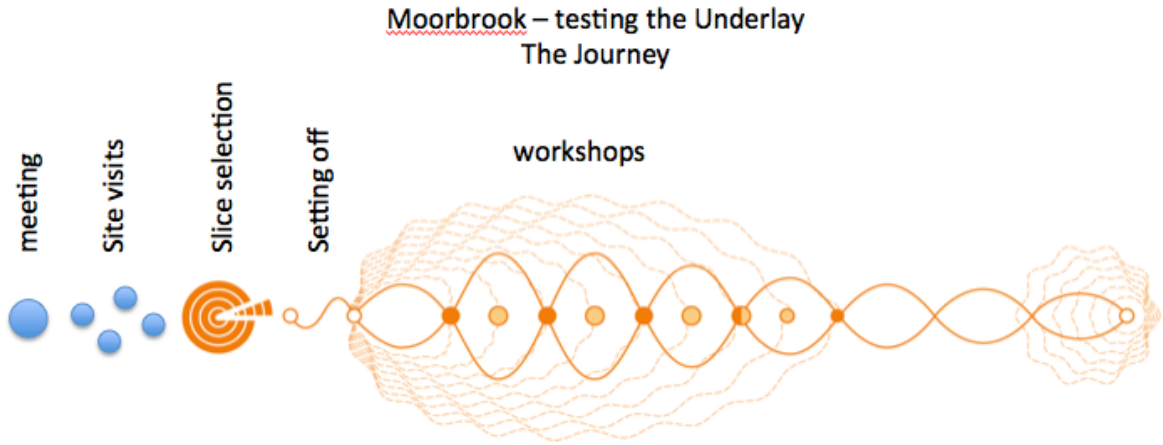


Fig. 5B, *CCoI Intervention Plan*, (CCoI, 2014)

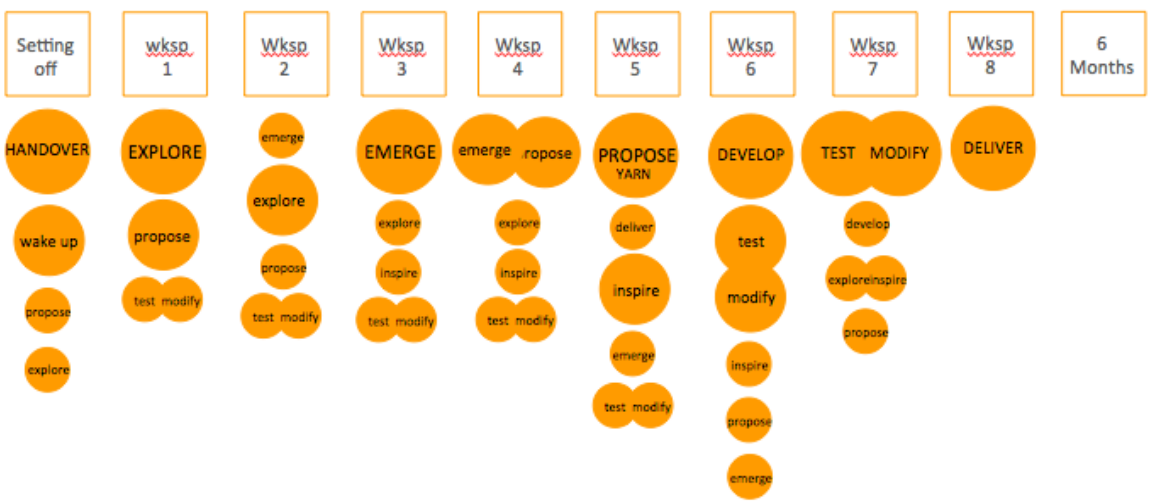


Fig. 5C, *CCoI Underlay*, (CCoI, 2014)

MB: ACTOR-NETWORK MAP
WORKSHOP 1

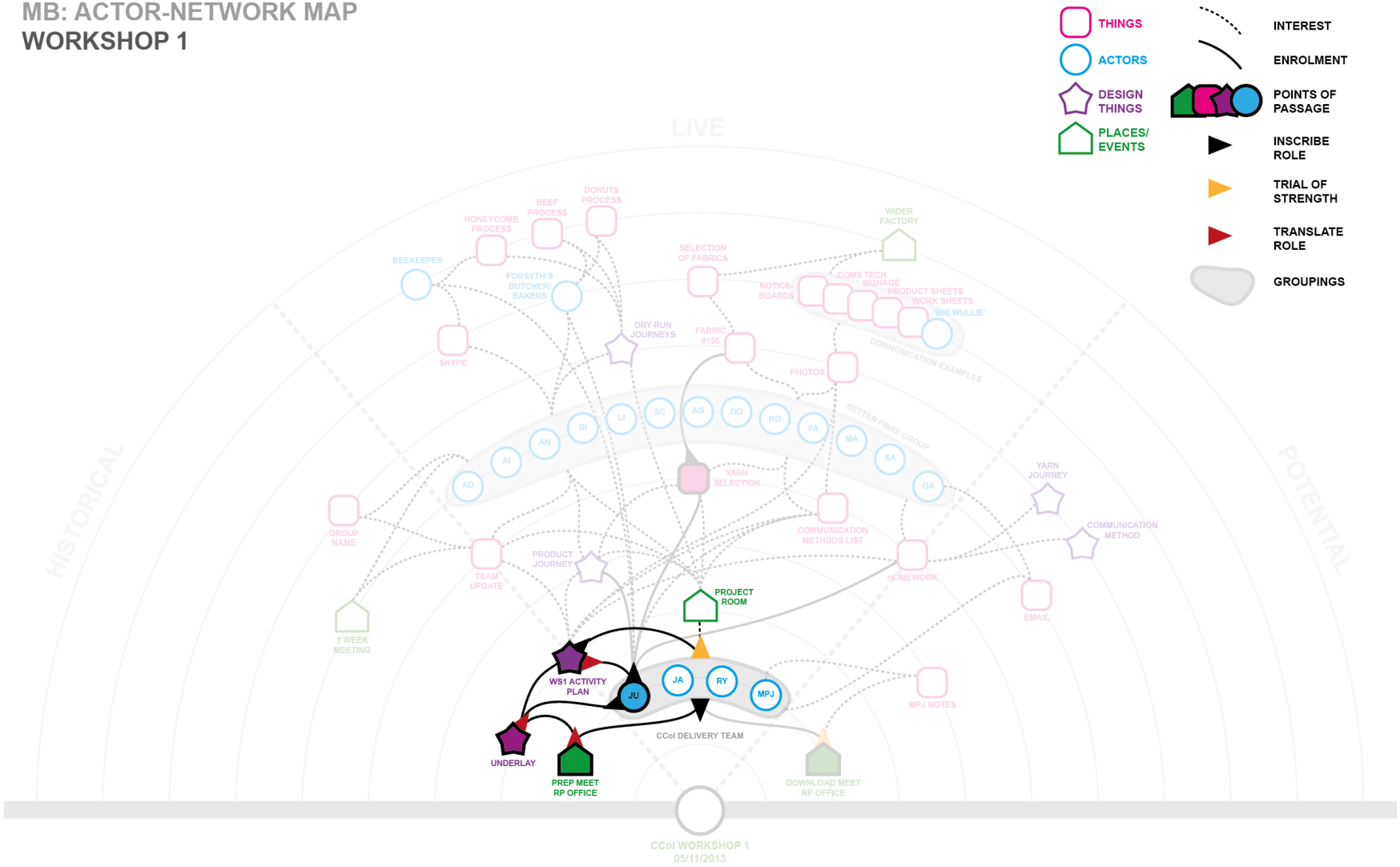


Fig. 5D, *The Underlay: CCoI actor-network map*, (Johnson, 2015)

Focus ANT Passage

At the start of the intervention the underlay was mapped by Julie, James and CCoI consultants onto an intervention plan for the entire series of workshops. A simple structure was drawn out in a PowerPoint file attributing the selected areas of improvement for each workshop (see fig. 5C). The PowerPoint file was brought out at every preparation session before each workshop, where Julie would produce an agenda with the rest of the delivery team. As the intervention progressed, the original plan for each workshop would be adjusted by Julie according to the progress of the slice. The input of content for the underlay was solely undertaken by Julie, as lead designer, and any of the changes would be made by her on reflection between sessions, apart from the delivery team, but brought into preparation meetings for their feedback and review. The workshop agenda informed the preparation work to be done by Julie and James on the design activities for each workshop, as well as record the reasons why they were being done.

During many of the workshops, particularly workshops 2, 3, 4 and 5, the original underlay agenda would change live in response to the work performed by the slice. In workshops 2 and 4 this was due to the lack of progress in the work achieved between sessions by the slice. In workshops 3 and 5, this was due to difficulties in performing the tasks asked of them during the session itself, or adjustment due to staff outside the slice participating in activities. On such occasions, Julie would rewrite the agenda in her notebook in short review meetings with the delivery team and then write the agreed changes on a sheet of flip chart for the slice.

During the download meetings following each workshop, the underlay was not the dominant feature due to discussion being led by a review of the author's notes, as embedded researcher, on the activities that took place. In workshops 0 and 1, the early nature of the intervention meant that the prepared workshop plan went as intended with little cause for deviation. In workshops 6, 7 and 8, the intervention format began to stabilise with more work being taken on by the slice between sessions and activities within the workshops focused on supportive techniques for the slice to take their work into the wider organisation. This was seen by the delivery team as evidence of the 'beanpole' methods starting to embed into the slice's projects. However, the delivery team recognised that the delays to the underlay workshop plan in workshops 2-5 meant that workshops 6-8 could not satisfactorily complete the intended plan, leaving methods to support sharing into the wider organisation unresolved.

ANT Discussion

The underlay was a simple design thing to trace within the intervention, as it was always located in the one PowerPoint file on Dropbox, with all updates by Julie visible to the author. It was also, however, one of the most complicated to associate to the wider workshops as it represented a very complex series of aims and areas of focus that the wider activities and artefacts were enrolled to address. The only physical presence for the underlay was as a printed A4 workshop plan, and the interpreted role of the underlay was vastly different between each delivery team member. The historical investment of Julie in the development of the underlay before the intervention meant it was ever present in her thinking, however the other delivery team members had little experience of the underlay, so their support for the intervention was more reactionary and based on experience. The ANT account of the underlay's role in the intervention can relate to the changing activities and pressures emergent from the workshops, but the delivery team's interpretations of the underlay's influence disorientate the traceable influence it might have had.

The Yarn Journey

Prelude

During the preliminary site visits by CCoI, a yarn 'customer' journey was put forward by Julie as a method for visualising the processes across the factory in response to the lead topic of 'yarn stock' chosen with the company's senior management. The method of visualising a customer's journey with a service was translated into the journey that yarn undertakes in the factory. At workshop one, the slice were taken through a dry run to understand the method, visiting local businesses to investigate their processes and draw complete product journeys. They would then relate these techniques to yarn by applying the method to a problem fabric. The slice selected a best-selling airline-seating fabric, known as 8136, due to Moorbrook's unique capacity to produce it, the yarn suppliers being problematic and the airline being one of their biggest clients. Management members in the slice drove selection of the fabric, despite many members having no role in its production.

Fig. 5E, *The Yarn Journey*, (CCoI, 2014)

Fig. 5F, *Selecting quick wins from the Yarn Journey*, (CCoI, 2014)

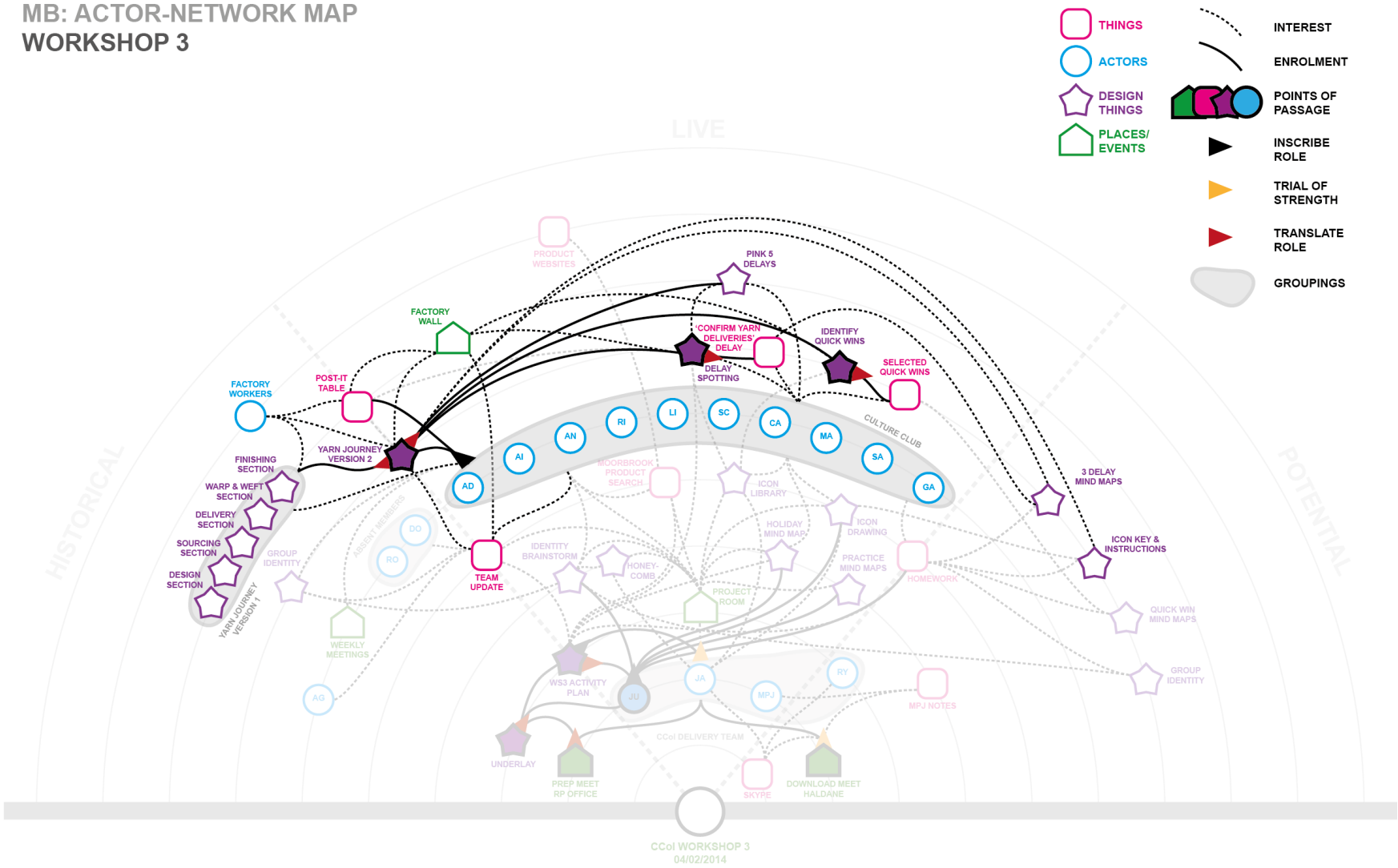


Fig. 5G, *The Yarn Journey: CCoI actor-network map*, (CCoI, 2014)

Focus ANT Passage

Between workshops one and two, the slice were tasked with building a first iteration yarn journey. They split into pairs for gathering details of the yarn journey throughout the factory, including departments and processes that were unfamiliar to individual members. Initial iterations were a mix of text-based flow diagrams and spider diagrams of particular stages on flip chart paper with gaps and questions to be asked written on post-its. At the second workshop, this resulted in an entire morning dedicated to giving feedback and inform ways of improving the journey between the second and third workshops. This second iteration was presented in workshop 3 to strong approval by the delivery team. It was about 10 metres long and roughly a metre high, made with brown card as a backing for A1 paper sheets placed alongside each other (fig. 5E). It was a linear, process diagram with drawings or photographs of each stage within the factory towards the manufacture of fabric 8136 and included colour-coded annotations above (positive) and below (negative). This was driven by 3-4 key members of the slice and put on display on one of the factory walls, though all slice members were able to input information (fig. 5F), while a table with post-its and pens was provided for the wider factory workers to feed in information. The yarn journey covered multiple sections of the company: from design, to yarn sourcing, yarn delivery, winding and weaving, through to the finishing.

Following the presentation of the yarn journey, the slice identified the delays that typically occur along the production process by writing them on post-its, noting the frequency at which they happen and the severity of the delay. Julie and James devised a 'traffic light' system to indicate the frequency and a number from 1-5 denoting the severity. Delays marked with a pink-five (frequent and long delays) were highlighted and discussed to understand the opportunity for tackling the delays identified. The process then focused on identifying how the group could achieve 'quick wins' among the problems and delays identified, which continued away from the yarn journey back in the project room.

Due to the high visual impact of the yarn journey, a video was requested to explain the yarn journey to board members and the process by which it would be used to improve processes in the company. In the remaining workshops, the only interaction the slice would have with the yarn journey was to add mind maps and summary sheets on the quick win projects. The yarn journey would be left unchanged until the end of the intervention.

ANT Discussion

The yarn journey represents one of the most crucial points of passage for the intervention, as it provided the context for many of the activities that the slice would be tasked with. The quick win projects, a deep dive project, communication tasks and more were all dependent on the insights learned through investigating and building the yarn journey (see fig. 5G). As it was placed outside the main project room where all other activities and techniques were deployed, it lost a lot of meaning in the intervention. The ANT account can trace this peak in influence by the yarn journey, as well as drifting influence as focus turns elsewhere. Its visual qualities brought demand for its presentation and positive reception to board members, and raised the delivery team's ambitions for introducing multiple other techniques, which ultimately stalled progress from the group. The fact that only a few of the slice members performed the task as prep work was not accurately picked up by the delivery team, resulting in difficulties in the following workshop due to uncompleted prep work.

The Honeycomb

Prelude

In the setting off workshop, the delivery team had introduced an Ao printed 'honeycomb' diagram, based on the Design Council's double diamond, as a scaffold of the process the slice would learn to undertake and related to the aims of the underlay. The honeycomb was devised from within the wider CCoI project brought into a previous intervention by Julie, similarly to the customer journey, in response to a demand from participants to see the process they were embarking on. The experience of the participants responding to the process diagram and gaining a better understanding of where methods fitted led to Julie deciding to include the honeycomb at the very beginning of the intervention this time round. Julie and James developed the honeycomb to replicate the key areas of focus from the underlay: wake up, explore, emerge, propose, inspire, develop, test and modify, deliver and review.

Fig. 5H, *Populating the Honeycomb*, (CCoI, 2014)

Fig. 5I, *Honeycomb Quick Wins*, (CCoI, 2014)

MB: ACTOR-NETWORK MAP
WORKSHOP 6

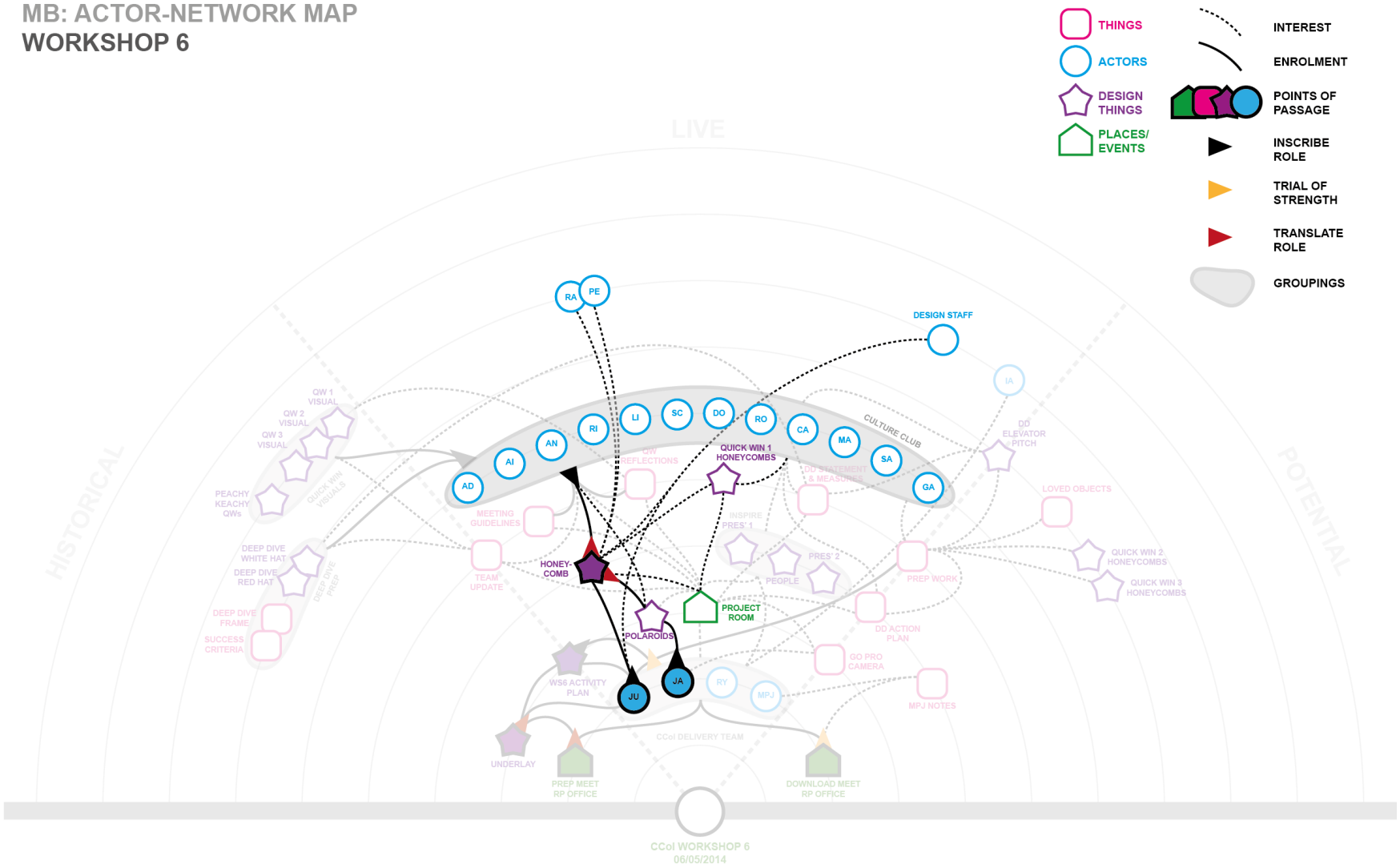


Fig. 5J, *The Honeycomb: CCoI actor-network map*, (CCoI, 2014)

Focus ANT Passage

The A0 honeycomb was positioned on one of the walls of the project room from the setting off session and remained there throughout the entire intervention. Julie talked through the honeycomb on introducing it, explaining the terms representing each stage of the honeycomb. Initial responses to the terms were minimal and for the following four workshops the honeycomb remained unused by the slice. In workshop three, James briefly talked through the stages the group had gone through so far using the honeycomb. It wasn't until workshop five that Julie used the A0 honeycomb directly to reflect on the progress the slice had made by drawing and annotating some of the activities the slice had performed, including the yarn journey and the quick wins.

In workshop six, the delivery team took reflections another stage further. James printed out a selection of Polaroid photos representing all the previous activities the slice had performed up until then. The group were asked to annotate and position the polaroids onto the honeycomb to understand their relation to each other in the process (see fig. 5H) and then use this to present the process to others in the factory. Two managers were then invited into the project room for the team to talk through the process and answer any questions. The honeycomb template was also provided on A3 sheets to reflect on the process specifically for each of the quick wins (see fig. 5I). Slice members were now more comfortable using the terms from the honeycomb to describe the activities they undertook. Julie also presented the populated honeycomb to the factory's design team in order to prepare them in participating with the slice's projects. Members of the executive management asked for this to be disseminated in the factory as a reference to engage with the slice. The managing director sat with the delivery team after the workshop to question whether this could be folded into the wider company business model.

Following the final workshop, the honeycomb was formalised by the slice as an excel document providing a template for members of staff to propose activities. A tab was created within the excel document for each of the sections of the honeycomb with an equivalent form with which to log methods to be chosen. There is little evidence that this has been used extensively within the factory so far.

ANT Discussion

The role of the honeycomb becomes particularly interesting through an ANT account as, following the peak of influence generated through the yarn journey, this was the secondary design thing to peak interest from the wider factory. As slice members began to familiarise themselves with the honeycomb, they became more confident in talking about the project through the honeycomb. This led to further iterations being devised from the delivery team and the slice. This aided internal discussions within the slice and initial discussions with management members, but there is little evidence the honeycomb continued to influence ways of working beyond these initial conversations. In the terms of ANT, they generated a lot of interest, but failed to translate into definitive roles being inscribed outside the slice. This points towards the honeycomb not sufficiently fulfilling it's role, and the slice members not having the capacity to appropriate it as required; a matter of concern for the delivery team that actor-network mapping could have helped to reveal.

The Dream Vision

Prelude

The dream vision was not part of the original plan for the intervention, but a tool brought in by Julie following discussion with CCoI on the challenge of handing over the project to the slice at the end of the intervention. It was adapted from a psychology technique for personal development and goal setting, articulating achievable ambitions for individuals through listing their strengths, what factors keep them strong, objectives for 1 month's time, and objectives for six month's time. This was represented by Julie as a large arrow pointing left to right, containing the first three stages, culminating in a dream bubble of the six month aims. This arrangement was devised in the prep meeting between the delivery team before workshop seven.

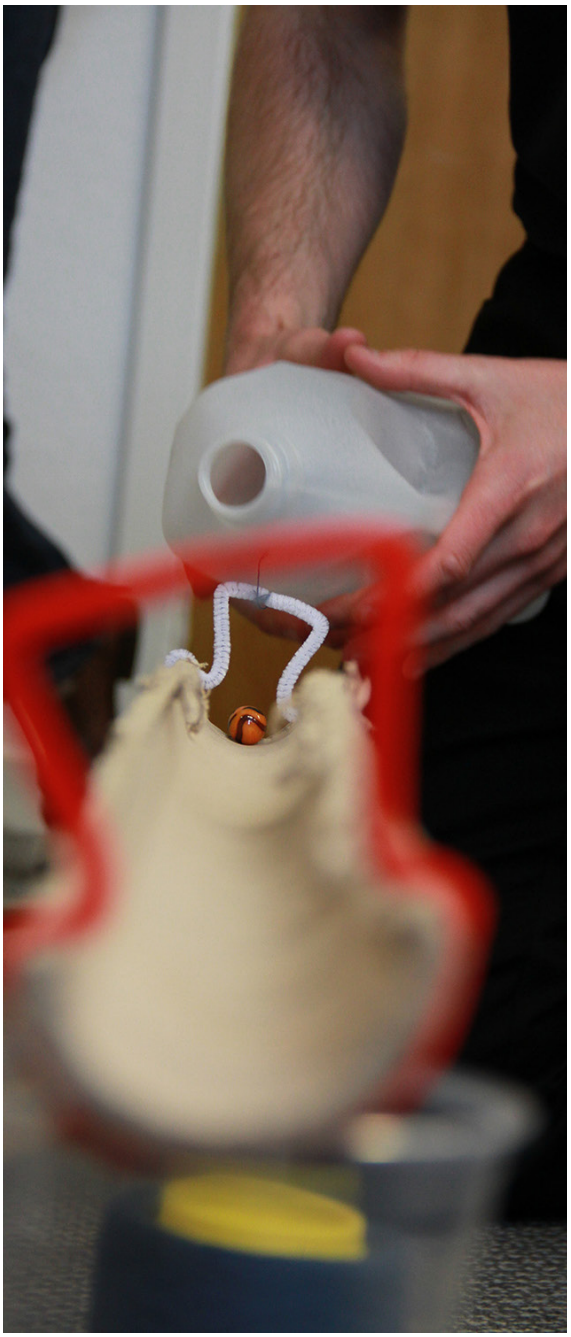


Fig. 5K, *Marble Run*, (CCoI, 2014)

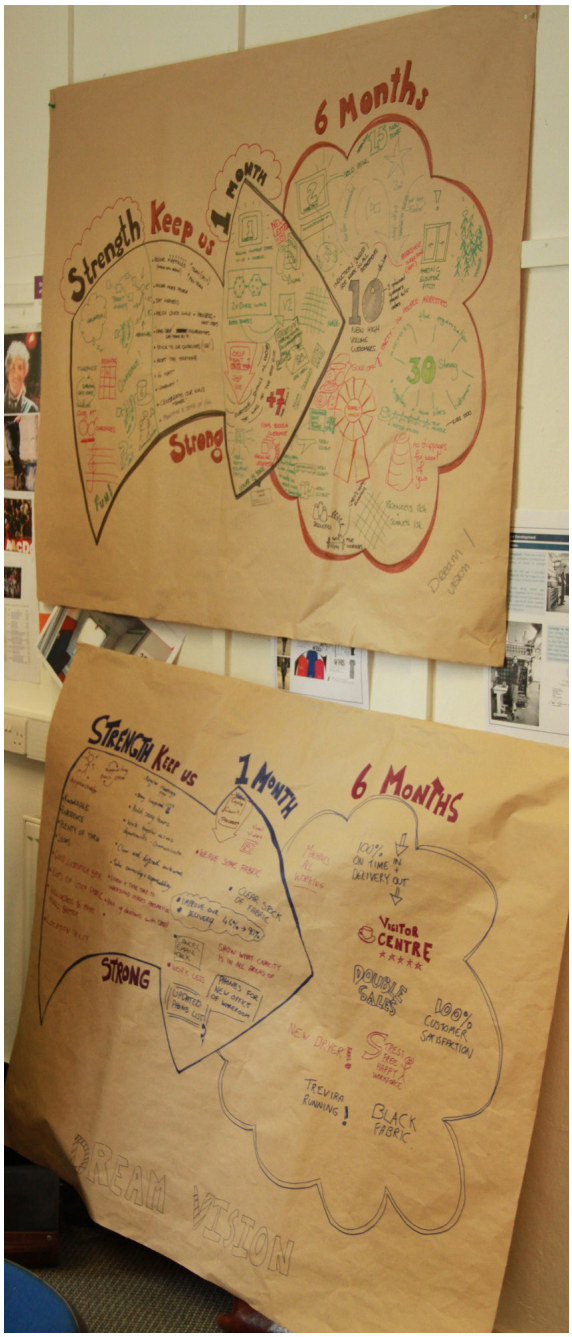


Fig. 5L, *Dream Vision iterations*, (CCoI, 2014)

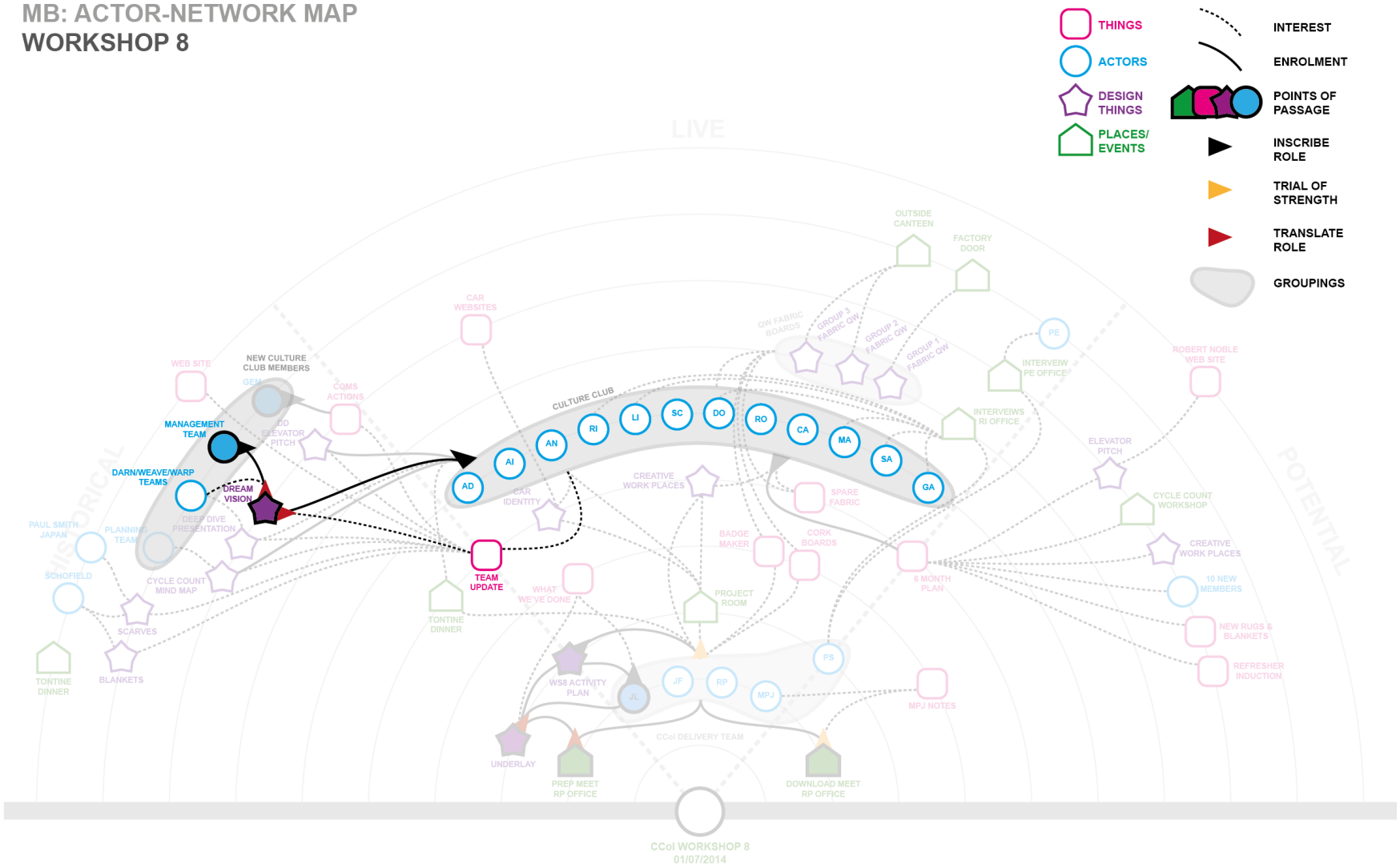


Fig. 5M, *The Dream Vision: CCoI actor-network map*, (CCoI, 2014)

Focus ANT Passage

A late method introduced by the design team was the dream vision, which responded to requests from the slice on how to recruit members across the factory into the process. A visual structure was devised by which to capture what workers thought was possible and the assets needed to get there. In workshop 7, the slice were first taken through an activity called 'marble run', where the slice was split into three groups each with a brief to use any materials, including fabric, cardboard tubes, water bottles, paper and any materials they could find, to transport a marble over a 1 metre distance in 30 seconds (see fig. 5K). The activity was repeated three times to allow for development of solutions through iteration. The permission to fail, playful nature and creative solutions devised were seen as important factors for relaxing the slice members' attitudes when approaching the dream vision. Julie facilitated a group discussion around the themes within the dream vision template, drawing them out visually as they called out suggestions. They were encouraged to be ambitious and duly provided clear and compelling cases for the slice and wider organisation to pursue. This was then expressed by Julie as their prep work for the next month, the first self-generated prep work.

The slice immediately adopted it with members of management between workshops seven and eight to reiterate their own vision. This was presented by the slice at workshop eight and had imitated Julie's visual style (see fig. 5L). During a car identity activity in workshop eight, echoing an activity performed with slice members to analogously describe what type of car Moorbrook was, one group had used the dream vision structure. They demonstrated an understanding and value in using the visual to articulate what type of car they were, through to what type of car they would like to be. After the final workshop, the clarity and accessibility of the dream vision was identified by the slice and senior management as a key method for introducing other departments of the factory to the slice's activities and projects following the intervention.

ANT Discussion

The dream vision represents the last peak of influence from any of the design things deployed through the intervention. Although only introduced in the last two workshops, the speed of adoption and engagement was immediate, evidencing a successful appropriation of the technique by the delivery team; especially considering it was not part of the original plan. The dream vision was being employed for similar reasons as the honeycomb was being appropriated for earlier in the intervention. What had stalled the honeycomb's dissemination throughout the factory had been partially overcome by the dream vision. Both attempted to articulate pathways for the slice. While the honeycomb was more complex, non-linear and using unfamiliar language, the dream vision allowed for everyday language to frame the methods and aims in a linear fashion. The honeycomb points towards long-term engagement, through management, to shape how the slice handles key stages of their projects, but the dream vision helped solve some short-term buy-in from the wider factory workers. The ANT account helps to differentiate how each method performed this role, identify the interested parties and, ultimately, points towards the potential ways each method could be adapted further.

Situational Analysis as Interpretative Overlay

The third stage of the methodological model uses aspects of situational analysis to map and assess the relations between the key design things and the wider actants within each workshop situation. For this case study, this involved presenting the actor-network maps of each workshop to each member of the delivery team and then overlaying the interpreted relations that emerged. While the delivery team members were encouraged to draw the relations and annotate them, the tool was used to facilitate semi-structured interviews that were recorded and transcribed. This section presents the selected moments of these long and detailed interviews relating to the informants articulating moments of realisation or insight into the matters of concern around the design things under analysis.

Julie Overlay - Selected Matters of Concern

For the very first overlay of workshop 0, Julie articulated the role of the underlay in relation to the honeycomb (see fig. 5N): "...if the workshops are an iceberg [...] the honeycomb is the bit that sticks above the water, the underlay is the bit that is underneath. So the underlay is the thing we use to plan, the thing we use to inform how we deliver the activities, the lessons that we're trying to share and the honeycomb is where we show people are on the journey." This articulation of the two design things was the first time they were connected in such an analogy. The analogy is clear, but was never used throughout the intervention, indicating that their relation became clearer for Julie over time and this reflection was the first opportunity to articulate this interpreted relation.

For workshop 1, Julie reflected on the slice visiting businesses outside their own context to then map the journey their products go through. While the visits were described as successful, Julie proposes additional elements to the task: "I would have added little tools for them to record things, or get them recording before we went out because none of them wrote anything down, [...] so that would be a piece of learning (see fig. 5O). We [designers] go around in notepads everywhere, and we forget that not everybody does." The focus for Julie here is on enhancing a key skill-set of data recording that was not made explicit during the workshop. The solution for Julie was to provide a tool as a reminder of the task in hand.

For workshop 2 to workshop 4, Julie described multiple occasions where the slice fell short of expectation, and expressed regret that the delivery team hadn't caught on to these sooner using the underlay (see fig. 5P). From a piece of homework poorly completed: "... this is where the workshops start creating stress, pressure on the team to respond. [...] Giving a fast response to the team's capacity, or lack thereof." From needing to complete a slow progressing stage of work: "The underlay means that you can't tear along at the same rate that you planned to, you need to stay focused on that wake up phase a little more, on the handover, because they've still not grasped what it was that they were [doing]." From the frustration of a tool failing to embed into the wider organisation: "They're project-weary and they have no confidence that any of the projects will last. They've not developed any process for retaining the impact of the project." These reflections are expressed by Julie as challenges for the underlay, but there is a disconnect to how the underlay is expected to account for these issues. Later in the discussion, Julie expresses these challenges as 'swim lanes' for the underlay: "So if you imagine that there were lots of swim lanes going on, the yarn journey was one swim lane, there was the building capabilities was another swim lane, there was the strategic intents of the company as another swim lane, I think a crucial swim lane, the underlay is a swim lane, building the team is a crucial swim lane. [...] The swim lanes are all part of designing the intervention and the delivery of the intervention." The notion of adding swim lanes to the underlay came from Julie's experience in another project that used swim lanes, and so the reflections allowed Julie to connect external factors to the design situation.

From workshop 6, Julie reflects on the efficacy of setting the slice a deep dive project, alongside the quick wins and the yarn journey (see fig. 5Q): "... the yarn journey became [...] the thing under the water and the quick wins were beginning to be the tip of the iceberg. It wasn't recognised as such and therefore wasn't used as an active space for reflection [...] that's the flipping deep dive. We had too many things going on. We had the yarn journey, quick wins and deep dive, and what we should have had was the yarn journey and a series of quick wins, then worked on how those quick wins could have been sewn together." Julie comes to the conclusion that an entire, major task set forward in the plan from the underlay had already emerged in the yarn journey. An opportunity to simplify the process had been missed, but was captured through the overlay.

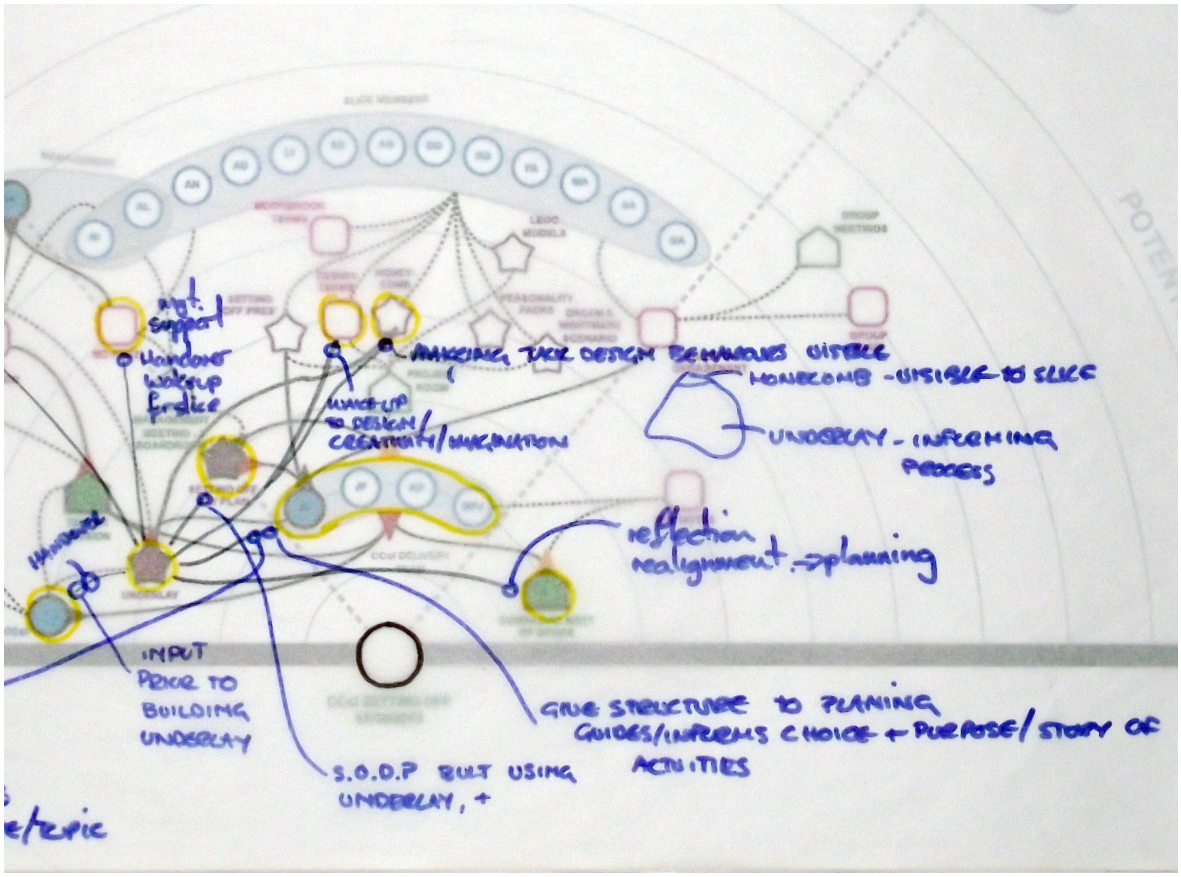


Fig. 5N, *The Underlay: Interpretative Overlay WSo*, (CCoI, 2014)

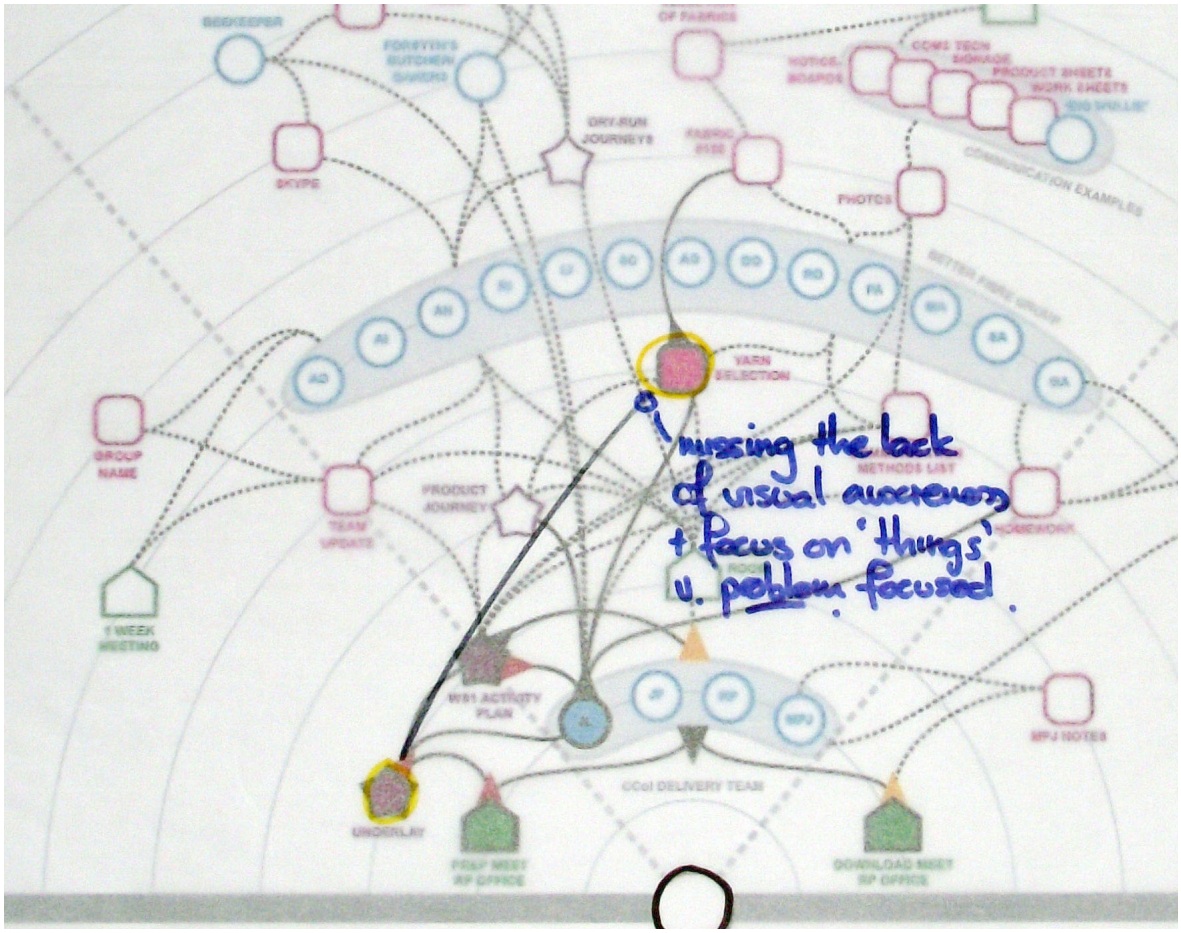


Fig. 5O, *The Underlay: Interpretative Overlay WS1*, (CCoI, 2014)

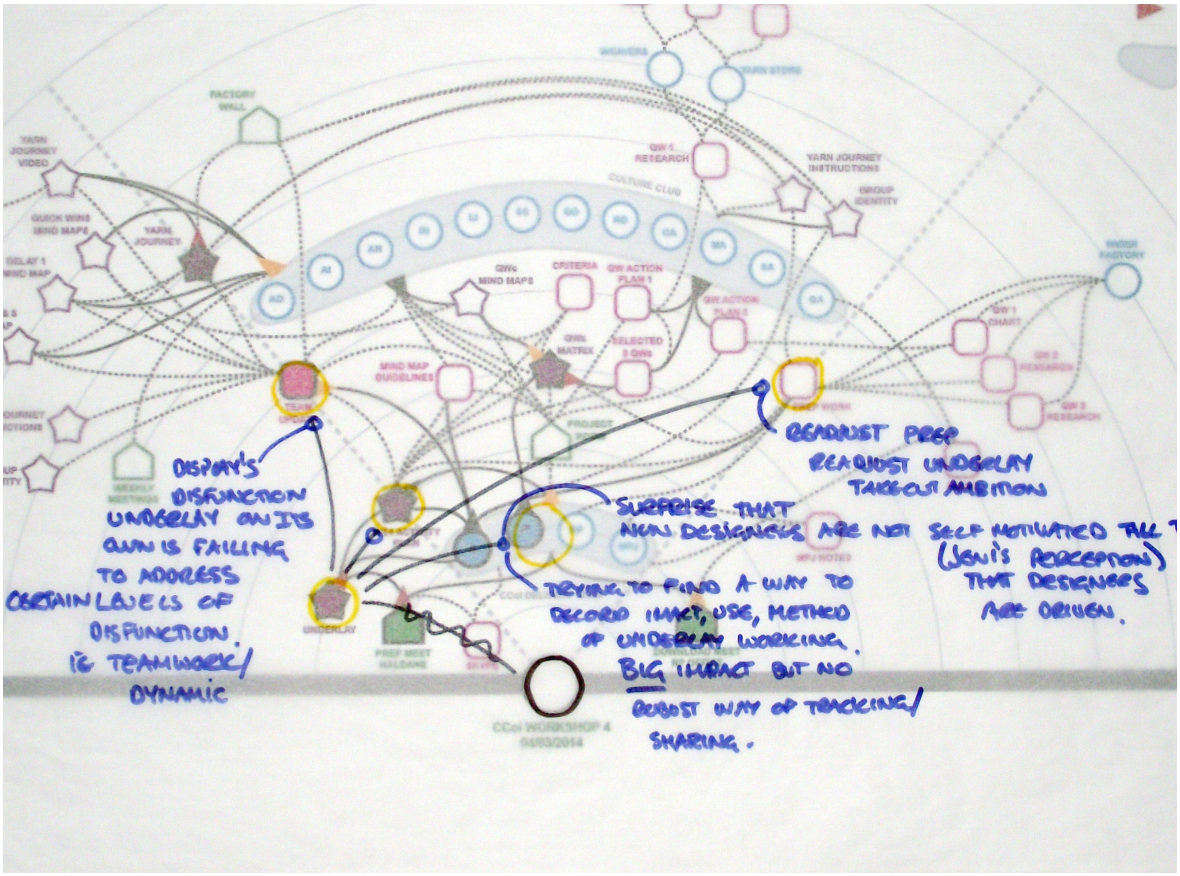


Fig. 5P, *The Underlay: Interpretative Overlay WS4*, (CCoI, 2014)

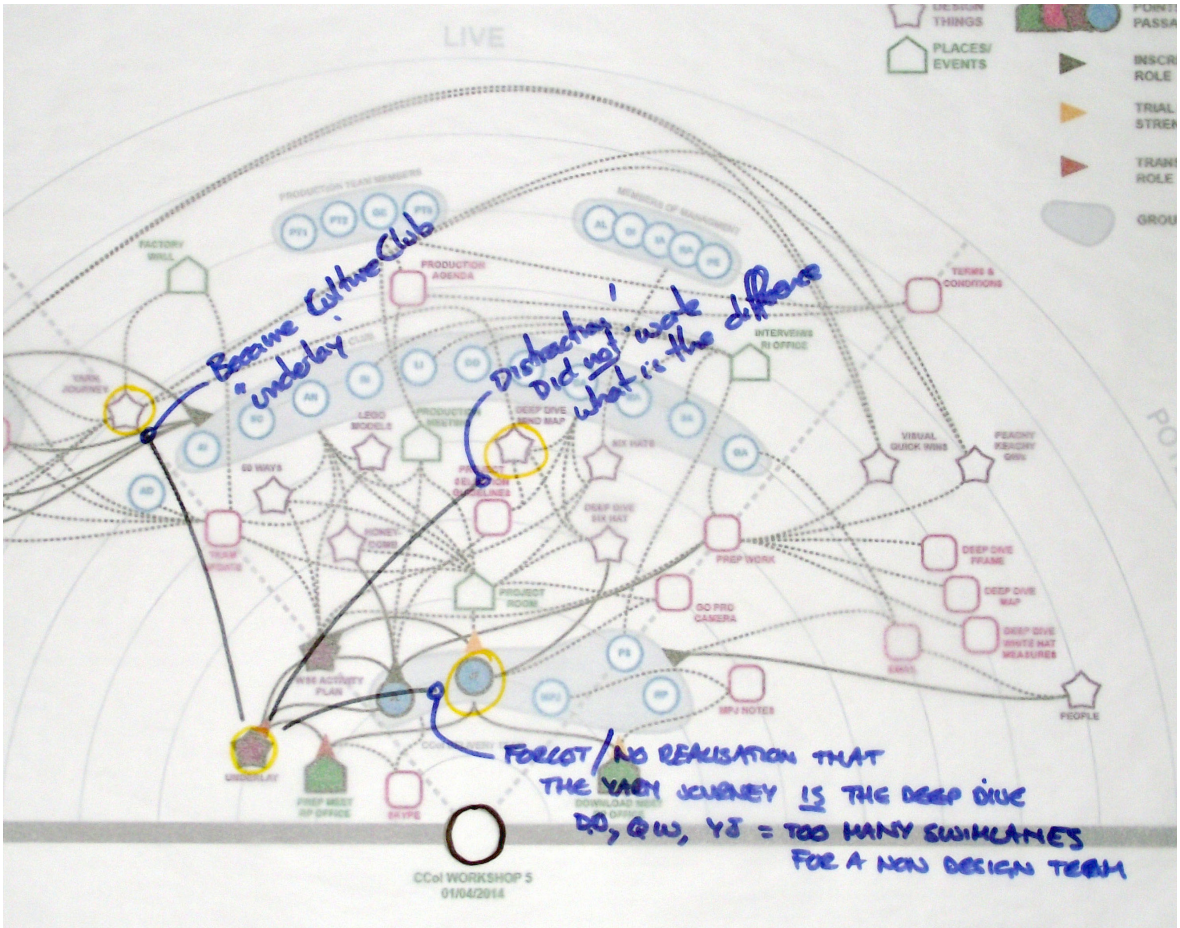


Fig. 5Q, *The Underlay: Interpretative Overlay WS5*, (CCoI, 2014)

James Overlay - Selected Matters of Concern

James reveals the tentative circumstances under which the underlay was brought into the intervention (see fig. 5R): "It was easier not to fight about it [...] simply because we had fights about it in the past and we were using it under the radar. We didn't want to make a big deal of it for reflection back on the things that we'd done." Ownership and use of the underlay early on was retained by Julie and James, with Ryan and the author only learning of its significance bit by bit. James believes this impacted the delivery teams capacity to deliver the intervention as planned with the underlay.

James identifies the positive influence of the yarn journey in workshop three, how it was: "the moment the project actually got started", "a really easy canvas to work from as it was well done" and "the slice developing their understanding [while] showing the wider factory they existed". However, in the next workshop he reflects how the yarn journey "had become a sort of albatross around their necks". He cites the "lack of changes" in the journey, "half-hearted responses" to improve its clarity and the delivery team "jumping the gun" in pushing other activities (see fig. 5S), as all stalling the project due to misinterpreting the initial success of the yarn journey. James recalled issues from a previous experience of similar interventions that were beginning to repeat themselves for this one: "... it's happened in every single CCoI [intervention]. The second half of the projects have gotten squeezed and squeezed, so we've never actually delivered anything as everything gets focused on the research, gets left too long. The last two sessions of any project are just panic to get something to happen. We were really intent that was not going to happen."

From workshop seven, James identifies a positive change in the workshops and the slice that pointed towards successful outcomes, but this is interpreted as distinct from the task of the underlay: "This was definitely the original intention of the programme, but it runs parallel to the underlay. It's nothing to do with what we're embedding, it's a requirement for the process to work. After we leave, change continues to happen. If it doesn't, we've failed. We require the people in this team to work on their own." This contrasts with Julie's observation that the emerging shape of workshops seven and eight represented the "ideal format" that the underlay was directly intended to support (see fig. 5T). For Julie, the underlay was the core design input in such interventions, informing all activities and the strategic approach for delivering them. For James, the positive shape of workshop seven and eight is denoted simply as how all the workshops should have been shaped, a matter of general design approach, regardless of the content or intervention context. Such contradiction reveals inconsistency in how the underlay was being used, and where the creation of knowledge for such design interventions resides.

James's reflections on the use of the honeycomb identified an opportunity for careful timing in revealing the process (see fig. 5U): "I think the honeycomb caused confusion when we had put it in before, when we hadn't done anything, but at this point you could show this is where you are, this is why it's hard, this is what you've got to do. If we had introduced it at this point to go 'ta dah!' it would have been more impactful." The suggestion is that the honeycomb needed a context of experience for it to have been more meaningful. Reflecting on such moments, in relation to reflection of the wider intervention, was a valuable assessment made on a few points by each of the delivery team. This point is extended to the honeycomb again by James where some activities appeared too abstract and out of context: "Of all the stages, inspire was the one we struggled to articulate most. It was a fantastic activity for building a team, for understanding each other's strengths, weaknesses, beliefs, personality, desires; but it didn't help to understand how to inspire work towards the project." The flow of activities comes under closer scrutiny, as opposed to the strength of individual activities.

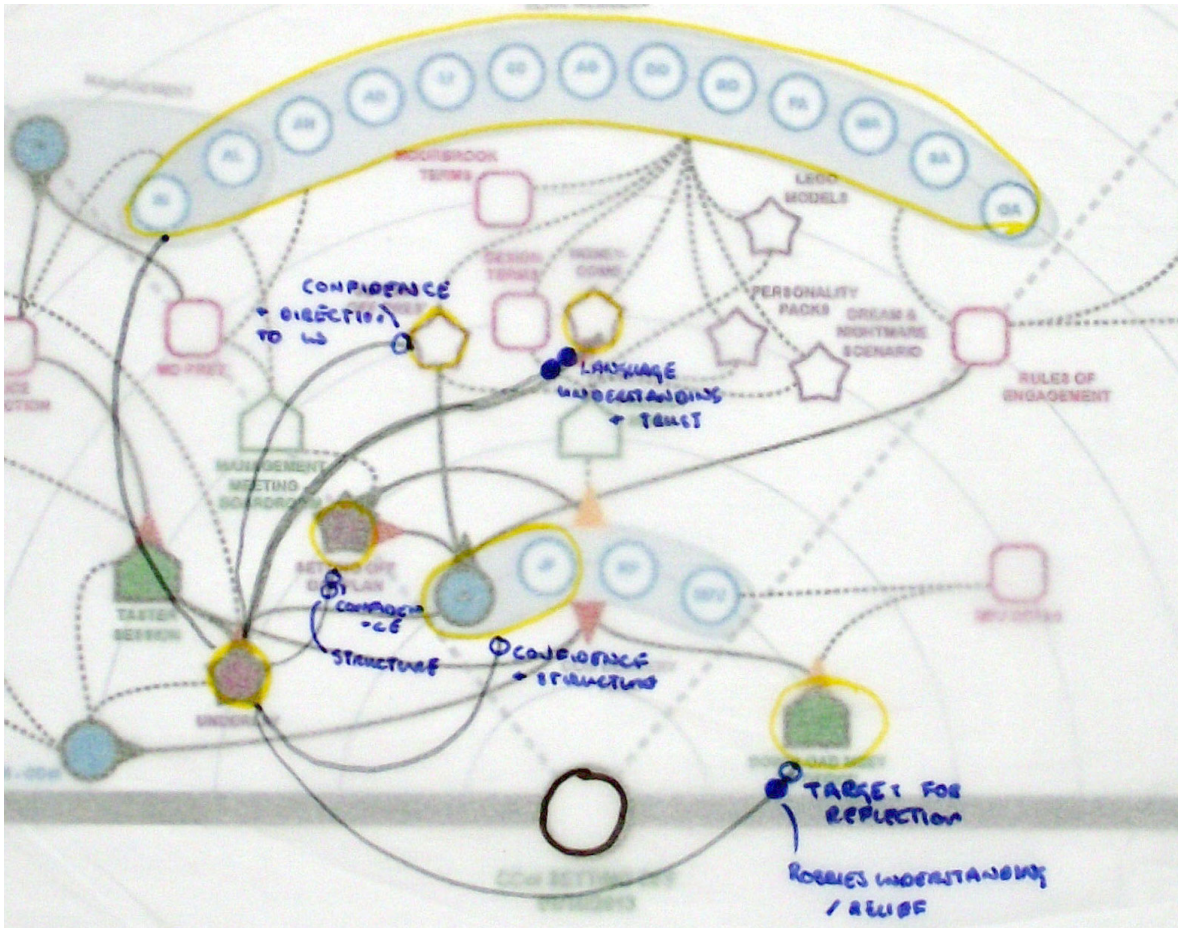


Fig. 5R, *The Underlay: Interpretative Overlay WSo*, (CCoI, 2014)

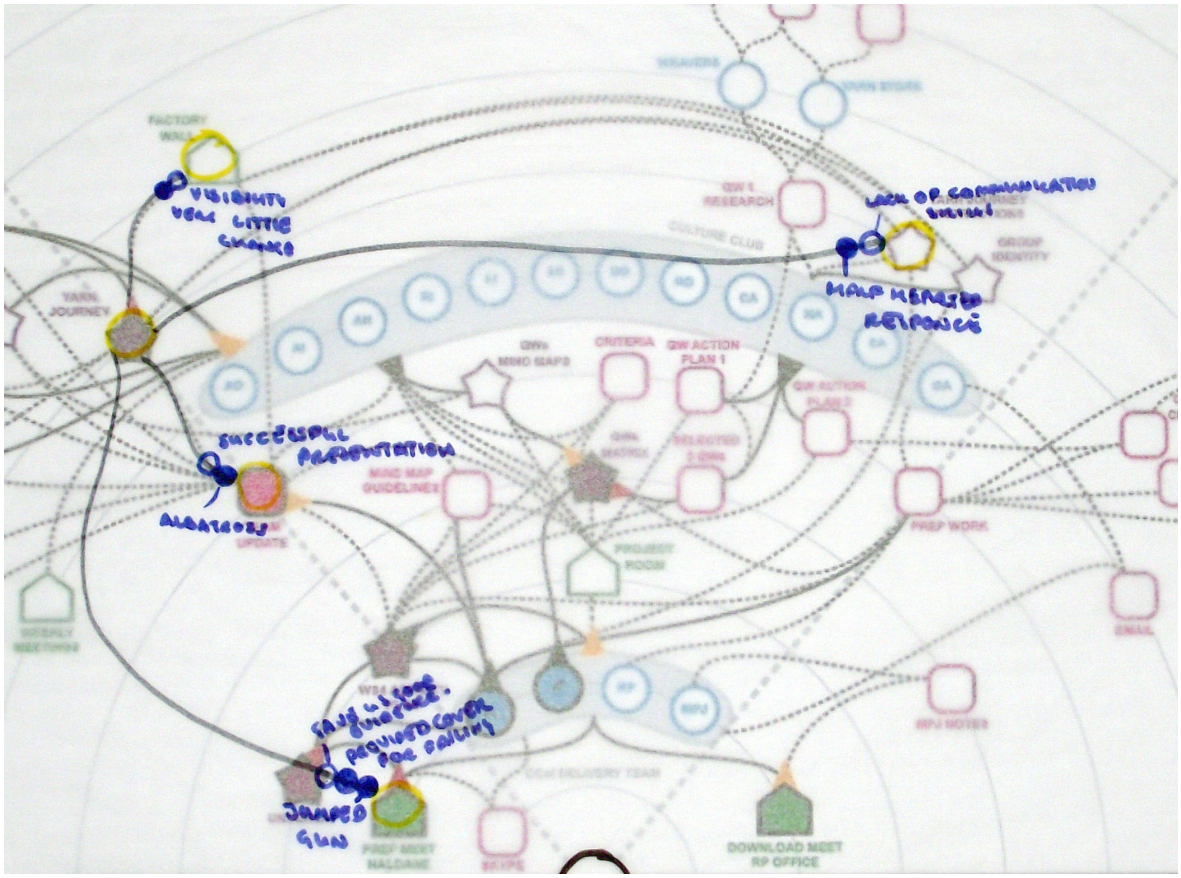


Fig. 5S, *The Yarn Journy: Interpretative Overlay WS3*, (CCoI, 2014)

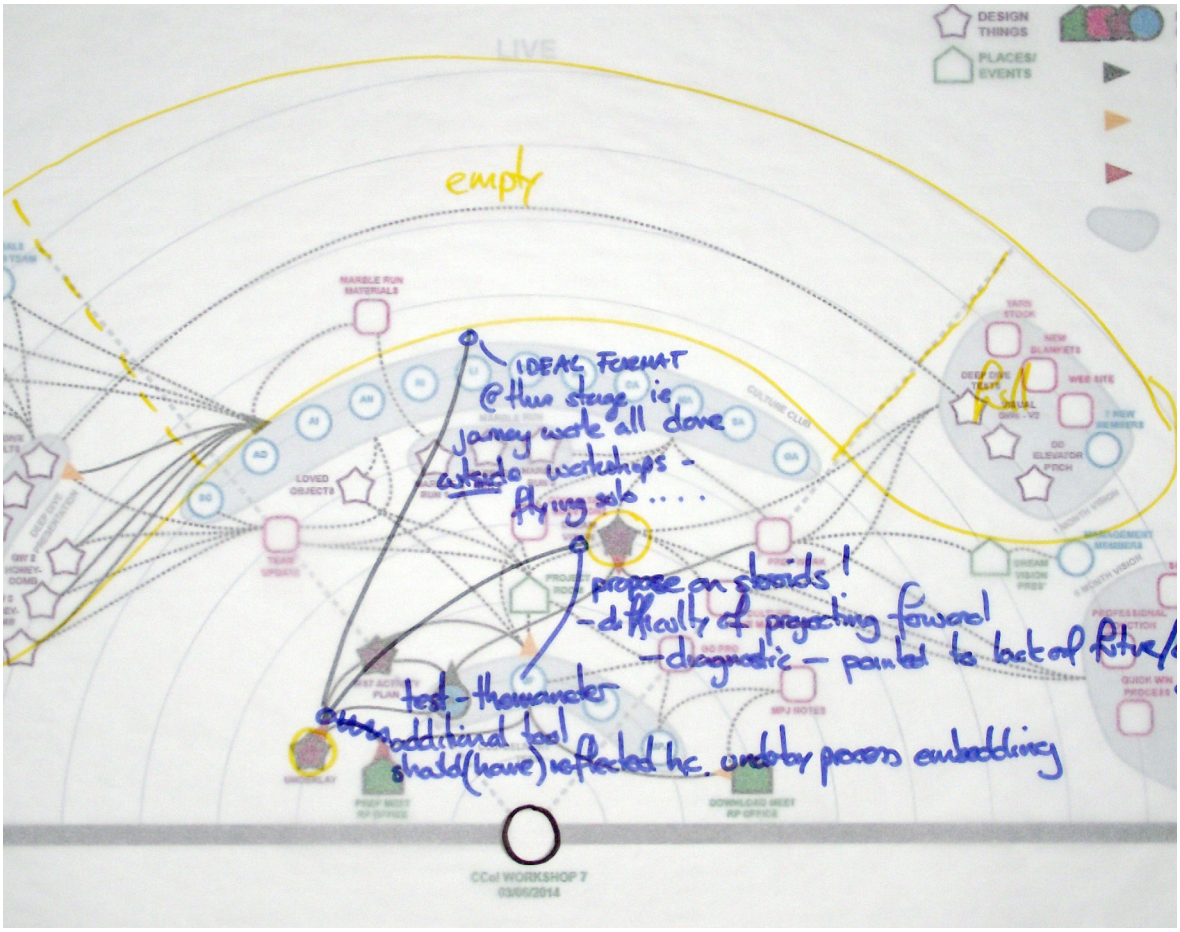


Fig. 5T, *The Underlay: Interpretative Overlay WS7*, (CCoI, 2014)

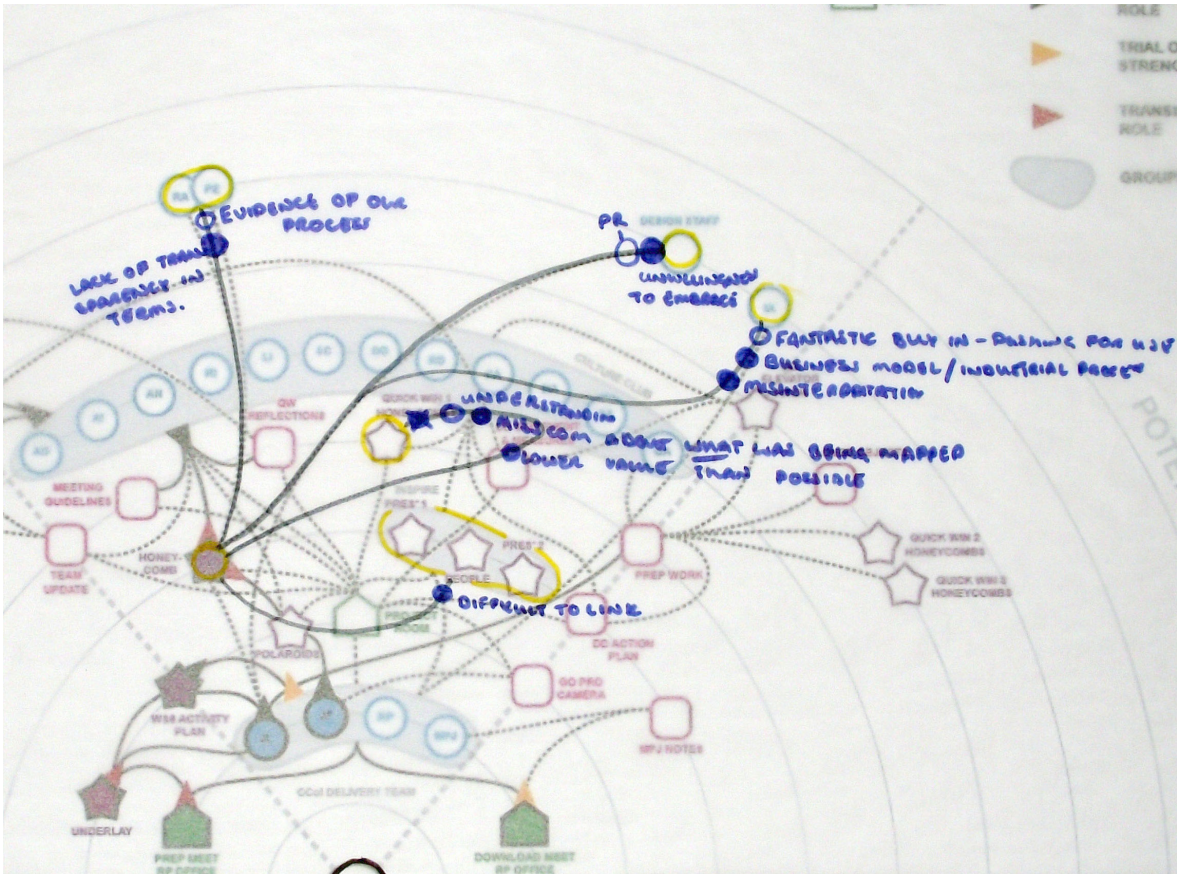


Fig. 5U, *The Honeycomb: Interpretative Overlay WS5*, (CCoI, 2014)

Ryan Overlay - Selected Matters of Concern

Ryan identifies a problem from the beginning of the intervention of power relations (see fig. 5V): "I think what we saw was a manifestation of expectations here being articulated by the management people within the slice. Management's expectations influenced it and I think they dominated the early discussions." This represents an insight born from significant hindsight, but also born from the appreciation of the democratic aims of the intervention, choosing a slice of the company to participate.

A key theme in Ryan's reflections are of ensuring a relevance to all the activities they do, and one of the activities he identifies is the product journey visits (see fig. 5W): "I think the sites could have been better selected and I think the providers better briefed. [...] We're in a mind set that assumes that people can readily pick up lessons from elsewhere; that there are parallels to be drawn. Not everyone is in that place, [...] they don't necessarily see the connection as readily as we do." This echoes the comment by Julie of better briefing the slice for data capture on the visits, but they saw different solutions for improving the activity.

Interpretations of the role of the slice came to the fore for Ryan, which was seen as an issue to be addressed right from the start: "That slice is not a team. Does it need to be one? To be honest I don't think we gave it enough consideration, and that's maybe going back to the point of thinking it out beforehand. Were we trying to create a slice as a team, [...] or were we content that this group tackled in sub groups various items? We never knew at the beginning what would be best or indeed if any one of them would be better." The strategic perspective of team building or grouped tasks represented by Ryan seems to echo Julie's call for swim lanes on such themes to strengthen the approach to such interventions.

The issue of identity for the slice was highlighted by all three members of the delivery team, but Ryan focuses on it in particular as a mitigating factor for the effectiveness of the slice (see fig. 5X): "It's as if we created a strike force who didn't know if they were playing basketball, football, rugby. So we were putting the effort into producing an effective force, which could have an identity so they could relate to each other, but also to the wider organisation and I think part of that identity depends on the wider organisation." While this issue was identified during the intervention, Ryan enthuses identity should have been more directly addressed, but also recognises this was a problem of the wider organisation that would have made life easier for the slice.

As a final insight, Ryan expressed the activity for communicating the quick wins - creating boards that celebrated them through using spare fabric - as a clear distinction between design and management that he enjoyed (see fig, 5Y). "I thought it was really, this is me wearing my management hat, I loved the visualisation of the process, the badges, the creating a visual identity around the message and their outputs. I thought that was really non-managerial, that was the bit that excited me the most." The implication here is of an activity that provided relevance in a way that management never would have. The surprising insight is that both Julie and James, the designers, felt these failed due to them being of poor aesthetic quality. Perspectives of added value are in total contrast here, revealing a clash in values for assessing this aspect of the intervention. Reflection from the designers seemed to have a design bias critiquing the designerly qualities, whereas Ryan saw a potential in how the activity combined multiple matters of concern: communication, identity, ownership, and relevance.

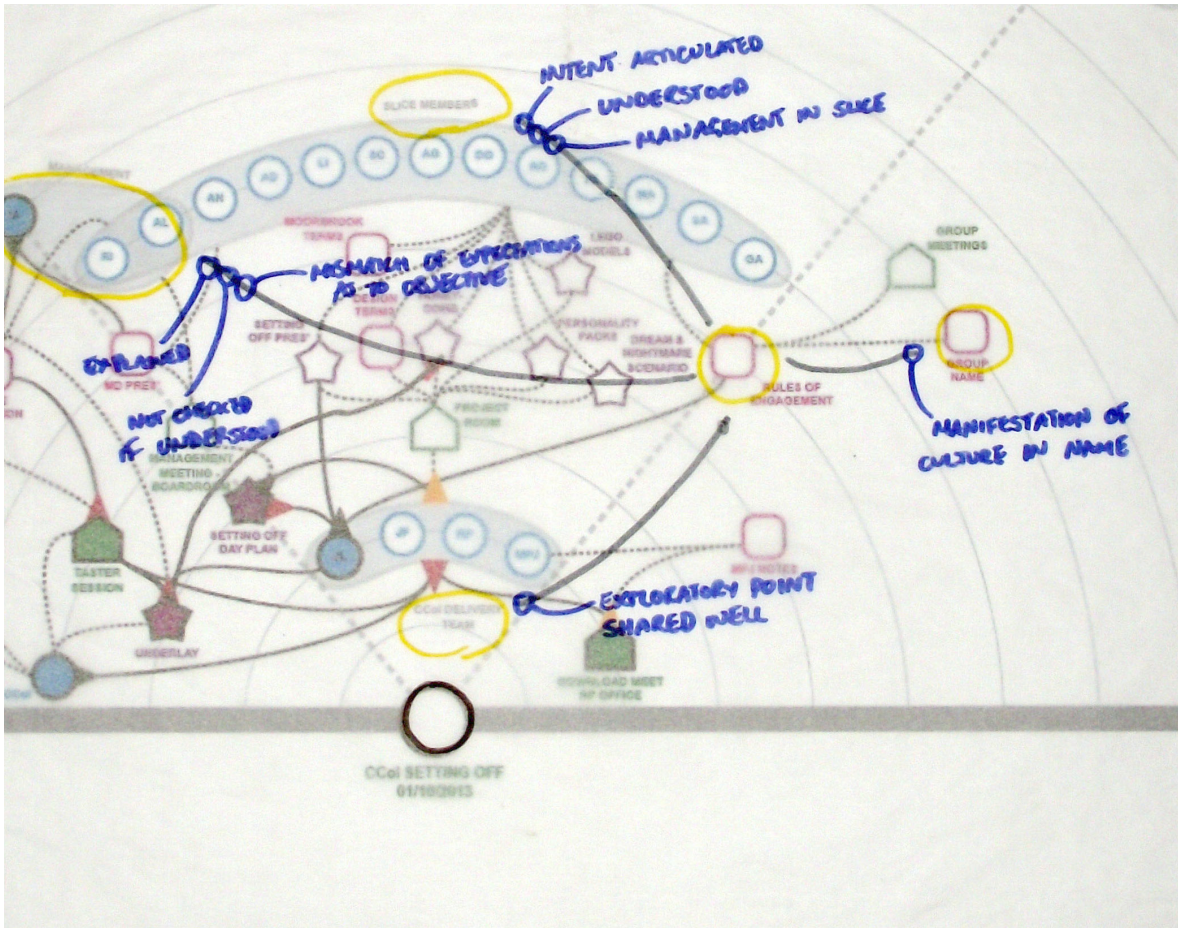


Fig. 5V, *Rules of Engagement: Interpretative Overlay WS0*, (CCoI, 2014)

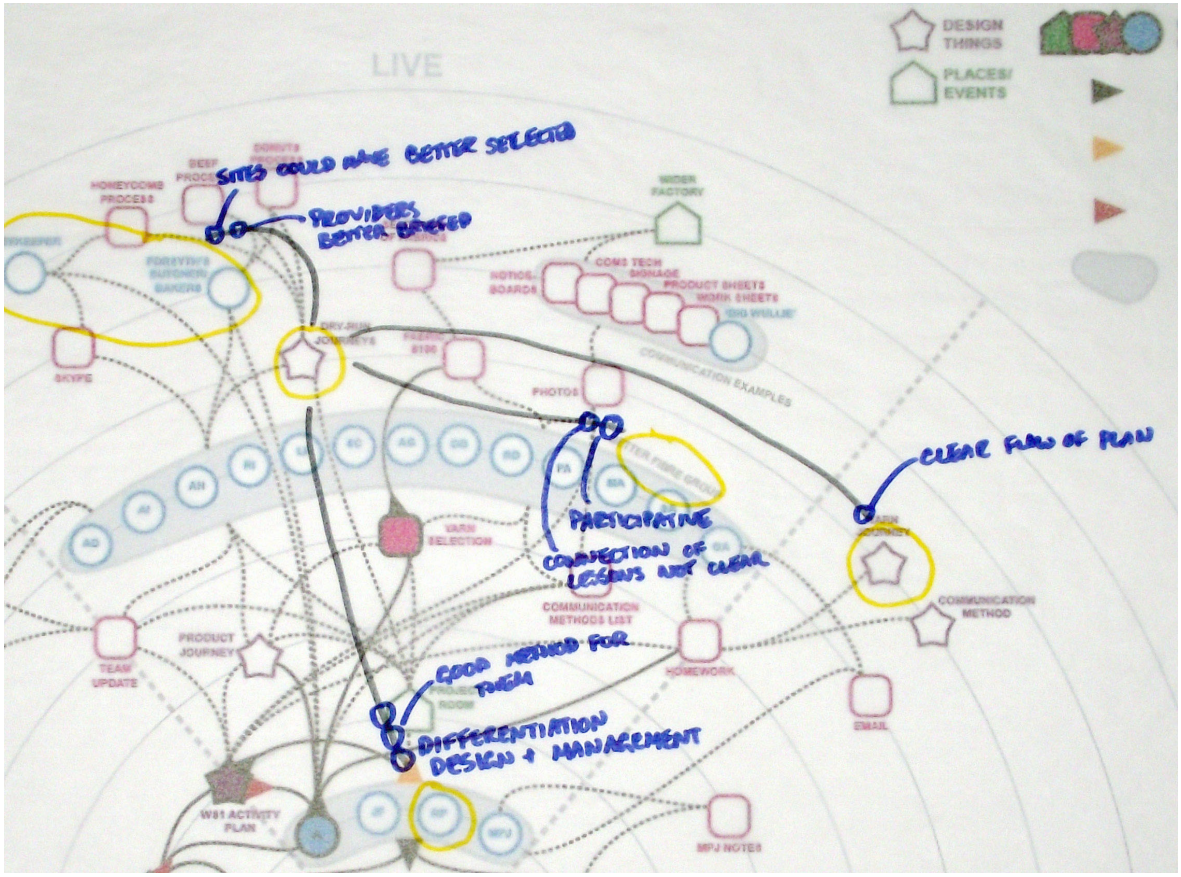


Fig. 5W, *Product Journey visits: Interpretative Overlay WS2*, (CCoI, 2014)

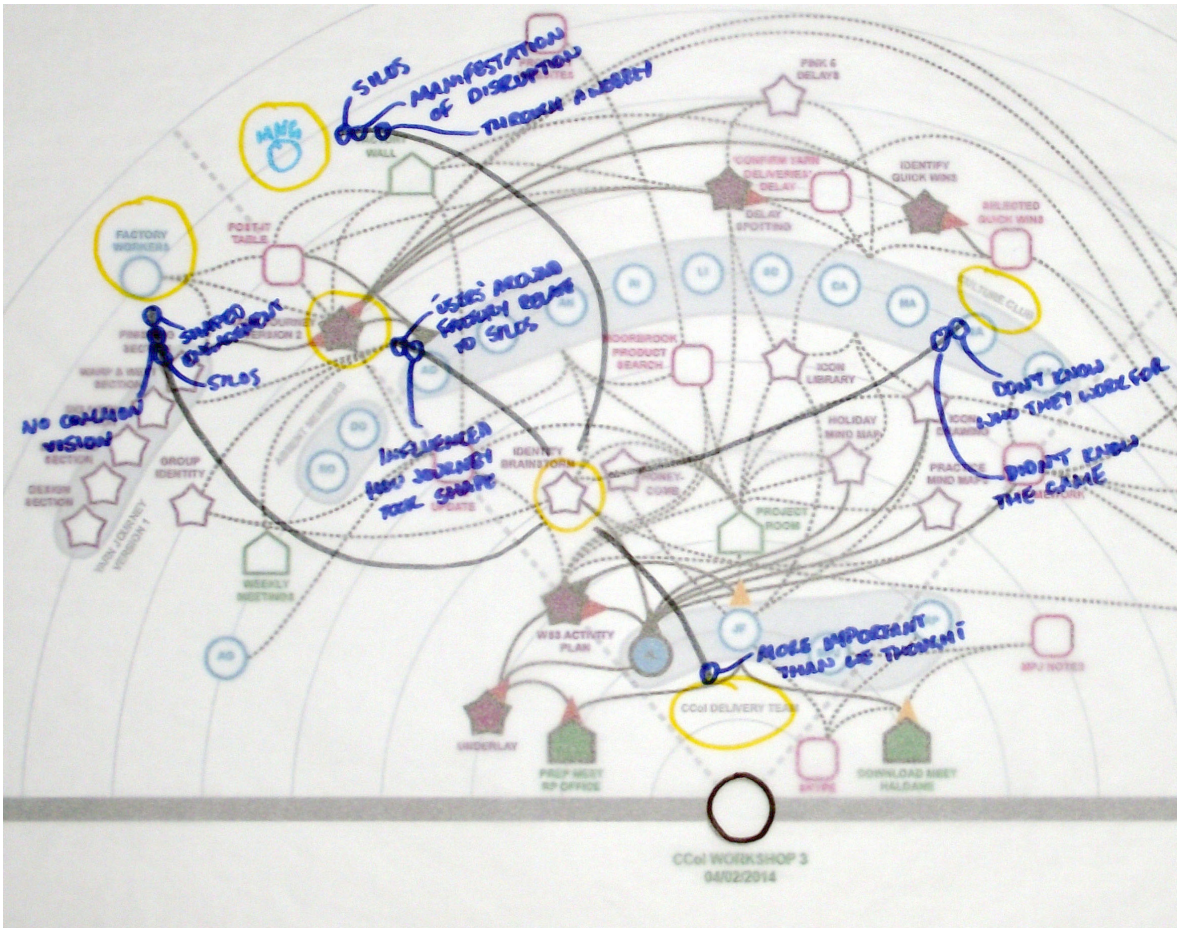


Fig. 5X, *Team Identity: Interpretative Overlay WS3*, (CCoI, 2014)

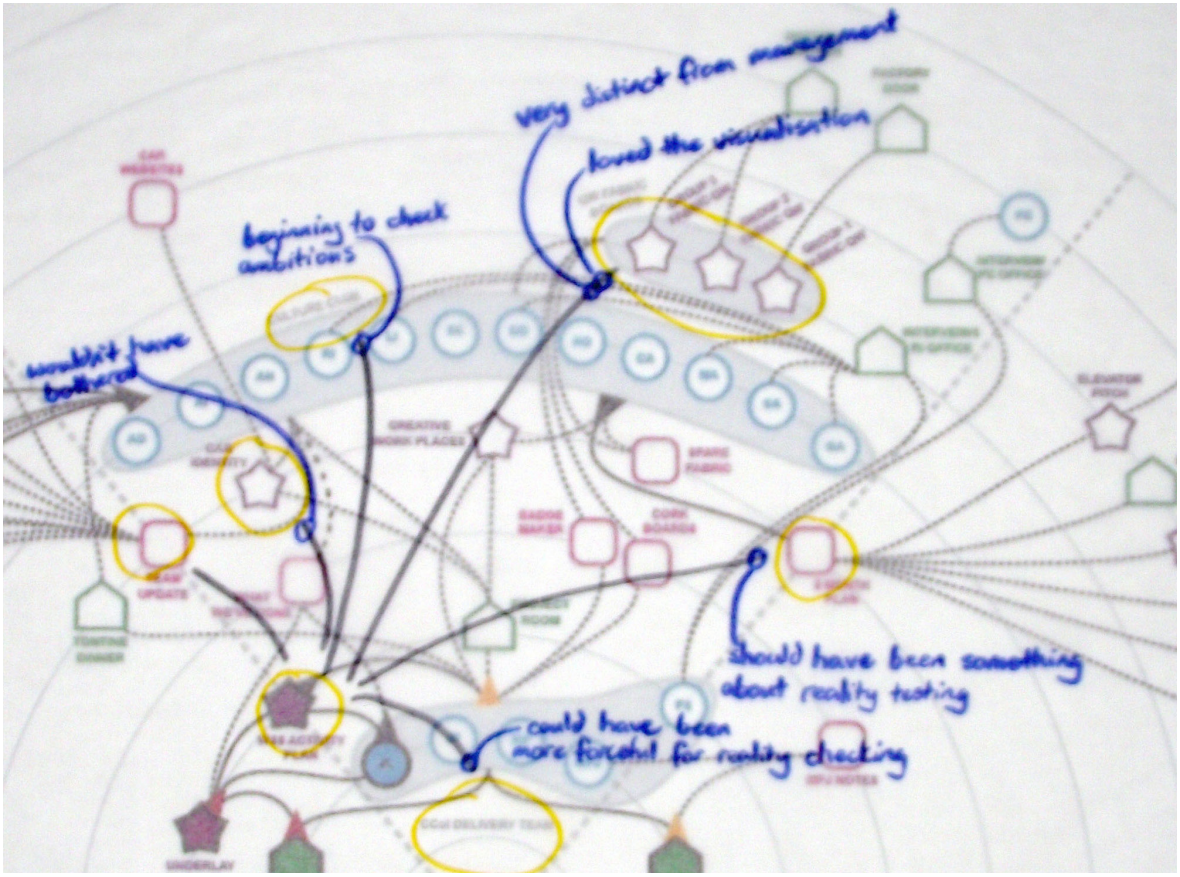


Fig. 5Y, *The Activity Plan: Interpretative Overlay WS8*, (CCoI, 2014)

Key Findings and Mapping Reflections

The key objective for this case study was to develop actor-network mapping, as a representation of the performative agency of design things, for designers to identify the potential for preferable change. The aim for developing this method of interpretation was to reveal the matters of concern around design things towards developing the methodological model of inquiry in this thesis. This section shall not repeat the reflections made using Lima's principles of visualising complexity, as was presented in case study one. Instead, a more general reflection is presented, firstly, on the development of actor-network mapping for this case study, then on interpretative overlays with the delivery team presented above.

The process of actor-network mapping differed between the first case study and this case study. The timeframes for each workshop in this case were almost identical and the structure for each workshop had repeated activities, allowing for many of the actants to maintain consistent positions between each map. For example, the delivery team and slice participants were kept on the same arcs for each map, while key actants such as the underlay, the project room and the meetings before and after each workshop could also maintain consistent positions. The reason for repeating such positioning was to allow easier comparison between each workshop, almost animating the workshop variations, while also increasing the legibility for the delivery team when engaging the maps. This also led to interesting and meaningful patterns developing for the workshops. The space between the delivery team and slice members represented activities that took place in the project room, but the space above the participants represented activity outside the project room. The increase of work performed by the slice between workshops was visually communicated by the increasing number of actants emerging within the historical and potential sections.

The process of mapping a second case study using a similar framework also allowed for the author to become more familiar with the process. The activity of mapping felt more intuitive with practice. Where the moments of translation, inscription or trials of strength felt uncertain in the first case study, they felt more certain during mapping for this second case study. In particular, the identification of key points of passage for the intervention, such as the yarn journey, felt more confident as they became associated with the activities, people or methods where palpable progress was felt by the participants. As an embedded researcher, this was easier to identify compared to the largely second-hand accounts obtained for case study one. The complexity in the amount of activity in each workshop was suitably reduced to icons representing whole activities, rather than each of the constituent elements, to aid with legibility. This was partly afforded by the anticipation that members of the delivery team, having been present throughout delivering the workshops, would be familiar with these constituent elements. The act of grouping was also quite fluid, purposefully applied around the participants to reduce the number of links to be drawn, as well as around methods using multiple key artefacts. This does reduce the detail of individual reactions to individual activities, but this was acknowledged as potential detail to be explored through the secondary method of interpretative overlays drawn with the delivery team members. The level at which performative agency of design things was brought into discussion, therefore, was not solely through the actor-network maps, but through the interpretations and recognition of these maps by the delivery team, based on their experiences of each workshop.

The interpretative overlays proved an intensive activity with the delivery team members, but they were consistently observed and embraced by all three towards a thorough analysis of the intervention. They freely critiqued each stage of the intervention, exploring the successes of some activities and fully examining the ineffective nature of others. The actor-network maps came to life through the interpretative overlays, with each informant expressing a fuller understanding of the intervention. The matters of concern, presented above, included traditional design concerns, such as aesthetics, communication and developing practical skills, as well as emergent design concerns, such as notions of timing, identity, power relations and even changes in the purpose of some design things. Each informant addressed the potential for preferable change almost instinctively; recognising how certain methods should have been performed in relation to each other or how the company could have been better prepared for the intervention.

According to Latour, matters of concern are controversial and contradictory by their nature, and the interpretative overlays exposed many of these controversies, not just for individual informants, but in the interpreted accounts between informants. The potential of group discussion through such interpretative overlays is palpable, bringing all these complexities of the design situation into a single site of discourse. Actor-network mapping provided a consistent representation of how design things interacted with the wider intervention, while interpretative overlays made the matters of concern around each design thing more explicit. The final case study, therefore, explores the potential of bringing these methods into supporting a live, reflexive discourse on the design situation.

CASE STUDY THREE
NEW WAYS OF PERFORMING DESIGN

chapter 6

This chapter presents the third of three case studies explored in this thesis, *New Ways of Performing Design*. This case substantiated the thesis investigation by exploring the question of whether the actor-network mapping of design things can support reflexive discourse around matters of concern in organisational discourse. As with the previous case study chapter, the methodology chapter provided the background context of the chosen project in this case study, the reasons for its selection and a description of the methods deployed following the thesis methodological model. This chapter presents the outputs and insights delivered from these methods towards an emergent discourse revealing matters of concern around design things in each Experience Lab. Digitisations of actor-network maps produced in all four labs are provided in Appendix C.

This case chapter initially summarises the developments in actor-network mapping as a live method, before presenting each of the four Experience Labs in sequence. Each live actor-network mapping session is introduced through the context of application, supported by images of the Lab activities and the mapping itself. The interpretative overlays informing situational analysis are then presented and summarised to provide the key matters of concern emergent from the discussions. Finally, a brief conclusion summarises how the case methods addressed the sub-question and support the overall analysis of the thesis to follow.

EXPERIENCE LABS OVERVIEW

Experience Labs explore experiences of health and wellbeing contexts and services, and potential digital design solutions towards them. All Experience Labs are delivered by The Digital Health Institute (DHI), an initiative between The Glasgow School of Art, The University of Edinburgh and NHS 24, to bring together health, care and third sector professionals, academics and industry partners to find new ways of innovating for societal benefit with economic advantage. The four Experience Labs represent concentrated stages of design research and development with potential users as participants, in varying project contexts, in collaboration with multidisciplinary healthcare professionals and organisations. The organisations, participants and DHI team members are all represented in accordance with the participation agreements established for the project by DHI. Throughout the chapter, the direct participants of the Experience Labs are referred to as participants, while those that contributed to the actor-network mapping sessions are referred to as informants in order to distinguish between them.

In the first two case studies, the actor-network maps were produced by the author digitally using Adobe Illustrator. For this case study, the map was co-produced with the delivery team of each Experience Lab; therefore each of the design elements was produced physically in a live workshop setting. This provided practical challenges on mapping the actor-network in a way that allowed informants to manipulate elements, as well as understand the process. For Experience Labs one, two and three, the map structure was iteratively printed onto large-scale, fabric sheets, onto which card disks of the actants could be attached and the links of association were variably drawn on or used black or white Velcro strips. A script was devised by the author to break down the process of mapping into four clear steps to aid facilitation: 1) setting the context, 2) listing the actants, 3) positioning the actants, and 4) drawing the links of association between actants. For Experience Lab Four, the scripts and elements were altered due to the context of mapping changing from a design situation that had just been performed, to one of a potential design future; as introduced within the relevant section.

The informants for the live actor-network maps of the first three Experience Labs are provided below. Names have been altered to protect their identities. The participants and informants for the fourth Experience Lab are provided in the relevant section, as they incorporate a complex set-up of three tables of up to twenty-four people split and mixed over two sessions.

Informant Names	Background
Tinav	Co-lead design researcher
Georgia	Co-lead design researcher
Josh	Designer supporting technical development of prototypes and data capture
Norman	Digital developer supporting technical development of prototypes and data capture

Table 6a, *Experience Lab 1, Reference of Informants*

Informant Names	Background
Tina	Co-lead design researcher
Georgia	Co-lead design researcher
Josh	Designer supporting technical development of prototypes, activity design and data capture
Norman	Digital developer supporting technical development of prototypes and data capture
Rachel	Designer supporting development of prototypes, activity design and data capture
Carmen	Project coordinator supporting data capture
Shona	Design researcher supporting data capture
Robert and Mark	Clients from New Co. who brought the original proposal
Aileen	Occupational therapist invited for her expertise and research interest

Table 6b, *Experience Lab 2, Reference of Informants*

Informant Names	Background
Tina	Co-lead design researcher
Georgia	Co-lead design researcher
Josh	Designer supporting technical development of prototypes, activity design and data capture
Norman	Digital developer supporting technical development of prototypes and data capture
Rachel	Designer supporting development of prototypes, activity design and data capture
Carmen	Project coordinator supporting data capture
Shona	Design researcher supporting data capture
Natalie	Human Computer Interaction researcher from UHI, invited to support the lab

Table 6c, *Experience Lab 3, Reference of Informants*

Experience Lab One: Guided Shopping Experience

The first Experience Lab to undergo live actor-network mapping was the second of a series of three focused on the development of a digital home notification system to support elderly users towards greater independence. This one-day lab took place in the Home and Electricals department of a major department store in Aberdeen. Seven elderly participants were taken on designed tours of key products that reflected the context of use for the digital concept being explored (see fig. 6A), followed by a workshop activity on potential scenarios and functions (see fig. 6B). The author was present throughout as an observer. The following morning, the author facilitated an actor-network mapping session with four members of the Experience Lab delivery team (see table 6a). The company that brought the concept proposal for development with DHI is here referred to as New Co. The informants agreed three design things to reflect upon through the interpretative overlay (see fig. 6C): the lab design and proposal, the scenario cards and the shopping tours themselves.

Fig. 6A, *Guided Shopping Tour*, (DHI, 2014)

Fig. 6B, *Scenario Cards*, (DHI, 2014)

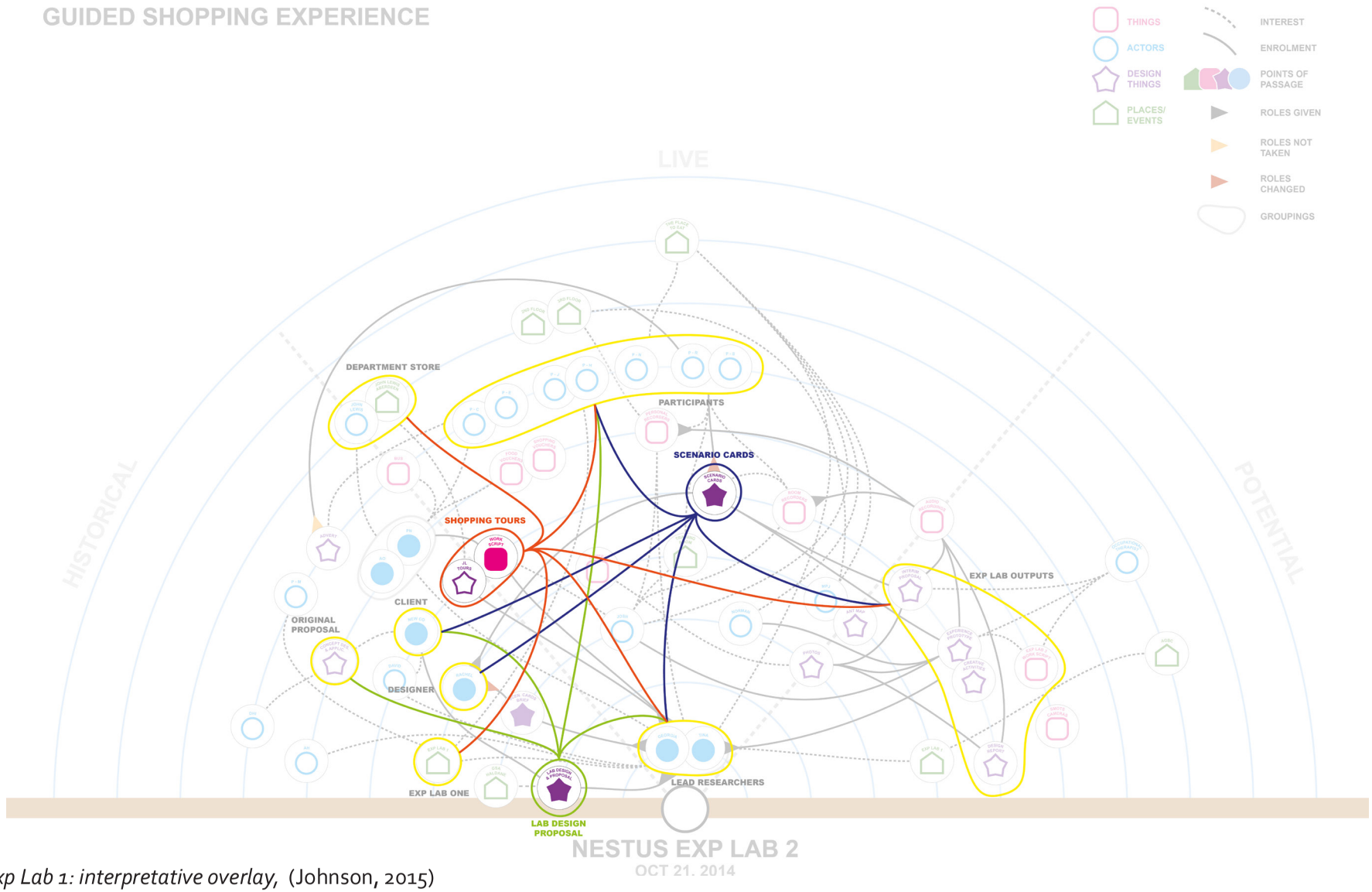


Fig. 6C, *Exp Lab 1: interpretative overlay,* (Johnson, 2015)

Overlay - Selected Matters of Concern

Lab Design & Proposal

Tina and Georgia expressed the lab proposal as the key reference when designing each element of the lab as it contained the objectives and reminded them of what they had selected to do and why. For developing the concept with New Co, the proposal was used as a reference to negotiate about what they interpreted would get the answers New Co were looking for and for sense checking their chosen direction with wider colleagues around DHI. This involved Tina and Georgia translating the original proposal extensively to make it more workable into the Experience Lab process, taking control of the conceptual development. This was an essential point of passage to enabling the Experience Labs to freely explore the context.

Scenario Cards

Georgia revealed that about half the scenarios came direct from New Co, and half from the participants' responses in the first Experience Lab. This was reflected as possibly being too many as it didn't allow for meaningful discussion on each scenario. The cards were laid out for participants to browse, which they largely did silently, only needing to sticker what they did or didn't like. Georgia would intervene to highlight any they reacted negatively to and added stickers herself. Norman questioned the collective setting of the scenario cards, recommending a more structured approach to systematically allow each participant to comment on each scenario. He argued, those left aside can't be evidenced as rejected or anything, simply that they weren't engaged. Josh and Georgia concluded that the collective method was still relevant as they showed what they could relate to and that the next lab would allow more extensive insights on key scenarios.

Tina and Georgia revealed that some scenarios were too inappropriate for the lab. New Co were pushing for older participants with more immediate medical needs, but Georgia found that older participants were the same, with identical needs and identical coping strategies. Josh concurred that the slightly younger demographic are those interested and relevant to such technology now, thinking of their coming needs, so the chances are they're going to buy it early and not when they're desperately in need. This evidence of how Tina and Georgia were implementing their control conceptually allowed a reassessment of their relevant market and subsequent selection of Experience Lab participants.

Shopping Tours

Related to the preceding Experience Lab, where they interviewed each participant in their home, Georgia reflected this allowed for them to personally recall details from the interviews during the tours and personalise parts of the tour. They showed great attention to detail by visiting the store beforehand to curate the tours, deciding in particular not to interact with the tablets too much, as they had done in the first lab. The lab participants had thanked the informants for a lovely trip, as they rarely go shopping in department stores, but Georgia and Tina felt the insights they gave were very understanding of the context of the questions. The informants were confident that because they each had a common experience of the participants' homes and circumstances this allowed more natural discussion without additional design tools. Grounding the findings in more natural experiences, shopping and conversation, was valued as providing more authentic insights for the next lab with live prototypes.

Experience Lab Two: Experience Prototype

The second Experience Lab to undergo live actor-network mapping directs follows the Lab presented previously. It was the final of a series of three focused on the development of a digital home support system for elderly users that supported greater independence in the home. Seven elderly participants were individually taken through a role-play showcasing potential functions of the developed proposal in a mock kitchen setting (see fig. 6D), as well as separate creative workshop activities exploring ideal scenarios. The author supported the lab in a 'wizard of oz' capacity, simulating functions of the proposal during the role-play, allowing for direct observations of the Experience Lab. After the activities, the author facilitated a live actor-network mapping session (see fig. 6E) with seven members of the Experience Lab delivery team and two clients from New Co, who had been invited to observe (see table 6b). The informants agreed a solitary design thing to reflect upon in the interpretative overlay (see fig. 6F): the prototype notification system grouping, which expanded into other factors on the single overlay.

Fig. 6D, *Role-play Prototype*, (DHI, 2014)

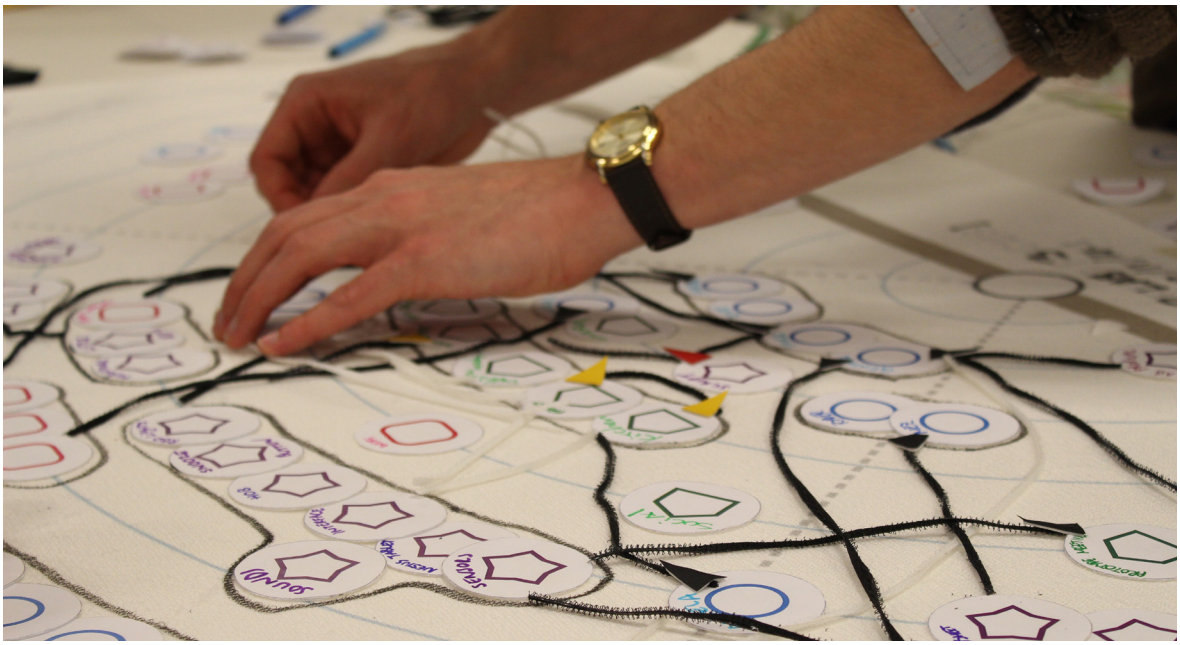


Fig. 6E, *Live actor-network mapping*, (Johnson, 2014)

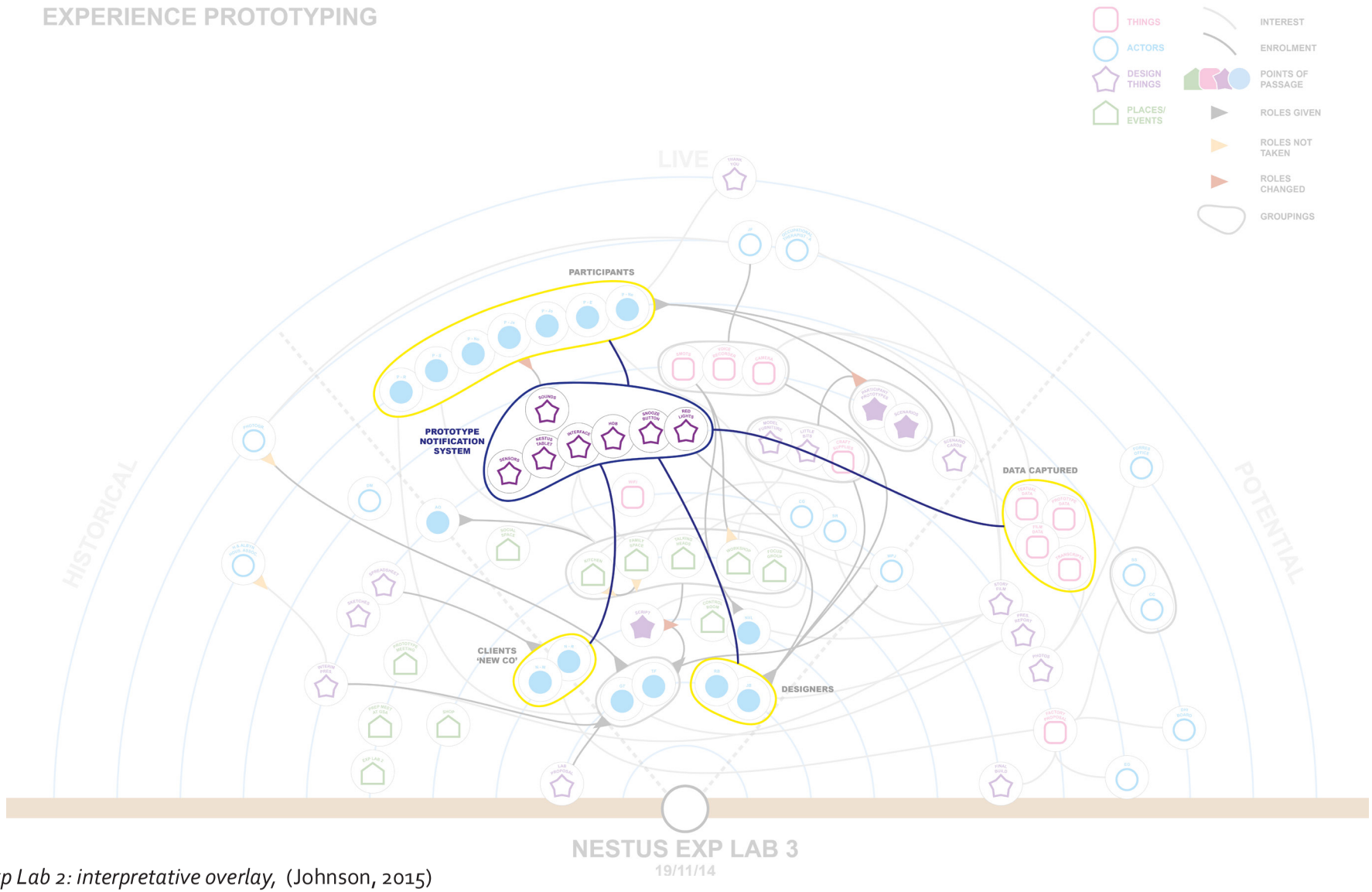


Fig. 6F, *Exp Lab 2: interpretative overlay,* (Johnson, 2015)

Overlay - Selected Matters of Concern

Prototype Notification System

Robert observed that a lot of the alert features, such as sounds, a red light, or screen visuals were quite obvious and next to the related home item, making the role-play slightly unnatural compared to real home situations. He then asserts the questioning was suitably neutral, with participants proving comfortable in giving honest responses, which he felt helped overcome the unnatural staging. Mark raised personalisation as a consistent, explicit requirement from the participant responses in order to simplify the information displayed. Carmen added that there was a variation in which features each participant would remove.

Robert saw that a significant factor in the participants' comments and thought process was cost, with the assumption that tablets and sensors would cost a lot of money impacting their judgement. Group discussion on the topic suggested explicitly giving each item a negligible cost to the participant may have refocused them on the experience. Georgia revealed that value for money was a significant factor throughout the three labs, which brought the cost perception of the concept into the foreground of New Co's consideration.

Robert felt the participants' trust in the system would have needed to be very high, with Tina quoting a participant saying the concept needing to be '*me*-proof'. This led Robert to reflect that their original intentions with the sensors may need to be much simpler in order to be 99% accurate. Tina retorted that often the participants' responses to each alarm was 'I would need to go check it out'. Georgia and Rachel commented that an alarm message could be quite passive – 'the tap is running' – rather than telling them to go turn it off. Shona added that participants did recognise some alerts were more important than others and so needed to be more 'alarming', which returned the group to acknowledging the depth of personalising the alert system. Aileen contributed that the system has to be quite non-intrusive if it's going to be for a carer to use, otherwise the person who is being cared for is going to feel quite invaded. Georgia responded it's not necessarily a carer, but a loved one, so finding some way to make it feel less like being watched by possibly only communicating a status update.

Rachel observed that the ideal scenario prototyping with craft supplies meant some participants took quite a while to build parts of their models. She felt that larger ready-made elements would have speeded the stories and insights from each participant. There was some kind of barrier to their confidence for making things. Aileen shared how she stepped in for one participant who came with experience as a carer, but step by step they found a scenario of falling in the shower and ideas would begin to flow.

Robert and Mark were asked about what information from the lab they felt would be useful in developing the digital home support concept. They saw the holistic insights, from what participants did in the scenarios to what they said afterwards, being drawn out across the labs and where design as intuition from insights comes into play. They also valued an independent group of people drawing those insights out, not influenced by their bias interests; actually going through a whole independent process of evaluation and research that constructively moved the concept forward. For the data capture in the lab, the SMOTs video recording system didn't record sound, so Tina took the occasion to ask the team to write down notes on the conversations they had with participants. This opportunity to hear the client's lines of interest managed to immediately refine data capture to these points.

Experience Lab Three: Directory App

The third Experience Lab to undergo live actor-network mapping focused on the development of a directory app for assisting Scottish paramedics in deciding the appropriate pathways for patients. This two-day lab took place in Elgin with eight paramedics from across Scotland. They were taken through a series of activities including regional resource mapping, scenario role-plays (see fig. 6G), then paper and digital prototyping of developed app concepts. The author was present throughout as observer and offering feedback on events. After the activities, the author facilitated an actor-network mapping session (see fig. 6H) with seven members of the Experience Lab delivery team (see table 6c). The original organisation that brought the concept proposal for development with DHI is referred to as Para Co. The informants agreed a solitary design thing to reflect upon through the interpretative overlay (see fig. 6I): the pair of Digital Prototypes as outputs co-designed with the participants, which again expanded into other factors on the single overlay.

Fig. 6G, *Role-play Prototype*, (DHI, 2014)

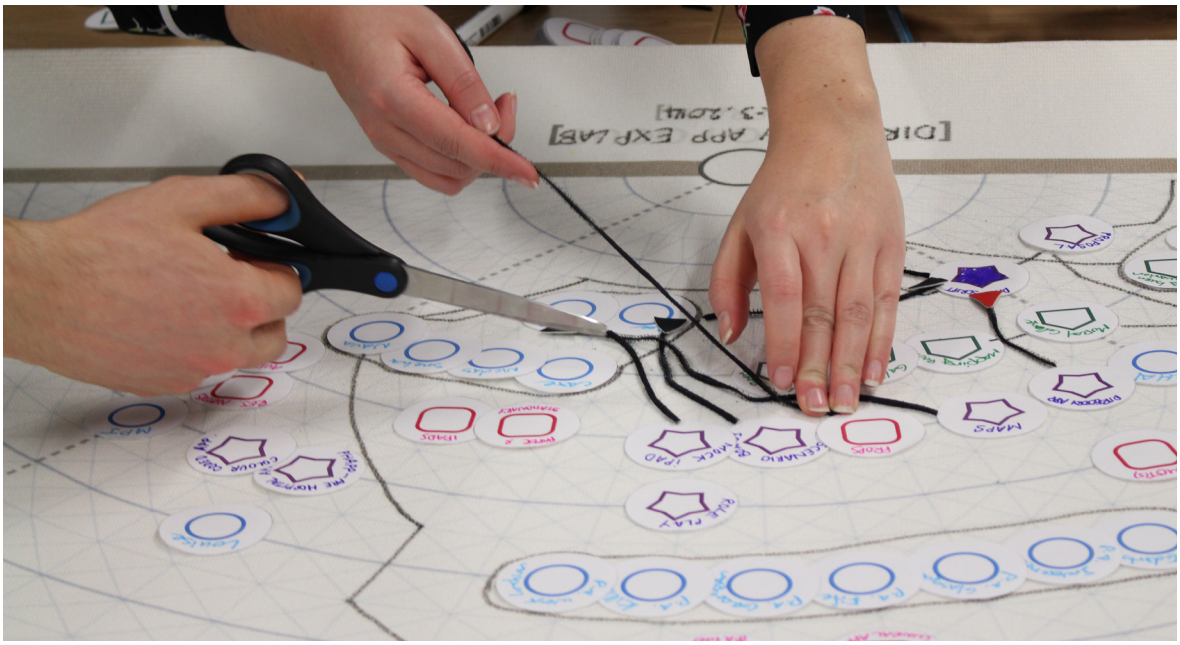


Fig. 6H, *Live actor-network mapping*, (Johnson, 2014)

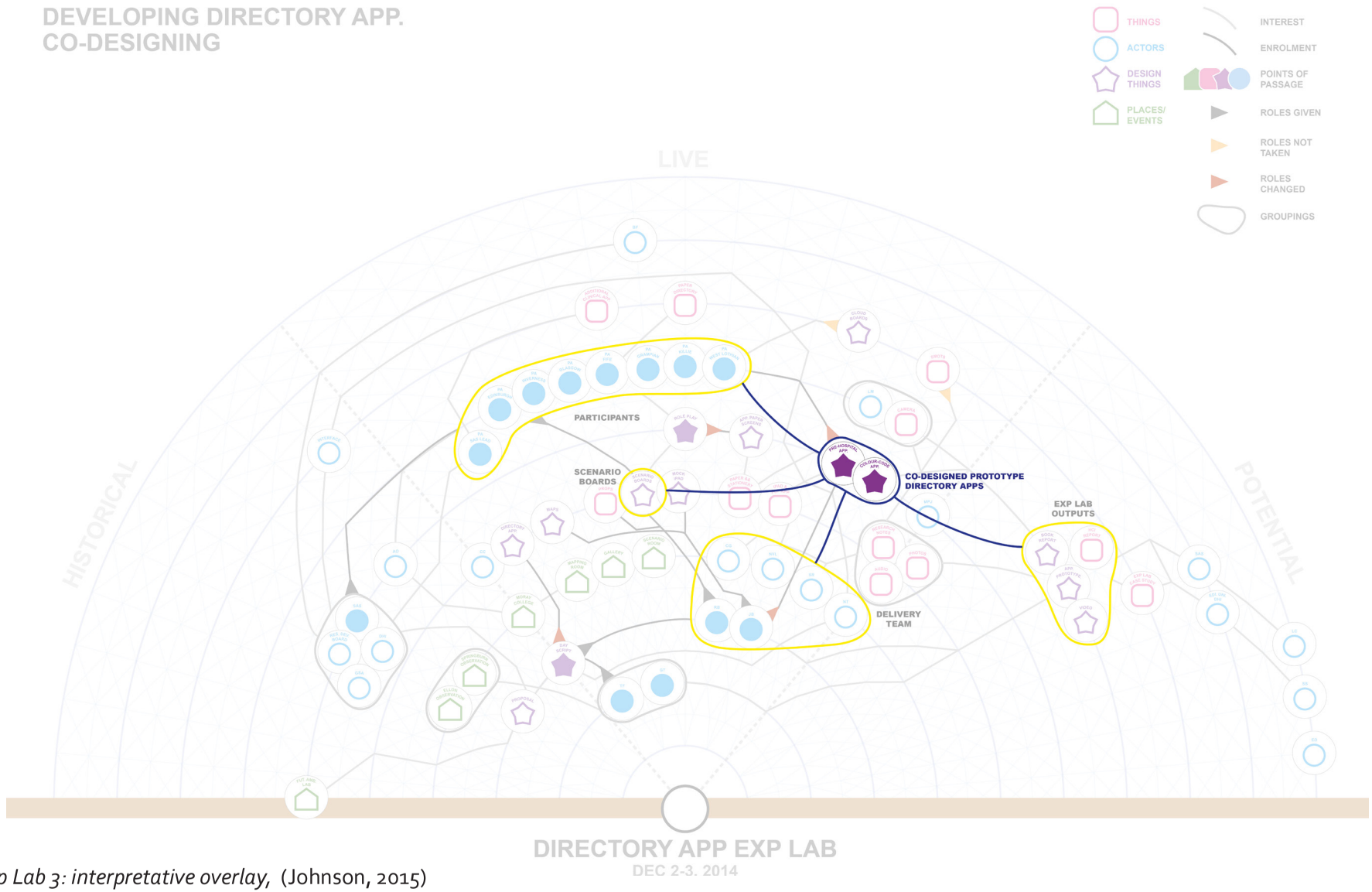


Fig. 61, *Exp Lab 3: interpretative overlay,* (Johnson, 2015)

Overlay - Selected Matters of Concern

Co-Designed Digital Prototypes

Just before the interpretative overlay, Rachel revealed that she had asked the photographer to try to film the production of parts of the prototypes, as she was worried she may not be able to capture some of the content going in to such a complex process.

Georgia reflected on the difference in how the two groups had developed their prototypes. One was very colourful and detailed, compared to her group being lo-fi. Carmen commented the set up was quite different with a larger table and craft materials in one, compared to a small table and fewer materials in the other. Rachel felt it interesting that it made such a difference, though enthused that the discussion became very a qualitative and focused debate without materials. The group with more making materials later reflected that their group didn't lack debate, but was better able to transition from debate into making as, not only did they have more room, but drawing on post-its and small pieces of paper allowed them to move small elements more easily. The other group drew directly on a single white sheet, which Rachel controlled as the designated artist.

The scenarios guiding the prototypes were identified as very influential by Georgia and Natalie as they kept coming back up as part of qualitatively evaluating each aspect of the prototype. Being specific scenarios experienced by the paramedics that were quite nuanced, Georgia commented they helped reveal some discreet aspects for the app. The level of detail in the paramedics' work came through strongly through role-playing the scenarios and emphasised multiple lines of provision the app would need to address. However, due to the level of detail in the scenarios, Georgia reflected she would have asked the associated paramedic to talk through their story to better inform the role-play.

The level of ownership from the participants was also discussed as a major positive, with them demonstrating the app on video afterwards 'like it was an advert', showing how seamlessly they felt it would fit into their experience as paramedics. This built on observations from the group that each paramedic had differences in each other's experience; some operating in rural areas of Scotland, others in major cities. This meant debate was rich in challenging how the app could function for each paramedi's situations.

Tina reflected on how the prototypes might be used in the final report; the key thing being what the requirements are for this app. The apps themselves were believed would do a lot of the talking and the report itself would be a supplement. They would be able to demonstrate physically, with the video of them actually talking through, and the report is just going to supplement 'this is what the app will need, this is where all the information comes from, and this is what people thought about it'. Norman, after the overlay session, commented that they had never discussed the fact that there were two different prototypes presented, with different features, so there would need to be an amalgamation of the two into a single group of recommendations.

Delivery Team	Background	Table No.
Norman	Co-lead researcher, digital developer and facilitator	one
Rachel	Designer and facilitator	one
Samantha	Invited researcher on social care and note taker	one
David	Design researcher, digital developer and facilitator	two
Shona	Design researcher and facilitator	two
Tina	Design researcher and note taker	two
Josh	Co-lead researcher, designer and facilitator	three
The author (MPJ)	Design researcher and facilitator	three
Carmen	Project co-ordinator and note taker	three

Table 6d, *Experience Lab 4, Reference of DHI delivery team*

Experience Lab Four: Digital Brokering App

The fourth Experience Lab, unlike the previous three, directly appropriated the actor-network mapping technique as the key method for concept development within the Lab itself. This transpired due to Norman and Josh experiencing the technique in earlier labs and deciding to adapt the method. The Lab focused on a digital brokering app for connecting the needs of vulnerable residents of remote Scottish communities to the local people and services that could meet these needs. The one-day Lab took place in a theatre suite in Inverness with fifteen participants from various organisations and personal backgrounds interested in the service and care of rural Scottish residents. They were split into three groups of five participants, with two DHI facilitators taking each group through two mapping sessions, and a researcher taking notes on the ensuing conversations (see table 6d). Following each mapping session, the groups selected scenarios from their respective maps to present through role-play, props or puppets.

The context for the actor-network mapping in this Experience Lab was significantly different to the previous three Labs. It was no longer focused on a specific design situation that had just transpired, but a much more open, societal situation perceived to represent a market opportunity for the app in question. There were two mapping sessions performed: one focused on representing the current situation from a service user perspective, as perceived from the participants' experience, and a second focused on mapping potential solutions into those situations, based on ideating possible functions for the app. As a result, there were six maps produced in total across the three groups. This section presents the participants (see tables 6e, 6f and 6g) and selected matters of concern for each table for each mapping session, supported by images from each tables mapping session and a digitisation of only the afternoon maps. The original organisation that brought the concept proposal for development with DHI is referred to as Health Co.

The author was no longer the lead facilitator for the technique, but disseminated facilitation to DHI members. The script was therefore developed into a series of five post cards communicating each step of the mapping process (see fig. 6J): 1) context, 2) actants, 3) positioning, 4) associations and 5) brokering. The language was altered to account for the new context and the mapping focus was changed from an Experience Lab to a representative service user chosen by the participants. The design things actant icons were removed from the morning session but reinstated for the afternoon session to distinguish the new app functions proposed by participants within the wider situation of people, things and places identified. The links of association from previous maps also changed in language: associations of enrolment changed to probable activity, while associations of interest changed to possible activity. For the afternoon session a third link of association was added to represent preferable activity. This was done to encourage participants to distinguish likely scenarios in the situation from less likely scenarios, as well as what scenarios they felt would work best. Step five, traditionally when the interpretative overlay was performed, changed to a simple act of flagging the issues of note identified in the map and marking them with coloured flags. This encouraged some reflection, but in a more efficient way with consideration for the labs time constraints.

Despite the provision of structured stages, the groups and facilitators only followed these stages very loosely, especially concerning the links of association. As a result, the maps do not provide a strict ANT representation, but are still grounded in describing the roles and relations between people and things. The matters of concern were able to be drawn from the discussions, rather than an interpretative overlay, as each stage still encouraged careful reflections from participants.

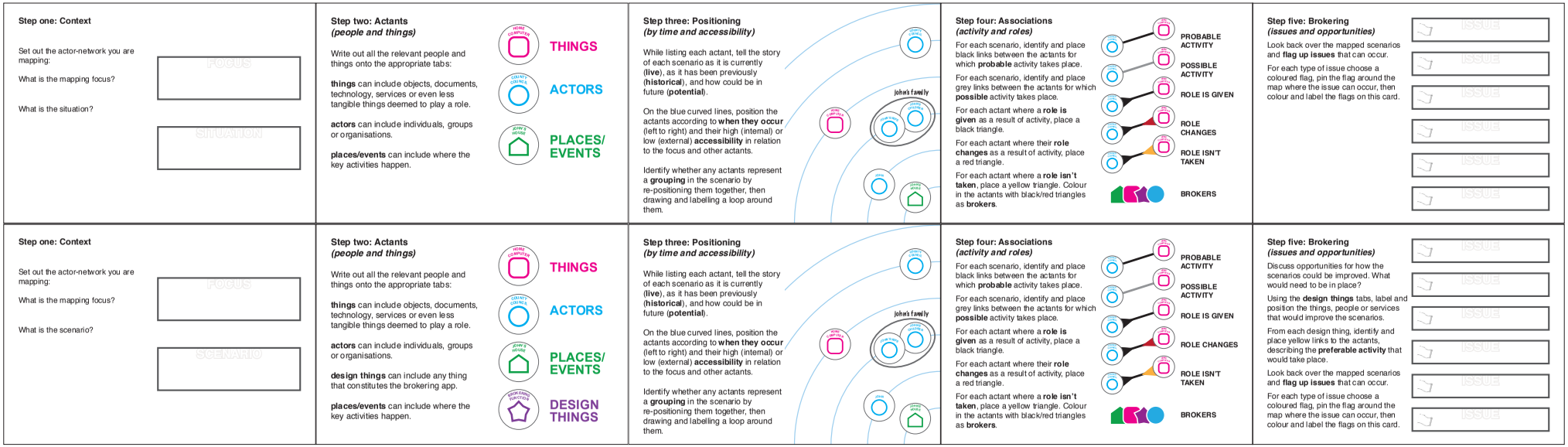


Fig. 6J, *Exp Lab 4: actor-network mapping script*, (Johnson, 2015)

Table One Actor-Network Mapping

Participant Names	Background
Jack	Digital health consultant and collaborator on the app development
Felicity	Project manager for remote and rural healthcare education
Anna	Policy officer from Highland Council
Charlotte	Rural resident and educator
Aaron	Assistant Chief Executive from Calman Trust

Table 6e, *Experience Lab 4, Table 1, Morning Session Reference of Participants*

Participant Names	Background
Laura	Community coordinator at a Highland housing association and collaborator on the app development
Abby	Communities assistant at a Highland housing association
Gemma	Housing policy officer at Highland Council
Lianne	Rural resident and former housing association tenant

Table 6f, *Experience Lab 4, Table 1, Afternoon Session Reference of Participants*

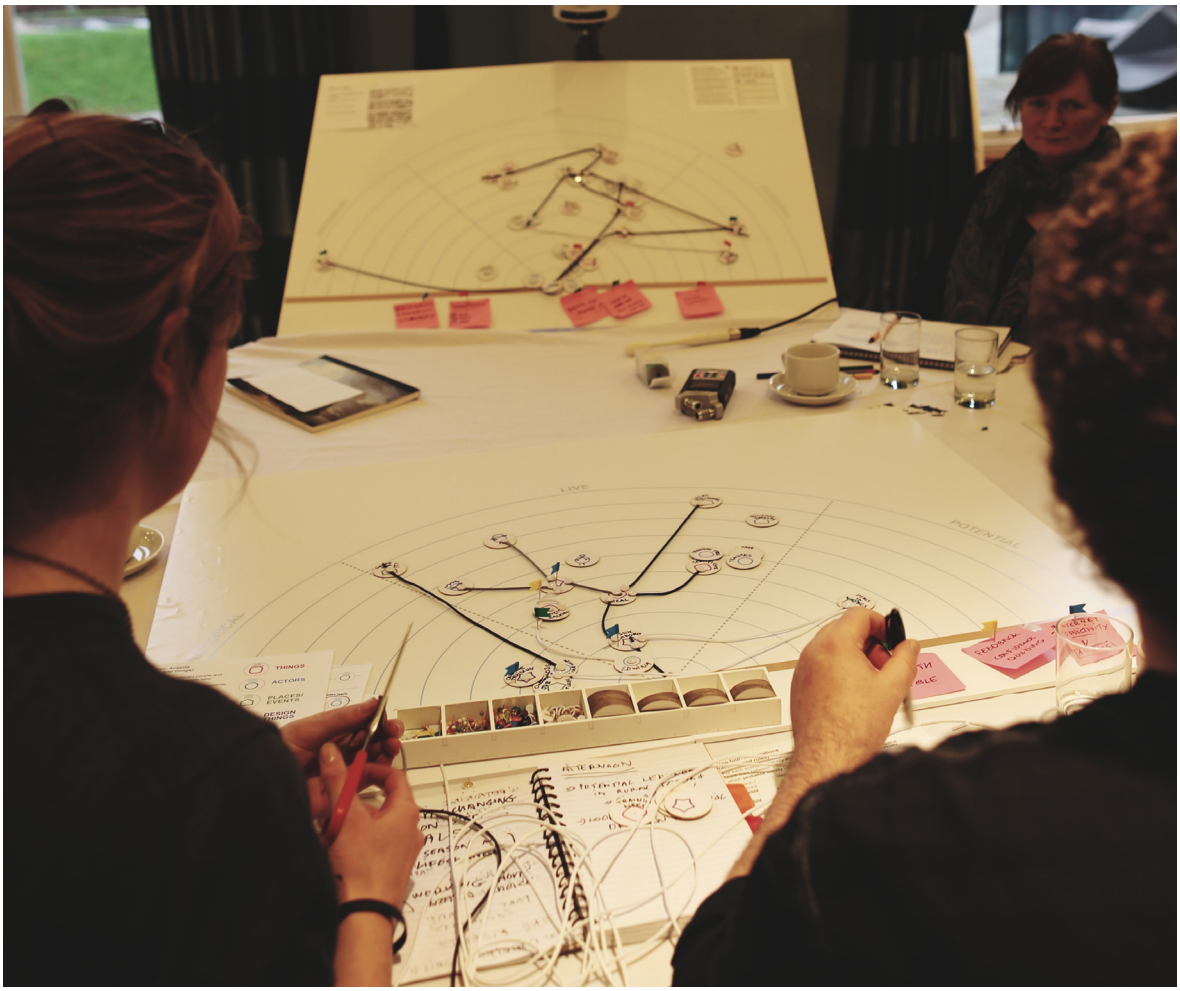


Fig. 6K, *Table 1: brokering app actor-network mapping*, (Johnson, 2014)

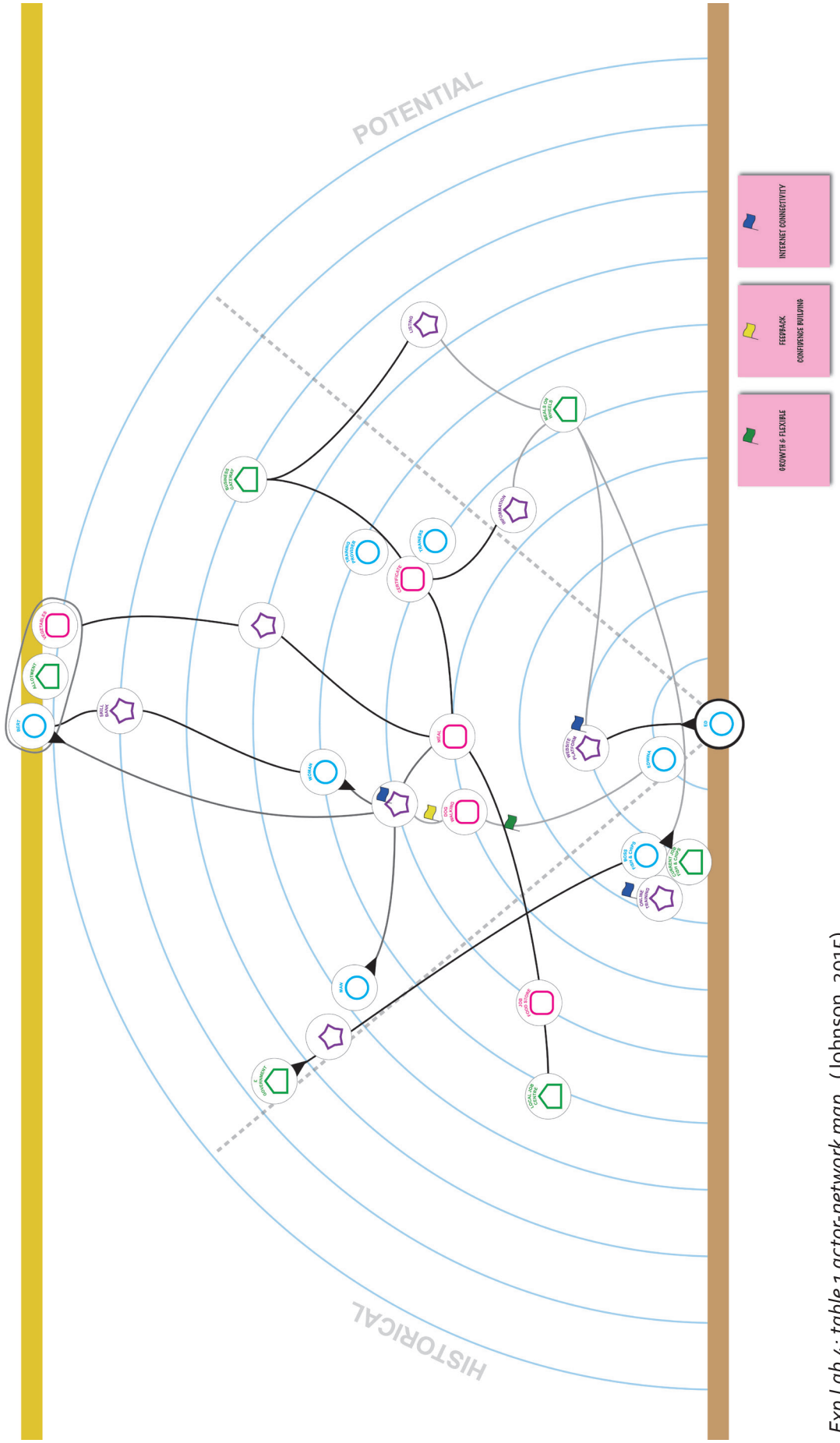


Fig. 6L, *Exp Lab 4.: table 1 actor-network map,* (Johnson, 2015)

Selected Matters of Concern

Morning Session: Mapping the Current Situation

Jack initially critiqued the problem needing to be expressed by the service user, not by them as service providers, which drew a response from every other participant that they did understand major parts of the problems faced. Anna expressed the problems coming from the people providing the services, and the stories that service users have told them as providers. Felicity continued that they are interlinked and interpreted this as the purpose of the mapping, to connect service user experiences to institutional concerns.

The focus of the map is a specific service user, Ed, a young male seeking to access education while in local employment and with a young family; a significant profile they felt needed to be retained in order to better sustain rural communities. His key motivation is attaining his dream job locally. They discuss the issues of broadband access and remote supervision on quality education and turn their attention to local employers being involved as learning and training centres on specific vocations. Jack pushed that Ed needs access to coms in order to access education remotely, rendering the issue unresolvable unless you provide the necessary coms.

Felicity raises the issue of culture shift, that remote education is not seen as an option more generally in the Highlands, so normalising it would make it a much more sustainable platform or model. They conclude that, if Ed trains in social care, with a framework in place to gain full qualifications in his local, rural setting, the shortage of care for local elderly residents is eased, and family-oriented services, such as schools & childcare, gain greater relevance to remain.

Afternoon Session: Mapping the App into the Situation

The participants recognise the app as a two-way service for those needing services and those willing to offer them; Ed is seen as someone willing to offer them. Laura reveals they hadn't looked at the app from that perspective. They discuss providing a web page for potential service providers, such as Ed, to display where the app reveals unmet needs in Highland communities. Gemma extends that an unmet needs page could provide evidence for funding from investors.

As part of enabling Ed to start a business in response to unmet need, discussion moves to how Ed can receive the necessary training and qualifications. They list organisations geared to support business start-ups as partners to bring in. The group summarise the unmet needs page as both interesting Ed as an opportunity for training and starting a business, as well as training providers being able to deliver strategic areas of training. Gemma and Laura feel this two-way approach makes the app more powerful, almost replacing the job centre. Rather than five hundred applicants for jobs they don't want to do, you have self-selected providers to small jobs they're keen to do.

Ed is positioned working in a fish and chip shop, keen to develop a meals-on-wheels business, with his current employer as partner, using the existing resources at the chip shop, revealing the potential for businesses to expand in response to local unmet needs. Edwina then emerges as Ed's wife without any previous vocation, but she would use the app to explore hobbies and interests to earn extra money for the family. A third scenario is drawn from an elderly service user, Bert, being able to access a skills bank, offering his experience, knowledge or resources as part of the network created by the app. The participants draw a second timeline above the original structure in order to position the elderly service user and such assets in relation to Ed's map.

Table Two Actor-Network Mapping

Participant Names	Background
Laura	Community coordinator at a Highland housing association and collaborator on the app development
Stuart	CEO of Health Co and collaborator on the app development
Peter	Local development officer
Patrick	Local development officer
Aaron	Assistant Chief Executive from Highlands social enterprise

Table 6g, *Experience Lab 4, Table 2, Morning Session Reference of Participants*

Participant Names	Background
Jack	Digital health consultant and collaborator on the app development
Aaron	Assistant Chief Executive from Highlands social enterprise
Peter	Local development officer
Patrick	Local development officer
Jane	Rural resident and current housing association tenant

Table 6h, *Experience Lab 4, Table 2, Afternoon Session Reference of Participants*

Fig. 6M, *Table 2: brokering app actor-network mapping and scenario*, (Johnson, 2014)

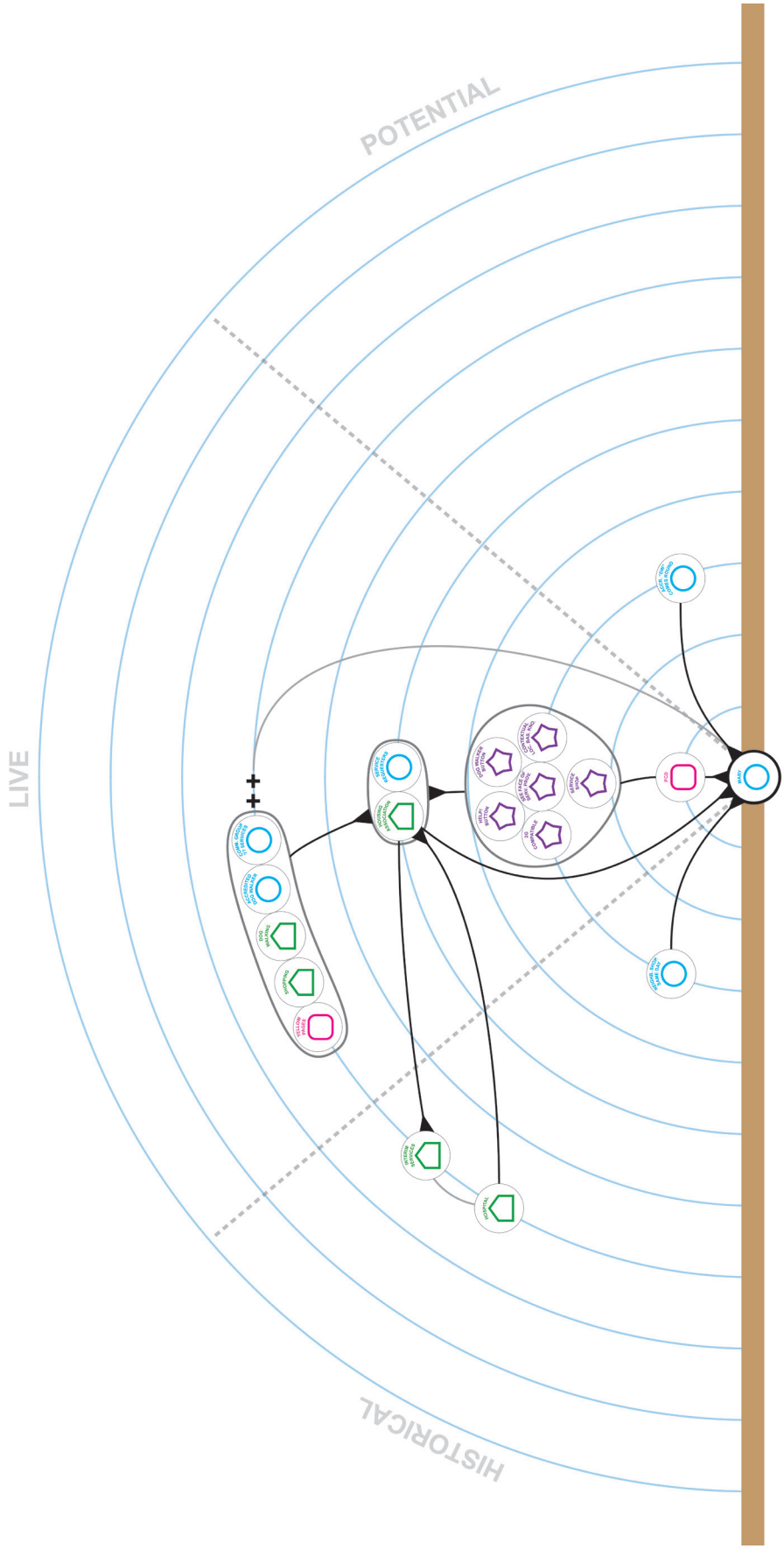


Fig. 6N, *Exp Lab 4: table 2 actor-network map,* (Johnson, 2015)

Selected Matters of Concern

Morning Session: Mapping the Current Situation

Laura and Stuart introduce the context for the app as supporting the social payments given to rural residents to go further by connecting users with providers more effectively. Laura shares that a person usually begins to need help following an incident, either to oneself or someone close. This leads to the mapping focus being an elderly resident, Mary, estranged from family, having had a knee operation and suddenly needs help. The group speculates on the people Mary could go to for help, revealing the barriers and variations in the types of help she may need; who's available to help and how difficult it is for Mary to access them. Part of the personal barriers for Mary is her reluctance to access services. Initial contact is feared as setting off interference in her life, but until that initial contact is made services intended for her cannot access her.

Peter highlights the recurrence of elderly people being discharged from hospital without sufficient care at home, only to be brought back into hospital. When hospitals do retain patients due to a lack of sufficient care provision at home, this leads to what is known as bed blocking. They focus on the moment of Mary being given money to arrange self-directed, when she would have little idea of who to contact herself, it's a nightmare. The services she can access, NHS or councils, have a conflict of interest in referring private services, revealing a complete disconnection between services that cater her needs and resulting in ill-informed decisions. In mapping potential care providers, the group observes how many options bypass the health services, leading to a discussion on who has the power in such a scenario. Empowering the user only goes so far. Empowering those interested in Mary's care means increasing the awareness of her needs in relation to the appropriate options.

Afternoon Session: Mapping the App into the Situation

Jane immediately identifies herself with the maps focus user, Mary, through living alone, her relationship with hospitals and knowing she'll need more help, without knowing where to get it. Jack reveals the app is designed to function on the low meg speed of the Highlands, and would be advised for download as part of identifying proof of care for Mary before she's discharged home. Aaron advises that social enterprises such as Red Cross, would become involved and use the app as part of eventually withdrawing services, an exit strategy, which Aaron feels is in their interests.

Jack states the app provider configures the app, not the user; the decision is based around who controls regulation, the provider, or whether it becomes self-regulated, like trip advisor, with only occasional tweaks. The group suggest part of the regulation may come from relatives, who want access to the app in some way, just as some childcare services are aimed towards parents. Peter suggested the app is centrally delivered and regulated by a housing association, who can potentially provide additional services, but it's distributed through local hubs catered to local needs. When the hospital was positioned as the app regulator, the group saw this as problematic; for the hospital to become involved, Mary would have to tell her housing association, who might contact the hospital.

Jane seemed to enjoy the idea of allowing people she knew to respond with their availability. If it was a recognized process, she would worry less about it. Patrick warned that sometimes the app would be preferable, but other times the relationship is established and the app is bypassed. This was seen as positive evidence of the app improving relations within the community. Such relations would cease to be regulated, but Jack feels that's worth it.

Table Three Actor-Network Mapping

Participant Names	Background
Jane	Rural resident and current housing association tenant
Lianne	Rural resident and former housing association tenant
Judith	Research fellow in rural health
Janice	Project coordinator for Citizens Online
Abby	Communities assistant at a Highland housing association

Table 6i, *Experience Lab 4, Table 3, Morning Session Reference of Participants*

Participant Names	Background
Judith	Research fellow in rural health
Janice	Project coordinator for Citizens Online
Felicity	Project manager for remote and rural healthcare education
Anna	Policy officer from Highland Council
Charlotte	Rural resident and educator
Stuart	CEO of Health Co and collaborator on the app development

Table 6j, *Experience Lab 4, Table 3, Afternoon Session Reference of Participants*

Fig. 6O, *Table 3: brokering app actor-network mapping and scenario*, (Johnson, 2014)

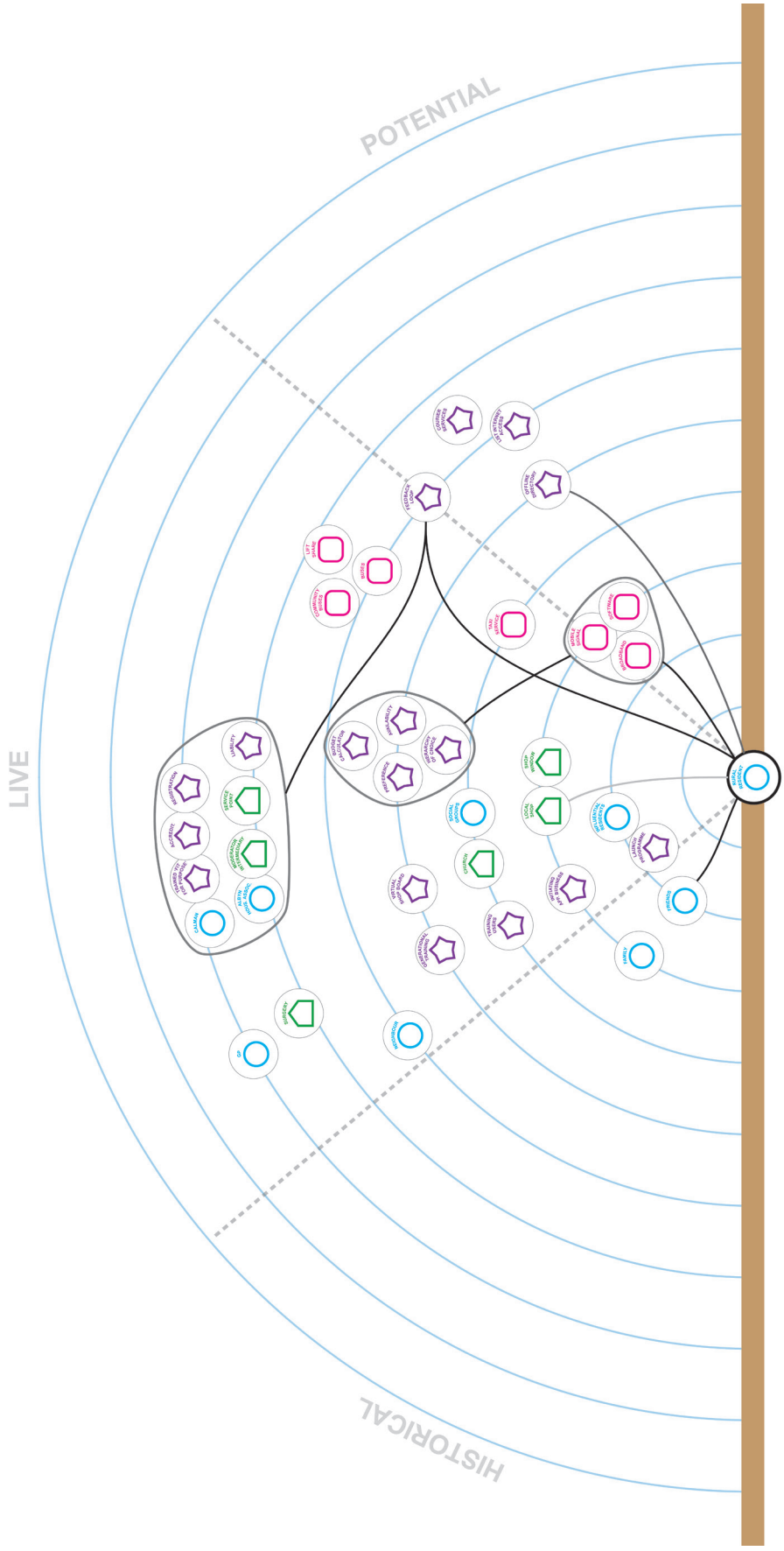


Fig. 6P, *Exp Lab 4: table 3 actor-network map*, (Johnson, 2015)

Selected Matters of Concern

Morning Session: Mapping the Current Situation

After Lianne shared her experiences living in an isolated rural community with high levels of need, noting how local services are closing down, the group decided to focus mapping around isolated rural residents. Transport emerged as a key issue for isolated communities, with a wide variety of options listed, but their availability, cost, and coverage widely debated. The replacement of local services that served as physical hubs – such as the post office, library, surgeries, service points – with remote/mobile services is lamented as the people delivering these services were a source of knowledge and connection within the community. Community-focused hubs, such as the church, village hall, or community centre, would be the site for various groups or clubs, preventing social isolation and providing activities. This reveals the committees, parent councils and community councils, which represent very engaged members of the community and a good access point into communities.

Discussion on the most accessible actors to isolated rural residents revealed variations among neighbours, local services, friends and what they're able to do. Places, such as high schools, became a barometer for what other services were likely to be around as well. The group also identified uncommon places that have some of the greatest benefits to a community, such as a community café, library, learning centres, etc. The GP is identified as difficult to access for rural residents as the surgery covers a large area, or only visits each fortnight. This is contrasted with their being an essential service and thus chosen as part of the scenario presented.

Afternoon Session: Mapping the App into the Situation

The group interprets the app as feeding information on the services that are needed. A potential function for the app is described as a virtual community board, such as those in shops or post offices, but with the benefit of being digital. Felicity suggests there are initiatives that function in a similar way, such as community websites. Stuart responds that the app differs in that it has a business model behind it, while specifically connecting people in the community to each other to overcome isolation. Felicity notes that the problem with relying on users to express their needs is that they sometimes don't realise what their needs are, or what services they'd benefit from. Stuart responded that housing associations have an interest in their tenants wellbeing, so can use existing relations with services to enhance conversations about support for the service user.

The group observes the app should function as an offline directory when the broadband is down, as this is a common scenario in the Highlands. Janice suggests that she would want a hierarchy of people to contact when sending out a call for help, as she would feel stressed by the possibility of multiple providers contacting her to accept the work. Felicity raises the concern of feedback comments featuring on the app, as local communities are in very close contact and have local histories. Negative feedback can have consequences, so responsibility for this could lie with the moderator. Stuart differentiates service providers as totally open, not in contract with the moderator but as a paying member. Felicity enthuses that this needs to be made clear for service users, as accreditation then becomes quite valuable in such circumstances. The role of other accreditors emerges as local needs are established, placing extra responsibility on the moderators to respond to such information. This results in the need for a feedback loop connecting local needs with available services. Felicity encourages a link between user and moderator, as if the service needs are not met often enough, reliability in the app system is lost.

Key Findings and Reflections

The key objective of this case study was to deliver the actor-network mapping method into a live design situation as an approach to support reflexive discourse around design things as matters of concern. For this stage of developing actor-network mapping, the method shifted from translating an actor-network account into a mapped visualisation, to translating the visual mapping elements into a practicable, physical, participatory design tool. The challenges, therefore, centred around the manoeuvrability of individual elements, their clarity of application towards representing the design situation, and the map's meaningful adoption by the informants to reflect on preferable outcomes.

The use of a hook and loop fabric worked well to allow the informants to wilfully and playfully move the actant tabs around. The drawn nature of early maps looked inelegant, imprecise and led to maps that were messy and difficult to read. While the aesthetic was intended to feel like a prototype, the combination of such rough elements with the increasing complexity of the map also prevented informants constructing parts of the map themselves. However, the actant tabs were visually strong over the map structure, especially with the white border around each shape, and identifying points of passage produced the most in depth descriptions from informants. The concentric semi-circles from the centre work as a useful structure, but needed strong facilitation as there was no clear rule in positioning actants for participants to follow. The strongest assertions were for positioning external and internal actants, while the mid-range actants were guided by the facilitator. Mapping the associations was the least clear part of the mapping sessions, with only links of interest and links of enrolment to guide the informants. The facilitator was central at this stage, as this is where the value of the actor-network map was intended to emerge.

The informants, generally, expressed most interest regarding the reflective session using the fabric overlays. This was where they felt they learnt more about the labs and conversations of value and reason behind certain design things would emerge. They saw value in having the whole session visually set out, which helped them appreciate the variety of roles played by individuals and how they fed into the wider situation. The interpretative overlays proved an intensive activity with delivery team members, but they were consistently observed and embraced by all informants towards a thorough analysis of each intervention.

Similarly to case study two, they freely critiqued each design thing, discussing how strong the methods were and, in particular, how strong the data was they had captured. The matters of concern presented above reflected on how the design proposals were translated into the Experience Labs as research projects, how well key methods and prototypes represented the concepts, and how well participants were able to engage with the concepts in a meaningful way. This last point in particular dominated each mapping session, and when brought to the context of potential outputs, began to draw out preferable narratives, articulated almost as words of caution, for the development of the final design thing.

In this case study, actor-network mapping again proved a consistent representation of how design things interacted within the Experience Labs, while interpretative overlays brought the matters of concern around each design thing into focus. These moments of discussion are the focus of attention within the next chapter of this thesis, using grounded theory as a mode of analysis to draw out the patterns and descriptions of performative agency and emergent matters of concern towards sampling a theoretical framework on design as a performative act.

ANALYSIS
DESIGN THINGS AS MATTERS OF CONCERN

chapter 7

Having presented each of the three case studies, it now comes to presenting the analysis performed on each case study using methods from grounded theory as a mode of analysis, supported by situational analysis. The analysis was conducted sequentially from the first case study (CS1), to the second case study (CS2) and completing with the third case (CS3). Each case underwent constant comparison with data from the previous cases to help both consolidate categories and determine anomalies circumstantial to each case. As a result, the analysis shall be presented sequentially according to each case study to demonstrate the traceable coding and categories applied, and to present the interpretations made by the author towards the sampling of theory and arguments addressing the over-arching research question:

> How can actor-network mapping represent design things as matters of concern in organisational discourse?

Analysis of the first case study begins by presenting initial descriptive categories emergent from the open coding of the interview transcripts with informants. A second round of open coding is then presented from these initial descriptive categories generating a deeper array of prominent sub-categories. The open coding from CS1 is then summarised with key findings to take forward to the analysis of CS2.

Analysis of the second case study presents a review of selective coding, consolidating the descriptive categories from CS1, performed on the interpretative overlay transcripts and supporting observational notes. These descriptive categories of the performative agency of design things are then translated as matters of concerns, through axial coding, as core categories. The subsumption of core categories is summarised with key findings to take forward to the analysis of CS3.

Analysis of the third case study follows the axial coding of matters of concern from CS2 by consolidating and subsuming core categories through CS3 for the sampling of theoretical concepts. The accounts from the nine mapping sessions with informants, across four Experience Labs, underwent a final stage of selective coding to confirm, refine or review each axial coding in order to subsume into core categories. The result of this process of subsumption is presented as a circular, reflexive framework (see fig. 7a) of eight core categories, for conceptualising the matters of concern in design-led innovation. This section presents these final core categories and arguments towards their conception.

Descriptive Categories	No. of Codes
Articulation of the concept	33
Articulation of experience	23
Articulation of roles	75
Call to capture data	19
Call to reflect on impact	24
Collaborative design work	27
Consideration for further actors	56
Cross-disciplinary language	9
Design thing as visual representation	47
Design thing as experiential representation	59
Design thing as part of network	7
Dynamic sites of progress	18
Exploration by experience	8
Intuitive assertions of opportunity	96
Intuitive assertions of situation	80
Meta-level design process	19
Politicising of actors	32
Referenced assertions of opportunity	26
Referenced assertions of situation	30
Trial of authority	80
Trial of interest	53
Trial of procedure & resources	90
Uncommunicated work	15

Table 7a, Initial Descriptive Categories from CS1 Interviews

Case Study One: Open Coding of Design Things

As presented in the methodology chapter, *Mapping the Role of Design*, CS1 was identified as the starting point for open coding to reveal descriptive categories articulating the performative agency of design things as the focus of inquiry. This open coding was performed using qualitative analysis software, NVivo, on the interview accounts with the case study informants, four in total, and generated extensive codes under an initial series of descriptive categories. These initial categories represented the various moments in the interviews in which participants were describing their experiences, relations, reflections and thought processes regarding the development of the Know Sugar project through design things. This produced twenty-three categories articulating design work in the informant interviews (see table 7a).

These categories provide a broad overview of the situational themes articulating the role of design things within the context of organisational discourse. As a result, the terminology chosen is predicated on actor-network theory, and the wider literature identified in the scope of context, *Design in the Discourse of Change*, which were positioned to inform a reflexive, object-oriented discourse. These initial codes provided a platform for a second round of more in-depth coding producing a suite of sub-categories within each descriptive category. This aimed to break down the codes within each descriptive category into more specific articulations of design things in organisational discourse. This is argued to reveal how design things shaped the ways of working during the project across the participants' interview accounts. This process produced over one hundred and seventy-nine sub-categories, varying from three to thirteen sub-categories within each of the twenty-three initial descriptive categories. The most common sub-categories are here reviewed to show how they engage within organisational discourse. These common sub-categories are presented with their coding frequency in brackets, and within their original descriptive categories, to illustrate the breadth of commentary, grounded in the case study context, the author identified.

Initial Descriptive Categories	Descriptive Sub-categories	Category Summaries
Articulation of the concept	*Connecting concept model to visual representations (10)*	fundamental acknowledgment of the role of design things in shaping the project's business model
	Connecting concept model to key aims (8)	prioritising a disruptive, design-led approach focused on changing consumer habits with sugar, rather than profits or stakeholder interests
	In relation to constituent development (9)	iterating a holistic representation for each actor and artefact to contribute to
	In relation to influencing stakeholders (6)	framing the opportunities and ways of evidencing the concept for stakeholders, but often without clear outputs
Articulation of experience	*In relation to work identity (8)*	relating their personal circumstance and understanding to the context of diabetes
Articulation of work	*Through individual discipline (10)*	contrasting their discipline from other actors they encounter to distinguish their approach
	For design representations (22)	focusing on service user interactions with representations or prototypes, and their own interactions, with detail and situated value
	In relation to analysis of the context (14)	soft-skills focus regarding data collection, while harder evidence is acknowledged but mildly speculative
	In relation to key tasks and outputs (30)	extensive work for concise details, with commitment seen as key but disrupted by the actions and capabilities of group members
Call to capture data	*To evidence interest in design things (16)*	retrospectively relating the experience prototype to methods of generating evidence
Call to reflect on impact	*To define concept readiness (10)*	concept is reflected on holistically in relation to the existing market factors, with a distinct caution in claiming a solution in such a sensitive context
Collaborative design work	*Facilitating team dynamics (10)*	familiarity with design methods allowed the group to function well at certain stages, while being unfamiliar with each other prevented other stages to flow fluently
Consideration for further actors	*Connecting the business model to potential partners (13)*	identifying potential partners that will enhance the proposal and flexibility with multiple options with the model

Table 7b, *Selected descriptive categories from open coding*

Initial Descriptive Categories	Descriptive Sub-categories	Category Summaries
Consideration for further actors (continued)	*Considering potential users (11)*	realism that well read, well-off users are the key market to prove and sustain the concept; the social impact is apologetically referenced as an indirect result
	Identifying gaps in team capacity (17)	appreciation for further expertise in skill/ knowledge based areas, but research areas are quite complacent, with funding seen as limiting their ambitions
	Identifying impact of potential partners (12)	judging major stakeholders' vested interests and how this affects their proposal strategically
Design thing as experiential representation	*Prototype as concept testing (10)*	testing on nuanced interactions and where it can add value/meaning, resulting with positive, negative or potential design decisions
	Prototype as touchpoint curation (23)	potential touchpoints are explored in relation to the core aim of changing sugar habits and the overall blueprint
	Prototype for content curation (14)	content is seen as playful, engaging and achieved simply; the process for reflecting on content factors is not broached
Design thing as visual representation	*Reference of context experience (12)*	the Know Sugar scale and blueprint emerge as the main foreground and background artefacts through which all other elements are associated; they are used for iteratively shaping dialogue with users around sugar
Intuitive assertions of opportunity	*Gathering consumer input and experience (10)*	encouragement through anecdotal rather than academic evidence, with focus on engagement figures rather than lifestyle change
	Hooking into consumer scenarios (10)	wide assertions of consumer vulnerability informing a step-by-step, multi-variant approach
	Identified market opportunity (10)	starting a dialogue around health and sugar, outside academic control, with the methods and insights for engagement franchised and transferrable to other issues
	Improve existing models (11)	leaning on supermarkets having an interest in their consumers eating healthily, with central communication and interventions around diet
	Stated potential of concept ideas (12)	positive belief in a design-led approach for retaining human-centred meaning across multiple partners and platforms

Table 7a, *Selected descriptive categories from open coding* (cont.)

Initial Descriptive Categories	Descriptive Sub-categories	Category Summaries
Intuitive assertions of opportunity (continued)	*Strategic approach for development (13)*	physically prove the concept in Scotland until it's transferrable, but capture an online audience to prove the levels of engagement and membership to sustain/ expand the model
	Targeting influential stakeholders (15)	taking a progressive stance that brings supermarkets, NHS or government into their line of thinking to change sugar habits
Intuitive assertions of the situation	*Interpretations of stakeholder positions (14)*	perception that main stakeholders are part of the problem and shifting their position as the major goal
	Observations of representative scenarios (18)	assertions and associations that perpetuate the issue, expressed from very personal points of view
	Reflections on project approach (11)	acknowledging a current merger of design and business methods led by a designerly approach, but that a team mentality with additional skills would best deliver the project
Trial of authority	*In relation to context exploitation (23)*	concerns over entering an issue with powerful, vested interests and expertise while lacking a discernable and robust concept/business model
	In relation to context stakeholders (17)	entering a massive conflict of interest where the project will be scrutinised severely, informing strategic approaches for every potential stakeholder
	In relation to subject knowledge (14)	seen as a risky area to manage carefully; being transparent without claiming clinical knowledge, while building a model that authorities can support
	With group direction and decisions (17)	strong and distinctive opinions across the group about the concept model, with a lot of work not shared and tasks showing mixed values, reducing the effectiveness of the group
	With individual contribution (15)	an open approach has been needed to allow individuals space in their tasks, but a lack of common formats or role adoption leads to work being ignored and lengthy discussions for buy-in

Table 7a, *Selected descriptive categories from open coding* (cont.)

Initial Descriptive Categories	Descriptive Sub-categories	Category Summaries
Trial of interest	*Collating consumer opinions (14)*	striking judgments on each detail of the concept, whether consumers understood, identified with it and would engage with it
	For hooking in consumers (14)	using familiar yet provocative devices to bring people into the Know Sugar narrative and consider users through various stages and media
	Investment into concept (9)	acknowledging an unconventional IP model, with complex messages that suggest a more aware target audience, but belief among the group of the concept's potential with appropriate partners
Trial of procedure and resources	*Accessibility of resources (12)*	expressing difficulty with the live prototype due to limited funds, necessitating alternative solutions and delaying some aspects of testing
	Capacity of the group (22)	acknowledging a severe lack of key skills alongside unnecessary overlaps, which have severely delayed progress and management of all contributions

Table 7a, *Selected descriptive categories from open coding* (cont.)

Main Findings for Developing Analysis

While the accounts of sub-categories presented above may seem extensive at this stage, it was felt that their complexity and variation within the context were important to demonstrate. This first case represented a project moving into a very complex space in tackling the sugar industry and people's sugar habits. Using design methods, visual representations and prototyping, they were able to develop and deliver a complex and sensitive prototype of Know Sugar as a high street experience. These sub-categories reveal a process of organisational discourse heavily facilitated by design things. However, they also reveal that it was not a smooth process, expressed within the descriptive categories denoting their *trials*.

Within the breadth of categories presented are accounts and insights into how design things or design activity helped progress the concept, or even provide a robust standpoint against other stakeholders on how to approach the context. Design could be argued to have empowered the informants to identify and represent a problem within sugar habits that current stakeholders do not address, and shape their practices and interpretations accordingly. This results in a concept prototype shaped around a Know Sugar scale; a representation of the general consumer's relationship with sugar. This design thing was seen to open up a dialogue with consumers that current stakeholders of the context are considered to fall short of achieving. Design was being implicitly discursive, while opening up opportunities for additional design things, prototypes such as challenge cards, to change people's behaviour with sugar, to address key matters of concern within this discourse, particularly in the space constructed for Know Sugar and it's users.

Design can also be argued to have been disempowering for the participants. While design things gave shape to their insights in new forms, the participants struggled to align with each other at controversial points of the concept. The project also struggled to ground methods of rigorous data capture to evidence their business model for potential partners. The strongest gains for influencing people came in their rhetorical devices, such as including a newspaper and local politician to launch their prototype, or visual displays representing the amount of sugar in everyday products that could shock consumers into participating.

The categories above, while nuanced by the specific context of Know Sugar, articulated the challenges and situations design faces in many contexts where design is addressing a complex, societal situation across multiple disciplinary, industrial and organisational interests. As a result, they are argued to provide a substantial and suitable platform for the next stage of analysis for this thesis, where they are applied as selected categories in the coding analysis of the second case study.

Case Study Two: Constant Comparison and Axial Coding

Following the coding of sub-categories from CS1, presented above, CS2 provided the opportunity to consolidate the descriptive categories, through constant comparison, and articulate the performative agency of design things as matters of concern, through axial coding. The original, broad-themed, descriptive categories of CS1 were used as a basis to begin line by line coding of the transcripts from the interpretative overlay mapping sessions with the delivery team in CS2. The coding under each descriptive category was then reviewed in comparison with the sub-categories from CS1 to reveal emergent properties, traced through the overlaps in between the descriptive sub-categories to first consolidate descriptive categories, and isolating circumstantial categories to be excluded.

There are seventeen descriptive categories presented in this section, with their CS2 coding frequency in brackets, as the following categories from CS1 – *cross-disciplinary language*, *exploration by experience, referenced assertions of opportunity, referenced assertions of situation*, and *uncommunicated work* – were seen to be too context specific, or better represented across other existing categories, particularly as many sub-categories within each descriptive category contained significant overlaps. This should not be seen as making them irrelevant to the inquiry, but simply that through constant comparison they could not be used as substantiating evidence to further the analysis for this thesis. Each consolidated descriptive category is presented with a summary passage reflecting the factors encompassed from CS2 in relation to CS1.

From this constant comparison, an axial coding was produced to articulate how the emerging performative agency of design things reflected matters of concern in organisational discourse. In order to best reflect matters of concern, axial coding took the form of extracting two contrasting but related properties or variables within the categories, and establishing what it was design was doing between them. These variables are highly qualitative and constituted what was considered a *lateral* dimension (on the left of each axial coding) and a *vertical* dimension (on the right of each coding). In the centre emerged a category, always representing a course of action, which gathered a situated interpretation of the matters of concern for design. The proposition is that each act of design can be associated with certain, or multiple, lines of discourse and when both variables are strongly addressed, the course of action could be deemed a strong one; a preferable course of action.

Articulation of the concept aims (42)

holistic discourse > refining the approach < localised practice

Comments focused on models of the process that referenced the intangible, softer skills the intervention intended to embed into the slice. The sense was of a controlled attempt at addressing these skills and targets. The effect was an experience of learning their relevance to the situation and a preparedness to perform it again. As with CS1, this category reflected the use of design things to represent and discuss the intangible and complex aspects of the context. The situations differed in that, rather than materials intended to be shared within the core team as with CS1, the delivery team used core artefacts within their own discussions, but other artefacts that only partially articulated and disseminated the concept aims according to the activities delivered.

Articulation of Experience (150)

historical influences > contrasting effects < live experience

Full of reflections on how well methods worked in relation to the slice and key aims. Explaining how previous experience of similar interventions informed this one and the challenge of communicating the relevance of activities in an emergent situation. In CS1, such accounts focused on the informants' identity and ways of working in relation to the context, whereas in CS2 the informants were connecting previous experience to the live situation.

Adoption of Roles (283)

flow of activity > enriching affordance < isolated reasoning

There were extensive descriptions of methods and activities in relation to each other and the project aims, referenced in the underlay. Some activities had individual reasoning to address key skills; others had a strong relation in terms of flow between activities. The execution of those roles is questioned in relation to their adoption by the slice and their effort in revealing insights, issues and opportunities to act upon. In CS1, the line of inquiry with participants was with on-going work on design things, so the effects they had were broad and notional. In CS2, each design thing and actor could be referenced and discussed providing extensive assertions on the effects and natures of the roles performed.

Call to Reflect on Impact (133)

situational influences > inscribing responsibility < group capacity

The designers felt the underlay could have been used more in shaping workshops as an understanding of the company's situation had emerged. For the slice, it was to look outside their situation and realise they're not unique in their issues. For the delivery team, the assumptions made in praise or discipline, considering the slice's lack of capacity to perform activities, and a lack of attention to leadership were seen as key oversights. In both CS1 and CS2, the holistic situation largely represents barriers or circumstances initially outside the remit of the design brief, but then emerge as contributing to assessment of how ready the projects are in addressing their key aims.

Call for Further Insight (18)

emergent issues > evidencing relevance < potential methods

At the beginning, it was reflections of learning more about the company dynamics; during the process, it was on data that might support understanding the design methods; but at the end, there was a call to place measures or tools in relation to what the slice had learnt about through effective methods. In both cases, though not extensive in either case, this focused on design things evidencing their relevance and value to the context; occasionally responding to the situational issues revealed in the previous category, reflecting on impact.

Collaborative Design Work (30)

constructive space > building confidence < critical discourse

Comments reflect on the moments of progression through activity and the factors supporting the slice taking on activities themselves. These touched on the set-up, in terms of timing and a safe space to learn, as well as the methods allowing a more democratic process. Unity and trust as a team became their strongest asset, but a major barrier with the rest of the factory. In both cases, the team dynamic of participants surfaced as the key matter of concern, not just in their capacity and interest in using design methods, but in the knowledge and contribution they individually provide.

Consideration of Further Actors (93)

mutual interests > constructing an argument < alignment of action

This progressed through identifiable stages: firstly, looking at external companies to contextualise their issues, and reduce external blame; secondly, using methods to engage the rest of the company and manage partners from within; thirdly, the experience of engagement led to more strategic, long-term engagement, project by project, to preserve a safe space. Management emerged as a problematic area, and a lack of confidence in using methods outwith the slice prevented change rippling out as intended. In CS1, potential users and stakeholders were clearly identified regarding their perceived power of influence within the context. In CS2, such factors were less clear until later in the intervention, leading to the positioning of participants and activities being adjusted.

Design Thing as Visual Representation (112)

interpretative clarity > engaging the intangible < aesthetic quality

Representations served as a reference for making tacit elements more explicit, which grew in influence through experience of the intervention. Iteration was a key theme, initially tied to visual aesthetics, but emerged more towards clarity and purpose. Combining visual care with clear purpose were the core reflections, and a key differentiator from management practice. In CS1, the role of the visual was also focused on clarity and quality. In CS2, the visual emerged as an inhibiting factor due to slice participants not being comfortable with visual activities.

Design Thing as Experiential Representation (23)

environmental envelope > coordinating meaning < potential thing

Rare moments of representing experience were influential. The honeycomb brought experience of the wider process into focus for the slice, and the yarn journey brought experience of the factory process into focus. Rich developments were seen to occur allowing recognition of value in the activities. The effects were not sufficiently capitalised on, as the value to the intervention was not recognised until late on. Both cases make significant use of experiential representations. In CS1, the focus is on finding value in a potential experience, while in CS2 the focus is on finding value in historical experience.

Design Thing as Part of Network (123)

translation of role > establishing associations < consistency of influence

There were consistent references of the underlay, honeycomb, yarn journey, and quick wins drawing on each other and constituting the wider intervention. Relations were spoken of as influencing, or impacting, and whether things had repeated influence or were just in the moment. Circumstantial disruptions were commented as affecting many activities down the line. In particular, behavioural and situational insights that were revealed to either support or disrupt progression. This category was surprisingly weak in CS1, possibly due to the line of inquiry. The interviews in CS2 were mediated with actor-network maps, making the network more explicit.

Dynamic Sites of Progress (97)

emerging insights > acting on opportunity < perceivable effects

These identified moments of learning or realisation, often grounded in the context and activities combining well. When activities were seen to bring about an effect, this allowed for interpretations of progress. At times this was grounded in how an activity revealed insights to enable other activities to come forth. These were also moments that opened up a lot of potential opportunities, when activities became meaningful. A key tension here was an understanding of relevance of activities for the slice. Again, this category was surprisingly weak in CS1 except for the first iteration of a service blueprint. In CS2, they centred on key activities that demonstrated strong understanding from the slice and wider actors.

Intuitive Assertions of Opportunities (80)

staging activities > reading interactions < intended effects

Many assertions are made in retrospect for changing the activities within the overall intervention. These regard the use or timing of methods and how they might have been more effective in different circumstances. Other assertions are regarding the intended effects from methods chosen within the intervention and how they would have helped; sometimes defending the method in lieu of poor reception from the slice, sometimes acknowledging greater consideration was due in their deployment. In CS1, this is predominantly applied to the project research engaging insights from the existing stakeholders and user experiences, while explaining ideas within the wider concept.

Intuitive Assertions of Situations (251)

patterns of influence > assessing stance < quality of insight

Broadly, the delivery team commented on the unfolding situation as they experienced it. They encompassed thoughts on why activities were effective or not, why the slice engaged at certain points or not, and whether participant behaviours, and the information they captured, were revealing or not. Some of these pointed out the influence of management, individual capacity and wider company issues impacting on the design activities, while revealing a lack of response to these issues as they arose. CS1 was channelled to target the users of least resistance, alongside a controversial stance to confront the current major stakeholders.

Meta-level Design Process (93)

familiarity of language > designating activities < exposure to process

Comments identified the level of design-centric or process-centric language the delivery team used in the models chosen to structure and orientate the intervention. Key moments and activities were confidently expressed as 'exploring' or 'proposing', even though these were notional interpretations. This tacit understanding of design work represented a key gap the intervention was trying to bridge for the slice. In CS1, meta-level discussion was only occasional, but did shape some of the informants' reflections for describing their approaches.

Trial of Authority (126)

contextual knowledge > gathering experience < relevance of references

Representations and models were perceived to offer structure and confidence to the designers and the slice during the intervention, while certain activities were critiqued as not grounded enough in the company reality. Comments also reflected the lack of confidence shown by slice members performing activities, associated with methods or tasks not quite coming off and struggling to evaluate why. For CS1, there were consistent questions on design's authority against experts and for the groups capacity to deliver parts of the project.

Trial of Interest (136)

mutual communication > motivating change < suitable appropriation

Informants illustrated multiple factors around embedding the intervention methods and techniques that served as barriers to understanding and seeing value in their use: language, demonstration, abstraction, preparation, capacity and motivation. The appropriation of approaches was also seen as a tension in the design methods key purpose. Individual slice members acted to change tasks to suit their own agenda and way of working. In CS1, the focus was on gaining buy-in from consumers and methods by which this could be achieved.

Trial of Procedure and Resources (118)

conditions of engagement > supporting commitment < intensity of work

Comments reflected on the issues within the company in supporting the slice, as well as issues delivering the activities to progress the intervention plan and key aims. The intensity of some planned activities was challenging for the slice at times, putting delivery of the intervention behind schedule. A structure relying on work in between the sessions needed clearer instructions and the slice decisions were dominated by management. In CS1, there were consistent problems due to the relationship with project funding and challenges with resources for key stages.

Main Findings for Developing Analysis

The use of axial coding has proved a key moment in the analysis for this thesis. Supported by constant comparison of the descriptive categories, and sub-categories, between CS1 and CS2, the axial coding began to gather and frame core categories around design things. These core categories were emerging based on the actions and types of agency being expressed. A pattern began to emerge from the axial coding across these core categories of work through design things sometimes addressing wider, insight gathering, external factors, and sometimes addressing progressive, performance-related, internal factors. The realisation for the author was that the nature of matters of concern in each core category could be expressed through these related yet contradictory dimensions. Contradictory in that they are difficult to reduce into one another.

This realisation did not come easily. An initial attempt was made to use the framework imposed by the actor-network maps as a matrix (interest-enrolment-point of passage-trial of strength against historical-live-potential) to help categorise and find patterns in the data. While it could have been argued to assist interpretation of the maps themselves, it didn't seem to help explicate notions of matters of concern. In fact, it seemed to dilute the relationships and agency that were being expressed. Axial coding permitted a stronger sense of interrelationships between design things and the wider network, while rootings these in lines of action, of movement, of formation. These fluid core categories would be further explored and consolidated through analysis of the third case study and point towards a wider body of literature that could shape new design theory.

Case Study Three: Subsumption and Theory Sampling

Following the axial coding of matters of concern presented above, CS_3 provided the opportunity for further consolidation and subsumption of core categories for the sampling of theoretical concepts. The accounts from the nine mapping sessions with informants, across four Experience Labs, underwent a final stage of selective coding to confirm, refine or review each axial coding in order to subsume into core categories. The result of this process of subsumption is presented as a circular, reflexive framework (see fig. 7A) of eight core categories, for conceptualising the matters of concern in design-led innovation. These core categories emerged through constant comparison across all three case studies and embrace the axial coding of contrasting dimensions as the most suitable representation of matters of concern. This section presents these final core categories and arguments towards their conception.

Each category is presented through a summary reflection upon CS_3, and specific examples from the previous two case studies, to assert how it consolidated an emergent conceptualisation of the matters of concern. Matters of concern are here presented as activities of representation and interpretation that design things were constantly trying to achieve. Performatively, they have been represented as contradictory dimensions between lateral, or outward-looking considerations, and progressive, or forward looking ones. The lateral dimensions relate to the purpose of design, the object of design, to the wider situation, that is, the complex nature of power, discourse, habits, structures and agency, that have been historically in place up until the live situation. The progressive dimensions are a matter of practice. A matter of honing an understanding of how the design thing is bringing about an effect to inform how it may bring about preferable change. The purpose of representing matters of concern in this way is to emphasise how work through design things, as interpreted through this grounded theory analysis, is trying to find a resonance, a constant refinement of activity between these dimensions. To paraphrase an elegant quote from Martin Heidegger on love: '[design] is the will that wills a design thing be, the will that wills a design thing finds its way unto its ownmost and sways therein.

A sampling of theoretical concepts then draws on the existing literature, much of it identified in the *Scope of Context*, with some additional sources responding to emergent themes. This sampling of theory has informed the formation of the reflexive framework and is presented as a discussion at the end of this chapter argued to address the representation and interpretation of design things' performative agency in organisational discourse, and each argued to be grounded within the process of research undertaken within this investigation. Alongside the methodological model, this reflexive framework is argued to complete the core contribution, as a theory/methods package, alongside the methodological model explored through this thesis.

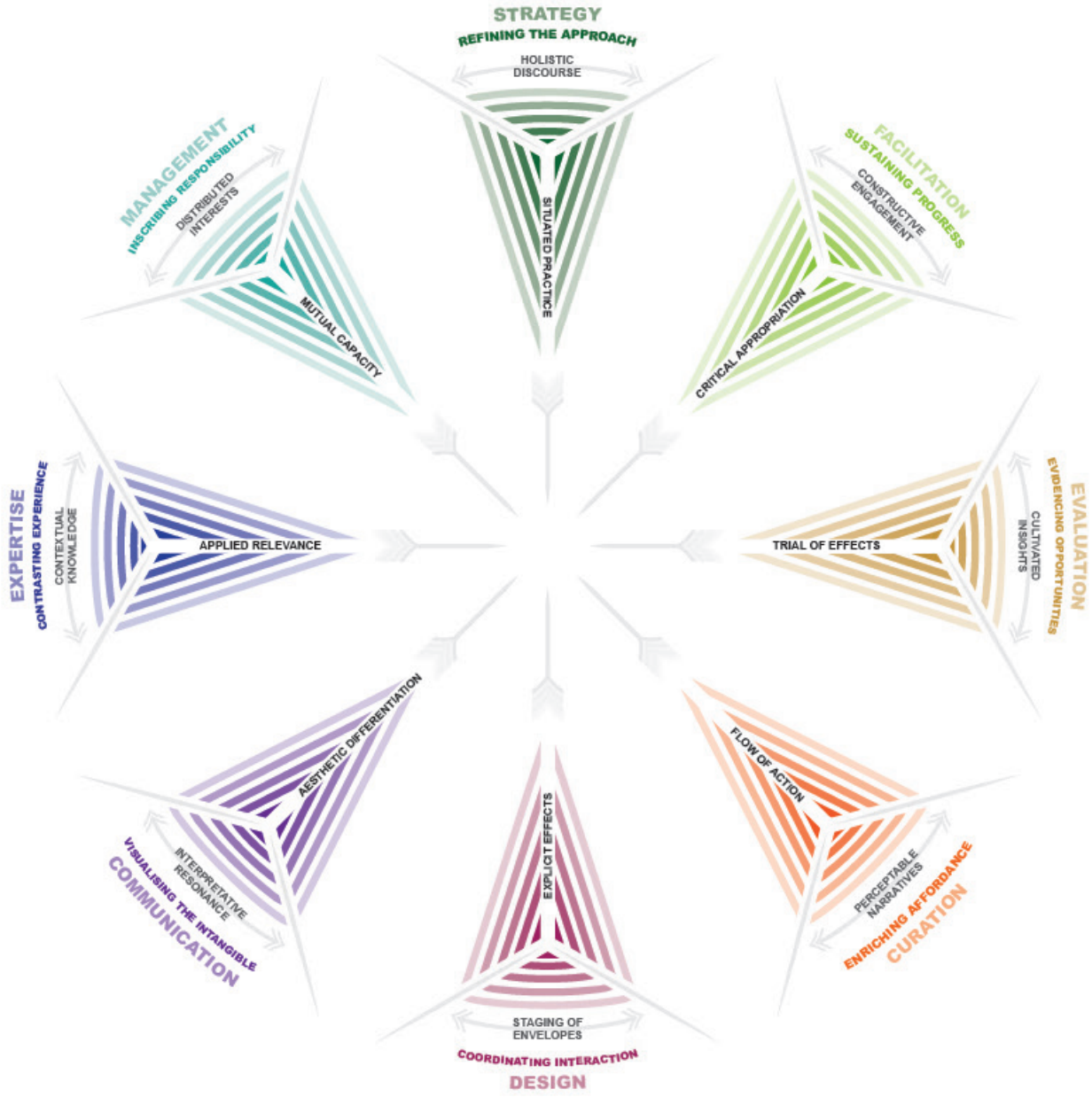
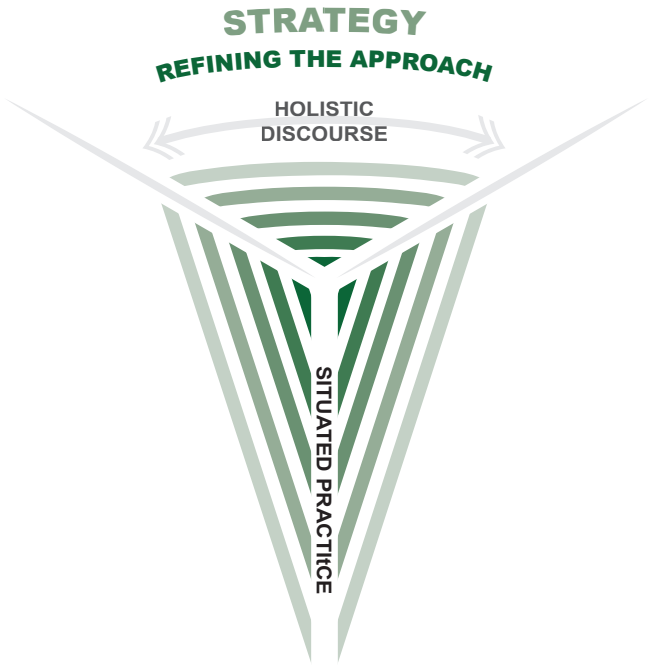


Fig. 7A, *A Reflexive Framework for Design-led Innovation,* (Johnson, 2016)

The structure and design of this framework aims to communicate the resonant nature between the progressive and lateral dimensions of the matters of concern emergent from axial coding. The colour-coding of each matter of concern is an analogy for a spectrum of concerns (light) refracted out of a central design thing (prism). The conception for the framework is to place any design thing of interest within its centre and it can be critically evaluated along the reflexive lines of inquiry constituting each core category. The potential application of such a framework in practice or research is described within the conclusion articulating future research.



Refining the Approach

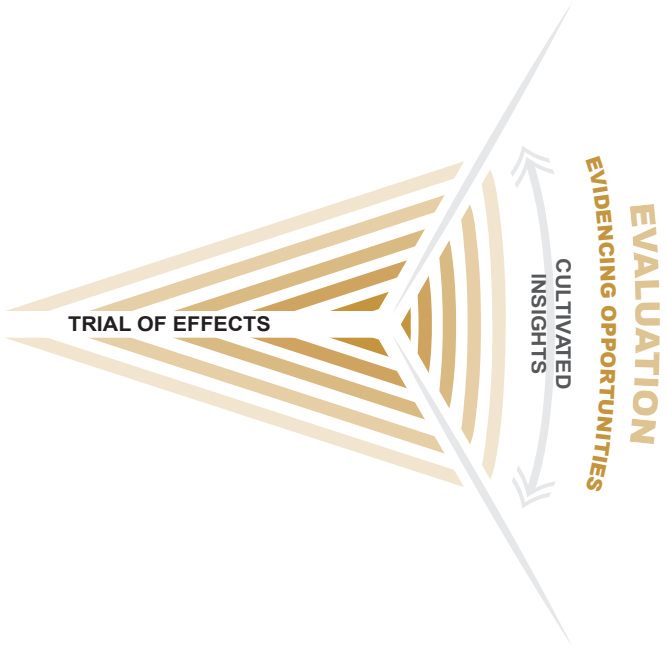
From the previous stage of axial codings, key overlaps were identified between *articulation of concept aims* and *meta-level design process*. The lateral dimensions of axial coding – *holistic discourse* and the *familiarity of language* – each pointed towards the disciplinary ways of speaking entering into a design situation; one focused on design, and the other opened out to other disciplines. Within the context of design-led innovation, this was observed as amounting to the same activity, only more reflexively across disciplines. To designate activities within the design process is to refine the overall approach. During the Experience Labs this mostly took shape through the discussions with clients in preparing each lab, the discussions between the designers and developers delivering technical aspects of the lab, and consulting experts on processes of research, such as ethics, and even inviting experts in to observe, or in the case of Experience Lab Four, as active participants. These discussions were translated into quite formal design things, within the lab proposals, day plans and final reports delivered following each lab, which adhered to traditional research practices. However, there was a strong notion to represent the wider process of the labs in the final reports through images and videos; how the activities achieved certain insights through constructed interactions and, crucially, how the participants responded to the authenticity of the activities. To consider the progressive dimensions, the effect could be considered a more explicit approach to connecting localised practice to the wider discussions they engaged, a way to expose the process and offer richer discussion across the disciplinary stakeholders.

The resultant core category, *refining the approach*, represents design things as a matter of strategy. The lateral dimension concerns design engaging in *holistic discourse*, how each discipline represents and speaks about the wider situation, which can necessarily abstract and simplify complex themes or phenomena. The progressive dimension for this activity is to translate this top-down view of the situation in practice. In a specific design situation, this means capturing ways of working, down to individual interactions and methods, and bringing them into organisational discourse. In theories of *communities of practice*, this speaks to *situated learning* advancing actual perception over concepts and representation (Brown, Collins and Duguid, 1989). As Lave and Wenger (1991) explain, this involves the gradual acquisition of knowledge and skills in the context of everyday activities, where learning is often unintentional rather than deliberate. Reflexively, it is this situated learning that design can feed back into wider strategy, letting models within discourse be constantly re-drawn according to the interpreted effects of *situated practice*.

Sustaining Progress

A group of previous axial codings reflected the challenges of collaboration, noted through lateral overlaps of setting *conditions* for collaboration that were *mutually* inclusive and *constructive*. These each spoke to activities focused around *confidence*, *commitment* and *motivation*. These all speak to much of literature on Change Management and the methods of leadership and management (Kotter, 1999) that proliferate the needs for setting a clear direction and clear goals to achieve that direction. Within the context of design-led innovation, this focused very much on setting up time and space for exploration, for failure and for iteration. In the Experience Labs, the line of inquiry with participants was often open-ended; participants would define the context, participants would define the scenarios, participants would come to define the preferable outcomes. The designers would translate these into visual, tangible forms at each stage to facilitate the refinement of the concepts explored. In CS2, the onus was on the slice members to visualise each stage, often an intense demand of work resulting in a tacit lack of confidence and motivation to change in such a way. When they did achieve strong visualisation, the Yarn Journey, this was produced by a fraction of the slice, but each member benefitted by progressing critical discussions around the aspects relating to their experience. These progressive dimensions of *intensity*, recognisable *appropriation* and the ability to engage *critically* therefore reflect how participants knowledge is actively translated into ways of working. They own it, they shaped it, they see their role in it.

The resultant core category, *sustaining progress*, represents the design thing as a matter of facilitation. The lateral dimension concerns the ways in which conditions are set for *constructive engagement* with participants and collaborators. How they are democratically encouraged to bring their knowledge and interests, and relate it to others' knowledge and interests. Latour's notion of an *object-oriented democracy* (Latour, 2005a:19), emphasises the methods of representing what is at stake as implicit within the activity of gathering the relevant parties around what is at stake. That process of representation through design things can be both empowering, where participants see a clear role they can provide, but can also be disempowering, where participants feel alienated by certain activities and see no sustained benefit in engaging. Along the progressive dimension, sustaining progress means participants identify the moments of added value and *critically appropriate* the new behaviours and tools that can sustain such moments of added value



Evidencing Opportunities

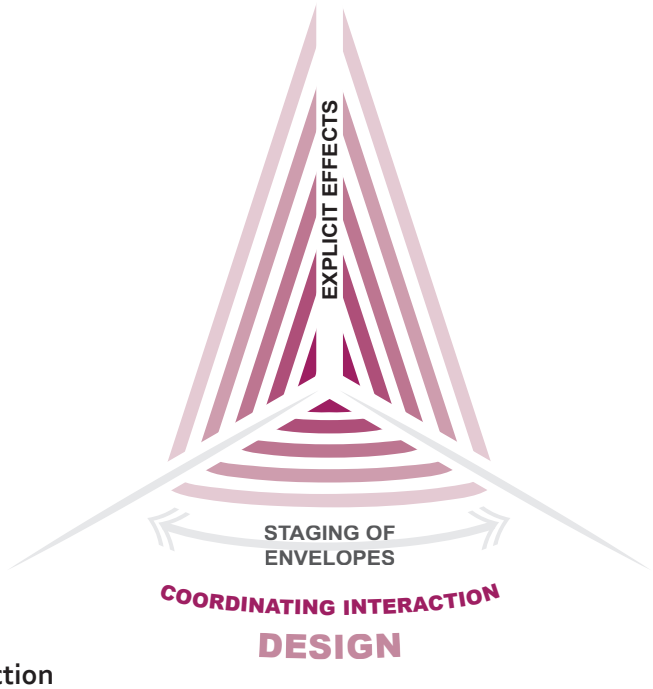
Three further axial codes from the previous section showed significant overlap when applied in the accounts of CS3, and that was largely due to the lateral dimensions acknowledging *emergent issues* and *patterns of behaviour*. The occasions addressing how the designers look at various aspects of the design situation were frequent and often brought into design work through intuitive interpretations. These echoed Donald Schon's ascription of *reflection in action*, allowing the situation to 'talk back' to the designer (Schon, 1983), but these interpretations were often only partially conceived. The challenge for the designers lay in gathering multiple perspectives of the situation into *quality insights*, through key methods, to assert progression being made. This could often translate into establishing quantitative measures, such as the *slice* attempted to do in CS2; or it could translate into simply voting on ideas using sticky dots, as in Experience lab One of CS3. A problem raised on reflection was around the lack of quality conversation with the lab participants due to there being too many ideas presented. The team appeased themselves on the method of selection as a logical process, but this represented a key point of passage for the project and highlights a key challenge for design generally. The requirement of evidence for justifying key decisions can become more explicit within multi-disciplinary situations with multiple lines of interest. Targeting the key points of passage in the design situation and folding in ways by which to judge the effects at such points is argued to show how design things can become a more explicit matter of concern.

The resultant core category, *evidencing opportunities*, represents the design thing as a matter of evaluation. The lateral dimension concerns how *insights* are *cultivated* within the design situation. Not just how insights emerge through observation, discussion and various exploratory activity, but how they are made manifest within design work as opportunities to be exploited. For design-led innovation, this concerns all the actors intended to act on such opportunities and draws again on notions of *communities of practice* (Wenger, 1998). There is a drive for shared learning and knowledge at each stage of insight gathering and the new knowledge being formed could be argued to manifest as an *opportunity*. This then moves into the progressive dimension of establishing a *trial of effects*, testing opportunities in ways that satisfy the situation, that is, the relevant actors, actants and structures are aware of, or participate in, the course of change. This could mean just bringing concerns into discussion; or bringing known or new methods of evaluation into place.

Enriching Affordance

This axial coding already existed in a slightly different form in the last section straddled between the *flow of activity,* where multiple actant roles are performed with clear understanding of their collective effect, and the *isolated reasoning* of a role, how well an individual actant performs their role. This naturally aligned with the category of design things, which are often novel things brought in, *establishing associations* with existing actants of the wider network. The process of a design thing being *translated* into the design situation, engendering meaning into the design thing, to use Butler's (2001) phrasing, performing and re-performing its role in the course of action, tied directly to the concept of *affordance* (Norman, 2013) except focused on its initiation. Yaneva (2009) described action as the realisation of affordances, where perception and environment come together to establish what is possible. When an action shows a *consistency of influence*, there is greater submission to its affordance. This is how social structures can hold, but is also how roles can be willingly taken on and perpetuated in apparent ignorance of unsustainable practices. This prioritises tapping into the knowledge distributed among the people and things which constitute the situation.

The resultant core category, *enriching affordance*, represents the design thing as a matter of curation. The lateral dimension concerns the collection of perceptible narratives, both from individual actors, and perceptions of the relevant non-human actants as well. This requires designers to discern and gather an understanding of the situation through narratives with participants. In Experience Lab Three, the paramedics selected the scenarios to test the potential support of a directory app. When the scenarios were played out with each additional function, the paramedics drove a very high degree of scrutiny, raising variations of the scenario time and again in relation to additional actants; such as the ambulance or Control Office, which weren't present in the role-play. Having such a great depth of narrative brought into the scenario enriched the potential for affordance, for meaningful possibilities, for influencing the *flow of action*. This emerges as being curatorial because it is an on-going process, even after a prototype has become a completed thing. The knowledge created, that is performative, for why an arrangement is worthwhile must somehow carry through each time the scenario presents itself, or even when new scenarios present themselves. The user of a designed thing can take over the role of curator, just as when clothes or furniture come under a person's ownership to dress or stage or perform their identity.



Coordinating Interaction

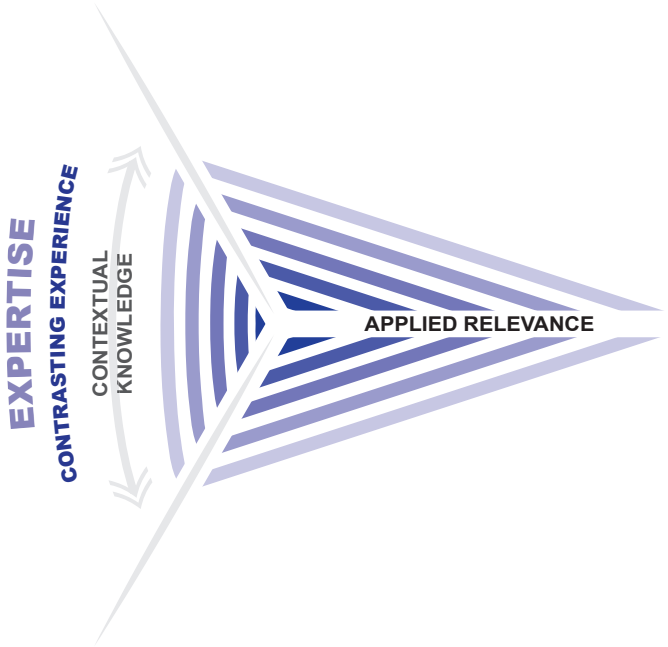
Closely related to the previous category is the focus around interaction expressed in two axial codes, *coordinating meaning* and *reading interactions*. In the previous category, the focus was on the socially and repeatedly performed meanings of things in relation to existing situations. Here, the focus is on the relation between the individual and the meaning derived interacting with a particular thing. Laterally, this drew on Sloterdijk's notion of environmental *envelopes* that constitute our 'spheres of existence', which Binder et al. (2011) translated into the *staging* of design things. This overlaps heavily with the previous category, but significantly points towards live experience, rather than historical perceptions. This is seen to draw most directly from traditional product design's dichotomy of form and function, asking those practical questions of how an artefact, or broader object of design, achieves an *intended effect.* The implication of the progressive dimensions prioritises design knowledge of the materials, production and interactions imbued through a traditional design process. In Experience Lab Two, this had no less need for collaboration, as the variety of knowledge required for producing materials, technical devices and digital development was spread across various designers and developers. Collectively, they brought their practical knowledge into staging activities that would inform interactive improvements of the digital concepts being developed.

The resultant core category, *coordinating interaction*, represents design things as a matter of design. A tautology perhaps, but this emphasises the original role of the designer as knowledgable in the production or making of things. The lateral dimension concerns the *staging* of the experiential *envelopes* the design thing resides within. This doesn't need to be a complete reimagining of a situation, but the scenario reduced to its constituent parts, as Experience Lab Two and Three demonstrate. The progressive dimension, therefore, focuses on the *explicit effects* of the design thing, comparing what it is intended to do, the role inscribed to it, with what it has actually done. This becomes a much harder process when the object of design is less explicit, as in CS2 creating a culture of innovation. The explicit effects are still reduced to individual methods, interactions and activities, but lean much more on the wider categories of *curation*, *evaluation* and *facilitation* to relate the design knowledge to the wider situation. This marks the need for such a framework as this, which gathers existing understandings of design alongside emerging ones and begin to construct a consistent discourse around matters of concern.

Visualising the Intangible

Here there is a direct transfer of an axial coding from the previous section, but consolidated through CS3. The original lateral dimension denoted *interpretative clarity*, which simply acknowledged the intended audience for a visualisation could recognise and interpret it as appropriate. This also touched on whether the person visualising felt they had portrayed the intended thing they were representing, especially when it was something intangible. The progressive dimension focused on the *aesthetic quality* of a visualisation, whether in materials, accuracy, beauty or other indicators. This was specifically mentioned within CS2 reflections, where the quality of visuals being produced by the slice were seen as particularly problematic in conveying their work to the rest of the factory. In the Experience Labs, the aesthetic quality took less precedence, except that it needed to be approachable, recognisable and encouraged participants to take part in activities. This raised a particular question over the nature of aesthetics in such complex activities. There isn't simply a one-way message being portrayed to an audience, but a dialogue that is often using visual means to mediate it. The refinement of materials by designers is more based on a particular visual tone or language, which conveys partially realised thoughts or ideas, rather than exemplary or finished items.

The resultant core category, *visualising the intangible*, represents design things as a matter of communication. The lateral dimension concerns, not just the clarity, but the *interpretative resonance* of a visualisation. This emphasises not just the immediate effect of looking at a visualisation, but the shift in meaning through activity, context, association, interaction and other factors acknowledging the visual as performing in time and space. The purpose of a visualisation at any point in design work is to provide a reference to a wider concept that can be associated to a particular course of action. This could be a simple sketch to capture a key form or scenario, a visual model of complex processes, an evocative and stylised poster, an abstract relational map, or just a basic graph. The progressive dimension lies in its *aesthetic differentiation* as a visualisation, which is grounded in its context and the intended effects of communication. Who is the audience? How is the message differentiated? What is being conveyed, and how well? This speaks most closely to Buchanan's (2001) positioning of design as a new rhetoric, a way to construct an argument. The challenge is making the visual a language that does not exclude, that is not visual for the sake of visual, but understands what the visual can achieve, and what it can not.



Contrasting Experience

The axial codes brought together here spoke most of all to the question of design's authority in the spaces of business, management and health. The lateral dimensions acknowledge the personal and professional knowledge and experience of designers in relation to key aspects of the design situation, not necessarily in the designers themselves, but in the participants, collaborators and consultants brought into projects. In the Experience Labs, outside academics were brought into all but the first one to help refine the types of discussions with participants and overall line of inquiry. The recognition of expertise as part of the process was prevalent throughout the case study, resulting in very large teams and rich discussions. The challenge each time, in relation to capitalising on such vast experience, was translating this into the live activities. When would individuals feel obliged to offer their experience? How could their interpretations be integrated and even validated? For Experience Lab Four, the mix of service experts, technical experts and experts of experience (i.e. residential service users) were facilitated through the actor-network maps as common reference. The understanding was that the sharing of knowledge and experience was going into an activity, with particular outputs and no more. The designers simply provoked discussion and the groups various, but relatable, knowledge would refine conversation according to the activity. The progressive dimensions subsume *live experience* with the *relevance of references,* which come down to the transparency of an expert and their contribution, and how it applied to the course of discussion.

The resultant core category, *contrasting experience*, represents design things as a matter of expertise. Particularly, in representing expertise as always only a partial, yet substantial, aspect of a design situation. The lateral dimension concerns the availability or gaps in *contextual knowledge* being identified and gathered into the design situation. What is unknown experience? Where is experience best known? Is there a shared sense of known and unknown experience? These are crucial factors towards the progressive dimension of *applied relevance*; that the pursuit of expertise, understanding and knowledge is represented in contrast to available perspectives. In Experience Lab Three, although all participants were paramedics, the variety of experience between them was surprising even to them. In CS1, the Know Sugar team had little expertise on sugar, but various experiences relating to the impact of sugar on diet and wellbeing. This drove a position that accepted academic expertise on sugar, but rejected their warnings not to focus on sugar. The relevance of expert advice was weighed against its effects in practice, through design things.

Refining the Approach

The final two axial codes from the previous section brought together concerned the process of converting any knowledge gained through design things into action. This incorporated how an *argument* was *constructed* and how *responsibility* would then be *inscribed* into a course of action. The lateral dimensions gathered both the *interests* of actants within the situation, and the key *influences* shaping those interests. In CS3, the clearest examples came through the project management of each Experience Lab, where the project leads would simply convert their interpretations of the project's development into the roles and tasks implemented at each lab. When expanding these dimensions beyond the core interests of the DHI team, however, this calls into question the interests and influences of participants and collaborators. A common experience of design practice engaging potential users is that they can participate to only affirm what has been presented, rather than be able to challenge propositions. In the progressive dimensions, the axial codes point towards generating a *capacity* for change in the *group* of actants identified in a situation and how this supports *collective action* towards achieving common objectives. In CS2, a major issue emerged in how members of management did not share common objectives with the rest of the factory, leading the delivery team to express there being a lack of identity in the group. In CS3, the situation for collective action is less explicit. There is only limited time and contact with participants and the focus is on intensive development of digital concepts, not embedding capacity for change. However, the issues these concepts address were key to representing the interests gathered. The potential for collective action was embedded in the reports, prototypes and responses presented and passed on to the clients of each lab.

The resultant core category, *inscribing responsibility*, represents design things as a matter of management. The lateral dimension concerns the *distributed interests* of actants in the design situation understood from their particular perspective. This is influenced by Holert's assessment of design's 'distributed agency' as an intermediary, able to disrupt existing 'political entanglement' and move into a 'practice of possibility' (Holert, 2011:24). Design-led innovation for preferable change is argued to focus towards generating a *mutual capacity* in the progressive dimension. Not just generating a capacity in a group to achieve their objectives, but to build knowledge in their capacity as a group. The argument here is that design things can be used to reflexively support both management and leadership, in that possibilities are generated that simultaneously *inscribe responsibility* in the course of action.

Towards Design as a Performative Act

Following the grounded theory analysis towards the reflexive framework presented above, it now comes to address this framework explicitly to the over-arching question of this thesis. The focus was on whether actor-network mapping could represent design things as matters of concern in organisational discourse. Following the three case studies and their analysis, the initial response to this question can only be, *possibly*. The evidence is there that the examples of design-led innovation investigated show a definitive potential for supporting reflexive discourse, that which bends back on itself through cross-disciplinary collaboration. The challenges and matters of concern expressed through interviews and actor-network mapping sessions emphasised a need for design things to be pushed, refined and differentiated as methods of representation and interpretation in organisational discourse.

As expressed early on, this thesis was positioned as a response to Latour's call for design to develop ways of representing 'the controversial and contradictory nature of matters of concern' (Latour, 2008:9). The expansion of design as a term was acknowledge as having 'eaten up more and more of what a thing is' and being 'applicable to ever larger assemblages of production.' (Latour, 2008:2). In Latour's view, the more objects are turned into things, that is – the more matters of facts are turned into matters of concern – the more they are turned into objects of design through and through. The question of whether actor-network mapping supported this conception of matter of concern is under-substantiated. Having a visual reference of key actants, people and things, arranged to express a design situation certainly allowed a breadth of reflection and analysis that the design participants hadn't pursued before. In CS3, the co-creation of such a representation from the beginning proved cumbersome and Callon's framework proved difficult for participants to adopt. This raises a question over whether the current form of the actor-network maps is appropriate, whether the links of association described through enrolment or interest, flagged as inscribing translation or a trial of strength, suitably articulate design things as performative. It hints at it by highlighting influential moments of progress or hindrance, but the interpretative overlay rarely addressed such indicators directly.

The strongest evidence for the approach came in its overall form, from attempting to represent the situation collectively, so that all accepted it as a reference to work with, to relating concerns around each actant to the wider issues that emerged, so that all learned more of each other's position. The importance of such a script for the approach is that it was *object-oriented*, that having the reference to things and design things led to conversations about what they were doing, how they were doing it and how it could be doing it better. It is these discussions that are argued to have most informed the reflexive framework above. Design things became matters of concern through these discussions. Not always explicit ones in discourse, but there was explicitation of the situation through analysis, and this is the methodological contribution that this thesis claims to make. When the space was created for such a line of discussion, through actor-network theory translated as a visual map of the design situation, followed by an interpretative overlay of the effects of agency, the resultant discourse was analysed to propose how it could become more explicit. The reflexive framework above is a proposition towards this and is grounded on design being a performative act.

Each design situation, whether it includes *refining an approach*, *visualising the intangible*, or *coordinating interaction*, is a process of trying to fine-tune these contradictory matters of concern. Fine-tuning a holistic discourse around an issue with the situated practice addressing it. Fine-tuning the interpretative clarity of a representation with its aesthetic differentiation. Fine-tuning the environmental factors enveloping interaction with novel, explicit effects. To propose that

design is doing these activities is not, or should not be, to predetermine the effects design will have, but to set the parameters by which design could be judged. To claim design is *sustaining progress* in a situation is to claim design is providing a constructive space for participation while also facilitating critical discourse. To claim design is *enriching affordance* is to claim design is translating the perceptible narratives in a situation into a consistent flow of action. To claim design is *contrasting experience* is to claim design is fully embracing contextual knowledge while pushing its applied relevance. It is the *while also* that determines how careful, how strong, how attentive to matters of concern, how reflexive the act of design and the culminating design thing can be evaluated to be. It is this fine-tuning of the design act that points towards articulations of design knowledge, or more precisely, the distribution of a *performative knowledge* through objects, people, systems and the environment. Once it is distributed, it needs to be gathered and performed again to matter, to affect change. This doesn't need to be done fully anew, as there are various people, things and design things that are in place to perform it again.

The nature of that change is what points this process towards the preferable. If the evaluation of these dimensions around matters of concern, performed through design things, is deemed to resonate with all those gathered, then one can reasonably suggest the direction is a preferred one. As Latour proposes through Sloterdijk's concept of *explicitation* through *envelopes*, to add materiality to a site is to render 'another fragile envelope into which we are even more entangled, explicit,' and so design takes its position to be 'carefully redical, radically careful' (Latour, 2008:5). The evidence is in gathering the changes in interest, the change in roles, the translation that each actant has undergone as a result of design things, becoming established things in the course of action. The trials of strength each design thing has overcome, to establish itself. But always being reflexive, always seeing how change bends back on the situation, always looking laterally to orientate discourse, the ways of speaking. As McAra-McWilliam has modelled through her lens for design practice, the Rose Window (McAra-McWilliam, 2008), this then influences the ways of thinking, the ways of seeing, the ways of being and the ways of world-making, around the things that design can bring into situations and lead innovation.

This chapter presented the results from a process of grounded theory methods as a mode of analysis applied to the case studies. The first section presented an expansive selection of descriptive codes from open coding the first case study, which was deemed to begin articulating the performative agency of design things. This was argued to provide a broad foundation for constant comparison in the second case study, presented the second section, which consolidated descriptive categories into axial codes that began to represent such categories as matters of concern across contrasting dimensions. The third section then focused on subsuming these axial codings into core categories representing the key matters of concern prevalent across all three case studies, but substantiated within case study three. Finally, a discussion was presented of how the methodology taken in this investigation answered the over-arching research question and argued how such an approach begins to represent design as a performative act, which could explicate its value in complex collaborations. It now comes to address the claims made in this thesis by acknowledging the research limitations involved, expanding on the contribution to knowledge and the potential for future research the thesis recommends.

CONCLUSION

chapter 8

This final chapter reflects on the thesis presented through four sections. This first section summarises the structure of this thesis and that it has done what it set out to do in the introduction. The second section then reflects on the contribution to knowledge this thesis argues to have provided. The third section assesses the research limitations posed by the methodological approach undertaken, and the areas of research this thesis sought to contribute to. Finally, the fourth section presents the key opportunities for future research according to the methodological approach and an emergent sampling of theory. These concluding sections aim to demonstrate where this research has landed, in relation to its aims and objectives, and ultimately provide recourse for the reader to reflect on the thesis as a piece of exploratory research aiming to both substantiate the expansion of design-led innovation, while offering a very specific approach by which it can begin to do just that.

Review of Thesis

In the *Introduction* chapter, the argument was made for design-led innovation – where design engages with increasingly complex disciplinary and social situations – to differentiate a more accessible and authoritative discourse. This was centred on providing a response to Latour's (2008) call for design to develop better methods of representing matters of concern. This investigation explored how such a discourse could be formed through an object-oriented approach, developing and applying a mapping technique based upon actor-network theory (ANT) through three case studies. The *Scope of Context* set out the argument of a gap in literature for design around what was termed an *object-oriented discourse*. This was explored as lying between a rhetorical positioning of *design things*, as the focus of inquiry, the influence of *organisational discourse* in managing change, as the context of inquiry, and how *reflective practice* articulates design knowledge around the object, as the mode of inquiry. Overlaps in these key themes were then argued to combine concepts of the performative, narratives and reflexivity towards an approach forming an object-oriented discourse.

A subsequent methodological model was presented as a theory/methods package developed through this investigation to support the representation of matters of concern in situations of design-led innovation. This model was iterated across three case studies: firstly, in practice, developing the method of actor-network mapping translated from ANT, the method of applying interpretative overlays translated from situational analysis, and how these manifest as a live, participatory method; secondly, in theory, producing progressive findings on the performative agency of design things, design things as matters of concern, and how matters of concern can support a reflexive discourse. These were presented within three case studies representing design-led innovation in three different contexts: the design-led formation of a new business, the design-led innovation of a creative organisational culture, and the design-led development of digital health concepts. Discussions from interviews and the mapping sessions were coded using methods from grounded theory and presented in the analysis chapter to provide a reflexive framework representing matters of concern around design things.

As final outputs a series of actor-network maps for each case, a final script for conducting actor-network mapping, and the reflexive framework for representing matters of concern, are presented in a final exhibition for this thesis. Each case study is presented exclusively through the actor-network maps, with a series of reflections and the reflexive framework retrospectively overlaid in places to demonstrate the practice of making design things explicit matters of concern.

Contribution to Knowledge

As expressed throughout this thesis, this is primarily a methodological inquiry, bringing together existing methods and theories to make design things more explicit as matters of concern within organisational discourse. The contribution to knowledge is therefore based within the resultant theory/methods package expressed through visual methods of actor-network mapping, interpretative overlays and a reflexive framework. The proposal is that by engaging in a script including these three elements, within any situation of design-led innovation, design practice can be made more explicit within complex collaborative situations. In addition, by evidencing through grounded theory analysis the contribution of each method towards constructing a reflexive, object-oriented discourse, groundwork has been established towards a theory of design as a performative act. This is as yet unsubstantiated, as it is limited to data drawn from three different case studies and coincided with sequentially developing each methodological output. As a result there is limited space within this thesis to develop such theory in relation to existing literature except to reveal the existing concepts and theories such an approach speaks to. This is handled in a later section exploring potential future research.

The specific areas of design practice and research this thesis is argued to contribute to focused on design-led innovation, centred around Design Management, User-Centred Design and Participatory Design. This has not been presented in comparison to multiple examples of existing forms of network mapping, simply because there are next to no examples in existing practice that draw on actor-network theory as an explicit mapping tool. The nearest example is a simple visual method devised by Liza Potts (2013) called 'ANT Mapping', which places a context in the centre and evenly positions icons of relatable actants to the context around like numbers on a clock face. It is positioned as a way to represent all the participants in a particular context of design or research before deciding tasks. The actor-network mapping approach taken in this thesis goes much further, almost providing these relations for all participating actants and using this to reflect on interpreted dynamics within the situation.

This methodological approach is not expressed as a direct contribution to ANT as it is recognised as a departure from the serial description of the historical fostered by traditional actor-network theorists. This approach is also not expressed as a direct contribution to grounded theory or situational analysis for similar reasons. The approach does not undergo extensive empirical research of a particular situation, but uses such methods to assess the breadth of activities performed within a range of design situations. The contribution, to reiterate, is very much a theory/methods package, bringing together actor-network theory, situational analysis and grounded theory, translated into a process of visual methods. The methodological model positions these methods within a cycle of representation and interpretation, which is not only seen to constitute a framework for investigating design things as matters of concern, but for investigating *performative agency* and the *performative act.* This follows Butler's conception of 'an "act" which is both socially shared and historically constituted' (Butler, 1988:530), and performativity, 'describing a set of processes that produce ontological effects [and] lead to certain kinds of socially binding consequences' (Butler, 2010:147). Bringing together this conception of design research, amalgamating existing theories, concepts and approaches from the social sciences, into a rigorous process for design is the final contribution of this thesis. This follows a long tradition of bringing sociological research methods into design practice.

Research Limitations

The research approach undertaken in this thesis was highly exploratory and resulted in multiple challenges to upholding, firstly, the quality of the findings and, consequently, the ability to effectively answer the research question. The first limitation to acknowledge was the variable accessibility and unpredictability of data collection for the case studies. This was particularly prevalent in CS1, where delays to the projects development meant it was fully sixteen months from start to finish of data collection. This meant data collection severely overlapped with CS2 and delayed the sequential development of actor-network mapping from case study to case study. This meant the visual translation of ANT accounts into actor-network maps did not develop as far as the author intended, as time for methodical development was impaired. In CS3, the focus turned to producing physical elements of the mapping, again limiting opportunity to develop the visual language without compromising the sequential rationale of the mapping technique. The findings for each case study were therefore developed post-data collection, rather than during, limiting the possibility to bring emerging queries to the live context.

The second limitation to acknowledge was the author's relative lack of experience in conducting complex sociological research approaches in ANT, situational analysis and grounded theory. This directly resulted in a highly sequential, case-by-case, methodical expression of the approach taken to simplify the rationale in progression for the thesis. This went as far as structuring the analysis chapter sequentially, which restricted the depth of analysis performed for each case to only meeting sequential objectives set for each stage, rather than explore each case study in depth. The consequence is that a substantiation of the reflexive framework was not possible within the case studies, and so the reflexive framework can only be argued as partially formed. The decision taken was to present a final, reflexive expression of matters of concern for each case study in the final exhibition of maps overlaid with the framework.

Further limitations to acknowledge regard the breadth of the *Scope of Context* and the range of disciplines addressed. As a design research investigation, this has made the contribution to design methods difficult to ground in relation to existing design practice. This thesis was driven by theoretical concepts outside of design and any substantiation of the methods developed have been articulated in relation to these broader concepts. The reasoning for this was that the gap identified was between such theoretical concepts and design theory. These are argued to work together with the resultant reflexive framework, as each matter of concern points outward beyond existing design discourse to engage other disciplinary theory.

Future Research

Here perhaps provides the strongest opportunity to ground this investigation as it can associate the findings from this research to existing design practice and theory. The first and clearest opportunity for future research comes in further substantiating the theory/methods package developed. Performing actor-network mapping in further design-led innovation case studies, iterating it on each occasion, and performing interpretative overlays guided by the reflexive framework, towards its refinement on each occasion. Just as with this investigation, analysis and development would be grounded in the discussions and interviews conducted with participants, in relation to developments in the design situations being observed. The core aim would be to develop an understanding of how and why representing matters of concern supports a reflexive discourse, as this can't be claimed to have been made explicit in this thesis.

The second opportunity for further research comes in developing theory around design as a performative act. This is where design theory would draw further on sociological theory, where concepts of performativity are most developed, possibly developing variations to the methods developed in this thesis. Claiming a theory of design grounded in performativity would have to further demonstrate design's relevance within existing discourse. The existing literature moves between object-oriented ontologies, where objects are given equal agency, and performance as a force within human experience. This thesis saw this space as a question design could contribute to, informing the approach taken. Demonstrating design's relevance would take such an inquiry to a very specific design situation (rather than across three variations), engaging in a longitudinal study to trace the performative agency and changes conducted through design more explicitly in relation to power relations, or technology, or wellbeing, or identity, or even politics. The point is it would be a more explicit situation to begin with. This would perhaps provide a stronger foundation for progressing such an approach as supporting preferable change, when grounded in contexts identified as needing progress.

The third opportunity for further research comes in developing methods of evaluation through such a reflexive framework. Part of the influence design has gained in business and management has been its implicit approach to look past the economics of a situation. Design Management, in particular, has developed extensive literature on how design can work as a strategic advantage, with Birgitte De Mozota's Four Powers of Design (2006) as a prime example. Developing the reflexive framework for business would aim to trace added value, as identified by business participants, within the interactions of a design situation. This could possibly start with actor-network mapping, but could also be open to other representations of the business that are already established. Evidencing new manifestations of added value, through a reflexive framework grounded in economic viability, has the potential to substantiate the growing relationship between design-led innovation and business. The challenge would be to resist the packaging of such an approach as a repeatable formula, removing reflexivity, rather than one based on knowledge gained in the situation, reflexively, through design work.

The final opportunity for further research specifically relates to design practice. One of the unanswered questions through this thesis regards how the designers in each case may have changed their approach, or their methods, in response to the representation and analysis of the situations presented to them. The implication from the final analysis is that design things are trying to do multiple things at any given point in the design situation, so it only follows that a reflexive framework is geared towards changing how design things are developed and implemented. A key aspect of further research would therefore seek to work alongside a design practice, specialising in design-led innovation in some context, and work with them over a period of time to integrate the use of actor-network mapping over regular intervals. The focus would be on observed changes in approach from start to finish and the way they talk about their approach from start to finish. This could also incorporate interviews and observations made with clients and collaborators, but the premise would be how this can inform effective design practice, and therefore design education, in preparing students approaching design-led innovation.

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appendix A
CASE STUDY ONE: ACTOR-NETWORK MAPS

Foreword

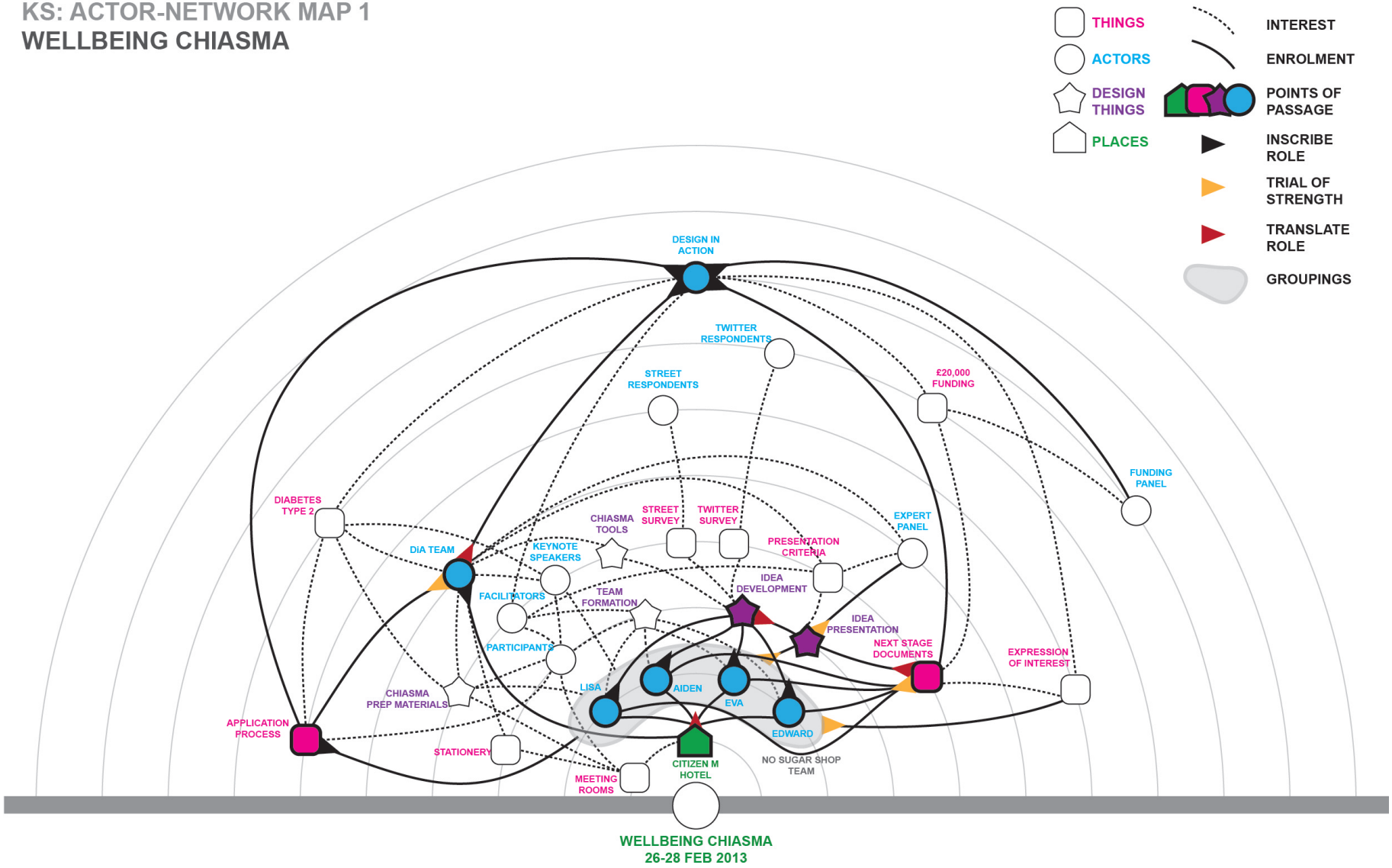
This appendix presents the actor-network maps produced by the author representing key stages in the development of Know Sugar into a live prototype. These maps tell the story of how Know Sugar developed and represent the initial iteration of the actor-network mapping visual language from ANT accounts. They were not presented to the informants from case study 1.

The maps are presented chronologically and without annotation as reference to allow the reader to browse the details of each map.

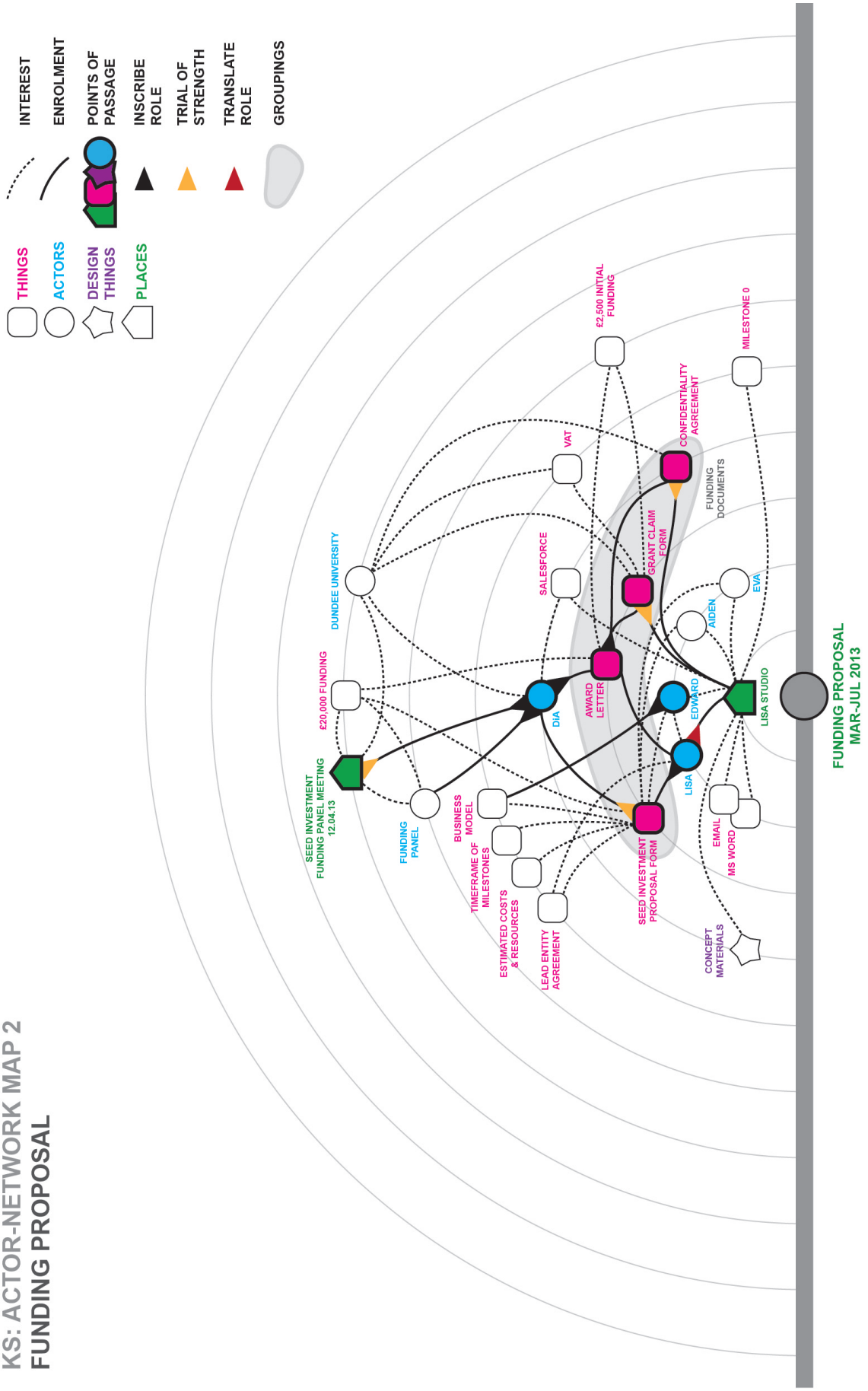
(All images are sourced from M. P. Johnson, 2015)

Arrangement of Actor-Network Maps

KS: ACTOR-NETWORK MAP 1
WELLBEING CHIASMA



KS: ACTOR-NETWORK MAP 2
FUNDING PROPOSAL



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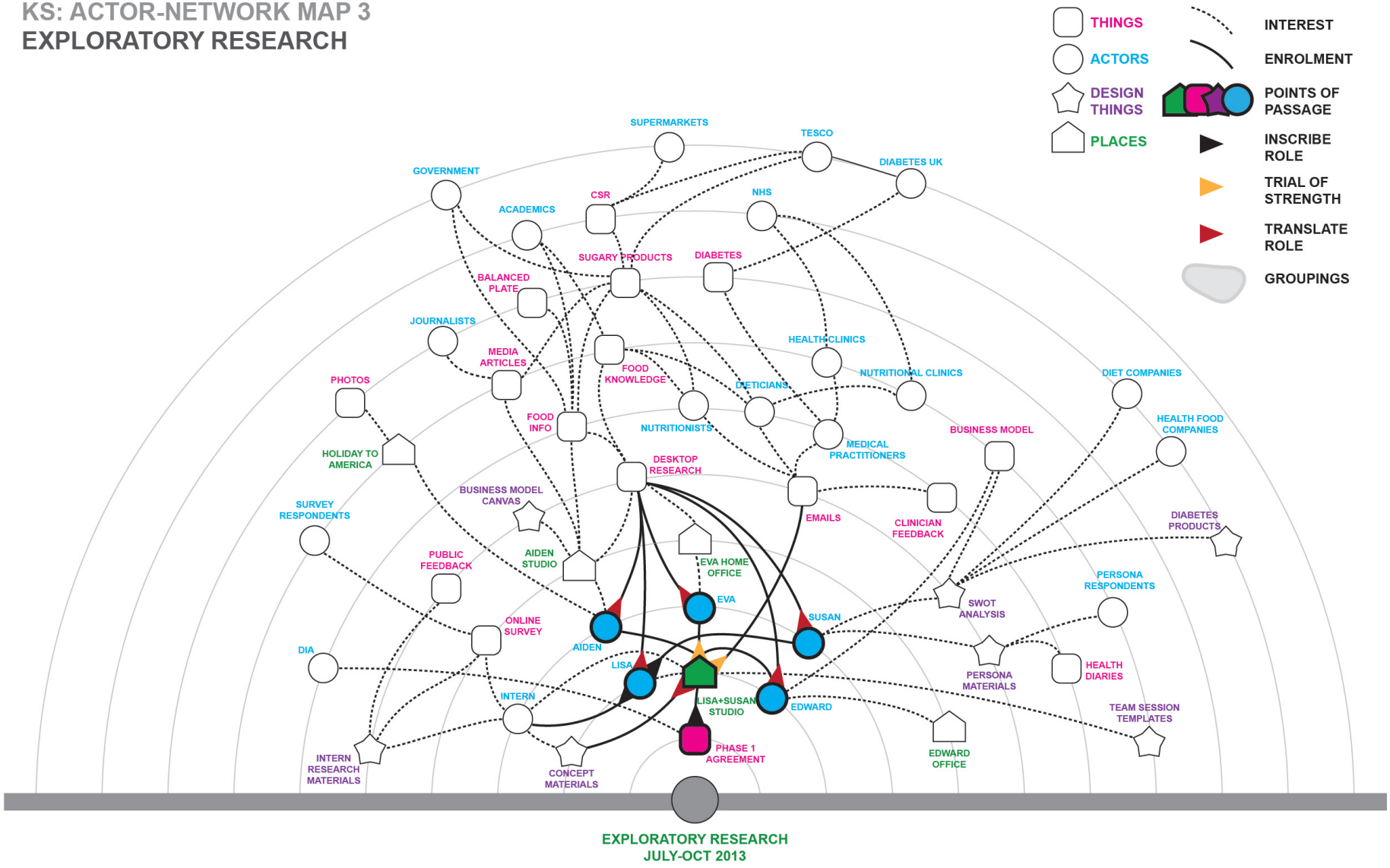
EXPLORATORY RESEARCH



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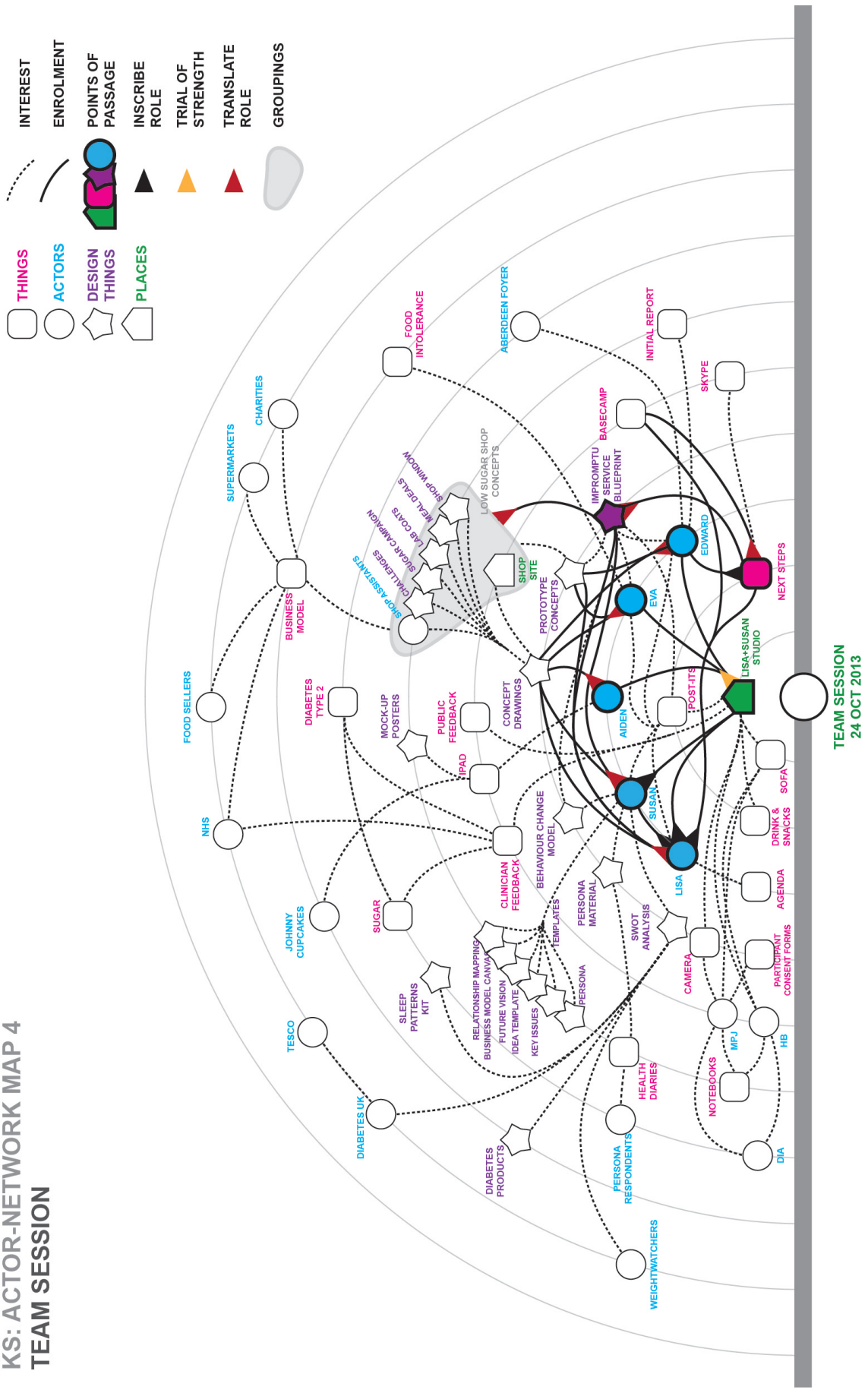
TEAM SESSION



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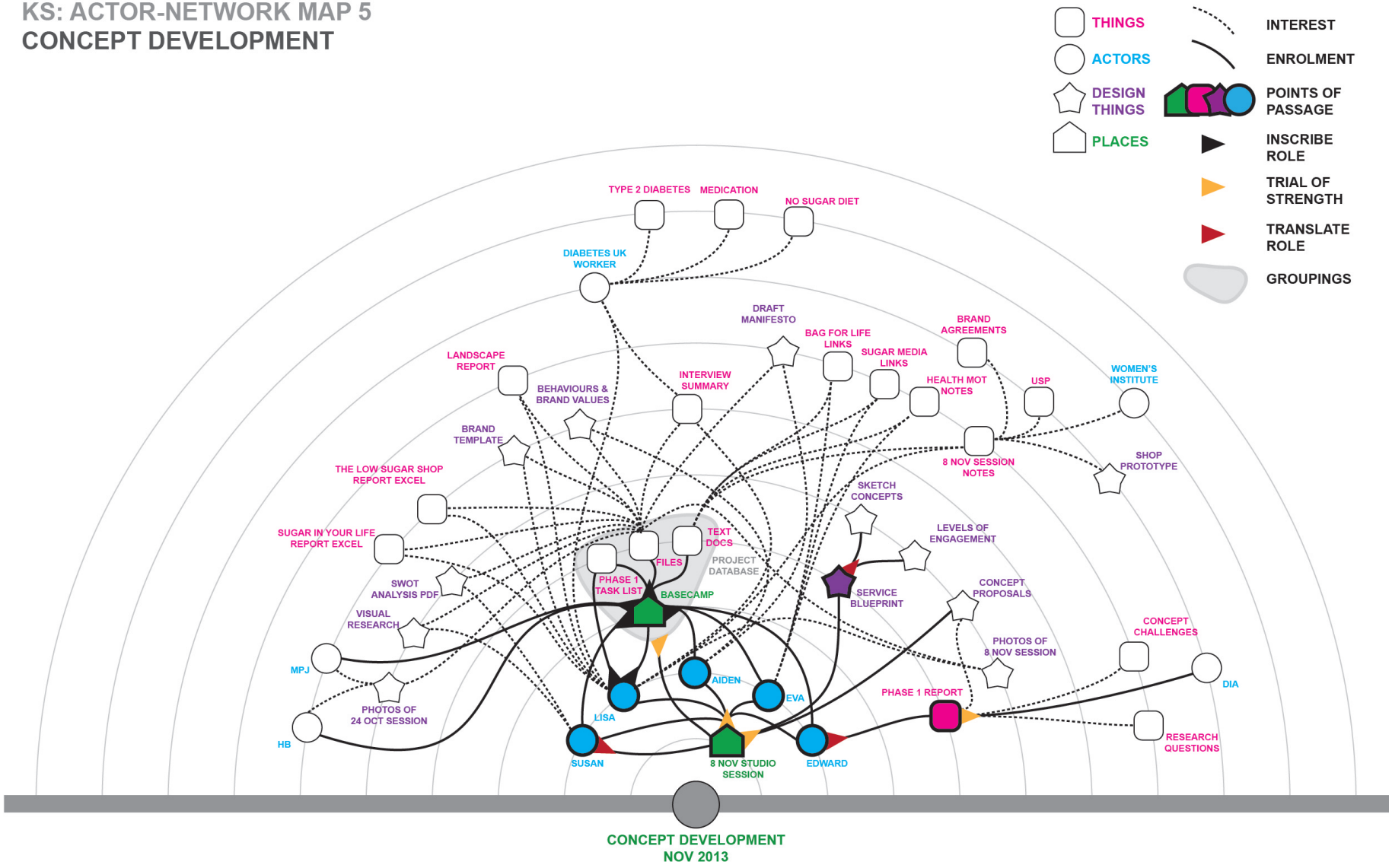
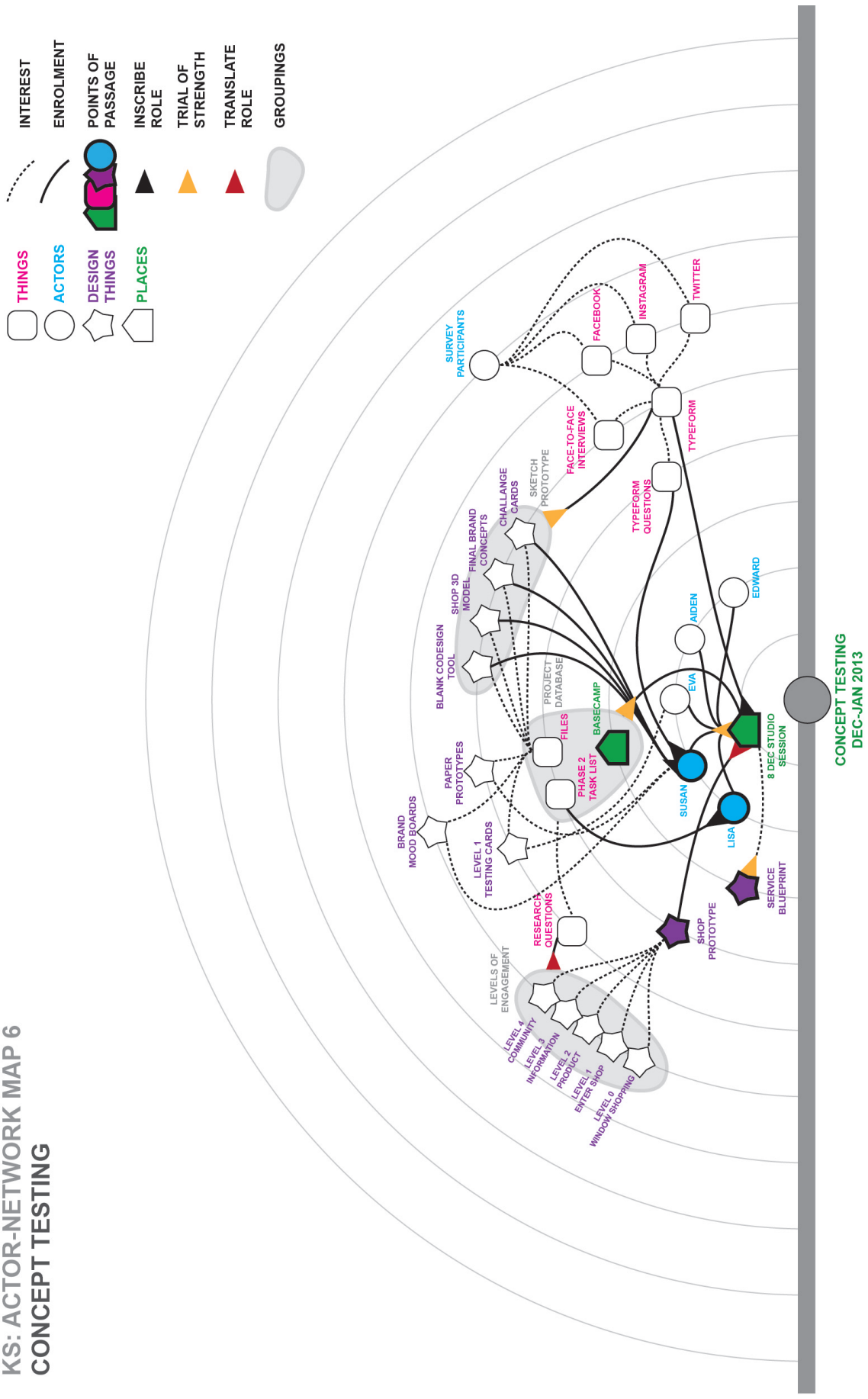
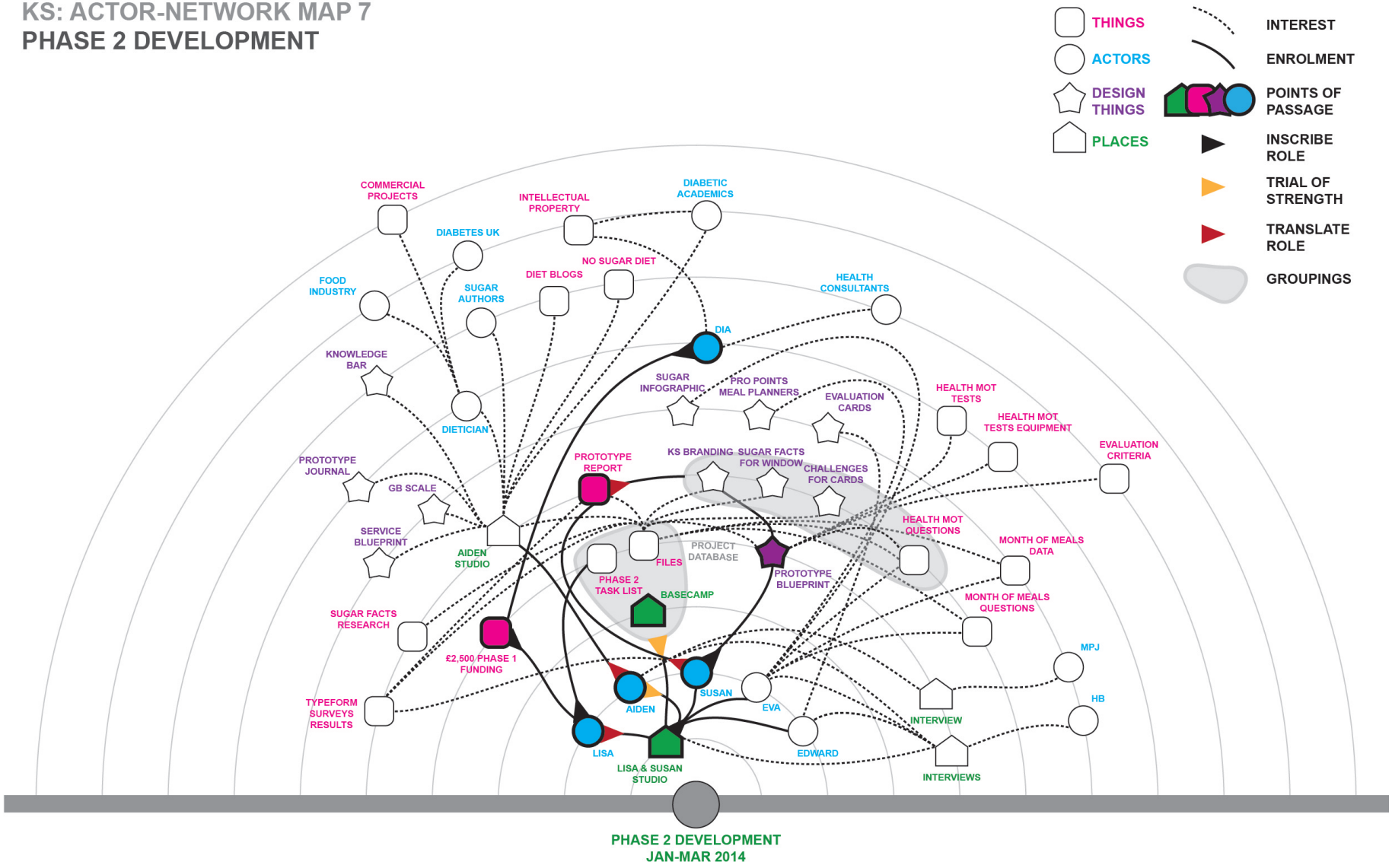
CONCEPT DEVELOPMENT



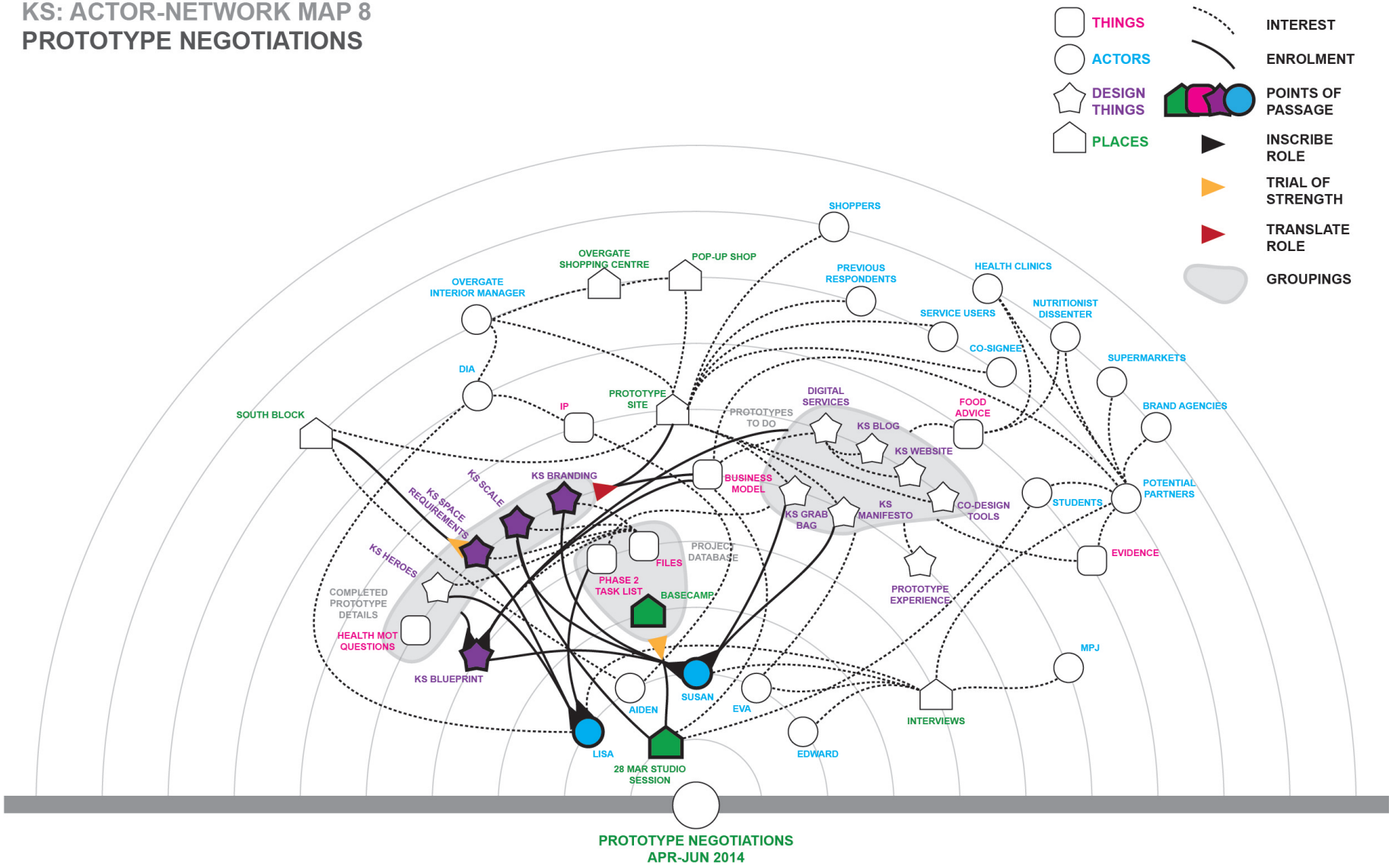
KS: ACTOR-NETWORK MAP 6
CONCEPT TESTING



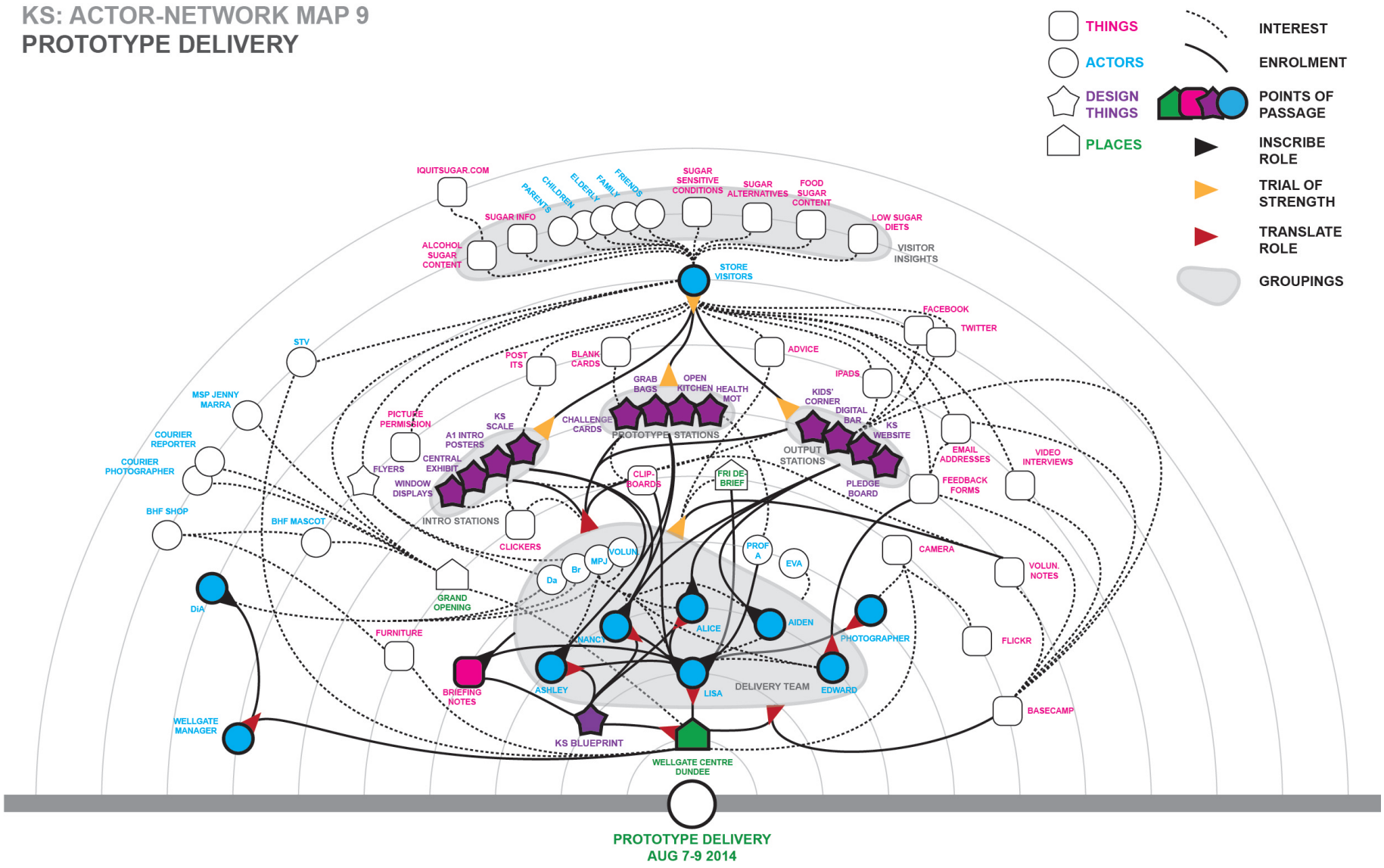
KS: ACTOR-NETWORK MAP 7
PHASE 2 DEVELOPMENT



KS: ACTOR-NETWORK MAP 8
PROTOTYPE NEGOTIATIONS



KS: ACTOR-NETWORK MAP 9
PROTOTYPE DELIVERY



appendix B
CASE STUDY TWO: ACTOR-NETWORK MAPS

Foreword

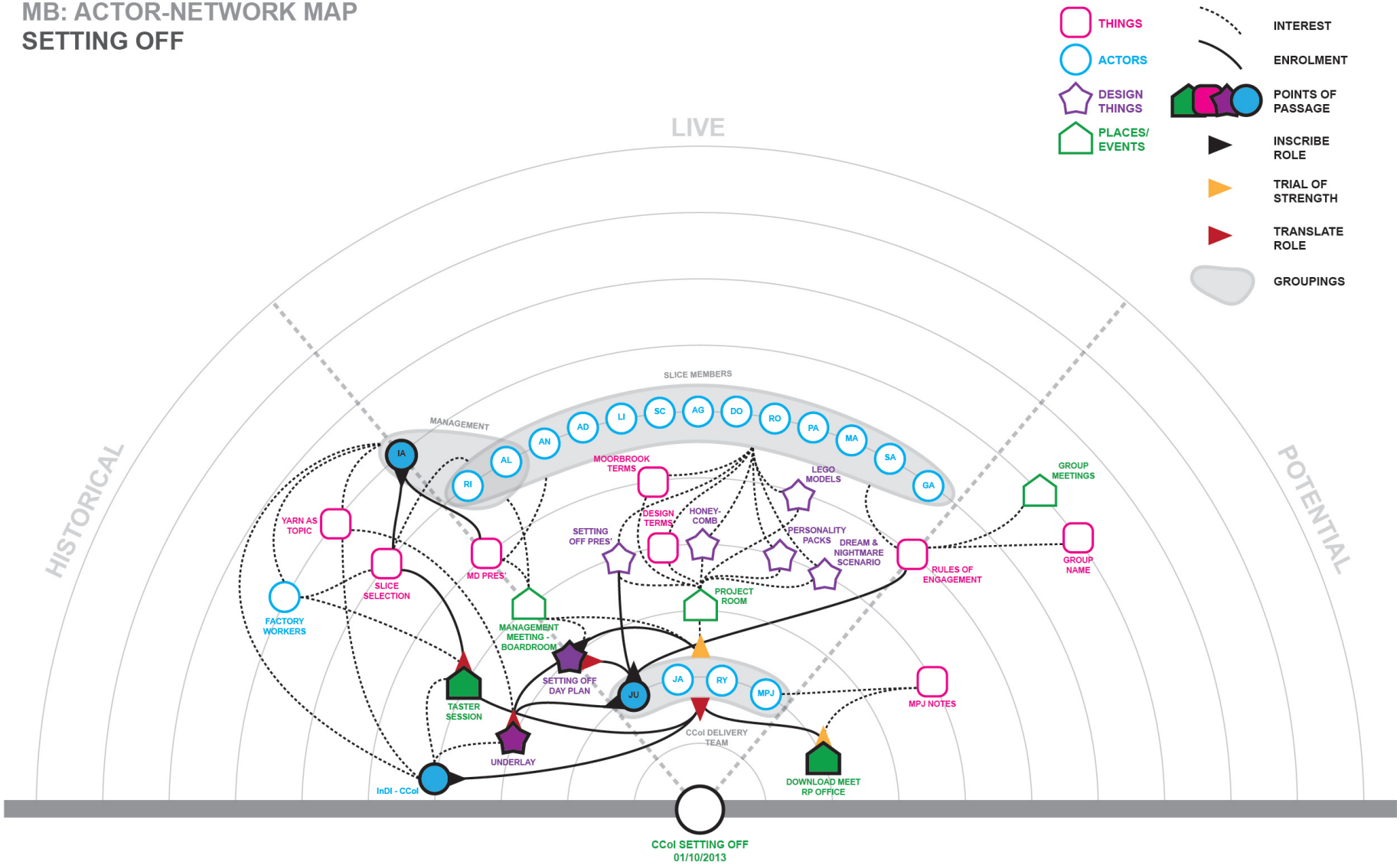
This appendix presents the actor-network maps produced by the author representing each workshop that was delivered with the slice members at Moorbrook Ltd. The maps were presented to the delivery team for gathering reflective accounts and producing reflective overlays as part of investigating case study 2.

The maps are presented chronologically and without annotation as reference to allow the reader to browse the details of each map's contents.

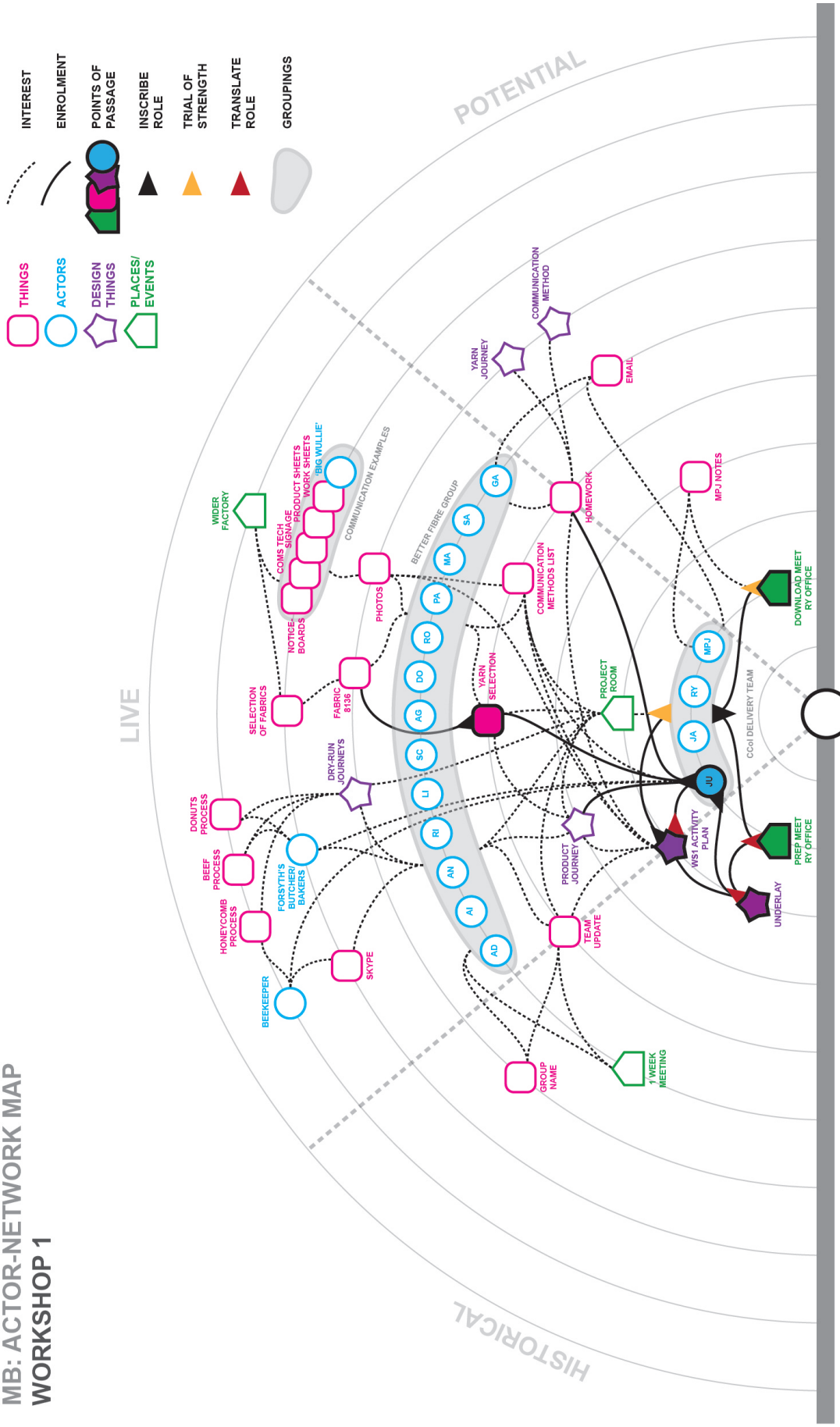
(All images are sourced from M. P. Johnson, 2015)

Arrangement of Actor-Network Maps

MB: ACTOR-NETWORK MAP
SETTING OFF



MB: ACTOR-NETWORK MAP
WORKSHOP 1



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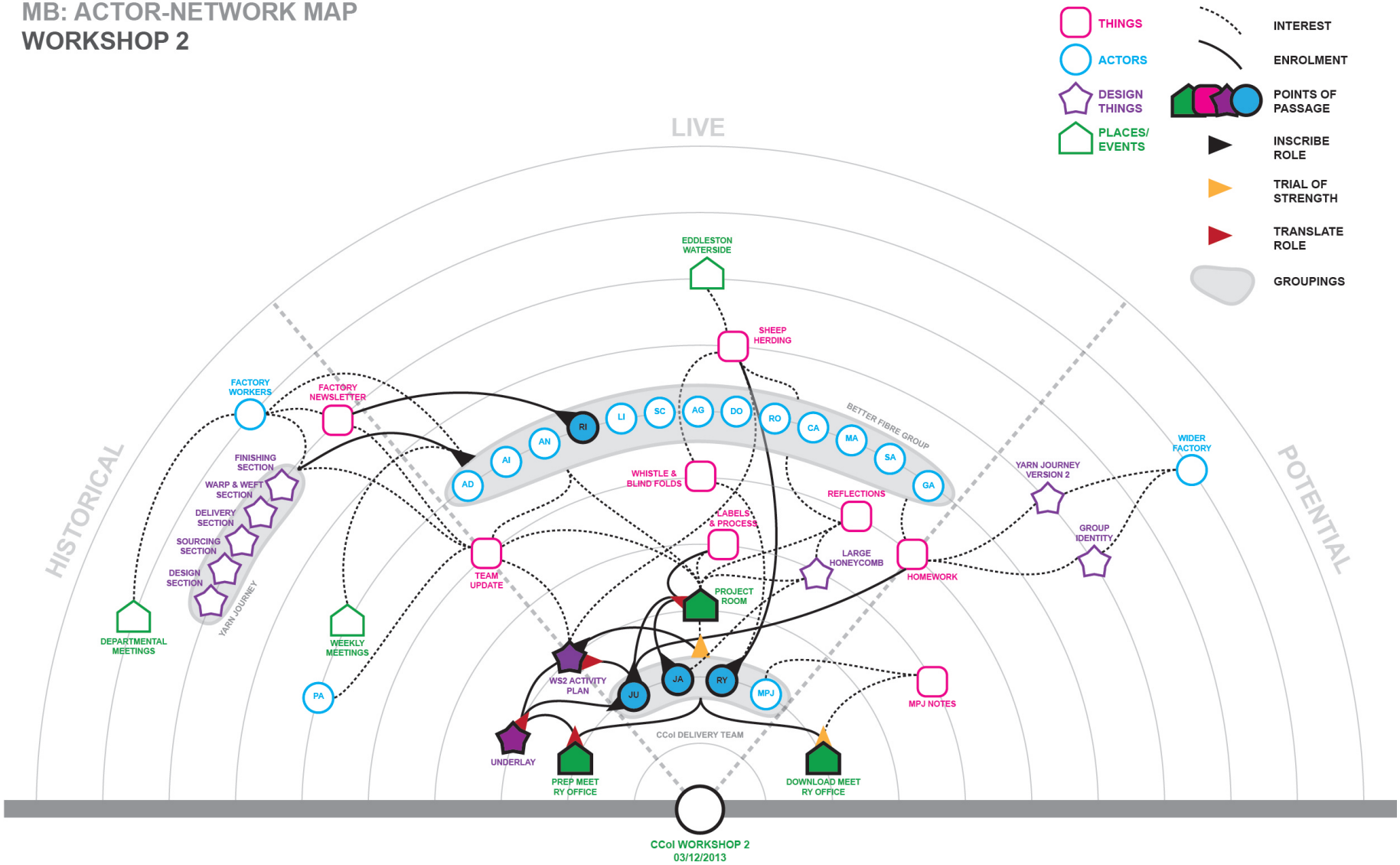
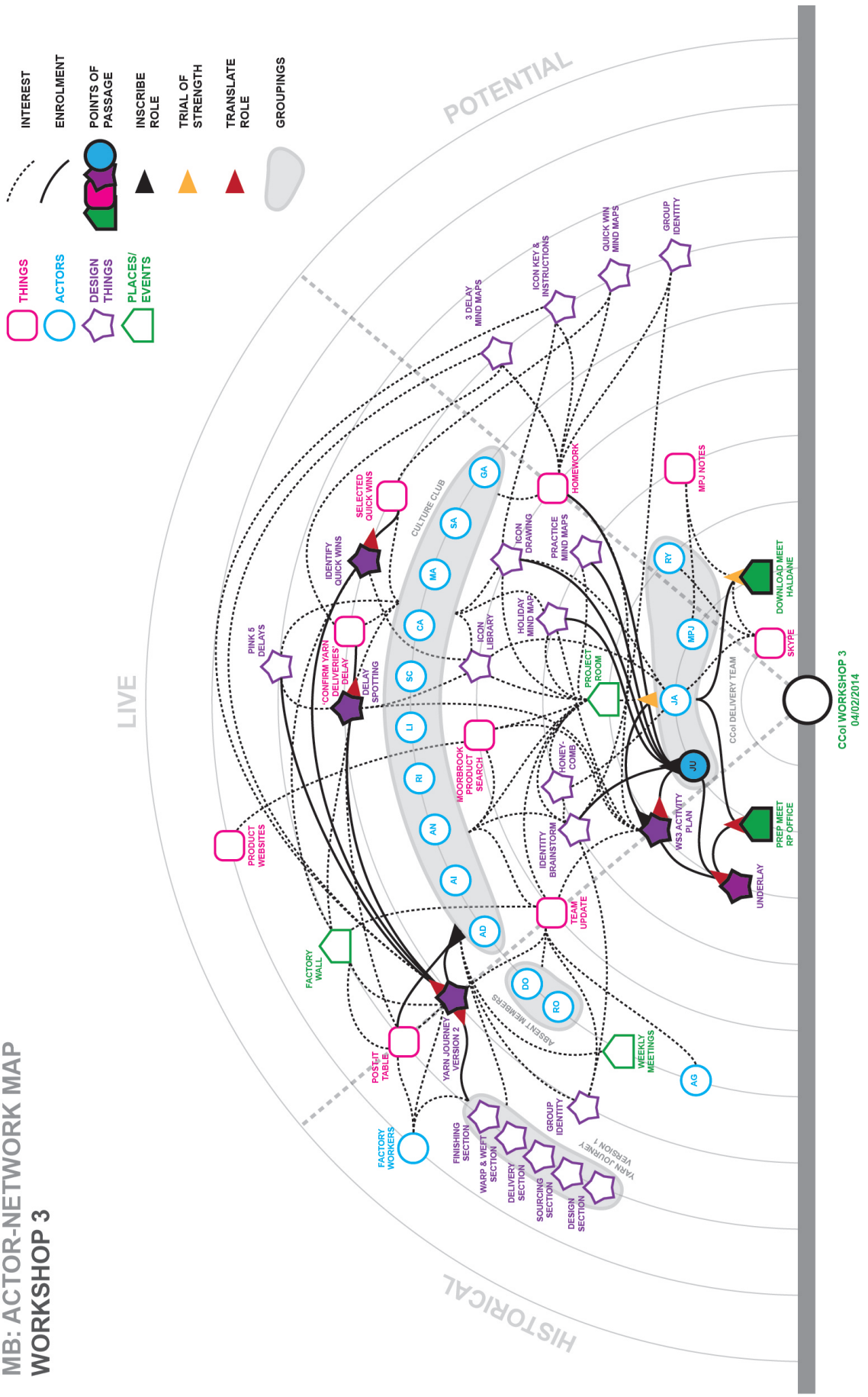
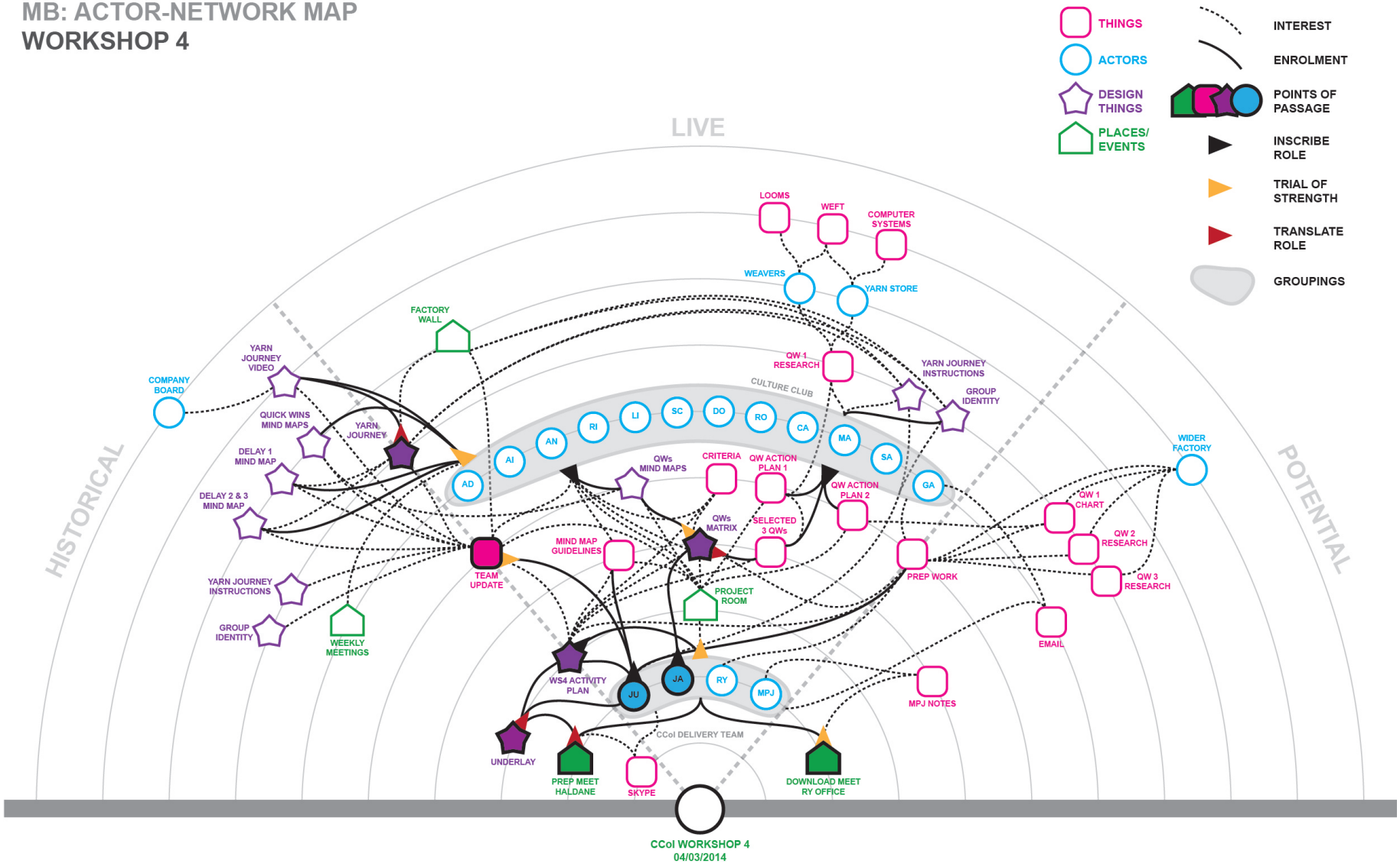
WORKSHOP 2



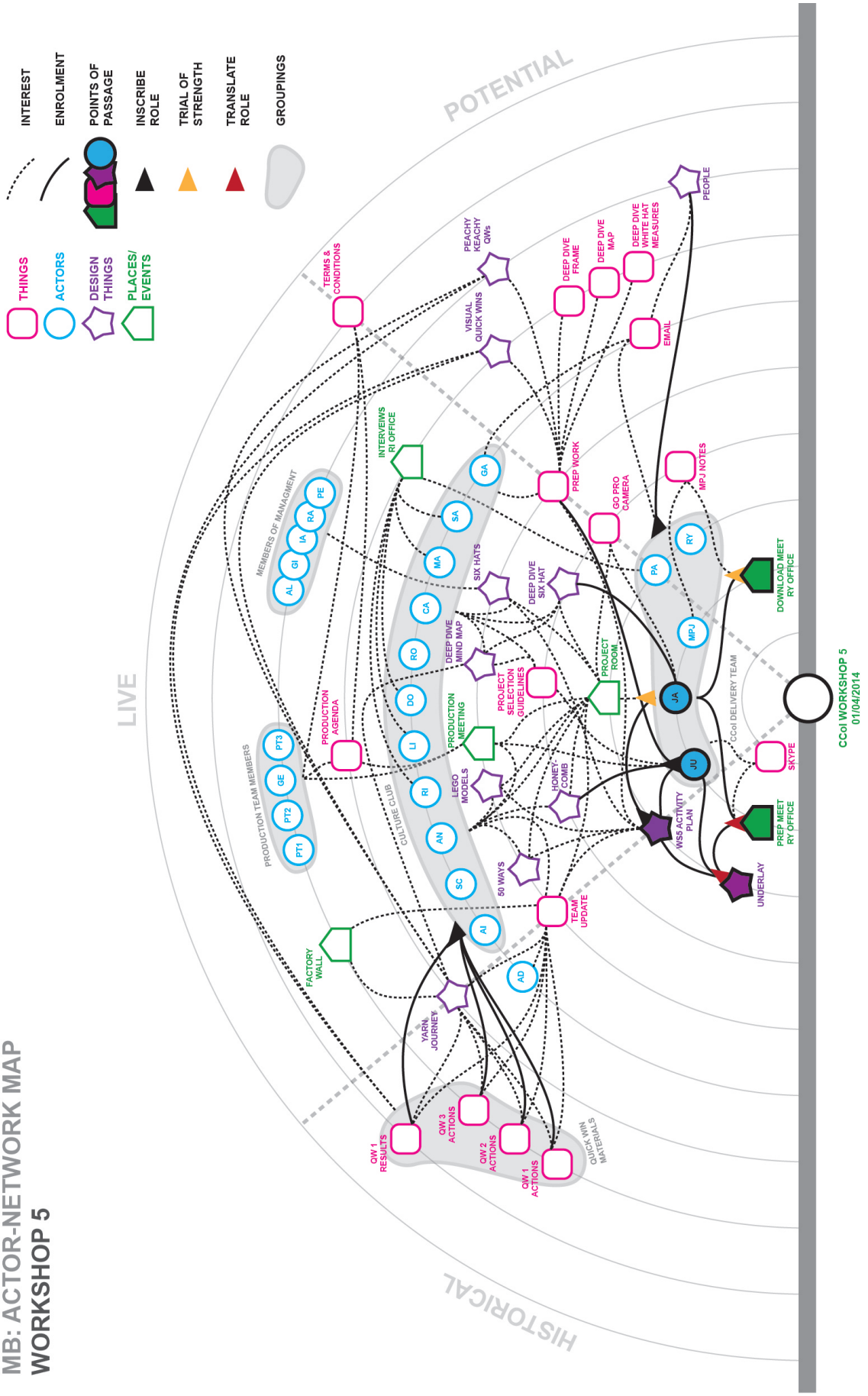
MB: ACTOR-NETWORK MAP
WORKSHOP 3



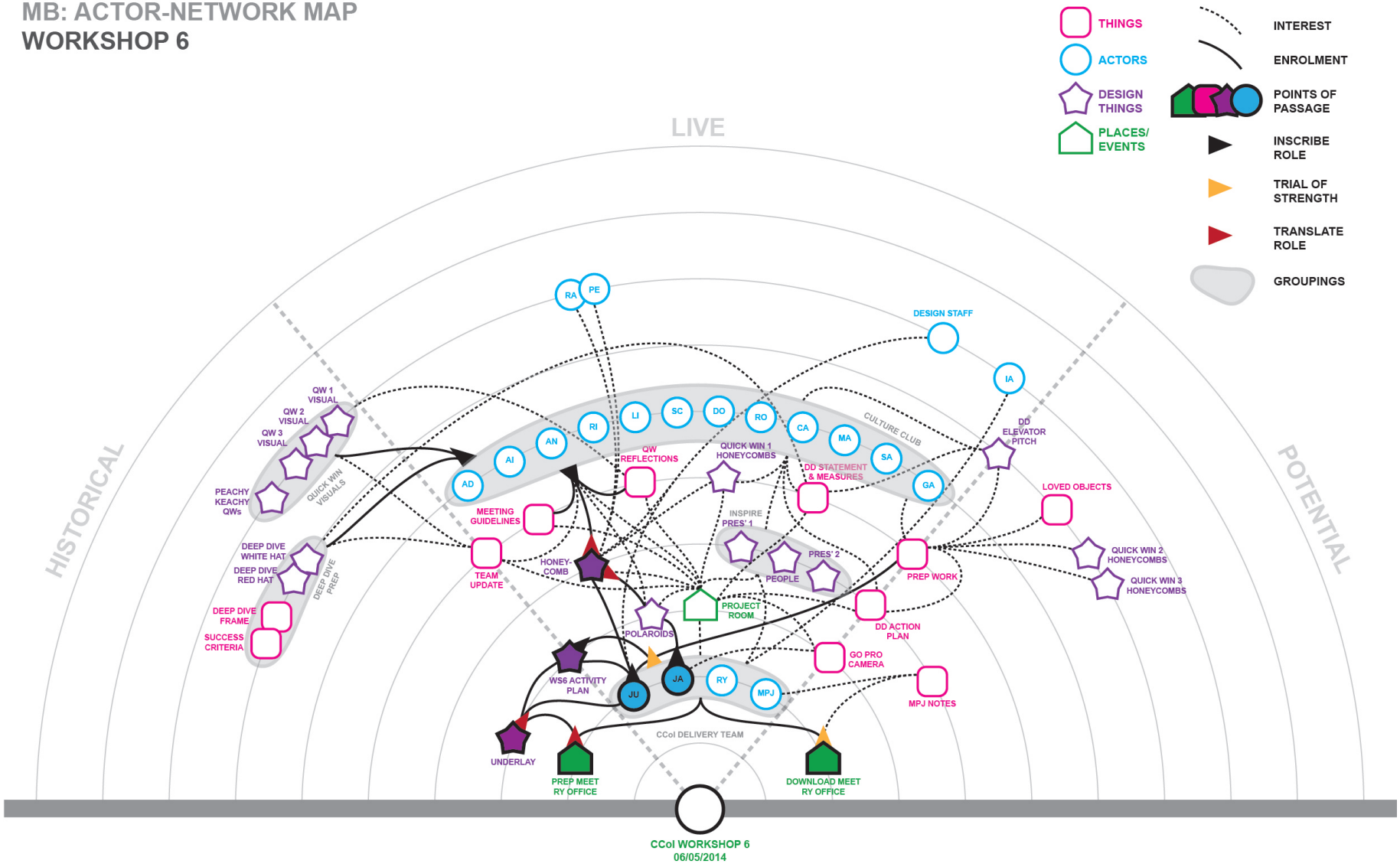
MB: ACTOR-NETWORK MAP
WORKSHOP 4



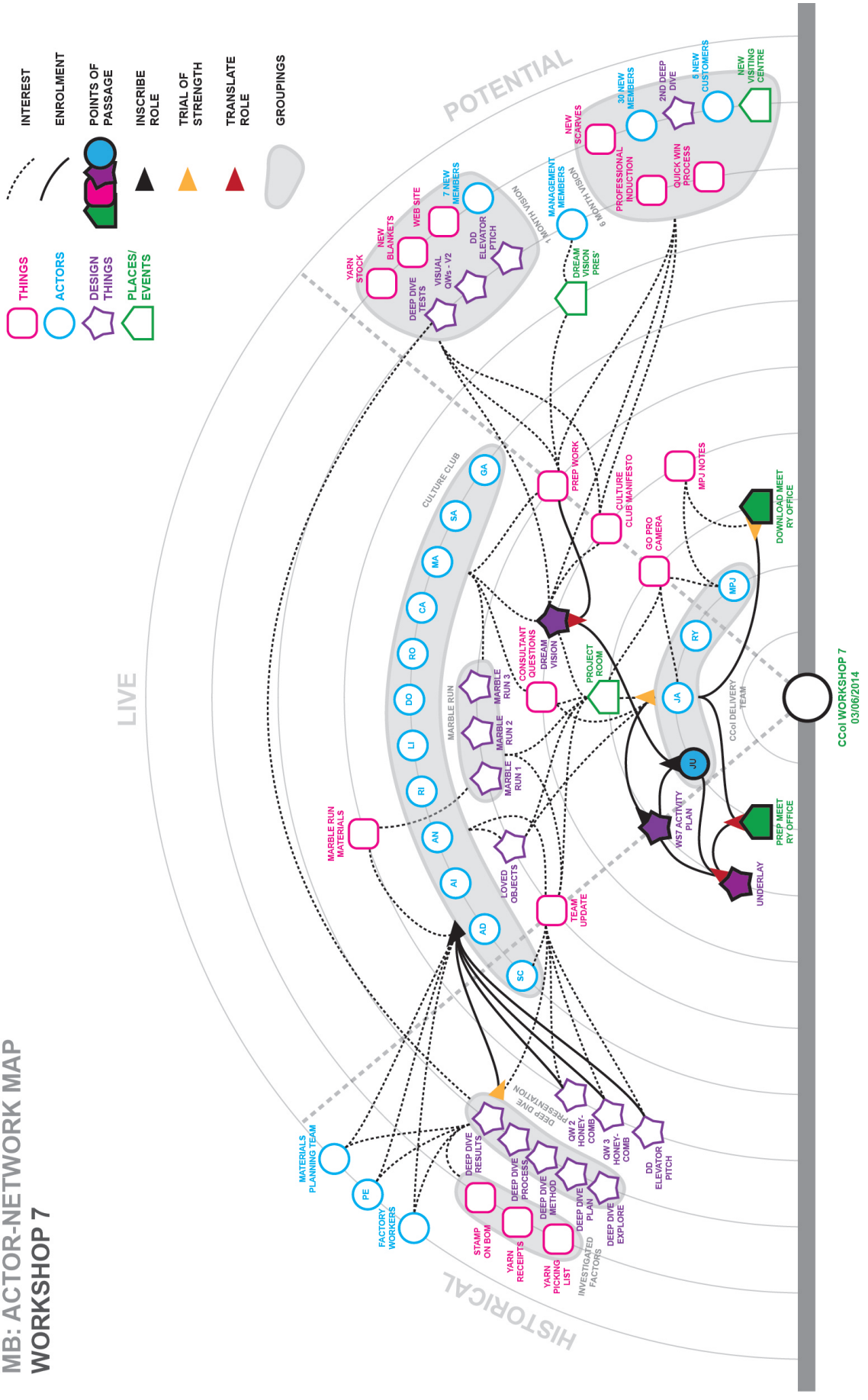
MB: ACTOR-NETWORK MAP
WORKSHOP 5



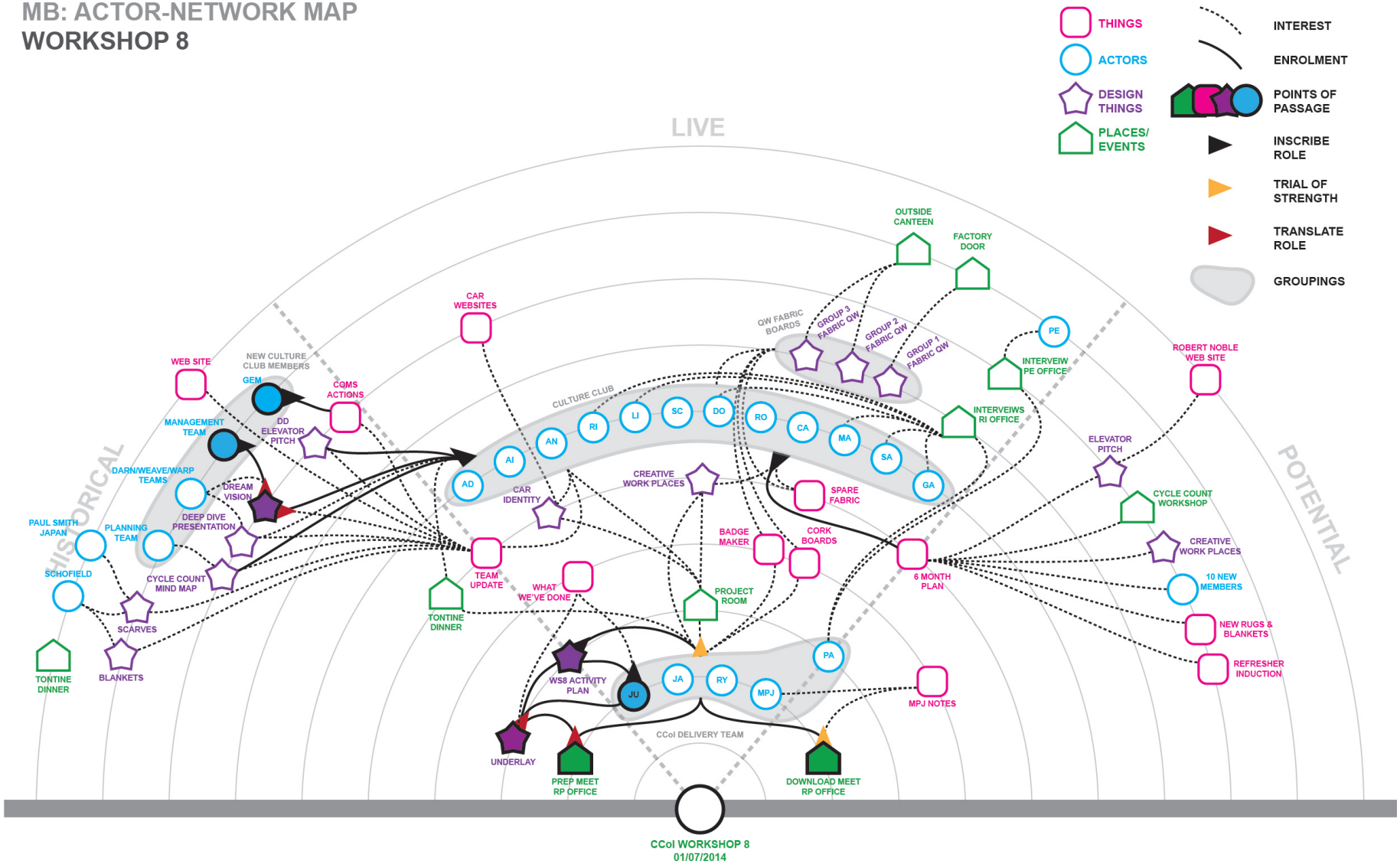
MB: ACTOR-NETWORK MAP
WORKSHOP 6



MB: ACTOR-NETWORK MAP
WORKSHOP 7



MB: ACTOR-NETWORK MAP
WORKSHOP 8



appendix C
CASE STUDY THREE: ACTOR-NETWORK MAPS

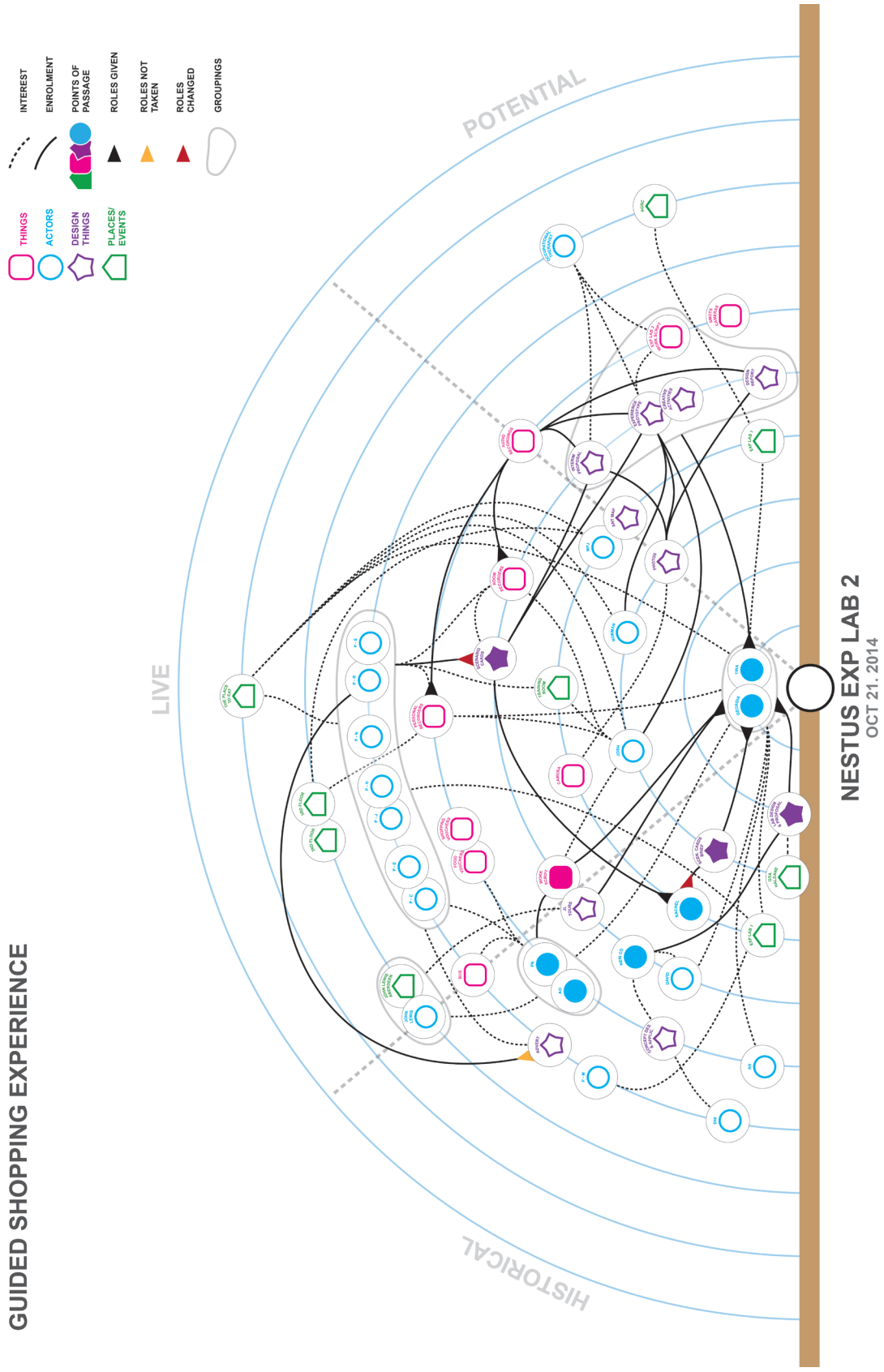
Foreword

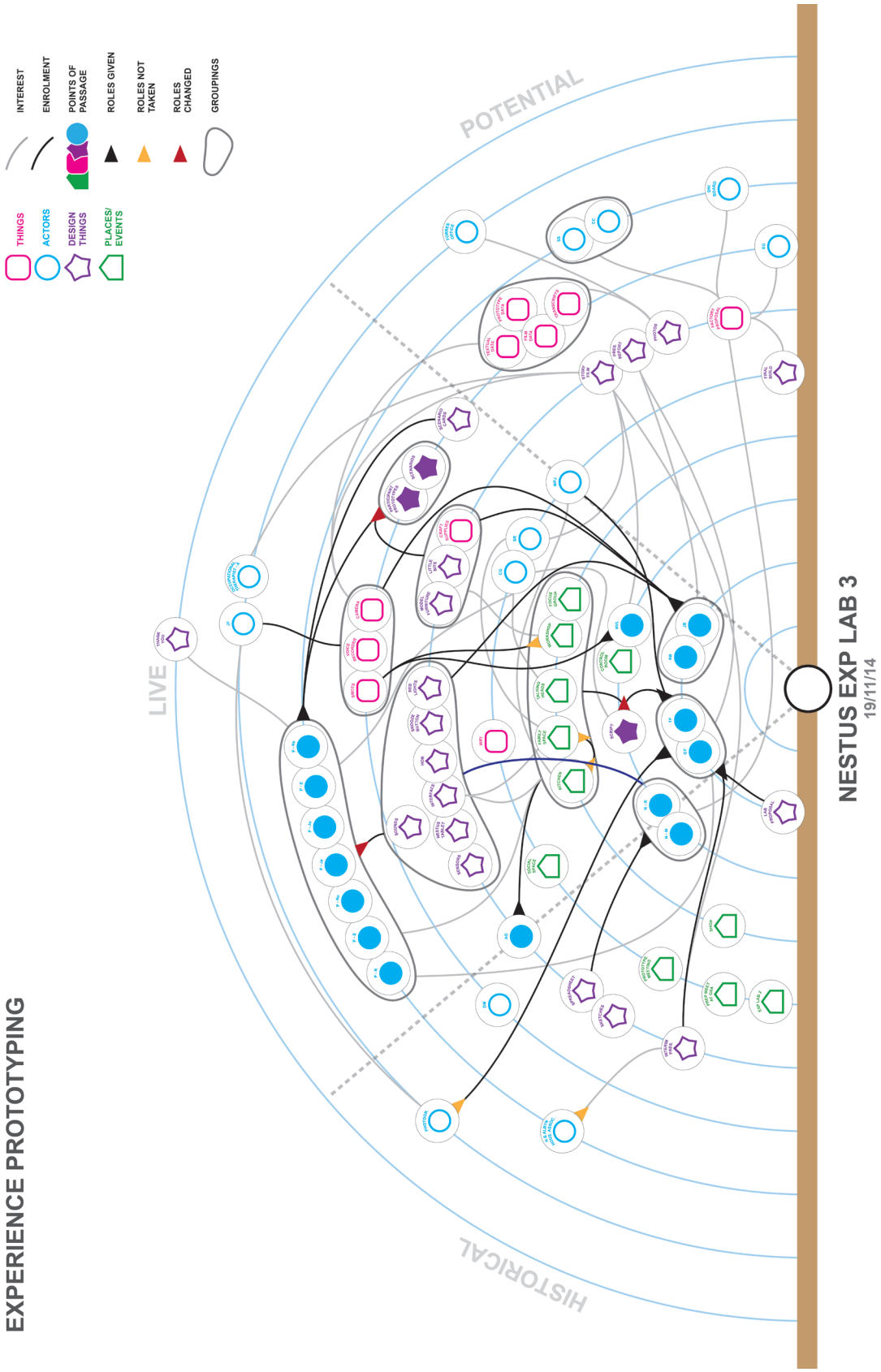
This appendix presents digisations of the live, physical actor-network maps that were produced as part of the Experience Labs investigated for case study 3. It should be noted that these digitised maps are a direct translation of the physical maps produced in each Experience Lab.

These maps are presented here without annotation as reference to allow the reader to browse the details of the map contents, which were co-produced with the case study informants. These maps are presented chronologically, in accordance with their presentation in the main thesis.

(All images are sourced from M. P. Johnson, 2015)

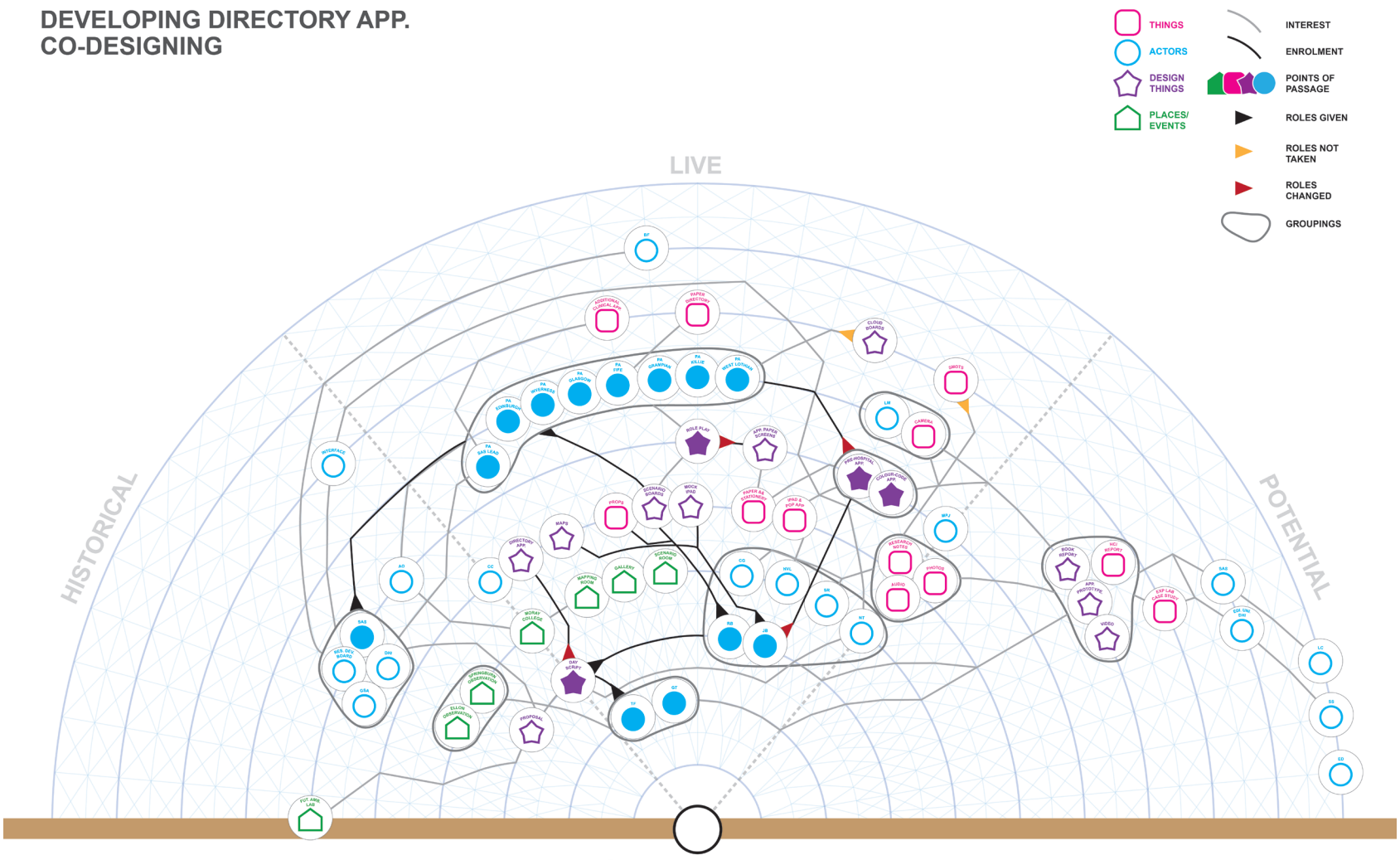
Arrangement of Actor-Network Maps

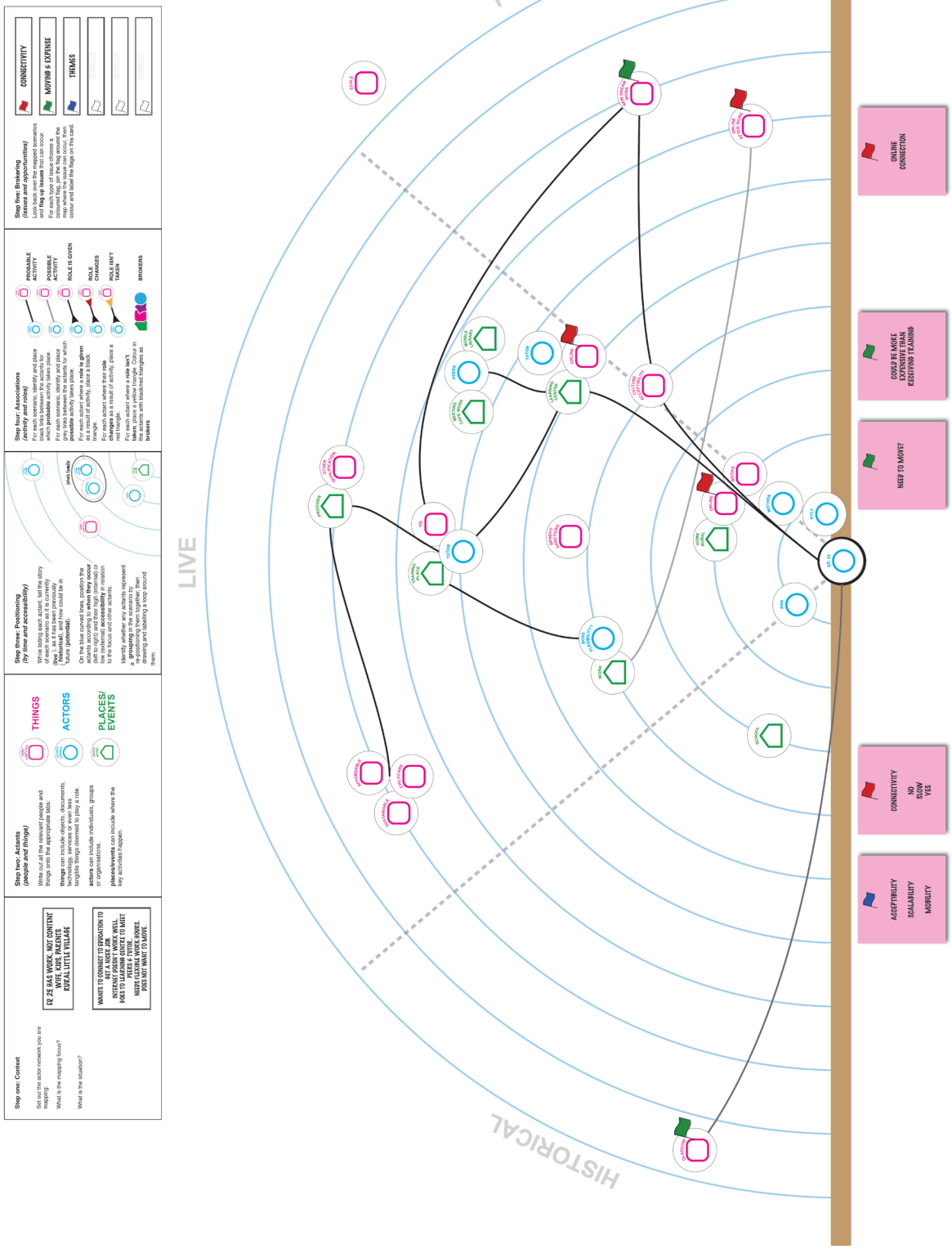

GUIDED SHOPPING EXPERIENCE
INTEREST
ENROLMENT
POINTS OF PASSAGE
ROLES GIVEN
ROLES NOT TAKEN
ROLES CHANGED
GROUPINGS
THINGS
ACTORS
DESIGN THINGS
PLACES/ EVENTS
POTENTIAL
LIVE
HISTORICAL
NESTUS EXP LAB 2
OCT 21. 2014

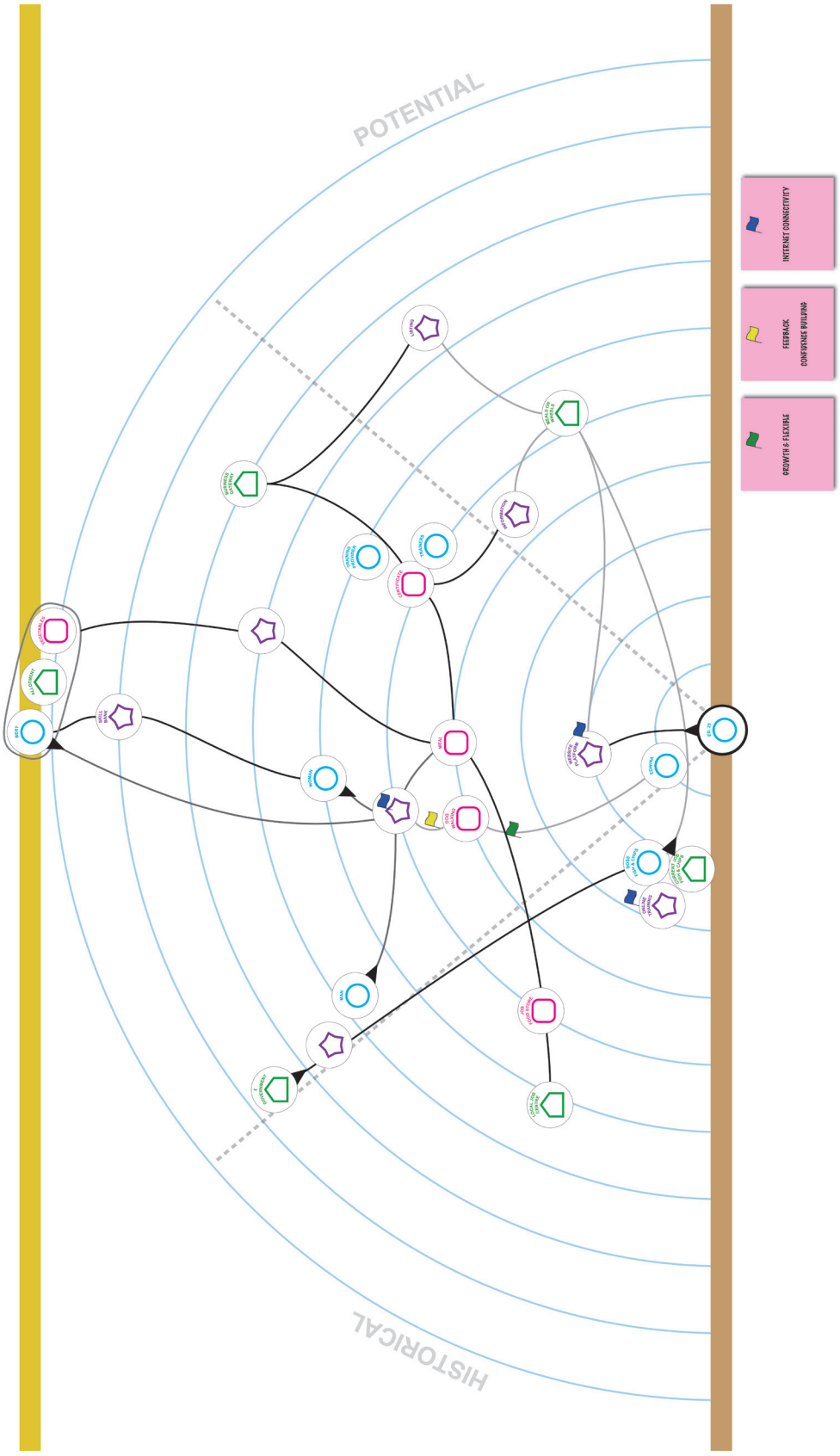


EXPERIENCE PROTOTYPING

DEVELOPING DIRECTORY APP.
CO-DESIGNING




Step one: Context
Set out the actor network you are mapping
What is the mapping focus?
EG 25 BAS WORK, NOT CONTENT WITH, KIDS, PARENTS RURAL LITTLE VILLAGE
What is the situation?
WANTS TO CONNECT TO EDUCATION TO GET A BETTER JOB
INTERNET DOESN'T WORK WELL
GOES TO LEARNING CENTRE TO MEET PEOPLE AND USE FACILITIES
NEEDS CULTURE WORK HOURS.
DOES NOT WANT TO MOVE.
Step two: Actants (people and things)
Write out all the relevant people and things on the paper provided.
things can include objects, documents, technology, services or even less tangible things deemed to play a role.
actors can include individuals, groups or organisations.
places/events can include where the key activities happen.
THINGS
ACTORS
PLACES/ EVENTS
Step three: Positioning (by time and accessibility)
Write listing each actant, tell the story of each scenario as it is currently (live), as it has been previously (historical), and how it could be in future (potential).
On the blue curved lines, position the actants according to when they occur (historical, current, potential) and/or how accessible (external) accessibility in relation to the focus and other actants.
Identify whether any actants represent the same thing and if so, consider repositioning them together, then drawing and labelling a loop around them.
Step four: Associations (identify and notate)
For each scenario, identify and place black links between the actants for which a connection is made/ could be made.
For each scenario, identify and place grey links between the actants for which a connection is made/ could be made.
For each actant where a role is given as a result of activity, place a black triangle.
For each actant where their role changes as a result of activity, place a grey triangle.
For each actant where a role isn't taken, place a yellow triangle. Colour in the triangles with blue/red triangles as brokers.
PROBABLE ACTIVITY
POSSIBLE ACTIVITY
ROLE IS GIVEN
ROLE CHANGES
ROLE ISN'T TAKEN
BROKERS
Step five: Reviewing (issues and opportunities)
Look back over the mapped scenarios and flag up issues that can occur. For each issue that can occur, a coloured flag, pin the flag around the map where the issue can occur, then colour and shade the edge on this scale
CONNECTIVITY
MOVING & EXPENSE
THEMES
LIVE
POTENTIAL
HISTORICAL
ONLINE CONNECTION
COULD BE MORE EXPENSIVE THAN ATTENDING TRAINING
NEED TO MOVE?
CONNECTIVITY NO SURVEY YES
ACCEPTIBILITY SCALABILITY MOBILITY


POTENTIAL
HISTORICAL
INTERNET CONNECTIVITY
FEEDBACK
CONFIDENCE BUILDING
GROWTH & FLEXIBLE

Step one: Context

Set out the actor-network you are mapping:

What is the mapping focus?

Mary
70s, Single, Female

What is the situation?

Remote area, independent, family in Devon, arthritis, day-to-day task, post knee op, moderate income, bedroom upstairs, neighbours similar age, keen to stay home.

Step two: Actants
(people and things)

Write out all the relevant people and things onto the appropriate tabs:

things can include objects, documents, technology, services or even less tangible things deemed to play a role.

actors can include individuals, groups or organisations.

places/events can include where the key activities happen.

THINGS

ACTORS

PLACES/ EVENTS

Step three: Positioning
(by time and accessibility)

While listing each actant, tell the story of each scenario as it is currently (**live**), as it has been previously (**historical**), and how could be in future (**potential**).

On the blue curved lines, position the actants according to **when they occur** (left to right) and their high (internal) or low (external) **accessibility** in relation to the focus and other actants.

Identify whether any actants represent a **grouping** in the scenario by re-positioning them together, then drawing and labelling a loop around them.

Step four: Associations
(activity and roles)

For each scenario, identify and place black links between the actants for which **probable** activity takes place.

For each scenario, identify and place grey links between the actants for which **possible** activity takes place.

For each actant where a **role is given** as a result of activity, place a black triangle.

For each actant where their **role changes** as a result of activity, place a red triangle.

For each actant where a **role isn't taken**, place a yellow triangle. Colour in the actants with blackred triangles as **brokers**.

PROBABLE ACTIVITY

POSSIBLE ACTIVITY

ROLE IS GIVEN

ROLE CHANGES

ROLE ISN'T TAKEN

BROKERS

Step five: Brokering
(issues and opportunities)

Look back over the mapped scenarios and **flag up issues** that can occur.

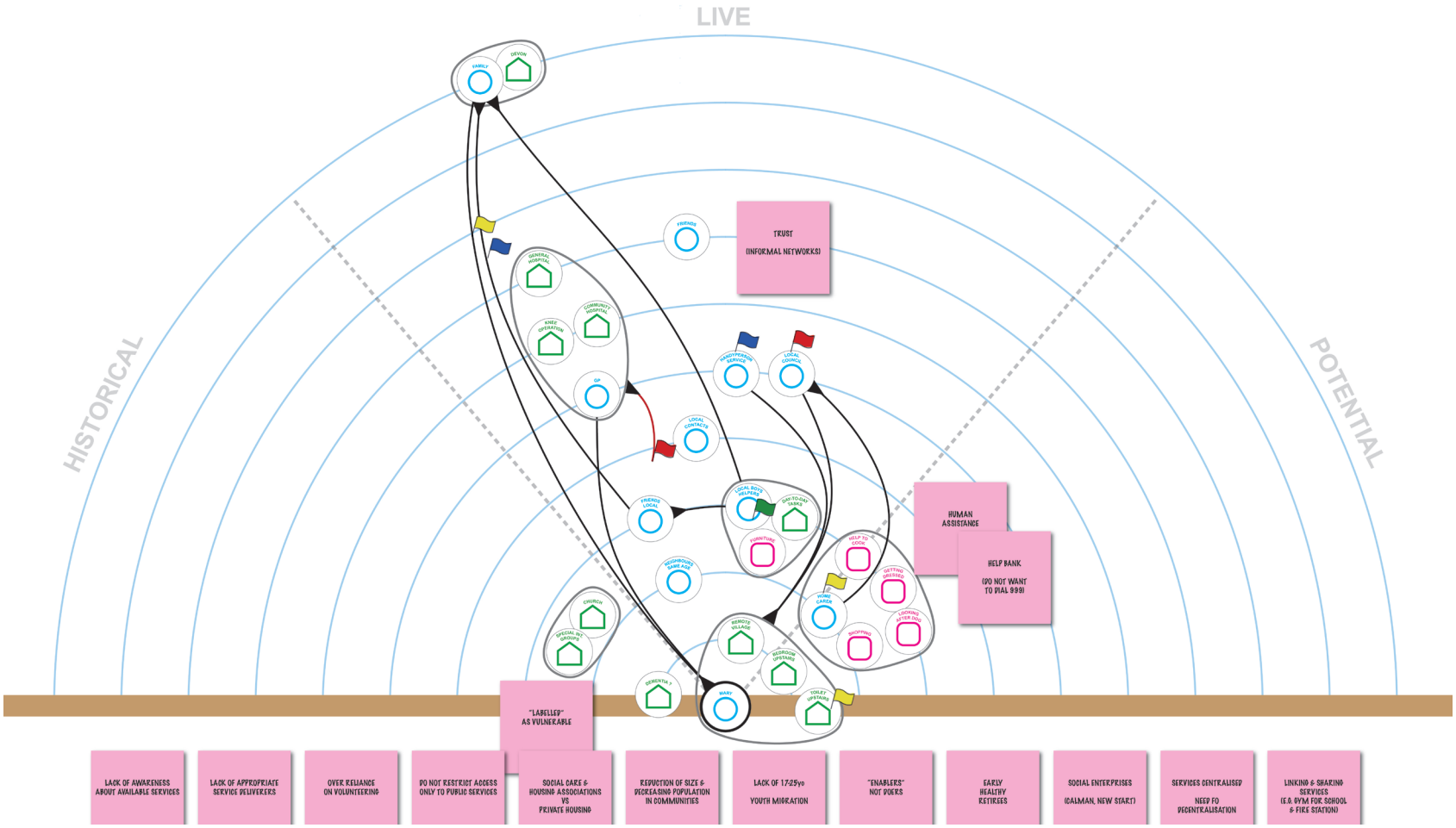
For each type of issue choose a coloured flag, pin the flag around the map where the issue can occur, then colour and label the flags on this card.

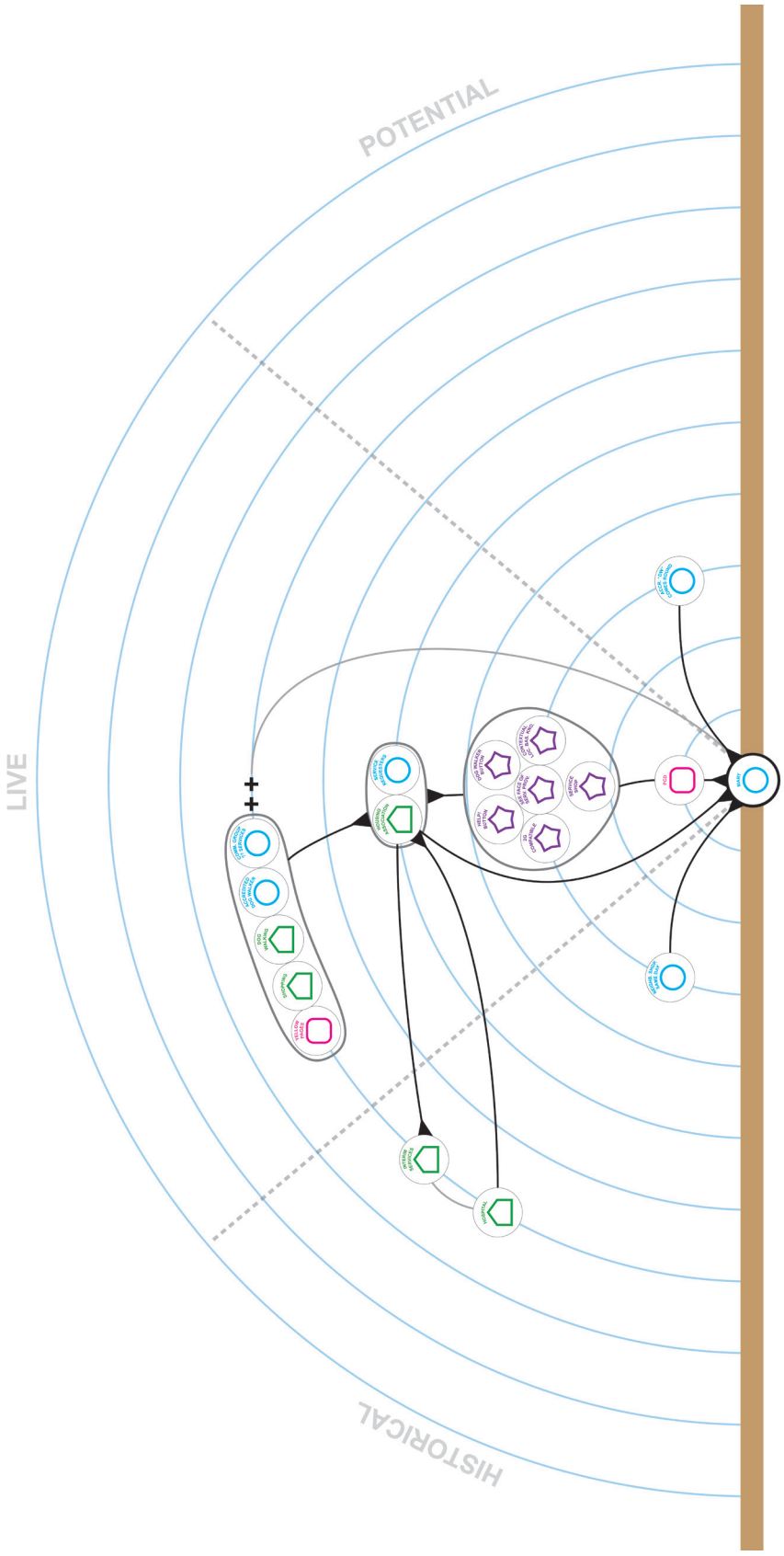
CONNECTIVITY

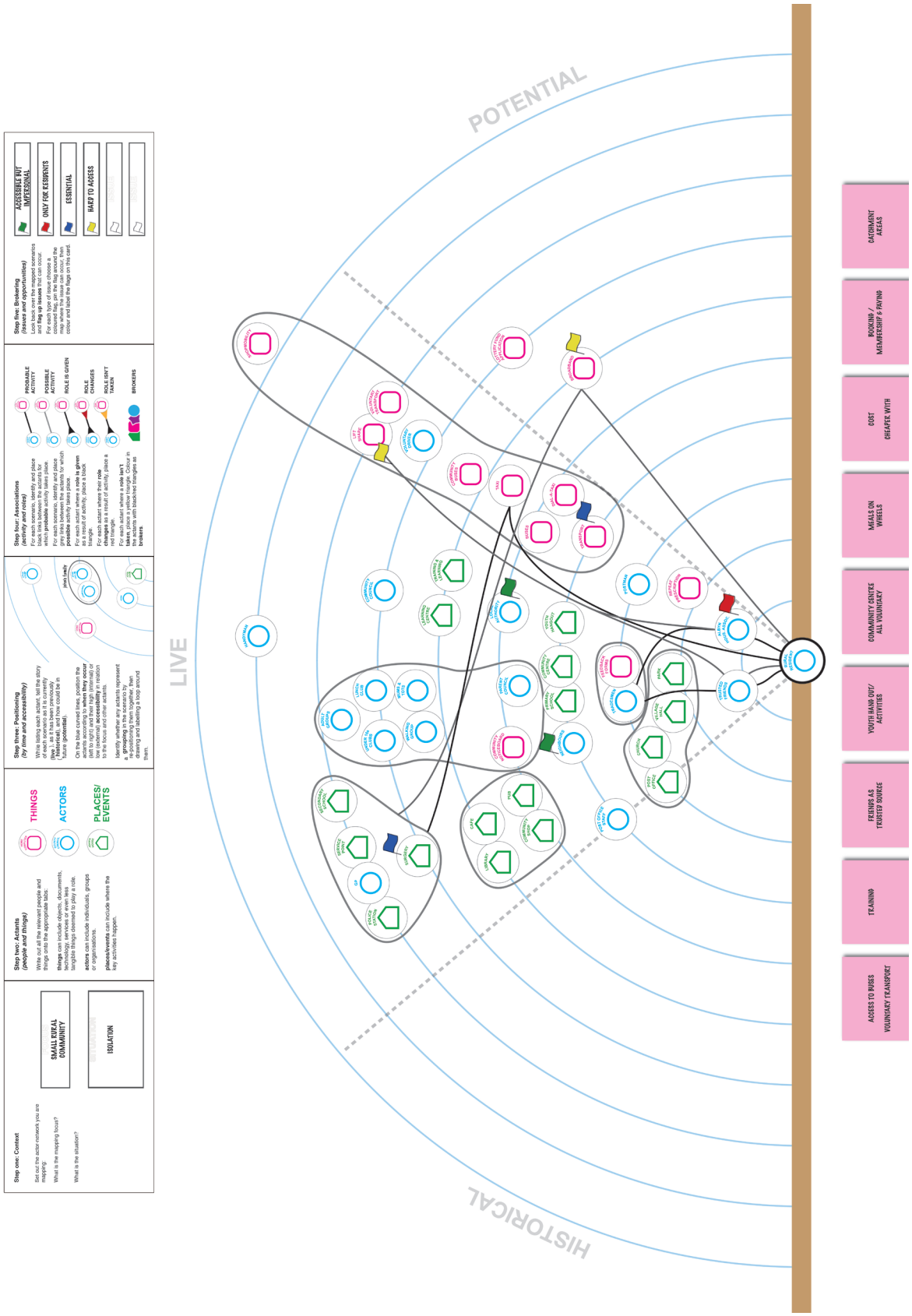
ACCESSIBILITY

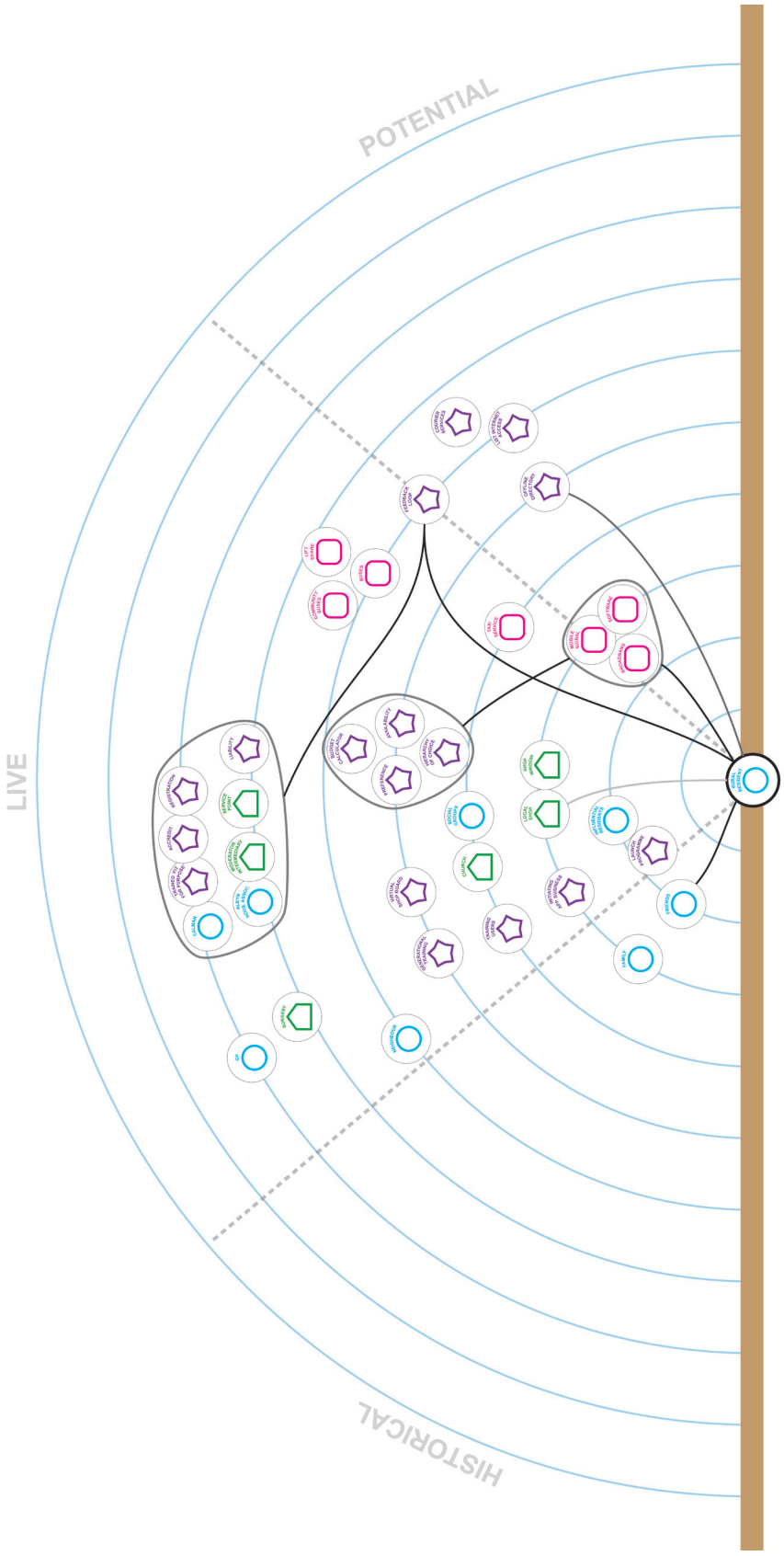
RELIABILITY

AWARENESS




POTENTIAL
LIVE
HISTORICAL


Step one: Context
Set out the actor network you are mapping
What is the mapping focus?
SMALL RURAL COMMUNITY
What is the situation?
ISOLATION
Step two: Actants (people and things)
Write out all the relevant people and things in the network you are mapping.
things can include objects, documents, technology, services or even less tangible things deemed to play a role.
actors can include individuals, groups or organisations.
places/events can include where the key activities happen.
THINGS
ACTORS
PLACES/ EVENTS
Step three: Positioning (by time and accessibility)
Write listing each actant, tell the story of each scenario as it is currently (map 1) as it has been previously (map 2) and how it could be in future (potential).
On the blue curved lines, position the actants according to when they occur (either in current, previous or future) and how accessibility in relation to the focus and other actants.
Identify whether any actants represent the same thing and if so, group by re-positioning them together, then drawing and labelling a loop around them.
Step four: Associations (identify and notate)
For each scenario, identify and place black links between the actants for which there is a relationship or tension.
For each scenario, identify and place grey links between the actants for which there is a relationship.
For each actant where a role is given as a result of activity, place a black triangle.
For each actant where their role changes as a result of activity, place a yellow triangle.
For each actant where a role isn't taken, place a yellow triangle. Colour in the triangle with blackfill triangle as broken.
PROBABLE ACTIVITY
POSSIBLE ACTIVITY
ROLE IS GIVEN
ROLE CHANGES
ROLE ISN'T TAKEN
BROKERS
Step five: Reviewing (issues and opportunities)
Look back over the mapped scenarios and flag up issues that can occur.
For each issue that can occur, a coloured flag, pin the flag around the map where the issue can occur, then colour and label the edge on this wall.
ACCESSIBLE BUT IMPERSONAL
ONLY FOR RESIDENTS
ESSENTIAL
HARD TO ACCESS
LIVE
POTENTIAL
HISTORICAL
ACCESS TO BUSES VOLUNTARY TRANSPORT
TRAINING
FRIENDS AS TRUSTED SOURCE
YOUTH HANG OUT/ ACTIVITIES
COMMUNITY CENTRE ALL VOLUNTARY
MEALS ON WHEELS
COST CHEAPER WITH
BOOKING / MEMBERSHIP & PAYING
CATERMENT AREAS


POTENTIAL
LIVE
HISTORICAL

appendix D
PORTFOLIO SUBMISSION: EXHIBITION OF MAPS

Foreword

This appendix presents the portfolio submission for the final viva examination as an exhibition of the actor-network maps and interpretative overlays produced across the three case studies. These were supported with select images of development and reflective accounts from the author, which provide a chronological narrative of the challenges and breakthroughs experienced in developing the method of actor-network mapping in practice.

The portfolio submission is presented here using images taken from the exhibition of each case study, interspersed with the reflective accounts in the order they were presented at the exhibition.

(All images are sourced from M. P. Johnson, 2015)

Arrangement of presentation

Welcome!

Mapping Design Things is an exhibition of the actor-network maps and interpretative overlays developed by Michael Pierre Johnson for his doctoral thesis, supported by key reflections, images and participant comments.

This exhibition displays the outputs and development of the methodological model in practice across three case studies of design-led innovation, and is intended to work alongside the complete thesis submission, in particular, the three case study chapters. As such, this exhibition is targeted towards practice-based design researchers in design-led innovation, and represents the complete practice submission for this thesis.

Attached are both the final methodological model developed through this investigation and the reflexive framework emergent from grounded theory analysis. The methodological model lays out the theories and methods brought together in this investigation through four sections towards the core contribution of a theory/methods package. Use this as a reference for associating the materials presented in this exhibition with the model's development.

The reflexive framework consists of eight categories emergent from the grounded theory analysis presented within the thesis. These eight categories provide a dialogical framework of lateral and progressive lines of inquiry for revealing matters of concern within design things. The reflexive framework completes the thesis contribution of a theory/methods package towards an object-oriented discourse in design-led innovation. Use this as a reference for exploring how future iterations of interpretative overlays could frame reflexive analysis on design things along each category.

Please begin at Case Study One and follow the reflective accounts, which provide a chronological narrative of the challenges and breakthroughs experienced in developing the method of actor-network mapping in practice. Additional images and comments have been provided to help elucidate select reflections. A black line has been marked across each case study. Items above the line are outputs of representation. Items below the line are outputs of interpretation. Case Study Three straddles the line in order to display their materials together. Please play the final video to hear comments from the final Experience Lab participants.

Enjoy the exhibition!

Case Study One: New Networks with Design

The actor-network maps presented follow the development of Know Sugar, a new business concept developed between designers and entrepreneurs following seed funding and support from Design in Action's first Wellbeing Chiasma in February 2013.

UNCERTAIN CASE CONTEXT

This case study was pursued as part of the requirements for this Arts and Humanities Research Council funded PhD. From the first DiA Chiasma, the author was tasked to follow any funded new start businesses in order to explore the role played by design in their development. This meant there would be a great deal of uncertainty regarding the representative level of design-led innovation, the level of access and progression with the funded projects, and the disciplinary make-up of the participant groups. This uncertainty culminated in two projects being followed, one finishing abruptly, and the second containing participants previously known to the author. This both aided a strong level of access and trust as the group progressed, as well as proving problematic when disputes emerged between project members, which were captured in interviews exposing the author as an invested mediator.

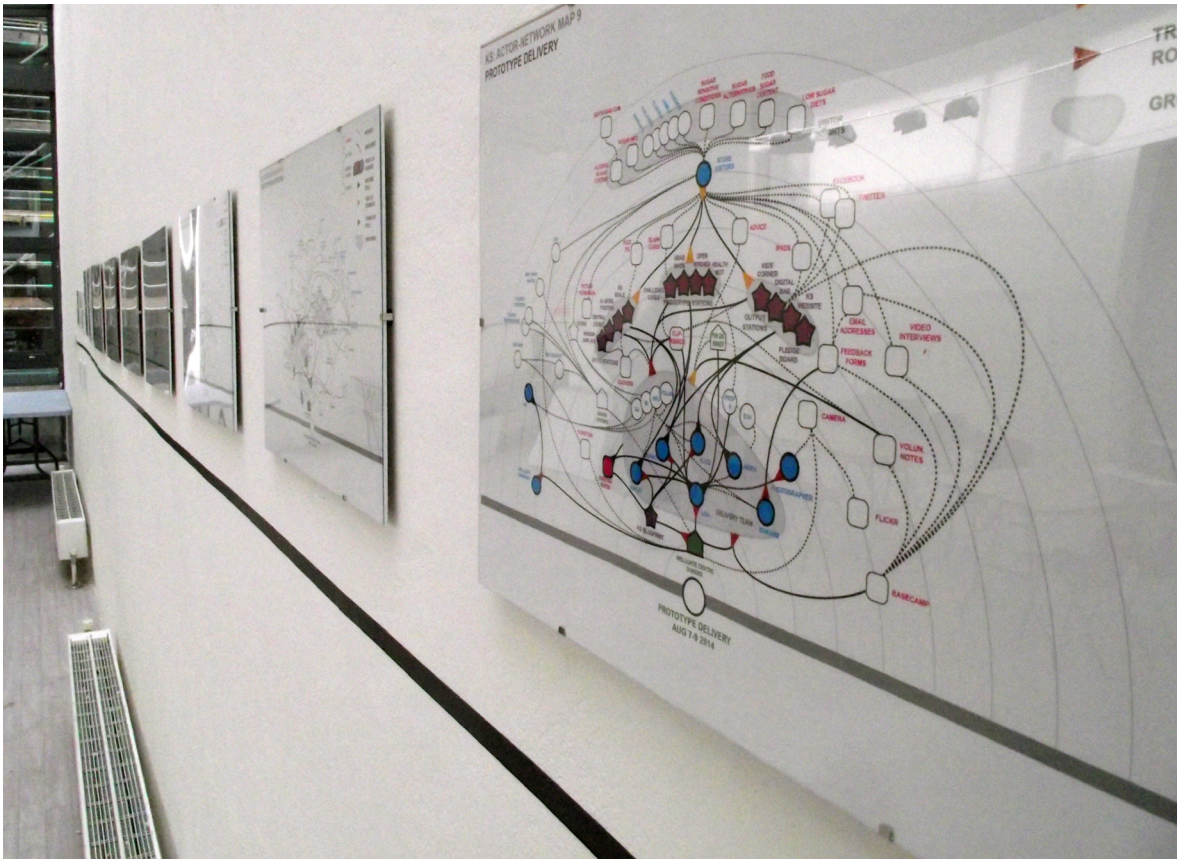
TRANSLATING ACTOR-NETWORK THEORY INTO VISUAL MAPS

Actor-network theory (ANT) was identified early on in the investigation as a methodological approach for tracing the roles of designers and design things. This complex sociological approach proved challenging to grasp quickly in practice, as the language of ANT was quite abstract to bring into participant interviews. As an approach of serial description, ANT demands the researcher does not make assumptions in forming ANT accounts. The line of inquiry came to focus on people, organisations, things, design things and places, and what role they had played in the project. This also provided scope for additional questions reflecting on their effects, helping to inform ANT categories such as enrolment, translation, points of passage, and trials of strength. However, in developing a visual language for the data, the author applied more generic categories, such as primary, secondary or external actants, but felt that this reduction was down to his own misinterpretation. As a result, each map became recognised as a form of visual coding of the accounts produced, processed using NVivo, with each element containing descriptions of action formed through nodes and links of association.

PROGRESS AND FRUSTRATIONS

Once a complete iteration of the actor-network maps was developed, visual patterns began to emerge, as well as difficult to resolve frustrations. As most associations were seen as links of interest, the moments when an actant represented a point of passage became quite clear as they demonstrated key moments of convergence, such as for the funding applications (see KS:2), service blueprints (see KS:5) and the decision making of key individuals (see KS:8). One stage reveals a visual indication of the imbalance in approaches conducted by core team members (see KS:4), where whole branches of activity do not feed back into key points of passage. This tension ultimately led to the decision not to share the maps with participants, leaving them only behind the computer screen. The complexity of the Know Sugar concept is represented through multiple design things within the prototype (see KS:9). This emphasised the rich, design-led nature of the concept in varying associations with other actants. This also marked the end of a long, eighteen-month period that would overlap significantly with CS2, limiting the impact such learnings could have in the second iteration of actor-network mapping.


Attending a development session for Know Sugar in one of the participant's studios, with three attending principals known to the author
EXIT


KS: ACTOR-NETWORK MAP 9
PROTOTYPE DELIVERY
PROTOTYPE DELIVERY
AUG 7-9 2014

Case Study Two: New Ways of Working with Design

The actor-network maps displayed follow each monthly workshop delivered through a Creating Cultures of Innovation (CCoI) intervention conducted with Moorbrook, an SME textiles factory based in the Scottish Borders.

DEVELOPMENT THROUGH OVERLAPPING CASE STUDIES

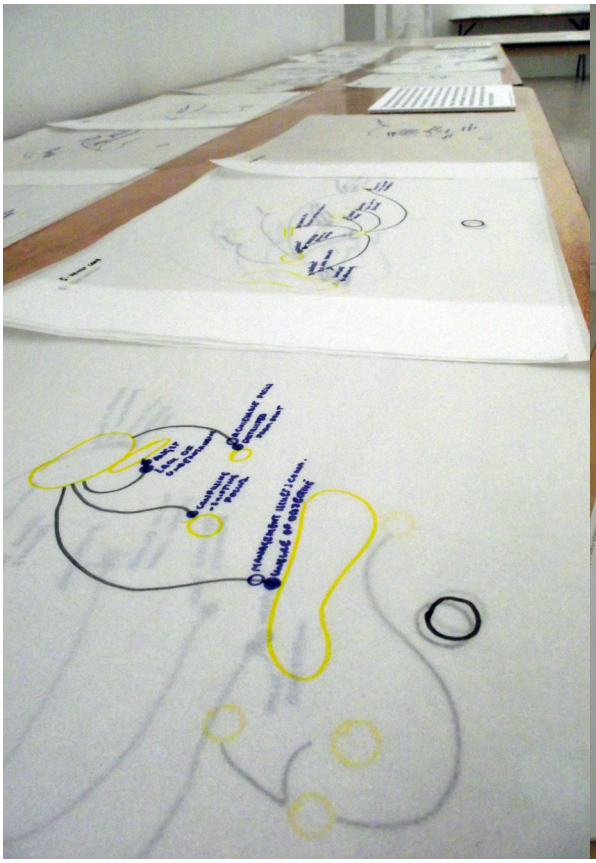
The initial intention for this case study was to bring the visual maps into reflective sessions between each workshop and iterate them according to feedback and insights. Due to the delay and overlap with CS1, the decision was taken to delay sharing the maps with the delivery team until the very end of the session, all in one go. This led to the visual elements of actor-network mapping being only a refinement from the CS1 iteration, using a similar key, while the background structure was split into historical, live and potential sections to accurately map the work before, during and after each workshop. This subtle change in structure served to accentuate the situational representation of each map within a timeframe. This helped to provide much clearer construction of the maps for the author, and ultimately made them more readable for informants.

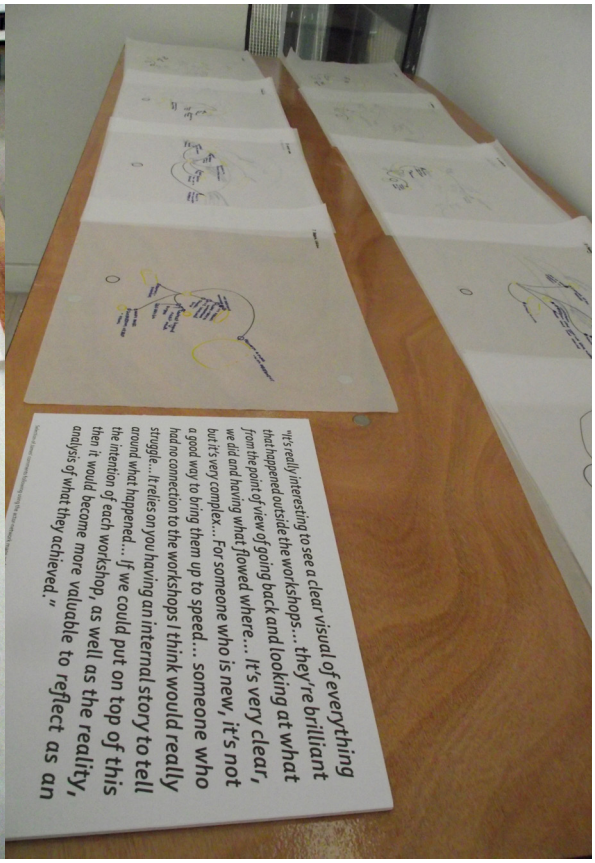
INSIGHTS OF REPETITIVE PROCESSES

As each map covers a similar scope of time, with similar levels of activity between the delivery team and intervention participants, a repetitive format of positioning actants came to be used. This repetitive structure made comparisons between workshops much more explicit, and served to afford strong reflections for the interpretative overlays. Due to the building understanding of the developing actor-network mapping method, the identification and representation of key moments of progress or difficulty became clearer for the author. An understanding also started to emerge of the barriers and limited effects design things were having in the intervention. Key effects of actor-network mapping included: the visual tracing of key methods such as the Yarn Journey (see MB:3 and MB:4) in the wider process; the moments of progress (see Honeycomb, MB:6) or difficulty (see Team Update, MB:4) for the participants, and the comparable differentiation of how each workshop performed.

VALIDATION THROUGH INTERPRETATIVE OVERLAYS

The maps were presented back to the delivery team at the end of the intervention, and they each performed situational analysis in the form of the interpretative overlays presented below. These discussions revealed a rich articulation of the situational factors around each workshop, with deep assessment of the effects each design thing was having. The interpretative overlay sessions were intended to last only an hour, but each lasted three hours, five hours and an hour and a half respectively. This was seen to be due to the intense reflection enjoyed by each informant. Constructive, critical suggestions emerged around how they would have delivered various elements differently, or interpreted certain effects differently. This was felt to be a crucial breakthrough for the author, as it was the first time that the maps moved from the computer screen to live discussion with informants. As a result, this spurred the ambition to expose the whole process as a live activity with design participants, in a live design-led innovation situation.





"It's really interesting to see a clear visual of everything that happened outside the workshops... they're brilliant from the point of view of going back and looking at what we did and having what flowed where... it's very clear, but it's very complex... For someone who is new, it's not a good way to bring them up to speed... someone who had no connection to the workshops I think would really struggle... It relies on you having an internal story to tell around what happened... If we could put on top of this the intention of each workshop, as well as the reality, then it would become more valuable to reflect as an analysis of what they achieved."

Case Study Three: New Ways of Performing Design

The first three actor-network maps presented here were co-constructed live with the delivery team members of three Digital Health Institute (DHI), Experience Labs. They are presented here in their original completed state alongside the fabric overlays that were also performed with the delivery team. The labs focused on the development of digital concepts in the context of health and wellbeing using experience prototypes and ethnographic design research methods with service users and service providers.

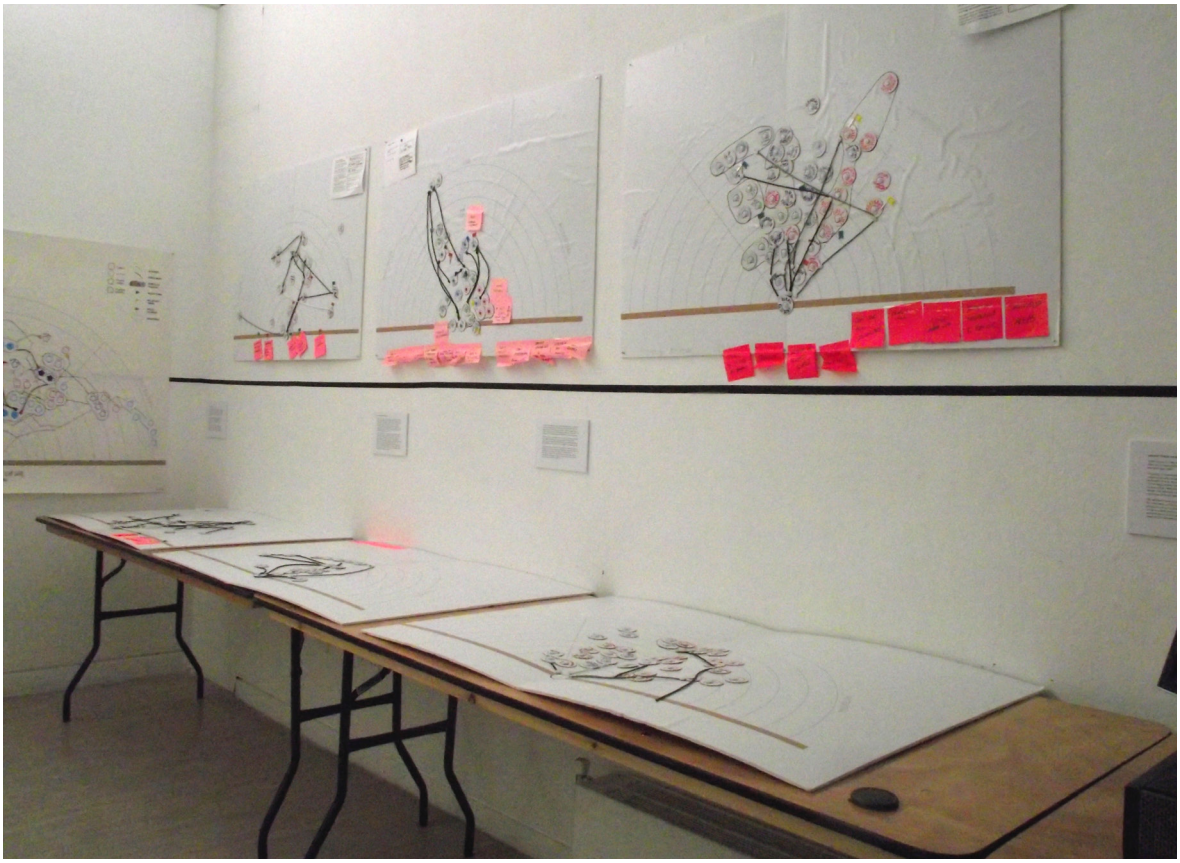
DEVELOPING THE MAPS AS A PHYSICAL METHOD

The first challenge for translating actor-network mapping as a physical method came in replicating the intricate individual elements that constitute each map. A Velcro-like material was sourced to allow the visual elements to both attach and be moved freely. They were again altered only subtly with the original key similar to the first two case studies, due to their effective interpretation in CS2. The first physical iteration is deliberately the most raw. While individual detachable icons were produced for the actants, the complexity of drawing links was left to using marker pen. The material was not wholly suited to such drawing and so the aesthetics for this map are very sketchy. The following iterations used a fabric-printer to provide a stronger visual structure, while the complex elements were resolved as detachable physical materials. While this significantly improved both the aesthetics and the playful nature of the method, emphasising the process of co-constructing each map, the third map acted on feedback that it still looked untidy. A grid structure was devised and tested to see if it provided more consistent aesthetics, particularly for the links. This grid was deemed to provide minimal effect, but the tension between a cleaner and prototype aesthetic is seen as still unresolved.

HEAVY FACILITATION

Throughout the live co-mapping in these three labs there was heavy reliance on the author as facilitator to translate the delivery team's accounts into the mapping structure. In the first iteration, the introduction of terms from ANT proved unfamiliar and slow to engage with. However, the interpretative overlays supported rich discussion on each occasion, as they weren't framed in such terms. One of the effects of actor-network mapping also included multiple team members being exposed to the wider detail and implications of the project network. They expressed gaining a wider understanding of the labs and that it proved a strong representation of key concerns that had not been expressed previously. The fact that many participants attended more than one mapping session allowed for familiarity to grow and more confident discussions on how to represent activities in the actor-network maps. The group reflections also allowed for key moments from the Experience Labs being identified for further data capture and reflections towards supporting their next stages.


LIVE



HANDING OVER FACILITATION

The final six actor-network maps were all co-constructed as the live design research method used within a final Experience Lab. The Lab focused on the development of a digital brokering app for connecting rural communities in Scotland with the care of vulnerable members, and was selected by the delivery team from DHI. The participants varied from service experts, community residents and technical developers, with facilitation of the maps shared with delivery team members. The maps themselves were simplified with the delivery team for easier production. The selection of the method evidences the value perceived by the delivery team, but also brought the challenge of making the method accessible for them to deliver. A script was devised according to the context of the lab, which simplified the ANT terms and explored historical and potential situations. While the actants and structure were strongly adhered to, the links of association were more selectively adopted in mapping. Individuals asserting their experience and expertise prominently drove discussion, with the physical elements still able to represent descriptive associations. These move a significant step away from an ANT framework intended, but revealed new interpretations among the participants.

Table one's facilitation enthused for free-flowing ideas, with no constraints. This led participants to focus on building connections between previously disparate actors in the network, forming capacity within the app functions based on tapping into existing knowledge and assets within the network. This culminated in them drawing a second perspective for another service user.

Table two was much more defined and constrained in its mapping, isolating key functions. Recognising the housing association as administrator emphasised key responsibilities and changes in the complex relationships to be developed with service partners, such as hospitals and social enterprises.

Table three's facilitation focused on the isolated rural resident's experience, mapping accessibility to existing service partners and community assets. This emphasised the need for grounding the app functions through an intermediary moderator and a feedback loop, ensuring the app would be useful, gain effective interest and draw on experience in use; all in order to sustain and grow its effective application.

DESIGN THINGS AS MATTERS OF CONCERN

Reflecting back on the development of the actor-network mapping method, there was a major shift in understanding of its effects in relation to its intended application. Originally, this methodological thesis set out to develop a visual method of mapping complex design situations, towards supporting the design of preferable futures. What emerged was instead more a response to Latour's call for design things to be represented as matters of concern, rather than matters of fact. Performing each interpretative overlay revealed the design things to be transient and uncertain, interwoven and dependent on the associations formed with other actants. The reflexive framework captures the effects of design things as expressed by the informants, which is argued here to offer a way of capturing the matters of concern across key lines of inquiry. These lines of inquiry point towards design as a performative act, engendering new meaning through creative representations and resonant interpretations, around which actor-network mapping and interpretative overlays are argued to have developed in practice.