

KNITTING

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Prototyping to explore innovation in Fair Isle knitting

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Master of Research 2019
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ABSTRACT

This practice-based research study explores possible roles for digital technologies in the contextually-located practice of Fair-Isle knitting in Shetland. The purpose of this research is to evaluate a *provotyping* approach in a traditional craft context to enable knitwear practitioners to reflect upon innovation in their own work. Furthermore, I will be exploring how the Product Design Engineering practice (PDE) can be harnessed methodologically for creative engagement.

This project follows an action research methodological approach and was conducted partially site-based in Shetland. The initial data was collected through a scoping trip to Shetland during which I interviewed a range of knitting experts to gain insights into the traditional nature of Fair Isle knitting. The process was evidenced through audio/visual data and thematically analysed. Based on the analysis of this engagement I developed three digital engagement tools (provotypes) that challenged the traditional design process in Fair Isle knitting. During the evaluation and dissemination stage these provotypes were brought back into the context in Shetland for participants to explore innovation in their own work and imagine future design approaches in Fair Isle knitting.

The findings of this study showed how provotypes can support reflective dialogues for craft practitioners to develop new perspectives on their own practice and showed a situational value of provotypes, in particularly as narrative tools that enabled the dissemination of research insights to a wider audience.

This research intends to provide an account of using technical artefacts early on in the research process. Contrary to similar studies that have been taken place in the fields of interaction design, this study explores the approach of provotyping in a traditional craft context. This might be of relevance to PDE practitioners interested in the methodological account but also to researchers and craft practitioners interested in the role of innovation in a traditional craft practice.

Acknowledgements

Studying towards the M.Res has been a transformational opportunity to explore learning beyond my existent practice and prior experiences. I am particularly grateful to the people who I have met along the way and shared insights about their heritage and way of living far up north in Shetland.

I am immensely thankful to Dr Marianne McAra for having the patience to guide my learning throughout this year. With diligence and humour she has greatly helped to be where I am now.

Thirdly, I would like to express my gratitude to Dr Michael Pierre Johnson who provided far-sightedness at times where I struggled to see beyond the horizon of my own thoughts.

And lastly, I thank Professor Lynn-Sayers McHattie for having the confidence in me over a year ago to complete this journey.

Declaration

I, Christopher Wild, declare that this submission of full thesis for the degree of Master of Research meets the regulations as stated in the course handbook.

I declare that this submission is my own work and has not been submitted for any other academic award.



Christopher Wild

The Glasgow School of Art, December 2019

Preface

This research comes from a place of wanting to develop a greater criticality towards my Product Design Engineering practice. Many of my projects in recent years have focussed on matters of concerns that were in my immediate surroundings, both geographically and in practice. I felt I was missing a critical distance towards the design of new technology and genuine awareness towards life outside urban environments. By embarking on this Master of Research, I intended to reframe elements of my design thinking.

I chose the indigenous practice of Fair Isle knitting on Shetland as a context for this study for two reasons. Firstly, I have a grandmother in Germany who has knitted for years with Shetland wool despite never having visited the place. In order to share a common practice I started knitting myself. During phone calls I asked her for knitting advice leading to many moments of laughter and joy. Secondly, I had read and heard reports about the fear of skill loss on Shetland. However, in early May (2019), I went on a scoping visit to Shetland to understand the precarity around the declining numbers of knitters and the plausibility of using digital technology to help with the preservation of skills. What I found during my visit was a voluntary organisation that was offering knitting classes to children outside school. By asking local knitters to voluntarily share their knowledge with young people on Shetland, the organisation had developed an informal and popular pedagogy that attracted both girls and boys to collectively enjoy the knitting heritage. In conversations with members of the knitting community on Shetland, I heard about the intergenerational benefits of this teaching program. However, the organisation preferred little interference to let children enjoy their knitting. Reflecting on this, I was concerned about the ethical tensions in designing digital interventions for a well-established, non-digital teaching practice on Shetland and, subsequently, changed the direction of my research to explore wider possible roles of digital technologies in Fair Isle knitting more broadly. Although, this turn has brought about challenges in finding the right audience for this research, I am greatly thankful for what I learned about Shetland, the communities, and the limitations and strengths of my own design practice.



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CHAPTER ONE

INTRODUCTION

1 Introduction

Set in the context of Shetland, this research project explored the role digital engagement tools played in gaining insights into the traditional nature of Fair Isle knitting, to identify opportunities for innovation. In this chapter, I will describe a historic overview of the Fair Isle knitting practice and outline factors for its contemporary resurgence. I then will describe the role of my practice before presenting the research questions, aims, and objectives. Lastly, I will set out how to read this thesis.

Knitting on Shetland has a strongly gendered history. During the 19th century, the majority of the male population on Shetland were fishermen, which, at times, would lead to a third more women living on Shetland than men due to them being away at sea combined with high mortality rates (Abrams, 2006). Working on a croft and producing garments supported women to generate an independent income within a cashless barter system (Abrams, 2012). Nowadays, some families on Shetland will have memories of little abundance and exploitative conditions due to the reliance on external merchants at the time (Carden, 2019). Up until the discovery of the oil and gas wells in the 1970s, knitwear remained a structural part of Shetland's economy. Since then, the knitting heritage was faced with a decrease of skilled knitters but has in recent years experienced a revival.

With the annual Shetland Wool Week, an event that has been running since 2009 in Shetland, a contemporary resurgence has been driven by an international community of yarn craft enthusiasts. During this event, visitors participate in workshops and talks held by local Shetland knitters to share and learn new skills together. Such tourism has been said to rely on a sense of belonging and a quest for authentic experiences (Turney, 2009). Furthermore, hand-made craft is seen again as desirable and ethical in times of a shift towards a more digital economy (Luckman, 2013).

New practices in traditional needlecraft have been found surrounding digital interactions through sharing, documenting, and selling (Rosner, 2010; Gauntlett, 2011; Orton-Johnson,

2014). These online interactions in pursuit of 'serious leisure' (Orton- Johnson, 2014: p.1) have been said to be a nearly inseparable layer of contemporary knitting practices.

It is this context of heritage, concerns surrounding skill loss, and the contemporary resurgence of knitting, which I am exploring with a focus on innovation and emergent roles of digital technologies in Fair Isle knitting.

1.1 The Role of Practice

This research is explored through the lens of my Product Design Engineering practice (PDE). PDE responds to socio-technical issues with human-centred design methods. My personal expertise is in the tradition of Design Engineering, which combines the transdisciplinary fields of electrical, mechanical engineering and manufacturing. For this project, I have taken inspiration from other practices outside of PDE in particular by drawing on literature from Human Computer Interaction (HCI). In this inquiry, I will adopt the approach of *research through design* (Frayling, 1993) and apply my practice as a means of inquiry. By doing so, I want to expand on my understanding how PDE can contribute to the generation of knowledge beyond the evaluation of technical functionality and human factors. Having provided an overview of the context and role of practice, in the next section, I will set out the research questions, aims and objectives for this project.

1.2 Research questions

The overarching aim of this study is to explore design approaches for digital engagement tools in Fair Isle knitting to identify opportunities for innovation. This inquiry therefore asks one main research question and two sub-questions:

Main question: What are the possible roles for digital technologies in the contextually-located practice of Fair Isle knitting?

Sub-question 1.: In what ways can the PDE practice be harnessed for creative engagement in the context of Fair Isle knitting?

Sub-question 2.: In what ways can *provotyping* encourage knitwear practitioners to explore innovation in their own work?

1.3 Aims and Objectives

In order to answer the research questions two aims and objectives support the execution of this study:

Aim 1: to explore the use of provotypes as a participatory platform for learning.

Objective 1: Disseminate design artefacts in different settings to identify meaningful ways of sharing them with the context on Shetland.

Aim 2: to bring forward an understanding for the needs and desires of using technology in the context of Fair Isle knitting.

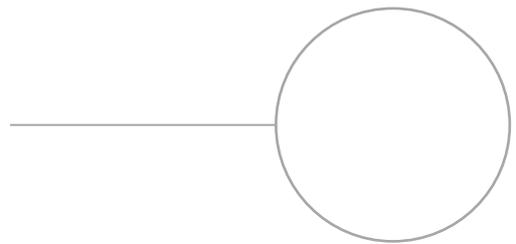
Objective 2: Engage with local and non-local knitters to receive feedback on the viability of the design interventions.

1.4 Reading the Thesis and Portfolio

This submission consists of part thesis and part portfolio. The portfolio of the practice-based work includes an detailed account of the design process that evidences how the findings are embodied in the design of the artefacts. The portfolio is printed and part-digital. The digital component contains a short video demonstration and a copy of the software that I designed as part of this research. I will direct the reader in chapter four section 4.5 to the portfolio. The portfolio can be read chronologically and in one go. The following chapter two will provide a contextual review of the surrounding literature. In chapter three I will set out the research methodology and theoretical perspective. In chapter four, I will provide a description of the fieldwork before I will analyse and discuss the findings in chapter five. The concluding remarks and reflections will be found in chapter six.

CHAPTER TWO

LITERATURE REVIEW



2 Literature Review

1.1 Introduction

This chapter will examine the role of artefacts in design research to support the central aim of this study, which is exploring the emerging design approaches for digital tools in the context of Fair Isle knitting on Shetland. The following sections will foreground material making based on four categories of prototypes in design research – derived from Matthews and Wensveen (2014, p. 262-276):

- 1) *Prototypes as experimental components – used for testing of specific hypotheses with systematic variations of prototype or context of use.*
- 2) *Prototype as means of inquiry – used for open-ended exploration in unsettled or open design spaces. Artefacts create a context of study.*
- 3) *Prototype as research archetype – used to show the understanding of a design space. The artefact itself can be a contribution to the discipline by being critical of, and confrontational with, contradictory agendas.*
- 4) *Prototyping as vehicles for inquiry – the process of making is used as a driver for the research direction, where the process is documented and critically assessed. Prototyping is a platform of participation.*

For this review, I will discuss in particular the relevance of category 4 – *prototypes as means of inquiry*. In the following sections I will take a look at bridging the present-future gap, with a particular focus on approaches to prototyping in design research.

2.1 The Present-Future Gap

In consideration of my PDE practice, the act of making and giving physical form to ideas has been situated at the end of the design process to solve a particular design problem and validate a chosen concept (Pugh, 1990; Pahl *et al.*, 2007). Prototyping, or the use of artefacts has therefore been concerned with solution finding for near future scenarios.

Contrary, in design research prototyping has been explored at the forefront of the process and concerned with the exploration of opportunities, evoking discussions, and questioning theories (Keller, 2007; Stappers, 2017).

A concern of using artefacts in design research has been bridging *the present-future gap* (Salovaara, Oulasvirta and Jacucci, 2017) – as the actual use of the design *thing* (Binder, et al., 2011) can deviate away from its envisioned use (Dix, 2007). Considering design for future appropriation by users has been referred to as *design-after-design* (Binder, et al., 2011) and presumes that different practices can arise around an object of design. Critical design approaches like speculative design, have been used to intellectually bridge this gap by stimulating discussions that point towards *possible, plausible, probable* futures, where the provocative nature of an artefact can provide insights into what is *preferable* (Dunne and Raby, 2013). Alternatively, participatory prototyping has been used to envision the design spaces of the future and supporting people to experience their own visions (Sanders, 2017). In this project, I am aiming to bridge the present future through designing exploratory prototypes to facilitate discussion and bring forward an understanding of the needs and desires regarding digital technologies and innovation in Fair Isle knitting. The following section will further examine approaches of prototyping in design research.

2.2 Prototypes as Means of Inquiry

This section will unpack how technical artefacts have been used to elicit knowledge from users by designing tailored research artefacts to be applied in a particular context. These artefacts fall within in the category of *prototyping as means of inquiry* (Matthews and Wensveen, 2014). I will discuss two types of artefacts which fall within this: Technology Probes and Provotypes.

Technology probes are an extended approach of Cultural Probes, which is a method used to creatively gather experiential insights from participants (Gaver, Dunne and Pacenti, 1999). Cultural Probes enable participants to self-capture data, for example, by using cameras and postcards, insights from which are used to reflect upon the topic or practice under investigation.

Technology probes have been defined by Lauderdale et. al. (2003) as technologies that enable to evaluate the potential of a future technology by deploying it in a concrete context. They thereby seek to provide insights beyond technical robustness, to inspire users to think about new technologies, and to bring forward an understanding of the existent needs and desires. An example of a technology probe can be seen in a study that looked at the communicative behaviour of families and how information and communication technologies (ICT) could be designed with and for the people involved (Lauderdale et al., 2003). Another example in interaction research explored people's attitudes towards environmental awareness through the long term deployment of bespoke weather stations, as shown in Figure 1, in 20 family households (Gaver et al., 2013). The researchers were foregrounding ludic design principles to encourage playful adaptation by users and study these over an extended period of time



Figure 1 - Indoor Weather Stations (Gaver et al., 2013)

However, in the findings the Gaver et al., 2013 describe how the technologies disappointed users and neither contributed to their environmental awareness nor did they provoke playful adaptations. Similar to technology probes are *provotypes* which are rooted in the idiom of provocative prototyping. They've been described by Mogensen (1992), who recognised the conflict in qualitatively developing new systems, on the one hand, whilst ensuring their usability in an existing practice on the other. Therefore, he saw deliberate provocations through concrete experiences as learning opportunities to design for preferable futures (Mogensen, 1992). He defined provotyping as:

[...] a bridge between analysis and design. It uses the results of analysis by taking as point of departure a general knowledge about the organization in question. And it facilitates the construction of first 'guesses' in a prototyping process by providing ideas as to what should be changed and what should remain. (Mogensen, 1992, p.25)

Mogensen (1992) describes in his approach how contradictions to an existing activity can serve as a resource to develop new practices. This model based on activity theory will be described in Chapter 3 Section 3.2.2 Theoretical Perspective. More recently, provotyping has been found in the field of Interaction Design to explore perceivably mundane everyday practices, such as laundry in private households with regards to sustainability issues (Raptis *et al.*, 2017), but also in the context of civic policy engagement (Braun *et al.*, 2013). They are being deployed to reveal hidden assumptions that are taken for granted, and have been described by River and MacTavish (2017) as low fidelity prototypes. However, Donovan, Boer, and Burr (2012) describe in 'Provotypes for Participatory Innovation' how they explored holistic ways of representing indoor climate to encourage the formation of new practices around improved well-being and energy reduction inside buildings. Prior to the design of the artefacts, five families participated in an ethnographic field-study investigating their practices around indoor climate. The ethnographic insights brought to the surface tensions between indoor climate and different themes surrounding peoples experience of comfort. The design of the provotypes, of which one an interactive lamp as shown in Figure 2, embodied tensions identified in the ethnographic analysis and sought to provoke a change of practice of the participants. This change of practice was meant to occur by creating an experiential and more relatable representation of indoor climate with different interactions consisting of light, sound, and movement and deploying the lamp back in the family homes.



Figure 2 – Provtotypes, Interactive Lamps (Boer and Donovan, 2012)

After a period of time, the interventions were followed up by semi-structured interviews. The results of this engagement were then discussed with other project stakeholders to contemplate learnings about the interactions. Finally, the approach was revisited in a follow on project (Boer, Donovan and Buur, 2013) to challenge conceptions of the building industry and to identify opportunities for new product development. In the findings, the report addresses how embodying tensions around a field of interest can enable collaborative analysis and the exploration of new design spaces. But also, the report notes how the provotypes failed to help with the formation of new practices in the families that would recognise greater awareness towards indoor climate.

For technology probes and provotypes, manifold design guidelines have been proposed to optimise the deployment in the field. Some centre around dimensional design balances such as, among others, “openness and boundedness” (Wallace *et al.*, 2013: 3444), levels of “ambiguity and interpretation” (Gaver *et al.*, 2013: 3452), or “inconspicuousness and intrusion” (Boer and Donovan, 2012: 369). Others propose provoking insights based on the parameters of time (scarcity vs. abundance), space (intimate vs. public), information (tailored

vs. generic) (River and MacTavish, 2017). These practical design recommendations have in common the aim to reveal unexpected insights and hidden assumptions through balancing familiar with non-familiar attributes.

In the context of this study, provocative prototyping will be used to embrace emerging tensions, rather than aiming to resolve them as previously done in my Engineering Design background. Therefore, for the remainder of this thesis provotypes will be used to describe the artefacts that were designed as part of the inquiry. Additionally, the term is chosen over technology probes, as provotypes speak more concretely about the research process through which the artefacts were constructed. Further, I seek to re-interpret provotyping, which has been found in the context of Interaction Design, by positioning it in a traditional craft practice. The next section will look at other practices which relate to designing for provocation.

2.3 Research Provocations

Provotyping can be seen to align with Critical Design by challenging the status quo and exploring the tension between unsettling unfamiliarity and plausibility to evoke critical contemplation (see Dunne, 1999; Dunne and Raby, 2001). However, whereas Critical Design artefacts are mostly concerned with societal and cultural issues and are often disseminated in public settings such as galleries, museums, or academic conferences (Kjærsgaard and Boer, 2015), provotypes are, as previously described, deployed in a concrete context over a longer period of time (Boer, Donovan and Buur, 2013).

An emergent practice that addresses further the relationship between ethnography and provocation has formed around Design Anthropology. In here ethnographic interventions extend into practices of future-making which offer more than the understanding of user needs and desires (Kjærsgaard *et al.*, 2016). Ethnographic materials have served as provocation to critically reflect upon an existing design practice (Buur and Sitorus, 2007) and secondly, as described by Kjærsgaard and Boer (2015) as a way of moving

[...] *speculative design beyond the production of critical objects serving as conversations pieces for intellectual debates in showrooms, towards a more situated engagement with mundane practices of future-making, where critique is not intrinsic to the design object, but unfolds through encounters within particular contexts.* (Kjærsgaard and Boer, 2015:14).

Following a provotyping approach, I want to gain insights into the traditional practice of Fair Isle knitting. As this is no ethnographic study, the insights into the traditional practice of Fair Isle knitting are ethnographic-in-style. I will respond to these findings with the design of provotypes and then explore them as engagement tools to help knitwear practitioners to envision future design approaches and to reflect upon innovation in their own work.

Building on this, the following section will outline how artefacts have been used to enable collaborative approaches of designing.

2.4 Collaborating with Design Artefacts

In this section I describe how boundary objects, as part of the social landscape of communities of practice (CoP) (Wenger, 1998), have been used to enable collaborative practices between different stakeholders. Susan Leigh Star described the role of categorising tools in a Zoology department that enabled different interlinked practices to work with each other (Star and Griesemer, 1989). These tools were coined *boundary objects* as they facilitated interdisciplinary communication. Boundary objects are said to emerge through the dynamic of participation and reification between COPs. Examples of boundary objects have been described in a product development context, which included technical drawings in an engineering practice, or patient records in a hospital (Carlile, 2002). A question of what qualifies as a boundary objects concerns the scale and scope of them (Star, 2010). Star (2010) believes that boundary objects mainly exist at an organisational level. However, in design research the idea of boundary objects has been used to describe design artefacts that help to mediate participatory design practices (Brandt, Binder and Sanders, 2012). Thus, they can align the communicative needs of research stakeholders and help participants to make tacit knowledge explicit (Bjögvinsson, Ehn and Hillgren, 2012). Lastly, a derived concept of boundary objects within CoPs are called *boundary negotiating*

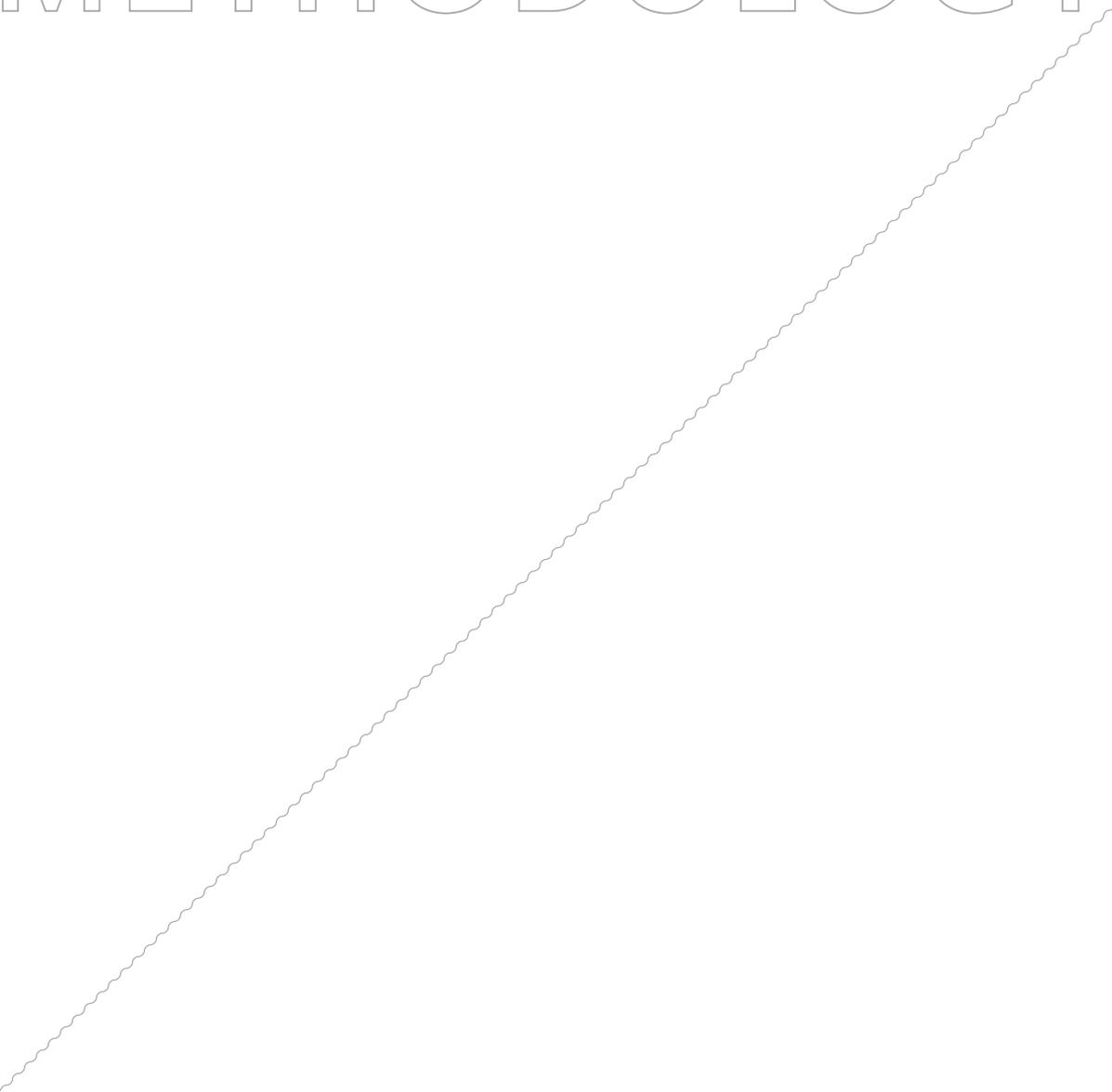
artefacts. Boundary negotiating artefacts draw on the theoretical perspective of boundary objects and cultural probes. An example is given how prompt cards, which were made externally by designers, enabled a group of performers to come together and work across the boundaries of their practices (Halpern *et al.*, 2013). They differ to boundary objects, as they do not have to occur out of the dynamic of participation and reification and therefore require less prior standardisation (Lee, 2007). Where standardisation describes a certain shared repertoire of symbols, techniques and tools etc. (Wenger, 1998) that help interlinked practices to work with each other. In summary, engagement with boundary negotiating artefacts can be more on an ad-hoc basis as no prior process of participation is required to form these artefacts. They can be lightweight, like prompt card or cultural probes (Gaver, Dunne and Pacenti, 1999) and enable interlinked practices to quickly come together and collaborate around a matter of concern. Additionally, these artefacts do not have to be designed by the collaborating partners, whereas boundary objects are usually produced or changed by the COPs working together. This difference will be reconsidered when exploring the use of the provotypes in the context of Fair Isle knitting. In the next section, I will summarise this literature review.

2.5 Summary

Following the categorisation of prototypes in design research (Matthews and Wensveen, 2014), the focus of this inquiry is on *prototypes as means of inquiry*. I chose to situate my approach in the context of *provotypes* due to the emphasis of them being built on the analysis of prior research engagements. *Provotyping* has been mainly deployed in the context of Systems Development and Interaction Design, whereas I will explore this approach in a craft context to explore how it can support knitting practitioners to envision innovation in their own work and as stepping stones towards future design approaches. In the next chapter, I will set out the theoretical perspective and methodological approach that I took to explore provotyping in a craft context.

CHAPTER 3

METHODOLOGY



3 Methodology

3.1 Introduction

In this chapter I address the methodological and epistemological considerations that have informed this thesis. The overarching aim of this study is to explore design approaches for digital engagement tools in Fair Isle knitting to identify opportunities for innovation. In the following sections, I will outline my epistemological and methodological positioning.

3.2 Theoretical and methodological positioning

3.2.1 Epistemology

The conception of the design approaches employed in this research will be interpreted differently by the people that I engage with. Accordingly, the interpretations of the digital artefacts will be conceivable to people depending on their prior experiences and interests. In social constructivism, the mind and the way we view the world does not exist in isolation from the culture we inhabit (Light, Berger and Luckmann, 1967). I believe, that the meaning people attribute to the artefacts cannot be explicated in quantifiable terms as done in a positivist world view, but only through subjective descriptions (Lincoln and Guba, 2016). Hence, my epistemological stand is rooted in a social constructivist paradigm. In the next section, I will be looking at the theoretical perspective that this study is taking.

3.2.2 Theoretical perspective

As the focus of this study shifted from contributing to the teaching practice of knitting on Shetland, to a more granular level of identifying opportunities for future design approaches, the theoretical considerations required continuous adjustment. I will discuss two theoretical perspectives, Activity Theory and Communities of Practice, which I will draw upon to explain the engagement through *provotypes*.

Provotypes, as described by Mogensen (1992), have been placed in the history of Activity Theory (AT), which was conceptualised through the writings of Engeström (1987). AT

consists of five fundamental principles of which one recognises contradictions to an established activity as a driver for change (Engeström, 2001). Engeström based his conceptualisation predominantly on the writings on the social psychology of Lev Vygotsky and his concept of a mediating tool between a stimulus and response in a cognitive process (Vygotsky, 1978) – where the mediating tool can be of physical form or represent a cultural symbol.

Alternatively, Communities of Practice (CoPs) constitute groups of people who learn together, share a particular domain, and embark on a joint enterprise (Wenger, 1998). In CoPs, opportunities for learning can take place through participation, and boundary processes between interlinked practices. Crossing the borders between different CoPs can be facilitated through boundary objects as described in section 2.4.

Wenger himself speaks of a *plug-and-play principle* with regards to combining learning theories (AT and CoPs), and recognises the role of multiple drivers of learning such as contradiction, participation and boundary processes (Wenger-Trayner, 2013: 3). The theoretical perspective of this study is therefore informed by recognising different drivers of learning in a social process to explain the design and use of *provotypes* in the context of Fair Isle knitting. This will particularly inform how knitwear practitioners will reflect upon innovation in their own practice. In the following section, I will describe the research design.

3.2.3 Methodological Positioning

The overarching methodological position is based on Action Research. Action Research centres around cycles of action and reflection, and is frequently used within communities, institutions and education to bring about practical change (David E Gray, 2014; Martinez-Vargas, 2018). The educational researcher Jack Whitehead (2017) encourages Action Research practitioners to be inventive with the methods they deploy in the field. This resonates with the use of the *provotypes* in this study. Participatory Action Research (PAR) has been taken into consideration. However, as the development of the *provotypes* was detached from the field, the study fell short of the deep integration of participants in the

co-construction of knowledge and co-learning that are typical of PAR (McIntyre, 2008). In the next section I will describe the methods that were used in this study.

3.2.4 Recruitment

Throughout this study the recruitment approach was based on snowball sampling, which is often used to access hard-to-reach populations (TenHouten, 2017). In the context of this study, this allowed me to get in touch with an initially geographically remote community. A trip to the Edinburgh Yarn Festival was undertaken to make contact with knitting experts from Shetland. There, I spoke to representatives from the Shetland Wool Week who helped me to identify other members of the knitting community in Shetland. I followed the same approach during my two engagements on Shetland, where local experts helped me to reach out to other knitting practitioners (a full account of this is described in Chapter 4.3.1). The next section will describe the methods I deployed in this study.

3.3 Methods and Interventions

This research project took place over three stages, where I implemented six interventions. This included interviews, an archive visit, a studio visit and interview with an expert knitwear designer, a pop-up display at an academic conference for feedback and evaluation, and a presentation, live-demonstration and evaluation activities at the Loch Ness Knit Festival. I will describe the methods in detail in the following sections.

3.3.1 Scoping Trip and Interviews.

After having established Shetland contacts at the Edinburgh Yarn Festival, I conducted a series of semi-structured interviews with Shetland based knitting experts, first via phone calls, and then during a one week visit to Shetland. I had prepared a topic guide around history (traditional approaches to knitting), learning and contemporary practices of Shetland hand-knitting. Although semi-structured in nature, I kept the interview style similar to informal conversations (Bryman, 2012) to gain a genuine view on participants' understanding of the local knitting culture and to not impose any prior assumptions that might have limited the field of inquiry (Fontana and Frey, 2006: 75). The weaknesses of

open interview methods are reduced comparability across interviews due to more diverse pieces of information and resulting greater difficulties when organising and analysing data (Patton, 2002). I documented the initial data collection through field notes, transcribed audio recordings, and photographic images of any relevant artefacts.

3.3.2 Provotyping as a Method

For this method I used my practice methodologically and drew upon the examples of Provotypes and Technology Probes as described in Chapter 2, section 2.3. I was seeking to reinterpret these approaches in a craft context. After the scoping and interviews on Shetland, I thematically analysed the data (described in section 1.5) and developed concepts to embody the insights and knowledge provided by participants. In a second step I designed and developed the provotypes based on the initial concepts to encourage participants to explore innovation in their own work. Figure 3 illustrates these steps in the overall research design.

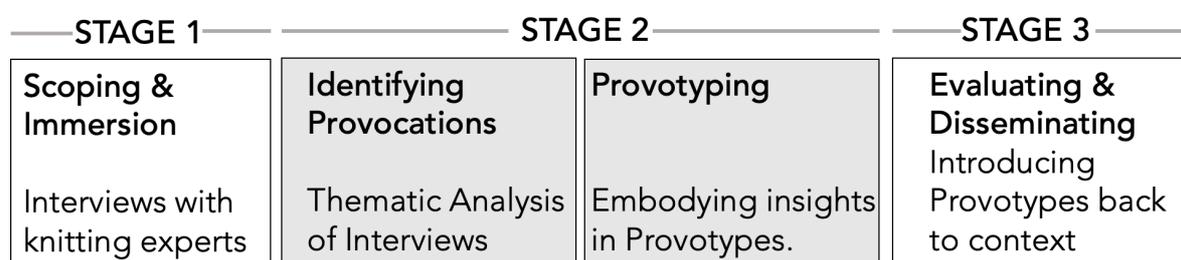


Figure 3 - Provotyping Approach Diagram

A detailed chronological account of how I translated the themes and insights from the first engagement into the provotypes is provided in the portfolio of practice. A weakness of this method was being removed from the field and attempting to receive feedback remotely. I addressed this by using video demonstrations and engaging with a local knitter as later outlined in the portfolio. The next section describes evaluating the provotypes back on Shetland.

3.3.3 Studio Visit and Interview

Following the snowball sampling approach, I was invited to visit and interview an expert knitwear designer in Shetland in her design studio. I brought the provotypes with me to explore them in the context of someone else's practice. This intervention enabled me to test the ability of the provotypes to encourage knitwear designers to explore innovation in their own work.

3.4 Dissemination and Evaluation

I was seeking at the dissemination and evaluation stage to engage with a range of audiences interested in the provotypes. Additionally, I attempted to evaluate the methodological approach of provotyping. This is described in the following sub-sections.

3.4.1 Display at Conference

I presented the provotypes at an academic conference on Shetland in the format of a display and had invited previous participants to co-evaluate the tools. The theme of the conference was aligned with my research by looking at rural practices – arts, crafts but also archaeology and island studies. The display format was chosen to allow delegates to have hands-on experience with the research artefacts. From the mainly academic audience, I anticipated interest in engaging in the wider narrative of the research and in the methodological approach that I had chosen.

3.4.2 Live-Demonstration and Questionnaire

I made contact with the organisers of the Loch Ness Knit Festival to disseminate my research to an audience outside of Shetland. I presented the provotypes and provided a live-demonstration, and asked the audience to respond with a questionnaire. In the questionnaire, which is shown on page 42 in the Fieldwork Chapter, I aimed to evaluate whether the purpose of the provotypes was perspicuous to the people in the audience and how they interpret them in the context of their own practice. A limitation of questionnaires

is the lacking ability to provide in-depth insights (Bryman, 2012), but within the scope of the engagement they also allowed me to continue a dialogue after the presentation.

3.5 Analytical Framework

3.5.1 Thematic Analysis

The interview data of the first engagement with knitters on Shetland was transcribed and then thematically analysed in two iterative steps. This was done by using a form of visual mapping to open up the data that drew upon the analytical method of Situational Maps (Clarke, 2005). After reviewing the transcripts, initial memos and the whole dataset of the interviews were laid out on a large paper and organised into classes that were derived from the topic guide of the interview and into classes that emerged during the mapping process. This process of classifying, connecting and describing (David. E. Gray, 2014) aimed at providing an accessible snapshot of the data. In the second step, preliminary codes were developed and categorised to form themes as done in Thematic Analysis (Braun and Clarke, 2006). This enabled the data to be systematically organised into subject headings. The diversity in the interview data only allowed the formulation of indicative themes. However, it brought to surface tensions in the practice of Fair Isle knitting that I aimed to address during the provotyping stage. Another benefit of attempting this form of in-depth analysis was being able to reflect upon the own interviewing technique and identify shortcomings.

3.5.2 Reflective Journaling

The final stage of the research provided data that was not always explicitly captured in the form of audio recordings. I therefore adopted a highly reflective approach of providing an honest account of the engagements in the field through fieldnotes. The analysis of these encounters was based on a layered approach of writing reflections in a journal, alongside visual documentation of the engagements. I then revisited the journal, annotated it, and synthesised themes through extracting key elements in headings. This narrative way of reporting research has been found to be situated between artefactual and written

outcomes in practice-based research (Gillham and McGlip, 2007). In Figure 4 I have provided a simplified model of this process.

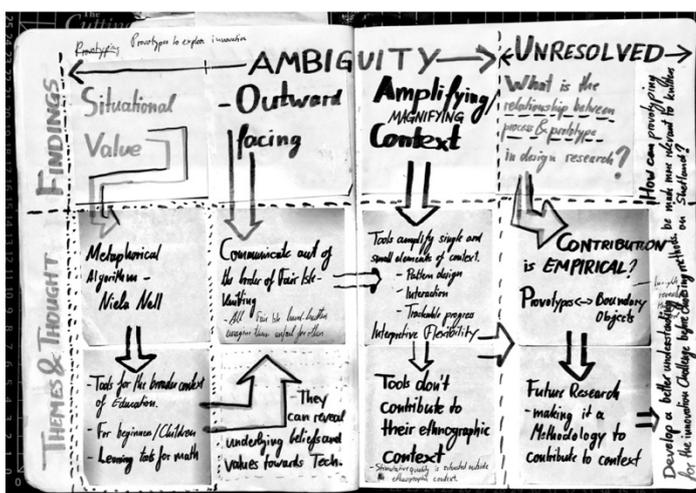
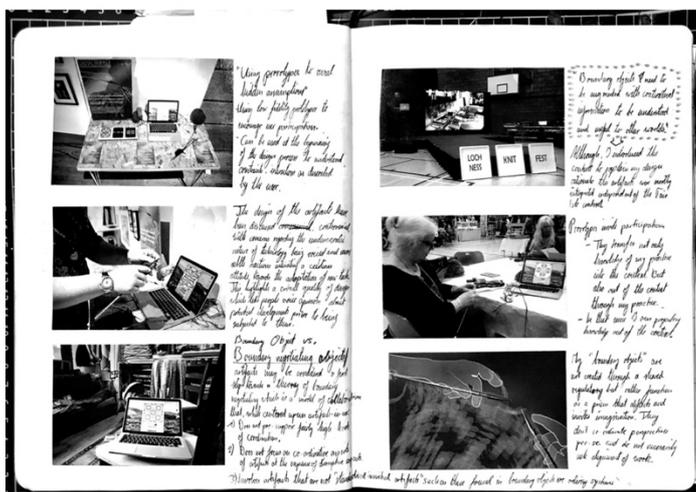
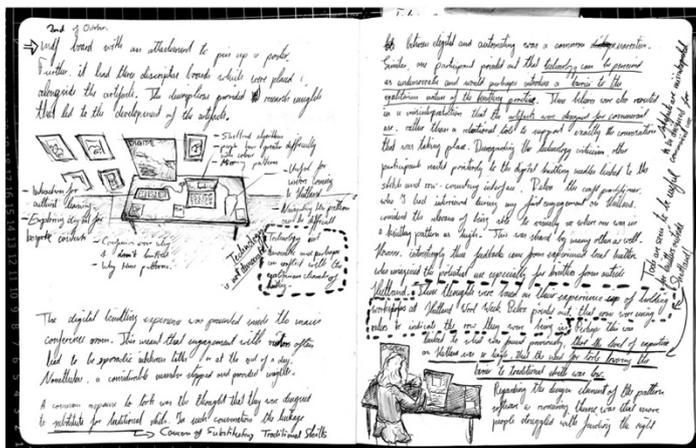


Figure 4 - Reflective Journaling. (Images authors own, 2019)

3.6 Ethics

I considered ethical practice from the start of this project by adhering to the GSA’s Research Ethics Code of Practice and Research Ethics Policy (2016) and sought informed consent from all participants. An example of the information and consent sheet used in this project is provided in the appendix A. I sought the guidance of GSA’s Ethics Sub-Committee and undertook a full ethical assessment before the fieldwork began. With regards to documentation and data handling, I used pseudonyms for all participants. However, due to the close-knit nature of the communities I engaged with, some participants might be identifiable by the description of their current role they hold.

3.4 Summary

In this chapter I have described the theoretical and methodological positioning of this project. Epistemologically, this follows social constructivism, and the theoretical perspective is informed by recognising different drivers of learning in social theories of learning as shown in Figure 5.

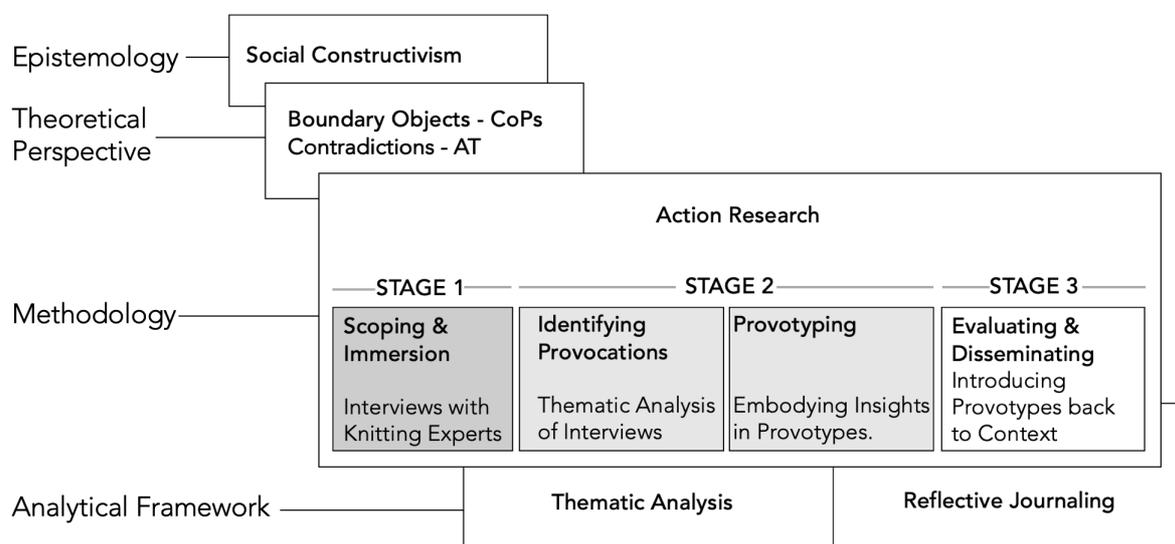


Figure 5 - Research Design. (Authors own, 2019)

The interventions that I used were a scoping trip with semi-structured interviews, provotyping, a pop-up engagement at an arts and crafts conference, a studio visit and interview, and lastly a live-demonstration with a questionnaire at the Loch Ness Knit

Festival. In the analytical framework I drew upon the method of situational mapping (Clarke, 2005) and used thematic analysis (Braun and Clarke, 2006) for the conversational data from the first contextual engagement on Shetland. For the analysis of the evaluation and dissemination stage, I adopted a reflective journaling approach to provide an honest account of the fieldwork. In the next chapter I will describe the fieldwork taking place across the different stages of engagement.

CHAPTER 4

FIELDWORK

4 Fieldwork

4.1 Introduction

In this chapter I will describe the three fieldwork stages of this study and the development of the portfolio, which shows the practice component of the research. During stage 1, I developed a contextual understanding of Shetland knitting by visiting a yarn festival. Here I was seeking early engagement with members of the knitting community on Shetland. A visit to Shetland marked the transition between stage 1 and 2. I then designed the prototypes and planned and engaged with a knitter locally in Glasgow. In stage 3 I exhibited my research through a pop-up dissemination event at an arts and crafts conference on Shetland, visited a knitwear designer in her studio and presented the research at the Loch Ness Knit Fest. All names of the participants have been changed to protect their anonymity. The chosen pseudonyms are chosen from a list of names in the Norse dialect.

4.2 STAGE 1- Contextual Scoping

The Edinburgh Yarn Festival is an annual event where producers, practitioners and researchers were exhibiting and selling their work. Present at the festival were a group of Fair Isle practitioners and representatives of the Shetland Wool Week. As I was speaking to the knitters, they demonstrated to me the traditional technique of knitting seamlessly in the round. Seamless knitting refers to the traditional technique of knitting garments in a tubular form. Following the knitters I spoke to an academic and museum curator called Aine who was representing the Shetland Wool Week. She offered to put me in touch with a representative of a Shetland-based organisation that teaches children traditional Fair Isle and lace knitting.

At the time, my research focus was on exploring the role of digital technologies in the learning of crafts. Accordingly, I was seeking collaboration with this organisation to co-design potential teaching tools. However, after a phone conversation, I had to adjust the focus of the research as the organisation intended to let the children learn knitting with as

little disruption as possible. Hence, I moved towards exploring the wider role of digital technologies in the traditional practice of Fair Isle knitting.

4.2.1 Designing the Digital Knitting Needles

As I adjusted my research question, I recalled observing the traditional techniques of Fair Isle knitting at the yarn festival. In response, I wanted to apply my PDE practice to design an artefact to prompt conversations around the role of digital technologies in traditional knitting practices. This resulted in developing the concept of the digital knitting needles



Figure 6 - Digital Knitting Needles. Photograph. (Authors own, 2019)

as shown in Figure 6. At this point the knitting needles were undetermined in use but had conductive tips that provided a simple method of digitally sensing the movement of knitting. These were taken to Shetland to act as conversational tools. The engagement with members of the knitting community is illustrated in the following section.

4.2.2 First Engagement in Shetland

Prior to the trip, I had arranged interviews with four participants. This included one local craftswoman and knitter (Belva), one local academic and knitter (Aine), and two academic researchers who were on Shetland at the time for their own projects - one had a specialist interest in the history of knitting (Earlene) and the other in contemporary knitting culture (Caitriona). In addition to the interviews, I visited a local museum with a small public archive. Visiting this museum provided me with the opportunity to arrange a fifth interview with a local knitter (Ida).

4.2.3 Visit to a Museum Archive



Figure 7 – Archive Tangwick Ha Museums. (Authors own, 2019)

On the first day, I visited the small public archive in the Tangwick Ha Museum, as shown in Figure 7, as an unobtrusive way (Bryman, 2012) to familiarise myself with the research context and supplement the interview data (David. E. Gray, 2014). The custodian of the museum, pointed me to different sources and showed me a folder with a collection of Fair

Isle swatches as shown in Figure 8. I was told that swatches were used in the planning of knitwear to test colorwork, patterns and gauge. These were gifted by the relatives of a local knitter.



Figure 8 - Fair Isle swatches, Tangwick Ha Museum. (Authors own, 2019)

As I explained my project to the custodian in the museum, she offered to put me in touch with Ida, a local knitter who knits intricate lace shawls for the museum shop, who I was able to interview the next day in the small museum archive.

4.3 Shetland Interviews

On Shetland I did four interviews with 5 participants. An indicative thematic overview of these interviews can be found in the portfolio of practice page 8. The following sections provide insights into the emergent theme of the Fair Isle design process.

4.3.1 Emergent Interview Insights

In the interviews I started asking questions about the design process after finding the folder of Fair Isle swatches in the archive in the Shetland museum. Whilst the interview was semi-structured, I followed a topic guide, which included:

1. How and where did you learn to knit?
2. What are you basing your design approaches on?
3. Do you think knitting has changed in recent years?
4. Can you make a distinction between traditional and innovative designs?
5. How would you describe your design process?
6. What makes Fair Isle knitting popular for knitters coming from outside Shetland?
7. Do you use any digital technologies in your practice?

This provoked a wealth of reflections as the following quote by Aine shows:

And there is a design process but it never is discussed. It is like this hidden thing and yet they are designers. I have started to refer to the people who made the garments in our collection as designer knitters. [...] Sometimes they were more than that, they had to spin the stuff, they had to dye it and finish it. [...] But we often don't know who did what. (local knitting academic Aine)

A description which was frequently used, was that all Shetland knitters were designers to an extent and that many had learned to knit before they can remember. Interviewees emphasised the ad-hoc, almost improvisational and fluent characteristics of the Fair Isle design process;

[...] they didn't charter it out. They figured it out along the way. It's nearly as if they designed on the go. (local knitting academic Aine)

This fluency particularly refers to the use of colourwork in which much of the creative practice seemed to take place. Patterns were often considered as something they *had in their head* and appeared to be part of a cultural repertoire as the following quote indicates:

There are on Shetland many knitters who knit only for a hobby like any other modern knitter. But their practice, their craft is based on traditional methods which they learned and absorbed locally from their friends and family. I don't know whether you've met Carla? I mean her designs are really based on family. It is routed in family patterns but then she gets inspiration from other places. (local knitter Ida)

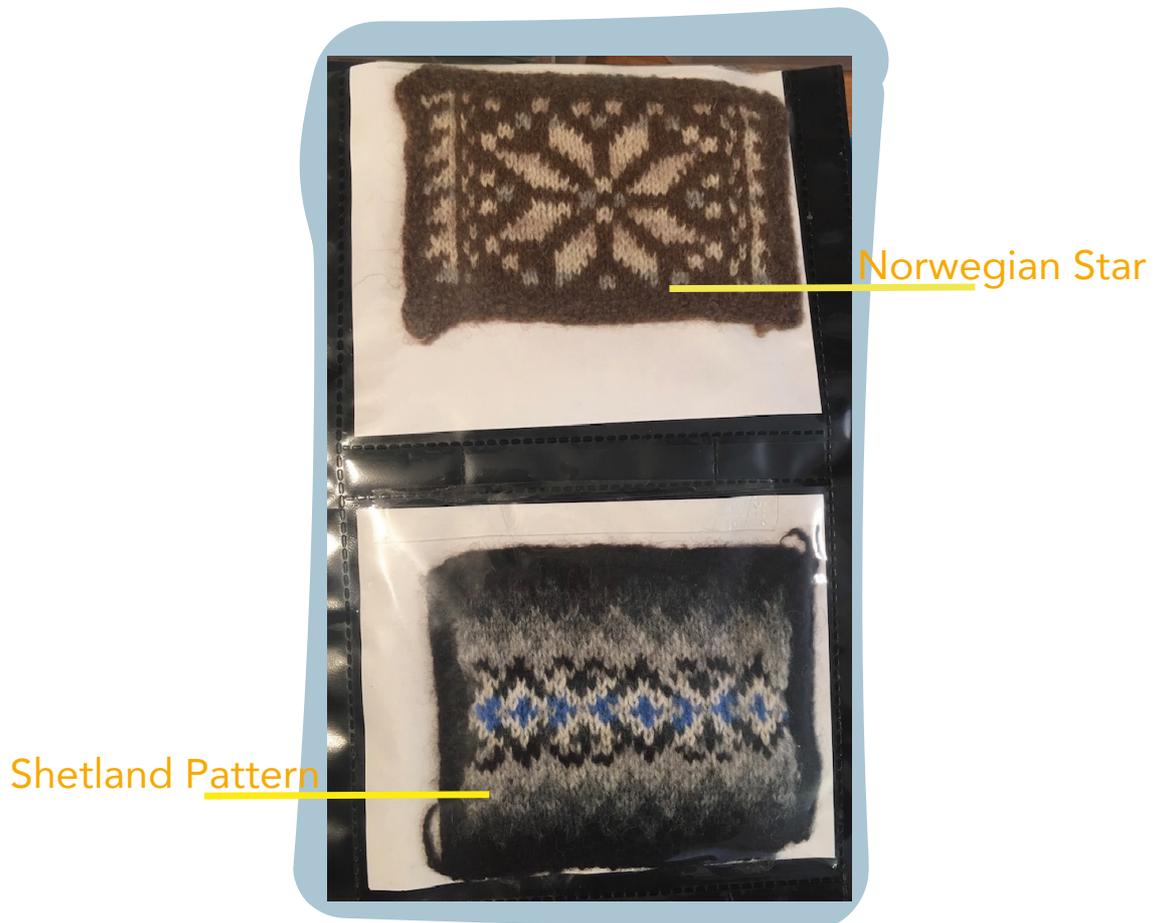


Figure 9 - Fair Isle Swatches, Nordic Star and Shetland pattern. (Authors own, 2019)

Lastly, it appeared that innovation in the knitting practice, in terms of aesthetic appearance, has been difficult to evidence. However, people in the knitting industry are considered to be innovators, as evidenced in Caitriona's statement:

One of the things that I am looking at, at the moment is the machine end of things. On the one hand it is not very innovative, they are making exactly the same jumper since the 60s, but it is quite an unusual jumper to make on these machines. Having 13 colours in Fair Isle jacquard on a machine is not normal, people I would say they are innovators...(Knitting Academic Caitriona)

Next, I will present a brief analysis upon which I then started building the provotypes.

4.3.2 Analysis of the Shetland Interviews

Following the emergent provotyping approach in this project, I used the interviews to identify elements that were under tension or could be perceived as hidden in the knitting practice. As set out in chapter 3 section 3.5.1 the analysis of the contextual engagement was done iteratively. A focal point that emerged from the interviews was the design process of Fair Isle knitting. The presence of craft tourism and online interactions appeared to be newer streams of influence in the knitting practice of Shetland knitting. Anecdotally, technology was mentioned to take an increasing role in the form of social networks, where patterns are sold, skills are shared through videos, and voluntary organisations, such as the Peerie Makers have turned to for crowd funding. However, whilst it was reported that knitters have used Excel as a simple means to plot patterns, digital tools seemed absent in the actual craft practice of knitting. Influences that emerged throughout the conversations and that effect in the broadest sense the Fair Isle knitting practice are shown in Figure 10.



Figure 10 - Influences on Fair Isle design process. (Authors own, 2019)

In a second diagram, shown in Figure 11, I visualised different roles that knitters take based on the interviews. From this became apparent a tension between the description of being a maker 'who just knows to knit' (Belva) and a designer with perhaps a greater strive for personal signature.

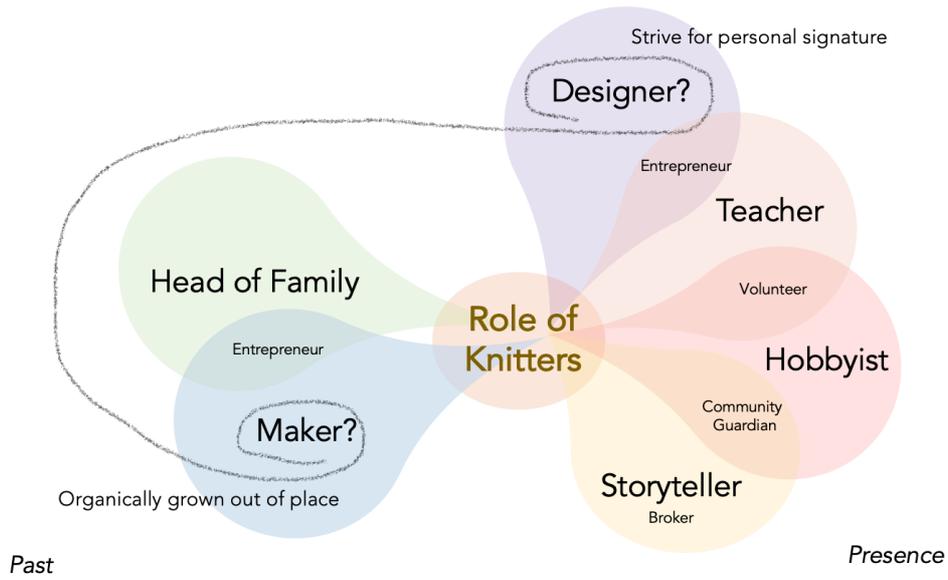


Figure 11 - Role of knitters. Diagram. (Authors own, 2019)

Lastly, I was interested in the descriptions of knowledge being passed down by mouth and rarely written down – specially, as many knitters learned to knit before they can remember. I used these insights as a basis and point of departure for the development of the provotypes. This will be described in the following section.

4.4 STAGE 2: Designing the Provotypes

The overarching aim of the Provotypes as shown in Figure 12, was to challenge aspects of the traditional design process and explore possible roles for digital tools in it. Please refer, after reading the description of the provotypes below, to the portfolio of practice for an in-depth description of how the provotypes embodied research insights of this engagement.

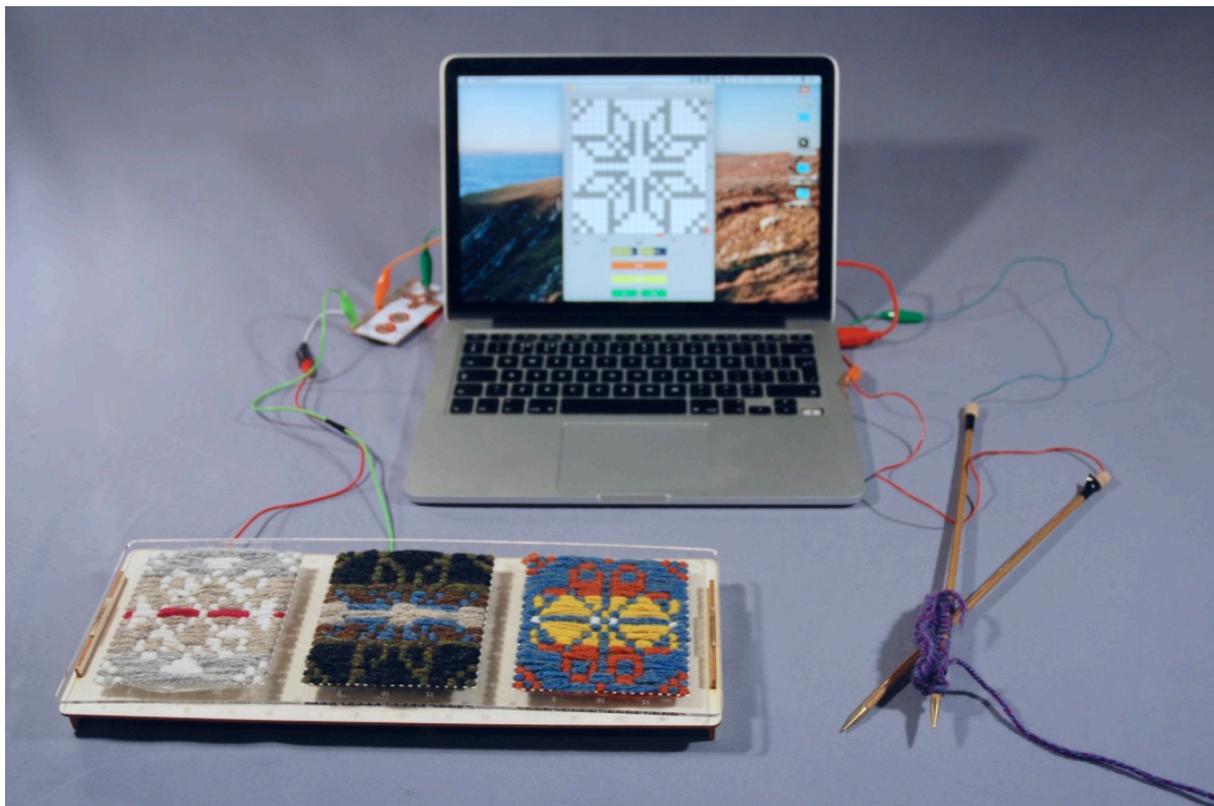


Figure 12 - Provotypes: Interactive Swatches, The Kniterator, Digital Knitting Needles. (Authors own, 2019)

- **Interactive Fair Isle Swatches:** The interactive swatches responded directly to the aesthetic and use of the knitted swatches found in the archive. Swatches have served as templates in knit and were used in the planning of knitwear. As part of the digital knitting experience they functioned as a tangible motif library and a playful way of interacting with the digital knitting experience.

- **Generative Pattern Software:** The Kniterator attempted to challenge the relevance of traditional motifs by purposefully disrupting the generational flow of passing on patterns within families or a social environment. It therefore used a generative algorithm as the seemingly opposite of a place-based design process.
- **Digital Knitting Needles:** I designed the Digital Knitting Needles before my first trip to Shetland. I intended to use them as conversational tools without concrete use ascribed to them. After receiving feedback in Shetland, I linked them digitally to the Kniterator where I had developed an interface that counted the rows and stitches. This was based on the insights that knitters on Shetland traditionally knew patterns by heart. However, it was supposed to evoke thoughts on how a new cultural repertoire of designs could be learned and perceived.

Please continue reading now the portfolio of practice

In the following section, I will describe the three different methods of disseminating the provotypes.

4.5 STAGE 3: Dissemination and Evaluation

For the dissemination I aimed to explore three different avenues of introducing the provotypes back into the context on Shetland and understanding the reactions they would provoke. This included a display at an academic Conference on Shetland, an engagement with a knitwear designer on Shetland in her studio, and a live-demonstration alongside a questionnaire.

4.5.1 Shoormal Conference

At the Shoormal Conference on Shetland, I had prepared a display which was exhibited in the conference room as shown in the Portfolio page 24-25. It constituted of the three provotypes and were augmented with a poster with three guiding questions for

engagement. Three smaller posters explained the individual artefacts and provided insights from the first engagement on Shetland. With help of the display, I was able to recruit a local knitter and a fashion and textile academic for an interview. Among other delegates, two of the previous participants, the local craft practitioner Belva and the knitting academic Caitriona visited the display. The interviews took place away from the display as I was limited to using the conference breaks to engage with people and it was difficult to audio record conversations on the spot. If people came to my stand, I used the provotypes as aids to enact and tell the research insights which provoked the design decisions. Furthermore, delegates had the opportunity for hands-on engagement with the tools as shown in Figure 13. This provided mostly feedback on the technicalities of the tools. The interview with the local knitter offered insights into the context but only tangentiality related to the provotypes themselves. Many of the Shetland based knitters imagined the provotypes to be potentially helpful for knitters coming from outside Shetland. In the following section I will describe the engagement with a knitwear designer in Shetland in her studio.

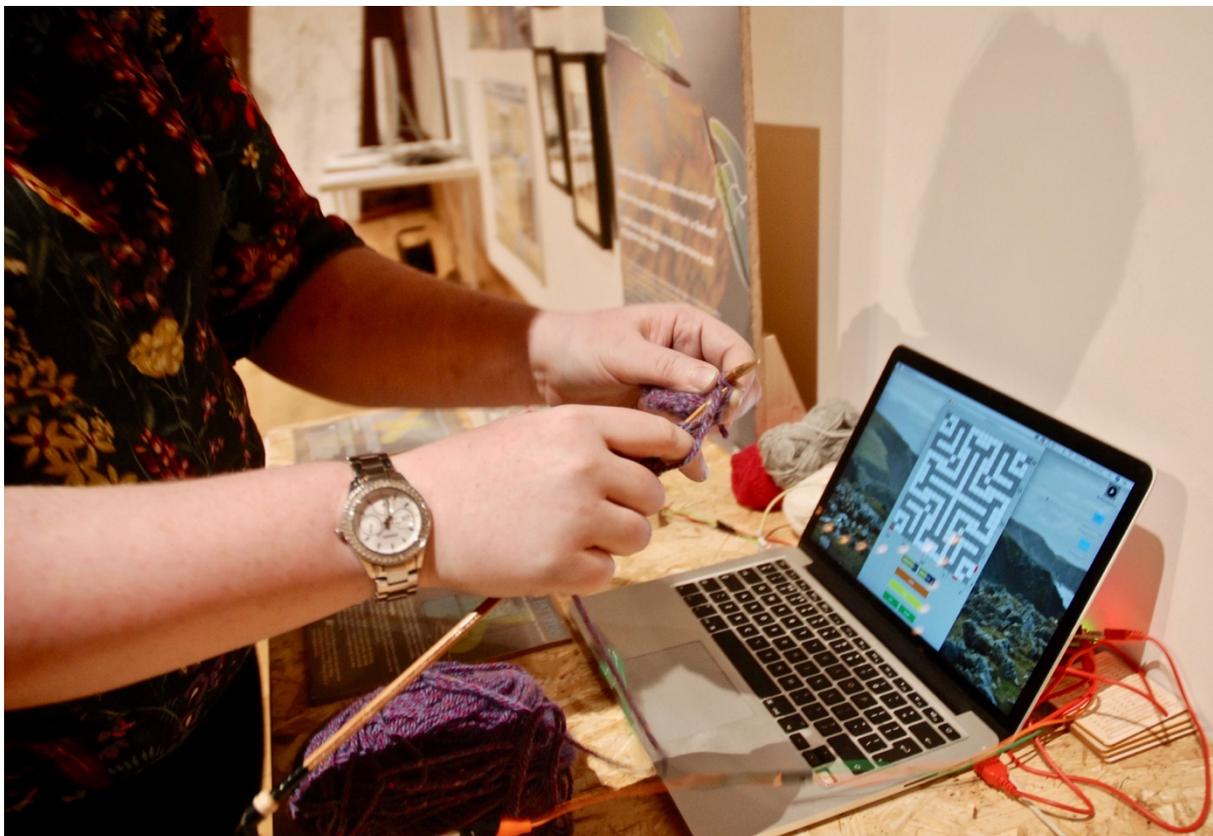


Figure 13 - Delegate engaging with the knitting needles (Authors own, 2019).

4.5.2 Visiting a Knitwear Designer



Figure 14 - The Kniterator Prototype in the knitwear studio (Authors own, 2019)

The engagement with the knitwear designer took place in her studio as shown in Figure 14. Her practice was based on machine knitting and used various deconstructed imagery representative of Shetland which she generated through craft based processes but also through image manipulation software. She invited me to a visit through contacts which were established at the conference. The conversation that unfolded centred around co-envisioning the software:

Knitwear Designer: If you say it is working based on an algorithm? Where is the algorithm getting the information from?

Researcher CW: It counts the neighbouring cells and depending on the current rule it will remove or add new cells.

KD: Right so you're driving the information behind it? So it is in no way random?

CW: It is in no way random! It is based on a mathematic rule. And this is quite a simple one...

KD: Or you could make it like chess pieces, that they can only go a certain direction.

CW: Yes, you can work on the algorithm, or fight with it as you said, and put your craft into achieving an aesthetic that you would like to execute.

KD: So it comes from the idea and the rule that you choose..

CW: Yes, developing the algorithm could become part of the design process!

KD: Yes exactly because it has a meaning!

CW: You could contemplate the same way as in your other design approaches; how do we relate to Shetland and the environment? And you could reflect that in the algorithm.

KD: That is the design question that has to be solved!

CW: But you could take that approach...

KD: ...in designing the algorithm! Oh that is exciting. I mean it could be anything... it could be a family tree... it could go right across the board. Couldn't it? [...] Shetland loves anything with generations and family trees. But it also could be about loss and taking away [...]. So it could show how quickly we come to nothing, when you look at the destruction of the planet. Or some of this could go into a baby blanket, if it is about regeneration as an idea. [...] And that doesn't have to be Fair Isle, that could be lace as well!

This dialogue will be used as a case study in principle of how the prototypes could allow practitioners to reflect on innovation in their own work in the analysis and discussion

Chapter 5.3. the following section will describe the live-demonstration of the provotypes at the Loch Ness Knit Fest.

4.5.3 Live-Demonstration Loch Ness Knit Fest

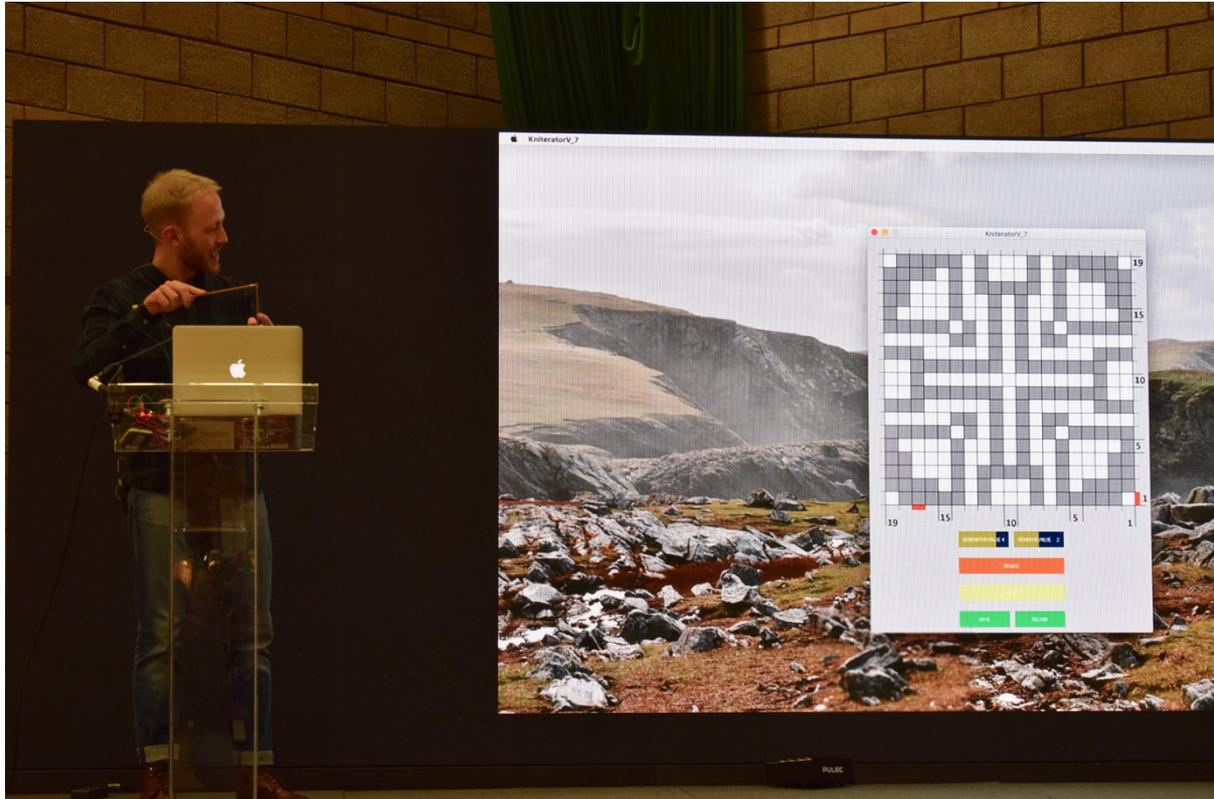
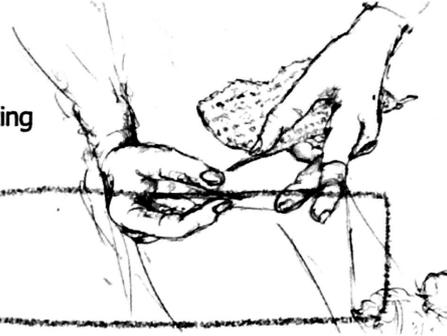


Figure 15 - Live Demonstration of Provotypes at Loch Ness Knit Fest (Authors own, 2019)

Finally at the Loch Ness Knit Fest, I was doing a live demonstration and handing out a questionnaire. During the talk and live-demonstration as shown in Figure 15, I foregrounded the role of provotypes as stepping stones to explore possible design approaches. The following discussion on stage showed a large amount of responses imagining the digital knitting needles as something that could lower the entry barriers for beginners. In Figure 16 is an exemplary feedback sheet that I received back from the audience. On the page thereafter, I will summarise this chapter.

Knitting In The Round

Exploring the Role of Digital Technologies in Fair Isle Knitting



What challenges do you have with stranded knitting?

Tough to get the tension right!

Do you use digital technologies in your knitting practice?

Of course, I'd imagine to use either a robot for knitting

In what ways could the digital knitting tools contribute to your own work?

→ increase pattern availability; change from the usual patterns already available; give more freedom to create, ease up the transport (not dependent on a book or paper)

Could you imagine other scenarios for the digital knitting tools?

- Learning for (geek) beginners
- New pattern making
- Visibility on social media (yes, it's important)



← Try a scribble?

Any other ideas, comments or concerns?

Research on old pattern is a plus when talking about machines.
 → Imagine the product you want to sell, it's usually best when having a pattern.
 Today, there is a group of clients more focused on old patterns and another on new ones.
 Could be a great business plan!

Strongly agree Neither Strongly disagree

This presentation was easy to follow.

10 - - - - - | - - - - - |

The role of the "Prototypes" in the research was clear.

| - - - - - | 10 - - - - - |

I understood the purpose of the research.

| - - - - - | 10 - - - - - |

Any suggestions for improvement?

Christopher Wild - c.wild1@student.gsa.ac.uk

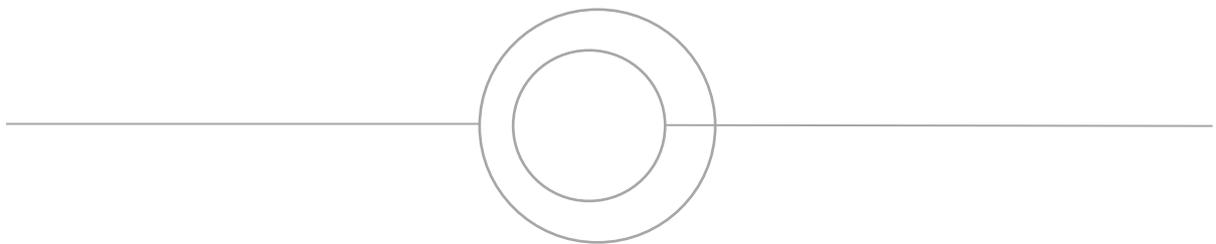
Figure 16 - Exemplary Feedback Sheet from Loch Ness Knit Fest (Authors own, 2019)

4.6 Summary

This chapter described the fieldwork across three stages. Firstly the scoping, and contextual engagement to develop a sensitivity to the context. Then the initial analysis of identifying themes which could be addressed through the design of the provotypes. And lastly, the three different ways of disseminating the research and provotypes. In the following chapter I will provide an account of the analysis and findings that emerged from these stages.

CHAPTER 5

ANALYSIS &
DISCUSSION



5 Analysis and Discussion

As part of the provotyping approach, I used thematic analysis after the first engagement on Shetland to identify tensions in the practice of Fair Isle knitting to design provotypes that could enable participants to envision future design approaches and consider the role of innovation in their craft practices on Shetland. The shift towards using my PDE practice methodologically emerged out of the cyclical movements between field, practice and literature. I therefore consider the act of provotyping in a craft context and the resultant artefacts as the first output that embody insights of this research. This chapter will analyse and discuss the provotypes during the evaluation and dissemination stage by presenting three main themes in increasing relevance;

1. Provotypes as tools for learning
2. Exploring the situational value
3. Supporting reflective dialogue

These themes are based on a reflective account of the engagements and interventions during the dissemination and evaluation stage as described in the Chapter 3 section 5.2. The interview data of the first engagement with knitters on Shetland was transcribed and then thematically analysed in two iterative steps. This was done by using a form of visual mapping to open up the data that drew upon the analytical method of Situational Maps (Clarke, 2005). After reviewing the transcripts, initial memos and the whole dataset of the interviews were laid out on a large paper and organised into classes that were derived from the topic guide of the interview and into classes that emerged during the mapping process. This process of classifying, connecting and describing (David. E. Gray, 2014) aimed at providing an accessible snapshot of the data. In the second step, preliminary codes were developed and categorised to form themes as done in Thematic Analysis (Braun and Clarke, 2006). This enabled the data to be systematically organised into subject headings. The diversity in the interview data only allowed the formulation of indicative themes. However, it brought to surface tensions in the practice of Fair Isle knitting that I aimed to address during the provotyping stage. Another benefit of attempting this form of in-depth

analysis was being able to reflect upon the own interviewing technique and identify shortcomings.

Reflective Journaling. After discussing each theme, I will then return to my research questions.

5.1 Theme 1 - Provotypes as tools for learning

Across all the engagements, the provotypes (especially the digital needles and software) were considered by participants to be potentially deployable as products. The Shetland-based knitters envisioned them for knitters outside of Shetland and the feedback at the Loch Ness Knit Festival showed a plausibility of developing the provotypes for beginners and young people to learn how to knit. Some knitters mentioned the difficulties of adapting and changing patterns or designing their own ones instead of purchasing them. A snapshot of this feedback data is provided in appendix B. Based on these insights, the provotypes formed an existent, or nearly reified design approach that was open for testing and validation. Whilst on the whole positive, the feedback fell at times short of adding to the concepts through critique or adaptations. The tendency of interpreting the tools as product proposals for market showed a potential misinterpretation of the provotyping approach and a difficulty of finding the right format to engage with participants with these tools. However, underlying to the technical feedback is the opportunity to use the provotypes as tools to collect user requirements. As described exemplary in the portfolio on page 20, the Kniterator did provoke insights regarding the knitters struggling with choosing the colours rather than with designing motifs. Building on this theme, in the next section I will discuss the values of the provotypes that emerged during the different engagements.

5.2 Theme 2 – Exploring the situational value.

An emergent theme was the situational value of the provotypes during the different types of engagement. I designed the conference display to offer delegates tangible access to the exploratory nature of my research and provide an instant experience to reflect upon. During the visit with the knitwear designer, I intended to use the tools to explore innovation in the

context of someone else's practice. And at the Loch Ness Knit Festival, I wanted to evaluate whether the provotyping approach would be conceivable to a wider audience of knitters. These engagements showed different values of the provotypes, which I will explore across three sub-themes.

5.2.1 Discursive value

The concern of one delegate at the conference about digital technologies undermining the democratic and accessible nature of Fair Isle knitting indicated the discursive value of the provotypes and the possibility of attributing meaning beyond their existent material form. This observation aligns with provotypes being able to show qualitative limitations and constraints at an early stage the research process (Boer, Donovan and Buur, 2013). Moreover, in this engagement, provotypes focussed the discussion and transformed a conversational space rather than a design approach. In contrast, the conversation with a local knitter Claire that took place away from the provotypes, provided further contextual information about knitting in Shetland but, without the materiality at hand, failed to explore the underlying meaning of the provotypes. In the following sub-theme, I will describe how the provotypes enabled me to tell and share the research process.

5.2.2 Narrative Value

During the conference and at the Loch Ness Knit Festival, the provotypes became narrative tools for me to share research insights. The Interactive Fair Isle Swatches particularly embodied this narrative value. They enabled me to speak about the traditional design process before demonstrating how I re-conceptualised it in the digital knitting experiences. It seemed this value was mainly provided to me as a researcher. Delegates and participants did not use the tools in a similar way to enact experiences of their own. However, I was able to observe a participatory quality in the provotypes in the engagement with the knitwear practitioner. This is described in the next sub-theme.

5.2.3 Participatory Value

During the visit to the knitwear designer, the Kniterator enabled co-envisioning of possible future design approaches in the context of her practice. From all the engagements, as the provotypes were the least contextualised by additional layers of information such as posters at the conference or slides at the Loch Ness Knit Festival. As the knitwear designer engaged with the software, she selectively asked for information in order for her to make it meaningful. In these situations the dialogue was between her and the Kniterator – where I only acted as the spokesperson of the tool. This contrasted the narrative value of the previous theme in which I was sharing research insights about the Fair Isle design process. Here I only assisted with technical knowledge as the following dialogue shows:

Knitwear Designer: When you say it is working based on an algorithm? Where is the algorithm getting the information from?

CW: It counts the neighbouring cells and depending on the current rule it will remove or add new cells.

KD: Right so you're driving the information behind it? So it is in no way random?

CW: It is in no way random! It is based on a mathematic rule. And this is quite a simple one...

By actively engaging the knitwear designer used the Kniterator as a participatory platform to create new meaning. This theme feeds further into the next insight that describes how the knitwear designer was able to reflect upon innovation in her own practice.

5.3 Theme 3 – Supporting reflective dialogues

The theme of supporting a reflective dialogue is based on the single engagement with the knitwear designer. It is divided into two insights – the contradictions that the Kniterator software embodied, as described on Page 16 in the portfolio, and boundary processes that occurred between her practice and my PDE practice.

5.3.1 Sub-theme: Learning through Contradictions

For the knitwear designer, the Kniterator software supported a reflective dialogue about how algorithmic design approaches could contribute to her practice. It indicated how the original design contradiction of disrupting the family and place-based origins of motifs re-evoked associations with the same element as the quote by her demonstrated:

[..] I mean it could be anything... it could be a family tree... it could go right across the board. Couldn't it? [..] Shetland loves anything with generations and family trees. But it also could be about loss and taking away [..]. So it could show how quickly we come to nothing, when you look at the destruction of the planet... Or some of this could go into a baby blanket, if it is about regeneration as an idea. [..] And that doesn't have to be Fair Isle, that could be lace as well!

Instead of looking at Shetland motifs as generational symbols, she speculated about new computational methods of visualising and embodying the idea of generations in textiles. Through active engagement with the Kniterator, the knitwear designer was able to interpret the concept of algorithmic design in a meaningful way. This observation falls within a social constructivist paradigm where meaning is co-created through engagement (Lincoln and Guba, 2016). Social constructivism is a pillar of the underlying epistemological mechanism of prototyping as described by Mogensen (1992). He called this aspect learning through concrete experience by seeing prototypes as contradictions that can expand a given activity or practice (1992: 8). A contradiction being mediated was between her craft-based approach of creating Shetland-based imagery for her textile patterns (printmaking methods and scanning, photographs and digital manipulation), and the emergent possibility of designing an algorithm that would produce metaphorical imagery for her. See page 19 in the portfolio as an example how an algorithm can generate larger scale patterns. In the following theme, I describe how this insight enabled us to observe a displacement of the boundaries of her practice towards a future innovation.

5.3.2 Sub-theme: Boundary Processes

On a conceptual level, the Kniterator software allowed the knitwear designer to explore the boundaries between her past and present practice and possible future iterations of it. This led to a temporary displacement of the boundaries of her practice. Communicating across boundaries of practice can be facilitated through the use of boundary objects. To recall Leigh-Star (2010), boundary objects usually appear at organisational scale, where they align different interlinked practices and inhabit levels of standardisation. Standardisation of boundary objects can occur through the dynamic of participation and reification between interlinked communities of practice (Wenger, 1998). In the case of this project, the provotypes were brought into the context of the knitwear designer's practice without prior participation that would have enabled an artefactual reification between her practice and my PDE practice. However, the provotypes presented the opportunity to allow a process of negotiation to occur. In case of having no prior alignment, *boundary negotiating artefacts* have been used to facilitate collaboration between practices (Halpern *et al.*, 2013). *Boundary negotiating artefacts* can be disruptive rather than coordinative (Lee, 2007) and destabilize existing boundaries of practice and assume a low degree of standardisation.

However, by considering the content of the conversation with the knitwear designer that centred around designing a metaphorical algorithm to represent generations of families in Shetland, I propose that the boundaries of my PDE and her knitwear practice were aligned prior to the engagement and that the provotypes had undergone a form of standardisation.

In the design process of the provotypes, I was looking for Shetland 'things' to provoke reflection of knitwear practitioners by balancing familiarity and unfamiliarity or inconspicuousness and intrusion (Boer and Donovan, 2012: 369). Similarly, the knitwear designer was looking for Shetland 'things' that she intended to embody in an abstract and deconstructed form in her textile practice. The standardisation between her practice and my PDE practice, and what was embodied in the Kniterator, is therefore a result of participating in the same cultural narrative that underlies knitting practices in Shetland. Reflecting on this, I would consider the provotypes as boundary objects, rather than

boundary negotiating artefacts, despite them not being part of an organisational scale, but reified through participation in a mutual cultural context. In the following section, I return to my research questions before presenting my key findings.

5.4 Answering the Research Questions

This project sought to answer the following research questions:

Main question: What are the possible roles for digital technologies in the contextually-located practice of Fair Isle knitting?

Sub-question 1.: In what ways can the PDE practice be harnessed for creative engagement in the context of Fair Isle knitting?

Sub-question 2.: In what ways can provotyping encourage knitwear practitioners to explore innovation in their own work?

My aims and objectives were:

Aim 1: to explore the use of provotypes as a participatory platform for learning.

Objective 1: Disseminate design artefacts in different settings to identify meaningful ways of sharing them in the context of Shetland.

Aim 2: to bring forward an understanding of the needs and desires of using technology in the context of Fair Isle knitting.

Objective 2: Engage with local and non-local knitters to receive feedback on the viability of the design interventions.

5.4.1 What are possible roles for digital technologies in the contextually-located practice of Fair Isle knitting?

As part of addressing the first research question, I am discussing the objective of bringing forward an understanding of the needs and desires regarding digital technologies in Fair Isle knitting. A need for Fair Isle knitters that emerged through the provotypes was the insight that choosing the right colourway is more crucial to the creative practice than choosing the motif. Other knitters mentioned the difficulties of adapting and changing patterns and designing their own ones. The Shetland-based expert knitters imagined

possible roles for digital technologies in Fair Isle for knitters external to Shetland. They believed that skill-levels in Shetland were so developed that there is no need for digital tools. This corresponded with the feedback received at the Loch Ness Knit Festival, which indicated a use for the digital knitting needles and the Kniterator as learning devices for knitting novices. However, as outlined in Theme 1 – Provotypes as tools for learning – this feedback was based on the current functional scale and scope of the provotypes and not on what design approaches they could open up. This showed limitations of evaluating provotypes through live-demonstrations and displays and a tendency of interpreting them as standard prototypes.

5.4.2 In what ways can the PDE practice be harnessed for creative engagement in the context of Fair Isle knitting?

At the time of designing the provotypes, I imagined them as a platform for participatory engagement and I designed the conference display to support this approach. I was thereby following the approach of prototypes as means of inquiry (Wensveen and Matthews, 2014) to create a context of investigation. During the conference it enabled levels of engagement with a diverse group of people but did not provide the intended participatory interactions. When I was presenting the artefacts to the delegates, it was often me enacting parts of my research story rather than them having a hands-on interaction with the tools. Despite the example in the studio visit, it was challenging to facilitate a discussion that would first explain the functionality of the provotypes and then the concept of them being stepping stones towards exploring future design approaches. The PDE practice was form giving to the provotypes and in the example of the knitwear designers provided a base for participation. This was serendipitous in nature as the engagement was not planned for. The visit indicated, that in order to become a form of creative engagement the process of designing the provotypes has to become more participatory – what Wensveen and Matthews (2014) called prototyping as vehicle for inquiry. However, this question can only be partially answered due to limitations and constraints during the engagements, which will be outlined in the next chapter.

5.4.3 In what ways can *provotyping* encourage knitwear practitioners to explore innovation in their own work?

In this study I harnessed the provotyping approach to embrace emerging tensions rather than aiming to resolve them as previously done in my PDE background. I explored this by challenging the traditional Fair Isle design process, that was described as hidden, fluent and almost improvisational. The Kniterator enabled the knitwear designer to explore innovation in her own design process. As described in Chapter 5 section 5.7, and in Theme 3 - Supporting Reflective Dialogues – we engaged in a process of co-envisioning applications of the pattern software in her practice. The Kniterator supported the knitwear designer to bridge the present-future gap. I explained this by referring to two learning principles of CoPs – participation and boundary objects and then the principle of contradiction which is routed in AT. This engagement showed how provotypes can support a process of negotiating new learning in a craft context. Wenger (2013) described a *plug-and-play principle* that recognises different drivers of learning in social theories. Therefore, provotypes must not be limited to the principle of contradiction but can be open to appropriations within the dynamic of participation and reification. This engagement also provided an insight into what Binder et al. (2011) call *design-after-design* where users adapt technologies in the future in a different way than set out during the design stage. Fundamentally, the Kniterator did allow for such future appropriations. In a further fieldwork cycle, and on more participatory basis, this might have helped the knitwear designer to explore innovation further in her own practice.

The over-arching aim of this project was to explore design approaches for digital engagement tools in Fair Isle hand-knitting to identify opportunities for innovation and answered the following three research questions:

Main question: What are the possible roles for digital technologies in the contextually-located practice of Fair Isle knitting?

Sub-question 1.: In what ways can the PDE practice be harnessed for creative engagement in the context of Fair Isle knitting?

Sub-question 2.: In what ways can provotyping encourage knitwear practitioners to explore innovation in their own work?

Through two engagements on Shetland I have developed a series of insights that have value from a methodological perspective for the PDE practice. These are deriving a contextually sensitive approach of designing digital engagement tools based on narrative insights. These are embodied in the practice-based output in form of the provotypes and explained through the design process in the portfolio. From the engagements with the provotypes key insights that emerged where the ability to support a reflective dialogue for a knitwear designers to explore innovation in her own work and a situational value of provotypes, in particular as narrative tools to share the research insights they embody. In the following chapter I will conclude this thesis by providing reflections and outlining limitations of this study.

CHAPTER 6

CONCLUDING

REMARKS _____

6 Concluding Remarks

6.1 Introduction

As I set out to explore Fair Isle knitting in Shetland, I anticipated a precarity surrounding a wide-spread skill-loss. However, during my scoping trip I realised that robust methods were in place, in form of an intergenerational teaching program, to keep this practice part of its indigenous landscape. Although, some accounts of people stated that there is a fear of losing very specialist expertise of older knitters. This caused the shift towards the provotyping approach and exploring future design approaches of Fair Isle knitting. I reflect upon this method in the next section.

6.2 Reflections on Provotyping

The provotypes in this study were built on narrative insights - participants reflections and perceptions surrounding the heritage practice of Fair Isle knitting. I describe how these are ethnographic-in-style by consisting of descriptive accounts of the traditional and contemporary practice of Fair Isle knitting. By thematically analysing these insights, I identified the Fair Isle design process as almost hidden, fluent and improvisational.

I designed the provotypes to embody insights of the design process and to challenge knitwear practitioners to explore innovation in their own work. The encounter with the knitwear designer showed in principle that embodying these place-based tensions in a playful way in provotypes can support relevant reflective thinking. However, I often found that what participants associate technical practices like PDE with solution oriented product development approaches – interpreting the provotypes as prototypes. Therefore, finding the right format to engage with participants space is crucial to provide them with the space to explore provotypes beyond their existent form and function. This further highlighted to me a discrepancy between time spend developing provotypes as digital engagement tools and time engaging with them in the field. The insights of this study are disproportionately small in comparison to the time spend designing. If I were to make a recommendation towards improving this approach to make it more relevant to craft practitioners in

Shetland, I would encourage a less foregrounded focus on digital technologies and greater emphasis on participation in the process of designing. Considering the variety and numbers of craft practitioners in Shetland, the provotyping approach would lend itself to being explored in a cross-disciplinary setting, where participants collaboratively identify elements taken for granted and design artefacts to challenge each other.

6.3 Limitations

A central shortcoming of the study was the lack of engagement by participants in the development of the provotypes. The evaluation and dissemination of the provotypes was lacking robustness in terms of achieving in-depth engagements. Although, I had carefully designed the display for the conference, I struggled to facilitate the ad-hoc nature to provide deeper insights and data. Furthermore, by recalling the design recommendations of *openness and boundedness* (Wallace et al., 2013: 3444) and *ambiguity and interpretation* (Gaver et al., 2013: 3453) of such design interventions, I believe the display was too bounded by my interpretations and perhaps as well by the conference room. This also draws attention to the sampling of this study, where there was an overemphasis of academics and less on local knitters. However, by considering the geographical distance between myself and the context it was challenging to build more sustainable links with the local community of knitters.

6.4 Conclusion

I set out to answer three research questions in this exploratory research study

What are possible roles for digital technologies in Fair Isle knitting?

In what ways can the PDE practice be harnessed for creative engagement?

In what ways can provotypes encourage knitwear practitioners to explore innovation in their own work?

This research intends to provide an account of using technical artefacts early on in the research process. Contrary to similar studies that have taken place in the fields

of interaction design, this study explores this approach of provotyping in a traditional craft context. This might be of relevance to PDE practitioners interested in the methodological account but also to researchers and craft practitioners interested in the role of innovation in a traditional craft practice.

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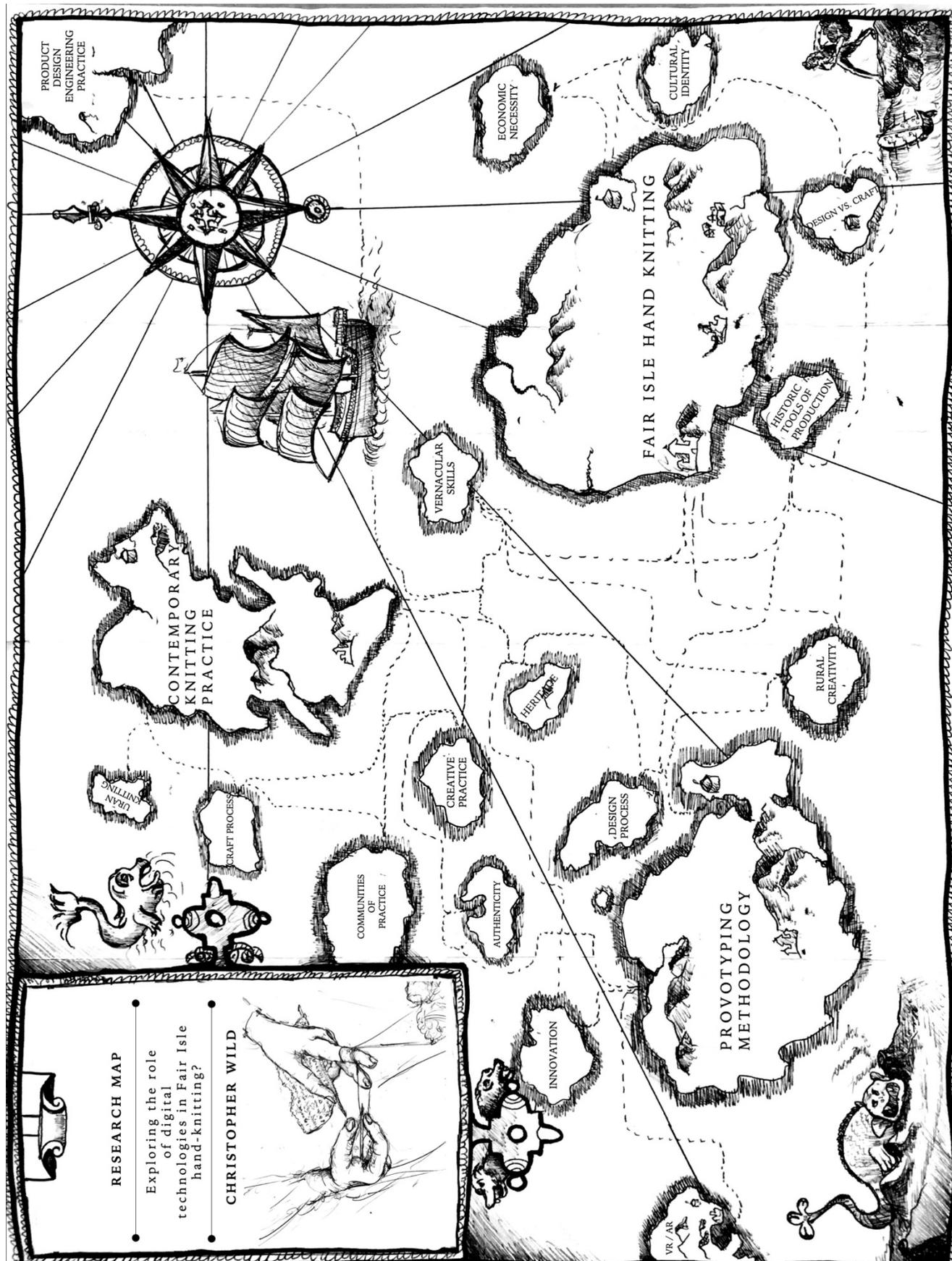
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Exploring the role of digital technologies in Fair Isle hand-knitting.

INFORMATION RESEARCH PARTICIPANTS

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What is the purpose of the interview?

The purpose of this pop-up engagement and interview is to learn about innovation in traditional craft practices and to evaluate the design of the digital knitting experience presented as part of the Shoormal Conference. In this digital knitting experience I am exploring possible roles of digital technologies in Fair Isle knitting in relation to innovation, place and youth engagement. This is done across three elements of Fair Isle; the material, the design process, and the tools and techniques.

Why have I been invited to take part?

You have been asked to provide your feedback based on your interest and expertise in traditional craft practices and interests in Fair Isle knitting, digital crafts, and/or rural creative practices.

Do I have to take part?

Participation is voluntary and you are free to withdraw at any given point.

What will my participation involve?

By taking part in this study you will be asked to engage in an interview which will roughly take 1hr.

What will be asked ?

You will be asked to offer a short feedback and related opinions on my research project which I exhibit as part of the Shoormal conference. This will be done in form of an informal audio recorded interview.

Privacy Information

In-line with GDPR, all personal information disclosed in the project consent forms will be securely stored at The Glasgow School of Art campus. After the project ends, the consent forms and research data will be kept for a maximum of 3 years. This is to account for writing up the project report and for publishing future academic outputs. After this time, the forms be destroyed. Your personal data will never be shared.

CONSENT FORM FOR RESEARCH PARTICIPANTS

I understand...

What this research entails and have had time to ask questions;

I can leave the research whenever I choose without having to give reasons;

I do not have to answer my questions I do not want to;

I agree to...

I agree to being audio recorded as part of the research and understand that these will be kept anonymous;

I agree to audio recordings being stored securely for up to 1 year on a password protected device according to the GDPR;

I agree to my contribution informing publications in form of a thesis or reports and papers – I understand that these will remain anonymous;

I agree to photos of me taken whilst interacting with the display to be used in the publication of the thesis. This will only include images in which the face is not visible.

Further comments or requests:

Name of participant _____ Date _____ Signature _____

Researcher _____ Date _____ Signature _____

Snapshot of Feedback from Loch Ness Knit Festival

Could you imagine other scenarios for the digital knitting tools?

- Learning for (geek) beginners
- New pattern v...



Learning for (geek) beginners

beginners could be taught on digital tools like a mac for knitters.



Beginners could be taught on digital tools

In what ways could the digital knitting tools contribute to your own work?

would make me, a beginner, think of doing a fair isle pattern

Would make me, a beginner, think of doing Fair Isle pattern.

In what ways could the digital knitting tools contribute to your own work?

help with following complicated patterns

Could you imagine other scenarios for the digital knitting tools?

teaching the skill/art of knitting to beginners

Teaching skill/art of knitting to beginners

Any other ideas, comments or concerns?

I THINK IN THE DIGITAL AGE ITS A GREAT IDEA FOR FUTURE GENERATIONS.

.. great idea for future generations

