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ABSTRACT

n-Use Clothing concept

The benefits of repairing products have been eclipsed by fast onsumption, faster production and a lack of attachment to the roducts we own. It is no secret that the apparel industry plays its art in the ecological crisis we are heading towards today. Waste ppears in all areas of the apparel industry; manufacturing, over roduction low quality garments, 'disposable' clothing to name a few. Conventional methods of dealing with these issues have been criticised s being symptom based. The key point conventional strategies have ot commonly addressed is, the way in which we consume (Chapman 009).

This research focuses on the design durability and longevity of roducts, both physically and emotionally. It explores the idea that onsumption patterns can be slowed if we are able to create a bond to he clothing we own. In order to change the way we consume we need o change the way we feel about our clothing and what that clothing an offer us. An emotional attachment to the product will change the alue we associate with them (Niinimaki & Hassi, 2009).

The project looks at sustainable clothing being more than just a iche market. The INUSE CLOTHING concept is a method of design nd business that can be applied to the design philosophy of multiple usiness sizes and collectives collaborating in economies of scale, and oes not rely on a environmentally conscious consumer.

In-Use clothing design extends the lifetime of the garments in an attempt to reduce consumption and does not result in the loss of revenue for the manufacturer. Consumer involvement with the design and lifestyle affiliation and the tracking and recording of one's own history, with the garment, develops a sense of attachment and user investment. The consumer-garment relationship works on an ongoing repair-and-modify basis and supplies a visual record of garment maturation and individualisation, all contributing to the consumers sense of self. The same relationship also works to create a consumer-manufacturer bond generating brand and service loyalty, repeat purchase and longer product lifetimes, in local and global hubs. This project undertook a mixed method approach to research and design research. Exploratory qualitative research is carried out in the form of in-depth interviews that explore garment attachment, and long-term ownership of first-owner garments. The design development of the In-Use denim jeans went through a process of sampling experimentation deconstruction and reconstruction. Garments were wear tested and th denim went through repairs. All components of the In-Use model were brought together by a process of connecting many parts of research including existing literature on sustainable design in niche markets an research into how users are creating their own continued experience and emotional connections to garments, and design development practice.

NTRODUCTION

Waste appears in all areas of the apparel industry; through anufacturing, over production, in low quality garments and disposable' clothing, to name but a few. In the UK alone Wrap 2012), the UK's leading body on resource efficiency, states the pproximately 350,000 tonnes of clothing goes to the landfill every ear. Conventional methods of dealing with these issues have been riticised as being symptom based. Conventional strategies have not ddressed the current consumption rates, it is now understood that o reduce the environmental impact of the apparel industry attention eeds to be directed towards increasing the lifetime of garments. Value eeds to be placed on use, attachment and stronger user-product and ser-manufacturer relationships (Armstrong & Lehew, 2011; Chapman, 009; Niinnimaki & Hassi, 2011).

This research focuses on the emotional and physical durability and ongevity of apparel products, the factors that elicit an emotional esponse/attachment to garments and what effect empathic design an have on slowing down replacement rates. It explores the idea that onsumption patterns can be slowed if a bond is created between user nd product. User product connection will increase the likelihood f product care, reducing replacement and increasing repair. User roduct attachments create user-manufacturer relationships which will ncrease post purchase. It investigates the shift in value from novelty to se and addresses the need for accountability from both manufacturer nd the user. In-Use Clothing aims to develop a sustainable apparel esign business model that encompasses an In-Use website. The ebsite develops emotional attachment to the design product, anufacturer and user accountability, design re-assembly through epair and modification and uses local and global production concept rocesses.

The studies covered in the literature review offer design strategies nd methodologies which are an outcome of qualitative and uantitative research, (Armstrong & Lehew, 2011; Cooper, 2010; letcher and Goggin, 2001; Forlizzi & Ford, 2000; Gam et al, 2011; Niniimaki & Hassi, 2011; Van Nes, 2010; Niinimaki & Koskinen, 011). Selected studies review waste reduction, reuse and design for isassembly with the focus on emotional attachment to design. This research project has taken design for disassembly one step further and created design for re-assembly, it focuses on technical design, construction methods and stitch use. Garment designs have been developed to be easily disassembled for the purpose of reassembly in the form of repair, modification and re-design. Repair and modificatio increases a product's lifetime, it alters frequency of replacement and creates bonds between product and user (Van Nes, 2010; Mont, 2008 and user-manufacturer relationships (Chapman, 2009). This project developed denim jeans as an example of an In-Use garment that is easily redesigned with time and desire. In-Use garments are created by making subtle alterations to classic design and shifts in traditional pattern drafting and construction. In-Use denim focuses on applying aspects of the chainstitch machine that are currently under utilised. Focusing on pattern drafting, construction methods and stitch use, and using denim as a key example, garments have been developed that are easily repaired and modified.

This project also considers that sustainability needs to start with the designer and involves more than just choice of materials and yield; manufacturers need to be accountable for what they produce. Accountability needs to be consistent throughout all stages of production including design, wholesale, retail and in use life time. The In-Use Clothing concept does not rely on the consumer's stand point on sustainability and the environment; it extends the lifetime of In-Use clothing and does not impair profit as repair and modification form new pathways to increase returns. The consumer-garment relationship is developed through use and the investment of time. It is aided by repair and modification services and, coupled with the continued user experience through recording the maturation of garment and self on the In-Use website, users develop a sense of attachment and connection to the garments they own. The same relationship also works to create a consumer-manufacturer bond generating brand loyalty, repeat purchase and longer product lifetimes. Ideally the In-Use Design business method is a comprehensive, integrated model bu various components could be used by companies wishing to become more sustainable in practice.

LITERATURE

"It is no longer worthwhile to repair products, and the whole conomic system in the industrialized world is actually based on roducts' fast replacement and planned obsolescence(Mont, 2008, as ited in Niinimäki & Koskinen, 2011, p. 166)."The textile and clothing eld is no exception"(Niinimäki & Koskinen, 2011) The concept of planned obsolescence' is the fore planning of shortened life cycle of roducts to ensure a market need for future products (Cooper, 2010b, . 4).

The transience of fashion trends survive on this strategy which nsures fast consumption and replacement rates, creating tonnes of vaste from the apparel industry each year. The conventional methods f dealing with the negative impacts of the apparel industry have been o develop manufacturing methods with less of an environmental mpact, the use of recyclable materials and the utilisation of waste nd bi-products. Although industrial development has successfully noved toward a smaller environmental impact over the last 25 ears, "production as well as consumption has increased…which rodes the environmental benefits of technological advancements" Niinimaki and Hassi , 2011, p.1877). Describing current sustainable esign methodologies as "adopting a symptom-focused approach" hapman (2005) explains that the root cause of the ecological crisis s often overlooked. Using recycling as an example, he speaks of the rowing suspicion that it provides 'an ethical get out of Jail card', for ompanies and users alike, and is effective only in reducing consumer uilt. "Consumers continue wastefully on but do so now with ecycled material instead of virgin ones" (Chapman, 2005, pp.10 -11). Opportunities still remain within the fashion industry to move towards educing the negative impacts of the industry on the environment. Design and product development represent a key inception point for multitude of impacts" (Armstrong and Lehew, 2011, p29). "Fields uch as engineering and industrial design have, in many ways, emonstrated an innovative shift in practice that may indicate ways orward applicable to apparel design, (Armstrong and Lehew, 2011, .31).

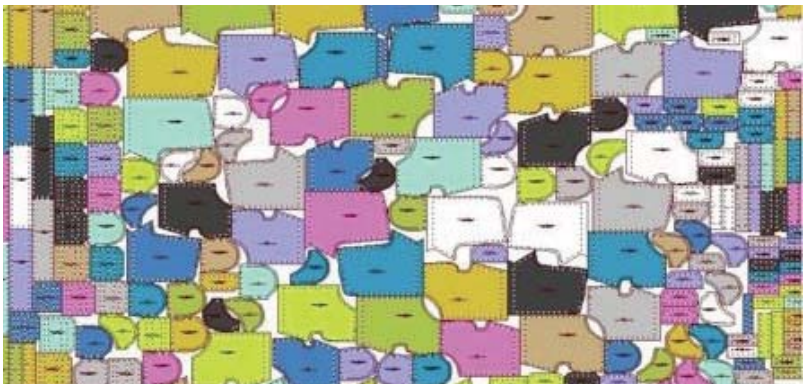
Sustainable product development and design concepts such as cradle to cradle for apparel design, design for disassembly, customisation, halfway products and modular structures have been developed to assist apparel designers in working towards eliminating environmental problems the clothing and textile industry may create. Borrowing from different industries, sustainable apparel design models have been researched and tested. Cradle to cradle design, (McDonough & Braungart, 2002) is a model in which "products can be designed from the onset so that they will provide "nourishment" for something new after their useful lives". Cradle to cradle apparel design (C2CAD) materials are seen as "biological nutrients" that can re-enter the soil without depositing toxins, and as "technical nutrients" that will continue to circulate as valuable materials within a closed loop" (Gam, Cao, Farr, & Heine, 2009, p.168). The Cradle to Cradle model puts emphasis on the designer to achieve sustainability. Following the cradle to cradle guidelines, designers should "seek to practice environmental responsibility and discover solutions for current problems since designers determine the properties of the products" (Pahl, G., Wallace, K., & Blessing, L, 2007). Gam et al., (2009) developed C2CAD by blending 'Cradle to cradle 'and pre–existing apparel design models. They employed the C2CAD model in the production and design of knitwear in 2007. When Gam (2007) tried the model "it became clear that the manufacturer could not comply with the tenets outlined in the

"It is no longer worthwhile to repair products, and the whole economic system in the industrialized world is actually based on products' fast replacement and planned obsolescence(Mont, 2008, as cited in Niinimäki & Koskinen, 2011, p. 166).

2CAD model. Collaboration within the supply chain, knowledge nd expertise necessary for analysis in material selection and onsideration were largely absent" (Armstrong and Lehew, 2011, .49). As public awareness of environmental pollution and resource epletion grows so too does the analysis of product lifecycle and ecyclability. One large cause of pollution and waste is the blending f synthetic fibres with natural fibres into one fabric. Once in textile orm the fibres cannot be separated and therefore cannot be re-used ithin the industry (LaBat & Sokolowski, 1999;May-Plumlee & Little, 998;McDonough & Braungart, 2002). Products can be recycled best hen they can be separated into individual material parts. Gam et al. 011) explain natural textile fibres are typically classified as biological utrients, meaning they can biodegrade and synthetic fibres, technical utrients, can be recycled through the industry. They, in C2CAD part 2, ontinued to investigate the application of design for disassembly in pparel production whereby consumers and manufacturers can easily, ompost recycle or re-use different materials and components at the nd of the garments' life. The jacket design for disassembly focused on aterial selection, jacket design, stitch evaluation and selection. Using men's blazer the design was based on having two main components, 100% natural fibre outer shell and a synthetic fabric lining. The aim f easy separation of the two components is to have one component eing wholly bio-degradable and possibly compostable, whilst the ynthetic component can be re-used in industry or recycled. Using a arge stitch length the jacket can be disassembled in 1.5 minutes by the anufacturer or user. The authors suggest in the conclusion that the anufacturer should take the initiative and collaborate with retailers to ecover used items from consumers to be disassembled.

I argue that design for disassembly has further potential. As xplained, design for disassembly was created so that the user and onsumer can recycle or reuse different components at the end of a arment's life; however it does not cover the ways in which efficient isassembly can aid in extending a product's lifetime, nor does it nvolve or encourage the user to change their consumption patterns. 2CAD part 2 admits that for design for disassembly to be effective he manufacturer needs to take initiative to recover the items (Gam t al, 2011), suggesting that the majority of users are unlikely to do o of their own accord. A consumer's pro-environmental or ethical otivations may differ in theory than they do practice. Carrigan and ttalla (2001) explain that although consumers may take a virtuous iew point of a companies' ethical or environmental practice, it oes not always translate into similar consumption choices. The lack f consumer desire to follow through with responsible disposal of arments could be seen as an outcome of what Carey and Cervellon 011) call egocentric motivations, or a way to compensate for the ther negative environmental behaviour. Sustainable consumption f fashion and apparel, larger than the niche markets that exist oday, will only become a reality if it does not inconvenience the onsumer or come at a cost, be it money, time or quality (Carrigan nd Attala, 2001; Joergens, 2006). Van Nes (2010) explores an pproach of catering to consumers needs and tempting them to reduce heir replacement frequency. She explains that "The strength of this pproach is that it does not demand people commit themselves to pro-nvironmental behaviour" (Van Nes, 2010, p. 108).

The most common approaches to sustainable design strategies are product-focused and results focused, dealing with the environmental efficiency of manufacturing, use and distribution of existing products (Armstrong and Lehew, 2011). Examples of common sustainable design strategies in practice can be seen in both high end and low end manufacturers. Cradle to Cradle design has been adopted by large and small companies alike. An example of a large established company undergoing a transition into more environmentally-aware production and design is Nike. Nike's considered line of products was introduced in 2005 and has expanded considerably since then (Agogino et al 2010). Technical nutrients are kept as valuable materials to be re-used at the same level of quality in the closed loop production system. Nikes 2009 Livestrong jacket is produced from 100% polyester, the zipper and cord locks are constructed from Nike Grind. Similar in theory to the C2CAD, Nike has set up initiatives to reclaim athletic shoes the end of their life and recycle them. Shoes are recycled into a product named 'Nike Grit' which is used as ground cover for running tracks, basket ball courts or playground or recycled into new Nike shoes, and apparel. "Nike Apparel – Products ranging from All Conditions Gear to the Livestrong Jacket use Nike Grind in finishes like zipper pulls, snaps and buttons" (Nike Reuse a Shoe, 2012). An example of a smaller scale re-use is Nudie Jeans' who manufacture a line named Post Recycle Dry Jeans. Effectively turning old jeans into new jeans, Nudie collects unwanted used jeans and recycles them by turning the old denim into cotton like pulp which is then turned into yarn and used for new fabric. "Since the fibres of pure recycled yarn are very short, virgin organic cotton is added in order to get a durable fabric. The final denim is slubby with a soft hand feel. The slubs are mainly a consequence of the natural irregularities of the recycled yarn (Nudie Jeans, 2012).



C2CAD focuses on waste of resources, toxic synthetic waste and recovering the same quality materials after recycling (Game et al, 2011). Another major area of waste in the apparel production process is fabric wastage during manufacturing. Most apparent in the cutting process, waste is created from the 'negative' areas of the pattern piece and the spaces in between pattern pieces. The issue of gaps between pattern pieces can be reduced when using laser cutting in mass production. In small to medium sized production runs gaps are needed to reduce risk of accidental cutting when using hand held cutting machines.

Figure 2 example of negative space and minimal gaps when mass producing with laser utter (McQuillan, 2012).

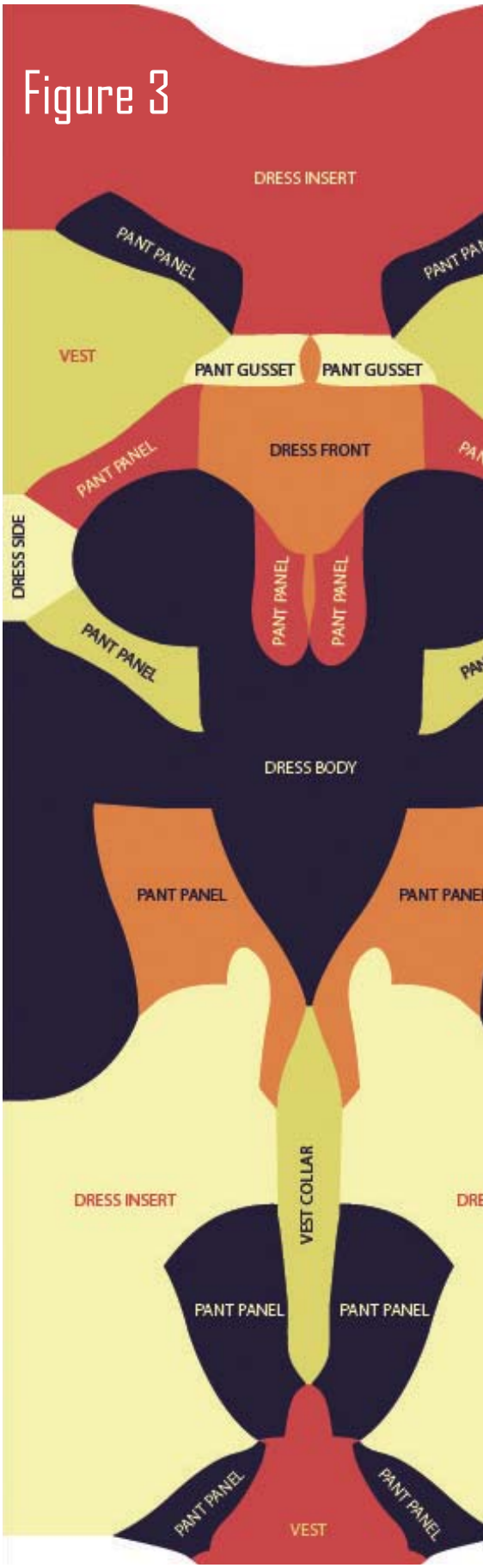
Holly McQuillan's work with zero waste pattern cutting focuses on reducing waste from gaps' but also eliminates the unused areas of negative space caused by flat patternmaking. s explained on the Yield exhibition website "Approximately fifteen percent of the abric used to create a piece of clothing ends up in a landfill, but the zero waste fashion esign movement aims to change this" (McQuillan & Rissanen, 2011). Zero waste pattern utting "aims to eliminate the production of waste from the production of clothing, while mportantly revealing exciting new detail, line and form" (McQuillan, 2011a). In response o criticism regarding the wearability and aesthetic of Zero Waste garments McQuillan xplains that the "outcomes of zero waste fashion are entirely determined by the designer" McQuillan, 2011b), Zero waste fashion doesn't have to be limited to high fashion.

an example of Holly McQuillan's Zero Waste Pattern Cutting(McQuillan, 2011a)

Another practice to eliminate waste in production is DPOL (Direct panel on loom) echnology produced in India. DPOL, designed by Siddhartha Upadhyaya, involves veaving ready to construct woven garment pieces, eliminating the cutting process and the vaste produced by cutting from roll of fabric. All edges are finished with selvedge and the veaving process can include colour, embellishment and shape. DPOL claims to increase abric efficiency by 15%-22% and reduces stress on other resources like energy and water y being 70%-80% more efficient than the traditional manufacturing processes (August, .d). The other bonus of DPOL is its ability to offer small runs, meaning this sustainable ractice is available to small and large designers alike.

The practice of reducing waste and reclaiming and recycling garments is an example f manufacturers being accountable for what they produce. Accountability exists within he sustainable apparel industry and like most sustainable design can be found in athletic nd outdoor apparel design. A clear example of this is Patagonia's latest approach to ustainability their Common Threads Recycling Programme: a promise that none of their roducts will end up in the landfill. Yvon Chouinard (2012) the Founder of Patagonia ays "we'll make sure of it with a liberal repair policy and by accepting old clothes for ecycling" (Chouinard 2012, cited in Wang J, 2012, para, 6). Offering product services ot only encourages environmental awareness it also has the potential to increase a roduct's lifetime. Niinimaki (2011) explains that in order to promote long life guarantee nd product satisfaction consumers need to be aware of the intended lifespan and naintenance of the products they are purchasing. Niinimaki and Hassi (2011) suggest that nanufacturers could provide consumers "information about the intended lifetime of the roduct…manufacturers could also provide information on how many washes the garment vill take and still look good" (Niinimaki and Hassi, 2011, p, 1879). Niniimaki (2011) lso explains that products life spans can also be increased by offering services such as pgrade, repair and modification. These services extend the enjoyable use time of the roduct as well as postpone the psychological obsolescence that consumers themselves eel about the product (Niinimäki, 2011). Product Service Systems (PSS), "is a strategic nitiative that seeks to replace product ownership with Utility" (Briceno and Stagl 2006). he United Nations Environment Program (UNEP) states that the move toward PSS is the ext logical step after a couple of decades of industry efforts towards cleaner production rocesses.

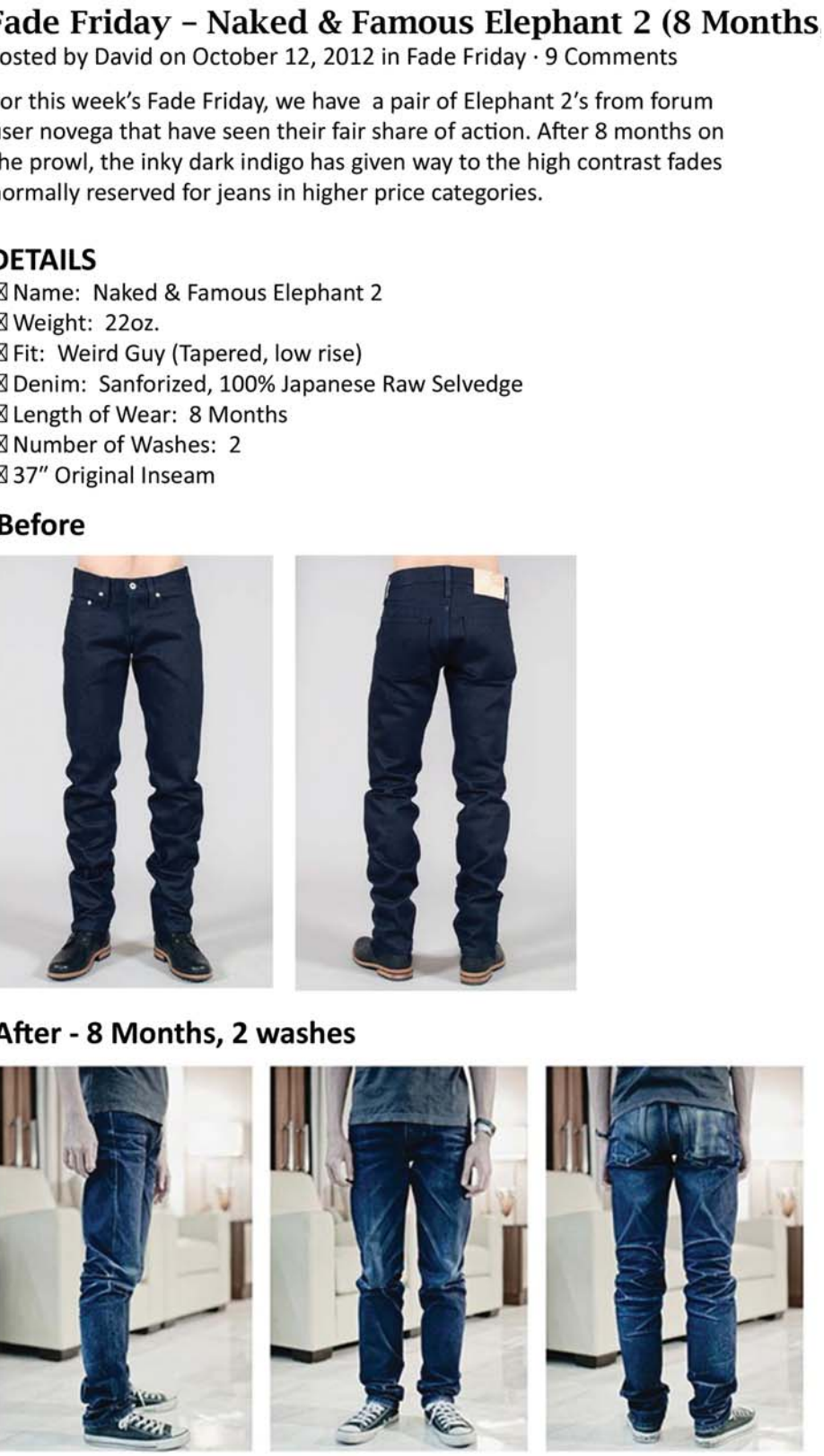
Consumers are ready to criticise or approve of a company's sustainable practice but, ustainable products alone may not be enough to appeal to consumer needs. Fletcher nd Goggin (2001) explain that "the dominant approaches to ecodesign to date tend o focus on pollution and resource use in production, rather than human choices and ctions. In contrast to this, a people focus in ecodesign considers ways of satisfying undamental human needs" (Fletcher and Goggin, 2011, p.25). Gam and Banning (2011) uggest another challenge to sustainable practices in the apparel industry, perhaps one



f the biggest barriers encountered, is the fact that fashion trends nd seasons make apparel one of the most change-intense categories f consumer products. Wait (2010), suggests that the advent of 'fast ashion' also undermines the sustainable textiles industry. Wait 2010) explains that the relationship between ease and speed of nanufacturing, consumption of fast fashion and the price of textiles eads to a less sustainable textile industry. "The short life span of extiles and especially clothing is one of the main problems in the urrent industrial system based on planned obsolescence"(Niinimäki & Hassi, 2011).The concept of 'planned obsolescence' "remains ntrenched in industrialized economies despite criticism over many ears" (Cooper, 2010b, p. 4) The reality is that product lifetimes have ecome increasingly shorter and companies want to "substitute their roducts at an increasing pace" (Niinimäki & Hassi, 2011, p. 1878). n Vezzoli and Manzini's (2007) four stage continuum, they describe he different levels of sustainable design strategies. The lowest level eals with the symptoms of the industry, such as reducing waste and esources during production, and the third level out of four describes atisfaction as being the crucial factor in product design. "This system esigns new ways to achieve satisfaction that may or may not include tangible product (Armstrong and Lehew 2011, p.41). Level four, he most difficult of all levels of sustainable intervention involves the reation of sustainable lifestyles, "here, design finds its function far eyond product design and is heavily reliant on the designer's ability o intuit socially created ideas (Armstrong and Lehew 2011, p.42).

Described as a "voracious appetite for novelty" (Jackson 2010, s cited in Cooper, 2010a), the social logic of a throwaway ociety(Cooper, 2010b) , the symptom of fast fashions, and many more, he current manner in which we consume is where change is needed. Sustainable development will only be possible if the throwaway ulture is challenged and there is an overall increase in the lifespan f products" (Cooper, 2010, p. 1). It is now believed that to increase products lifespan user-product relationships need to be increased nd an emotional attachments formed. Chapman (2005) describes he early stages of subject-object relationship as a "period in which verything is new and exciting" but all too often expectations are set oo high. In a very short space of time novelty becomes normalcy which often leads to disappointment. "Products are emotionally iscarded so the consumer can once again experience the emotional igh of newness"(Armstrong & LeHew, 2011, p. 44). Chapman (2010) xplains that most waste, in an emotive sense, is a failure of subject bject relationship. He remarks that there is little point in designing urable products so they can last forever in a landfill. He suggests that felong partnerships between consumer-to-product and consumer-to-nanufacturer can be formed by taking a more empathetic approach o design. By identifying areas of attachment, between design and onsumer, relationships can be formed that make it easy and desirable o care for a product during its lifetime through repair, upgrade and ervice. The aim if empathic design is to "design products that are neaningful to the user over a long period of time and thus they are ot easily disposable this often means a unique design process or o-creation with the user. The objectives of empathic design and motionally durable design are to build on a deeper understanding of the individual consumer's needs and values" (Niinimaki and Hassi, 2011, p. 1880). Niinimaki has carried out three extensive research questionnaires in Finland in 2009 and 2010, which investigate product attachments and long term use in the context of textiles and clothing. A study entitled "Empathic knowledge in sustainable design", focusing on textiles and clothing explains that "in order to promote sustainability, designers need to aim at enhancing long-term product relationships" (NIininaki and Koskinen, 2011, p.165). The study consists of two questionnaires; the results were content-analysed in regards to product attachment and satisfaction. In the first 2009 questionnaire, respondents were asked to write about their oldest owned garments and or home textiles and the reason for keeping them. In the second 2009 questionnaire respondent were asked to write a short description of the garments and textiles which for them stayed long-term in use and to give the reason why. Many of the respondents in Niinnimaki's 2009 survey identified a strong emotional bond to the oldest garment by way of a connection to another person, "they could be inherited, a present, or simply represent someone close, be they mother, grandmother, another relative or friend" (Niinimaki and Koskinen 2011, p. 169). Likewise in Kate Fletcher's Local Wisdom project, User Stories, delivered on the website under the title Users' Craft and Wisdom, is overwhelmingly dominated by attachment to garments stemming from links to other people. Grouped into umbrella categories such as My community, Transfer of ownership and Connections, many more users explain their love for the garments are due to the history embedded into them by previous owners, whether the owners are known to the user or not. An idea that goes hand in hand with sustainable fashion is "slow fashion" (Collins, 2010). Reflecting on a panel discussion on sustainable fashio held at Manhattan's Prat gallery, Collins explains the discussions were centred around a whether there is a possibility for a slower production consumption model in the fashion industry. "One really good point that Gilhart (Julie Gilhart - Barney's New York senior vice president an fashion director), mentioned in light of this question is that if we inves more history and memories into our clothing, in a sense investing mor emotionally, then maybe we could effectively slow the tempo of the industry" (Waite, 2010).

Attempts to introduce memory and emotional attachments into apparel products have been carried out for example the Colour- in dress by Soepboer & Schuurman (2011) or the 5 ways project by Early & Fletcher (2002-2003). I query whether such ideas will ever appeal to more than a niche market. They are far removed from classic design lines, colours and material; as Fletcher (2008) describes, slow design utilises classic styling and fabrics that age well. I believe the sustainability of fashion needs to be seemingly invisible in product, and appeal to a consumer's aesthetic needs. As Armstrong and Lehew (2011), explain of Verlozzi and Manzini's (2007) highest level of sustainable intervention, the designer needs to have the ability to perceive socially created ideas. An example of emotional attachment and memories embedded in mainstream apparel can be seen in the denim industry. Within the denim world exists a denim enthusiasts (affectionately referred to as 'Denim heads') who have created their own continued experience with the product by way of blogs, forums



Fade Friday – Naked & Famous Elephant 2 (8 Months

osted by David on October 12, 2012 in Fade Friday · 9 Comments

or this week's Fade Friday, we have a pair of Elephant 2's from forum
ıser novega that have seen their fair share of action. After 8 months on
he prowl, the inky dark indigo has given way to the high contrast fades
ormally reserved for jeans in higher price categories.

DETAILS

- Name: Naked & Famous Elephant 2
- Weight: 22oz.
- Fit: Weird Guy (Tapered, low rise)
- Denim: Sanforized, 100% Japanese Raw Selvedge
- Length of Wear: 8 Months
- Number of Washes: 2
- 37" Original Inseam

Before

After - 8 Months, 2 washes

and web sites devoted to the wear and fade of denim.¬ A main element of these pages are fade features, with storie and photographs of before and after shots of denim jeans. The basic information added is brand, denim weight, length of time jeans have been owned and how many and what type of washing the denim has been through. The Rawr Denim blog has a feature named Fade Friday. Here it shows denim as a new 'before shot' and the faded 'after shot' when the denim has had time to mature. It explains how long the jeans have been worn and how many and what type of washes they have gone through (Rawr Denim, 2012).

Figure 4 - Rawr Denim.2012.[Fade Friday Images and text - October 12, 2012] Retrieved from http://www.rawrdenim.com/2012/10/fade-friday-naked-famous-elephant2-8-months-2-wash/

Most Fade Fridays come with user stories of how the specific areas of fade have occurred such as, the 'whiskers' at the crotch and the 'honeycomb' behind the knee. This is beneficial for the manufacturer as it displays the on-going development of a pair of denim jeans. It also creates an example for future users of how their new denim jeans will wear and become their own individual pair of jeans. The images are telling a story and the user wants to share it. Many denim aficionados follow and comment on the progress of others. Super Future, a globa urban travel guide, runs a contest spanning two years that is a worldwide challenge of fades. All contestants wear th same contest-specific pair of Eternal's classic, fit 811, for two years. The final fade results are judged by Eternal in Japan and the winners are rewarded with Eternal compan credit. According to Rawr Denim one of the most popular pairs in the competition are worn by forum member ah_long. An article on Rawr Denim tells the story of these jeans: "Worn for the last two years by forum member ah_long, these jeans have seen a lot of wear between frequent fishing trips and an amazing travel-log. Accordin to ah_long, in the last couple years the jeans have been to Toronto, Vancouver, Montreal, Halifax, St Johns, Calgary, our home town of Edmonton, Winnipeg, NYC, Chicago, Los Angeles, Boston, Santiago, Santa Maria, Hong Kong, Shanghai, Beijing, Tokyo, Dublin, Athens, London, and more" (Sean, 2012). Currently this type of recording of 'own history' can only be found as posts on forums. However what has been noted is that there is no archiving of this information. Own history is available until the forum is deactivated but, as forums are on-line conversations, post are essentially lost until stumbled upo by chance as part of a Google search. Holding on to your clothing archive is archiving your history. In an interview Wayne Berkowitz, Founder & Producer of SuperFuture speaks of his denim history when asked what his favourite raw denim is. "I used to be an A.P.C. whore through most of the early 2000s and went through an astronomically expensive dior homme phase around 2005. Though these

ays I look like a slob and live in my jet fuel stretch chitch ksubis" as cited in Coe, 2012). Users tend to remember what they wore ecause they wear them often and commit with time and personal tyle. The brands one wore become a symbol of who the user was and heir values at a certain point in their lives. This project asserts that a narket exists for an online space where users can record the lifetime nd evolution of their personal product use. An example of market nthusiasm is the major denim forum SuperDenim on the SuperFuture ebsite. Berkowitz, the founder and producer of SuperFuture, xplains that "superDenim is 100% user generated organic content. uperFuture just gave it the airspace and paid for the bandwidth" (Coe, 012). As explained in the literature, respondents and users identified motional attachment and long time use with garments that have a re-existing history (Niniimaki and Koskinen 2011 and Fletcher, 2010). Garments with a pre-existing history are a distinct factor in product ttachment and an example of the strength of emotional attachments. Iowever the garments with pre-existing history are for the most part ifted, found or bought second hand. Existing research wasn't found about how bonds are created with newly purchased items, which constitute the bulk of what we consume. This research project is a complex combination of all aspects of sustainable design method and theory. I have developed a coherent comprehensive integrated model that opens the sustainable apparel market to a wider range of consumers of fashion and mainstream apparel. Using existing and accessible technology to achieve sustainable apparel design and manufacture the In-Use concept is aimed to be a comprehensive, integrated model. In addition, various components could be put into practice separately. The In-Use model can be applied to businesses of varying size, from micro ventures to global corporation. It is intended to run as a collective beneath an umbrella In-Use company. Pre-existing manufactures or brands would become part of the In-Use Collective, however the model can just as easily be taken up by free standing companies.

SUMMARY OF METHOD AND PROCESS

Development of the In-Use Business model began with a mixture of multiple iterative design exercises, analysis of sustainable design literature and design practice precedents in design research. Taking note from the literature and my own apparel transformation design research, I developed a solution to the gaps I could see in the growth of sustainable clothing in today's market. To test these solutions I have developed construction and manufacturing processes and designed garments that physically and aesthetically stand the test of time and offer the user ways of connecting to the products they use. Research was carried out to gain a stronger understanding of product and consumer emotional attachment. First-owner garments are items the user has selected of their own accord at time of purchase or, at a minimum, has personally chosen to utilise. Due to time restraints on this project, qualitative research was carried out and will be furthered in a future study. Three respondents were chosen; as the research is exploratory, the methodology used was in-depth interviews. This project uses semi structured in-depth interviews to explore the latent and manifest factors that determine garment attachment, and long-term ownership of first-owner garments. The interviews helped develop an understanding of factors that contribute to why we form bonds with our first owner clothing. Interview notes were recorded but future data analysis will be carried out in accordance with Rubin & Rubin's Qualitative interviewing: the art of hearing Data (2012). Other qualitative research to aid market profile included interviews with alteration specialists, to ascertain what the most requested alterations are and who the consumer is.

I used the final project from my honours degree in design as a starting point for further research in transformative design. For this project I developed garments that were given to wear-testers to record daily life and adventure travel. Using a hooded sweatshirt I designed for this project that functions both in an urban setting and in the bush, a wear tester took the garment on a trip to Nepal, the Philippines and Sydney. He was able to record his adventure in a series of images which act as anecdotes for sharing his adventure and the manner in which the marks and wear patterns developed on his garment.

his project uses denim jeans as an example of the In-Use esign model, chosen because of their global popularity nd obvious wear patterns. The design development of the enim jeans went through a process of sampling experi- nentation, deconstruction and reconstruction. Many pairs f experimental jeans were made and fit-models wear-test- d the denim tested throughout this design process. Tech- ical design modifications were carried out along the way; ll are recorded in a work book and on the website. The In- Use website itself had been through multiple style changes s the concept developed. I considered it important to de- elop a contemporary and minimalist aesthetic which will not restrict users of differing subcultures. The In-Use mode was formed by connecting many types of research: existing literature of sustainable design strategies in niche markets; how users are creating their own continued experience and emotional connections to garments and design devel- opment practice. Low risk ethics form was carried out to ensure safety for all participants (fit models seen in photo- graphs gave permission for images in this project).

In-Use

Sustainable Apparel Design

In Use apparel is the concpet developed for this masters of design. Below i Present a table of the compnents that make The In-Use concept.

CLOTHING

D4re

Design for reassembly

Increasing product lifetime

- Mass produced base product
- User creates bespoke.
- Individualisation occurs after purchase.
- Repair
- Modify
- Redesign
- Chainstitch
- Gusset
- Tangible notches

In-Use Website

Platform for users to develop emotional attachments to products. Increase user experience post purchase. Shift in value from novelty to use

- Every item logged on to the website on the DOP – date of purchase
- Track and archive garment fade and maturation recording own history photographically daily, weekly, monthly, four monthly: user choice
- Share and promote individual outcomes with other users on web site and social media
- Extend product lifetime and user satisfaction offering examples of other users' wear results as 'guidelines' of how the end result is achieved.
- Educative process regards to sustainability. Promoting not ordering environmentally focused consumption
- Creating strong user-manufacturer relationships
- **Accountability**

Manufacturer accountability

Manufacturer takes all precaution to prevent product ending up in the landfill

- Every garment produced is given an individual code and is able to be tracked.
- Creating reverse logistics of unsold stock as 'Re-calls' to be re-designed.
- Sends prompt to user if the In-Use garment seems to be out of action
- Change of owner ship if garment is re-sold as a pre-loved item
- Provides repair and modification services to prevent early replacement
- Initiates use value for consumers – consumers desire to keep In-Use items for as long as possible. The longer the history, the richer the fade the higher the value.

User accountability

Consumers desire to keep In-Use items for as long as possible. The longer the history and the richer the 'fade' the higher the value.

- Garment logged and User given personal page on the In-Use website
- Leather tab is branded with date of purchase
- Record own history
- Visual recording of all items the user is 'working on. Can be photographed daily at home or as user pleases in store.
- User earns a 'notch' every four months of ownership and after every repair or modification to develop a visual record of wear.
- If bonds are not formed with the garment users have the option to on-sell, trade or lend items with other members on the website.
- Some members of In-Use may choose to only purchase used In-Use items. Reasons being they may appreciate a particular fade, not enjoy breaking in an item, or feel a connection with garments that have a pre-existing history.

In-Use Venture Concept

In-Use brand – developed for the sake of this project as an example of the In-Use concept.

- Locally made until experienced growth
- User experiences local services and participatory design in the process of their item becoming bespoke.
- Repair and modification happen in store. The user can monitor their highly valued worn in item.
- Where user can not be present the company offers means of reverse logistics and personal appointments can be scheduled to take part on-line.
- Once developed produced off shore, reducing cost of base garment.
- Off shore production is a very small percentage of product's life. All subsequent repair and modification are local.

In-Use Collective

- Established brands participate in the In-Use Movement.
- Mass produced or produced as per manufacturer's current production.
  Taking part in the global factory reduces cost of base garment, subsequent cost of repair and modification more 'manageable'.
- Shared In-Use web space
- Shared local hubs for repair and modification.
  Each manufacturer has guidelines for repair and modification that are followed by the In-Use hub
- Local hubs could exist as participating retail stores; In-Use will educate and supply out-workers, or
- Local hubs could consist of retail space of collective of manufacturers. Repair and modification done in store.
- Global local hubs. Passport notches, Logable on website.

IN-USE

Sustainable Apparel Design

D4re – Clothing Design for Reassembly

I have developed Design for Re-assembly (D4re) for this master project with the aim of creating easily repairable and modifiable clothing with minimal alteration to traditional construction techniques. D4re is a strategy that enables inconspicuous repair which extends the physical durability of the garment. To deal with the ever changing style of clothing D4re allows for the modification of fit and style. This eliminates early disposal due to aesthetic obsolescence, a symptom explained by Burns (2010) as consisting of two components – wear and tear and the transience of fashion trends.

D4re- Design for reassembly, is clothing designed by the manufacturer to be easily disassembled for the purpose of being re-assembled. It incorporates modular like panels that the garment fit can be re-styled through. Specific placement of such panels allow for areas of high wear to be repaired easily and inconspicuously. Extending the use of the chain stitch to cover more areas than the traditional in-leg and centre back seams, D4re utilises the 'negative aspects of this stitch to its advantage. Designed for this project D4re is demonstrated in denim jean design.

n-Use Denim D4re design

n-Use denim jeans are made up of a base shape with interchangeable usset and yoke pieces. The base fit consists of front and back legs and y, pocket shaping may differ between ranges. The base fit does not iffer between styles. The fit and style is modified by the manufacturer hrough the gusset. The user purchases a pair of In-Use denim of the tyle that suits them best. They are then able to choose from different usset shapes that will alter the style of the jeans.

- A short skinny gusset adds only a minimal amount to the base cut resulting in tight fitting jeans.
- A short gusset is slightly longer and deeper than the short skinny gusset. This allows for a roomier thigh girth and extends the crotch depth, allowing for a more relaxed fit.
- (Both the short skinny gusset and the skinny gusset are the same fit form the knee down)
- A long skinny gusset extends from crotch to hem. This widens the leg and creates a fitting straight leg style.
- A long gusset widens the leg and increases the crotch depth creating a relaxed straight leg style.
- The yoke is also interchangeable. Like the gusset the yoke can be removed and replaced. Changeable yoke depth is for style purposes and functionality, for example, urban cyclists may desire a higher sitting waist line at the back.

Other alterations and repairs are made possible by the ease of disassembly but may be permanent modifications to the original base cut. Examples of this may be darning wear holes on the base denim or adding knee articulation.

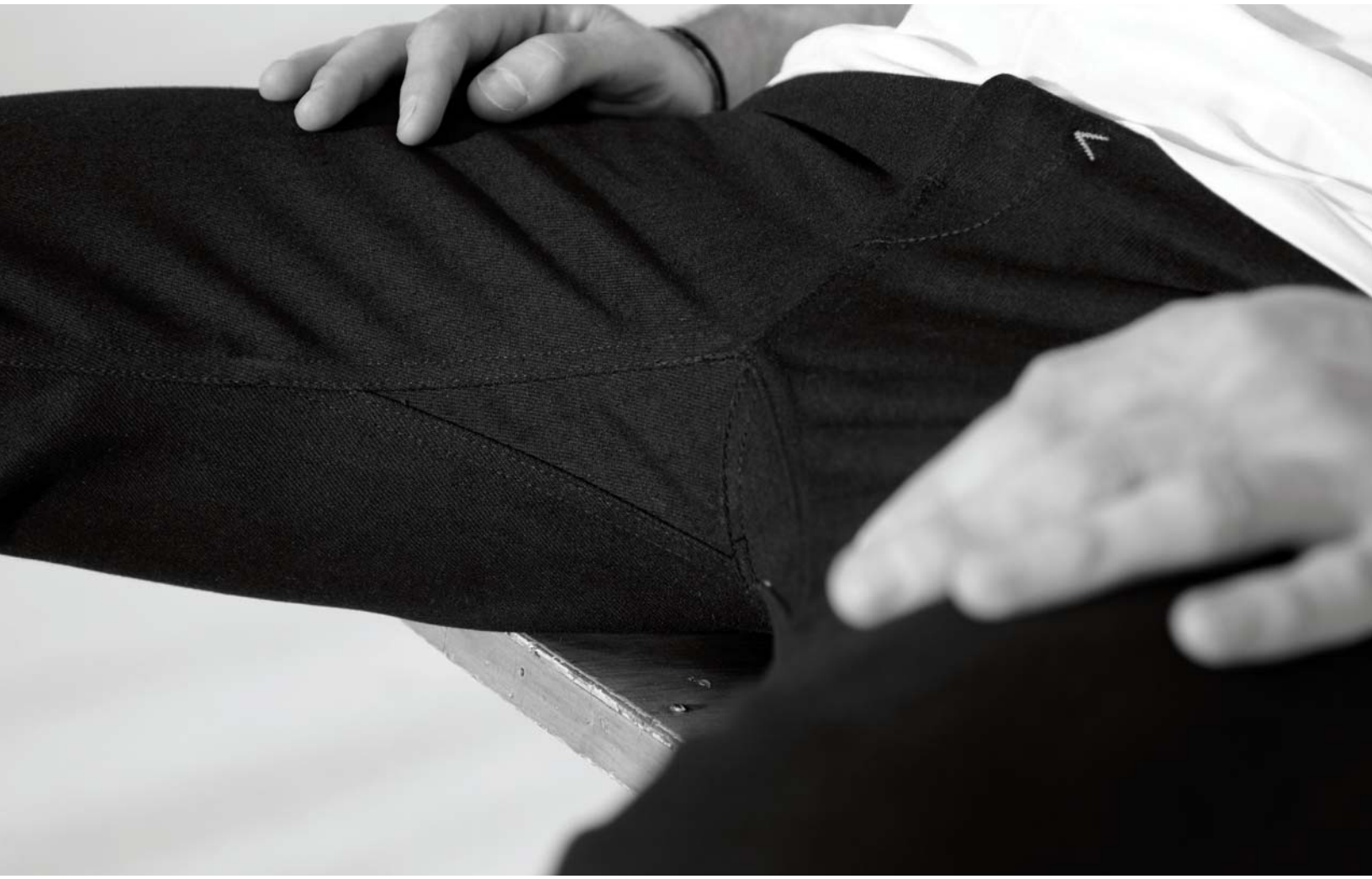


Figure 1 - Common areas of wear and tear In denim Jean

he Design Process

he D4re study began by investigating a worn pair of denim jeans. his pair of denim was deemed to be at the end of their useful life by he wearer, and was headed for the rubbish bin. The denim had been wned for two and a half years, were worn and washed regularly. When questioned why the wearer was set to dispose the answer was hat although he had a connection to the jeans, he felt he had already eld onto them for longer than he should have. Over the four year eriod changes in style meant that the user felt like the legs were too ide in comparison to the slimmer line of today and wasn't happy earing them in an urban setting. In regards to the holes and wear ears the user was happy with the way they looked but didn't like the rotch rips. In the early stage of the crotch wearing thin the user felt k about it as it was not too obvious. But as the hole grew and denim ashions changed the wearer felt it was time to let the jeans go.

After evaluating different areas of wear the jeans went through a econstruction process. Due to the weight of the thread used in the onstruction of denim jeans, pulling the stitches from front and back as quite arduous and time consuming as the thread does not snap. ttempting to rip the seams the denim tore as the jeans were relatively ld the fabric had become thin, this resulted in tearing the denim. In erms of manufacturer repair disassembly needs to be fast and clean, either of which these methods were. The in-leg seam and centre back seam had been sewn together using a double thread, single needle chain stitch. Due to easy unravelling of the chain stitch, a couple of long pieces of strong thread and several shorter pieces were salvaged and wound onto bobbins.

Attempts were made to reuse the thread on a plain sew industrial machine. Due to the weight of the thread and the short lengths the knots where the salvaged pieces had been joined were unable to pass through the tension plates resulting in a low quality stitch. Experimentation re-using the thread on the bar tack machine also proved to be unsuccessful.

Modular pattern drafting

From here I began drafting trouser patterns to experiment with a modular construction. The use of a modular drafting is to enable

epair and modification of smaller areas of the garment as opposed to aving to replace whole panels or the whole garment. Modular design vailable in the market today such as this has been developed for the onsumer to be able to modify into different styles, mostly through use f unzipping components. This idea is effective in its offerings but it difficult to create invisible variations to classic styles. For example ong trousers that zip off to become shorts are very difficult to design ithout the trousers looking like active pants.

Another issue is that the garment design has not followed classic styling or design and has followed current trends. It is unlikely that all styles will be worn for long periods of time; once the style has been created it cannot be changed. If the dress is a purple sun dress then a mini skirt then a maxi dress, all styles are of a current season's fashion trend, so whilst they are interchangeable in form now, all forms may fall victim to what Brian Burns (2010) terms aesthetic obsolescence and become out dated within Figure 2 - In-Use denim jeans, worn in. In-Use, 2013.

Gusset drafting

Beginning with cotton drill a discreet gusset was drafted into the rotch. The aim was to investigate how fit could be altered through he crotch gusset seam, the most discreet seam on a pair of jeans, nd to investigate how modular pattern cutting can create garments hat can be repaired and altered discreetly, and with ease to make it iable in higher volume. The Gusset in denim jeans was seen first as an lteration to denim jeans for cowboys when straddling the horse. Cut n the bias to allow movement the next notable trousers with a crotch usset were advertised as action pants, catapulted to stardom by Chuck Norris.

The gusset also became a mainstay for hiking and adventure pants. his is due to freedom of movement, but also to eliminate seam rub in the inner thigh region, which can create serious chaffing when walking for extended amounts of time. Off the urban wear radar for approximately 20 years, the gusset has made a comeback of late specifically in trendy cycling jeans. Companies such as Rapha and SWRVE create urban cycling jeans that feature the crotch gusset.

The first fitting of the gusset was successful, in terms of fit. Design lines were drawn on for extending the gusset higher up the centre bac to accommodate wear and tear repairs in the seat of the jeans.

Slight alterations were needed to the long gusset. Both short and long gussets had been drafted to be interchangeable with in a base cu of the jeans. The short gusset was intended for a slim fit skinny jean, while the longer gusset adds to the girth of each lewg and lengthens the crotch, creating a wider fitting style.

Chuck Norris jeans (Denimology, 2006)

Figure 4 - Toile experimentation - In-Use Denim, 2013

Figure 5 - Short skinny gusset - In-Use Denim, 2013



Figure 6 - In-Use toile experimentation. articulated knee. In-Us
Denim, 2012

Knee articulation

The next step was to create modular pieces to the garment for choice of alterations. Starting with an articulated knee a knee 'patch' with shaping was mocked up. A successful fit and keenly accepted by the wearer who is also a motorbike rider. The articulation is useful and the patch has an attractive design line. The negative factor is in its permanence. A patch requires seams meaning that unless the whole front leg panel is changed the knee will always have seams. This affects the ability of a more aesthetically complete modification and it is far from the classic design line.

Seams

In order to have repair on large scale be economically viable it needs to be easy, clean and fast to disassemble. The initial thought was to use a needle and looper thread chainstitch on all seams. This would allow easy disassembly with no risk of tearing fabric. The first attempt at all seams being stitched using a chainstitch used a heavy weight thread in the needle and a standard on the looper. Many issues developed with the machine skipping stitches. Places of concern were corners, inter-crossing of seams causing bulk and sharp curves. To reduce these issues a few different factors needed evaluation one being thread. The different weight of thread was causing uneven timing. A chain stitch machine does not cope well with the stopping and starting that is necessary when stitching short seams and turning corners. During experimentation it was found that if the machine wheel was turned by hand, enough to almost end the stitch, the machine is more likely to pick up the thread and not skip stitches. This works on right angled corners but not well enough to expect it to work in mass production.

Implications for the chainstitch machine

Constructing the first pair of fully chain stitched denim jeans it was observed that it could be commercially viable if the industrial machines were modified specifically to manage with problem areas. The risk factor in going into production with a temperamental machine is that time will be taken up fixing. Another very real risk is that if the machine skipping goes un-noticed the whole seam is likely to unravel.

Using the so called negative factors of the chainstitch to its advantage In-use benefits from the ease of unravelling and the large amount of thread the chainstitch uses. After experimentation with the chainstitch machine and not achieving overall positive results, re-evaluation was needed in regards to the necessity of all seams needing to be chain stitched.

Ease of unravelling is the positive and the negative of the chainstitch machine. It does unravel easily but in its current use in commercially produced denim jeans it doesn't seem to cause any issues. The

technical right side of the stitch is unlikely to get caught as it is flat. The thread is also of a heavier weight than general dress thread so is unlikely to snap. All chain stitch seams have multiple rows of stitching making them stronger, and less likely to reveal the body were a stitch lie to unravel.

The second so called negative factor of the chainstitch is its use of thread. It does use more thread than the lock stitch however this is an advantage in In-Use denim. Where long seams fall the thread is re-used, shorter seams are too short to re-use the thread. I have eliminated use of the stitch on the fly construction and topstitching of the fly. The ends of the waistband will not be chain stitched and the back patch pockets will not be topstitched nor attached to the back pieces using a chain stitch. These areas are the least likely to need repair or modification, are high risk areas for the chain stitch machine, and are short thread lengths meaning the thread is not re-useable.

After determining which seams will be using chain or lock stitch, it became apparent that In-Use Denim was not at the same level of construction as other international denim brands. Seams needed to be flat felled and overclocking minimised. Minimising overclocking was to use less thread and to create a higher standard finish. As a local producer creating hand flat felled seams is a time consuming process which translates into a higher retail price. In a commercial factory a flat felled folding machine will eliminate time consuming procedures. The benefit of hand felling is extra stitch runs meaning extra strength.

Re-use thread in notches

At time of purchase the signature leather tab is branded with the date of purchase using an interchangeable electronic heat branding tool. Each time the user gets a repair or modification the garment is notched. This Notch utilises thread salvaged from In-Use alterations. To measure length of owner ship, the garment is also notched every four months. The notches appear on the inside of the waist band, a nod to notching one's belt, and an In-Use arrow is added to the back of the garment so it can be seen when worn. Users of In-Use will instantly recognise the symbol and will be able to gauge the effort and time that has gone into the garment. Tangible recognition of the length of ownership and repair is a way of extending the user experience after purchase and creating an emotional attachment to the garment.

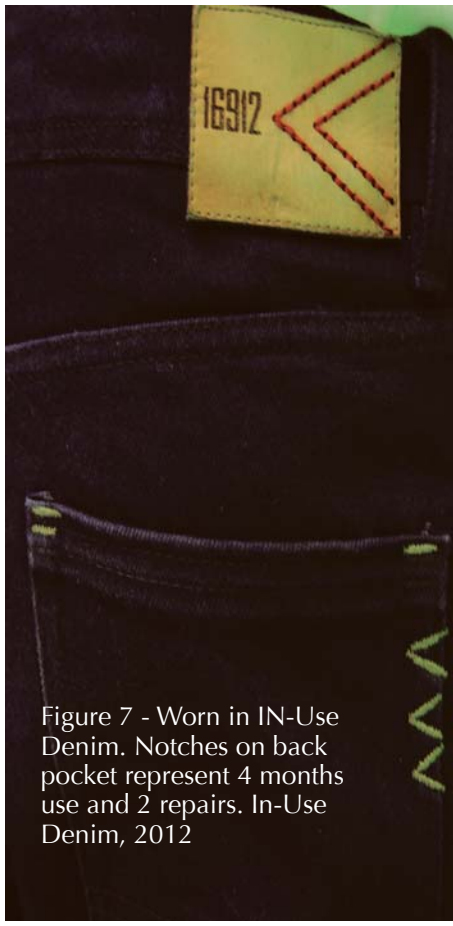


Figure 7 - Worn in IN-Use Denim. Notches on back pocket represent 4 months use and 2 repairs. In-Use Denim, 2012

Figure 8 - New In-Use denim - purchased 16 Sep' 2012

In-Use

Denim

WEBSITE

Why the website/why In-Use

Designers cannot craft an experience but only the condition or levers hat might lead to an intended experience"(Forlizzi & Ford, 2000). he In-Use website is the platform that creates longer user-product elationships and generates user-manufacturer relationships. As orlizzi and Ford (2000) describe, designers cannot design emotional ttachment into a garment but they can offer pathways for connections o be made.

Denim enthusiasts have created their own continued user experience y way of on-line forums and websites. These spaces are completely ser created and exist purely because of the user's love of the product. he In-Use website harnesses this enthusiasm and sees it as an pportunity to offer consumers continued and more enjoyable use xperience. At the time of purchase of their first In-Use garment, the onsumer will become a member of the In Use community. They will e logged in and given a page of their own which will hold information bout every garment they own from the company. Alternatively the user an sign up prior to purchase to explore experience and become part of the community before purchasing their first item. Once purchased, using photographs and text, the user is able to follow their garment fade and maturation. The website allows the user to record, share and brag about their fade results and the routine, adventure and lifestyle they live that lead to those results. At the time of purchase the user is photographed wearing the brand new item, this photograph and is added to the user's online in-Use wardrobe and specific information about this garment can be accessesed on the user's personal 'Your ite page.

In-Use supplies a canvas backdrop with specific footprint positionir that is located in the dressing room of all In-Use stockists. The User ca return to the In-Use space to be photographed wearing the garment a often as desired. Alternatively the user can download the 'Poseprint' and can photographically log the wear of their denim at home.

IN-USE CLOTHING

About In-Use
Design methods
Your history
Our clothing
Your clothing
Brag
Share
Trade

>

My Denim

WHAT: In-Use Denim 16912
WHEN: September 6, 2012
WHERE: Welington, NZ
HISTORY: fresh
WASHES: fresh
FIT AT PURCHASE: base cut, high waist short, gusset
WAIST: 29”
INLEG:
DENIM: Raw indigo - 10oz

IN-USE CLOTHING

My Denim

About In-Use
Design methods
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Our clothing
Your clothing
Brag
Share
Trade

WHAT: Morgan Denim 16912
WHEN: Jan 6, 2012
WHERE: Home photo NZ
HISTORY: 4 months
WASHES: 1 machine wash
FIT AT PURCHASE: Base cut, high waist, long slim gusset.
WAIST: 29"
INLEG:
DENIM: Raw indigo - 10oz
MAKING MY MARK: Ha, that awesome knee graze. I work for Weta and was setting up our Born 2013 show. I fell off a ladder whilst hanging balloons. I didn't look cool at the time, but I do now!
MODIFICATION:
I love these jeans they are ridiculously comfy and the deep yoke (high waist) makes my bum look awsome! I'm not that happy with the way they've worn in though. I bought the long slim gusset and would prefer them to be skinny. Can I change the gusset to short skinny?

In-Use offers users a space to log and track own garments. At the users discretion they are able to share their 'hard work' (their routine and lifestyle that created the fade of their denim), adventures and lifestyles with other members. On the item specific page users are able to upload images of fade but also images and albums of experiences had whilst wearing the garment e.g. travel. Alternatively users are able to link to albums on their social media sites from the In-Use website. Linking to social media will increase the likelihood of users sharing stories; ease of involvement is a very important factor in sustainable fashion and the In-Use concept.

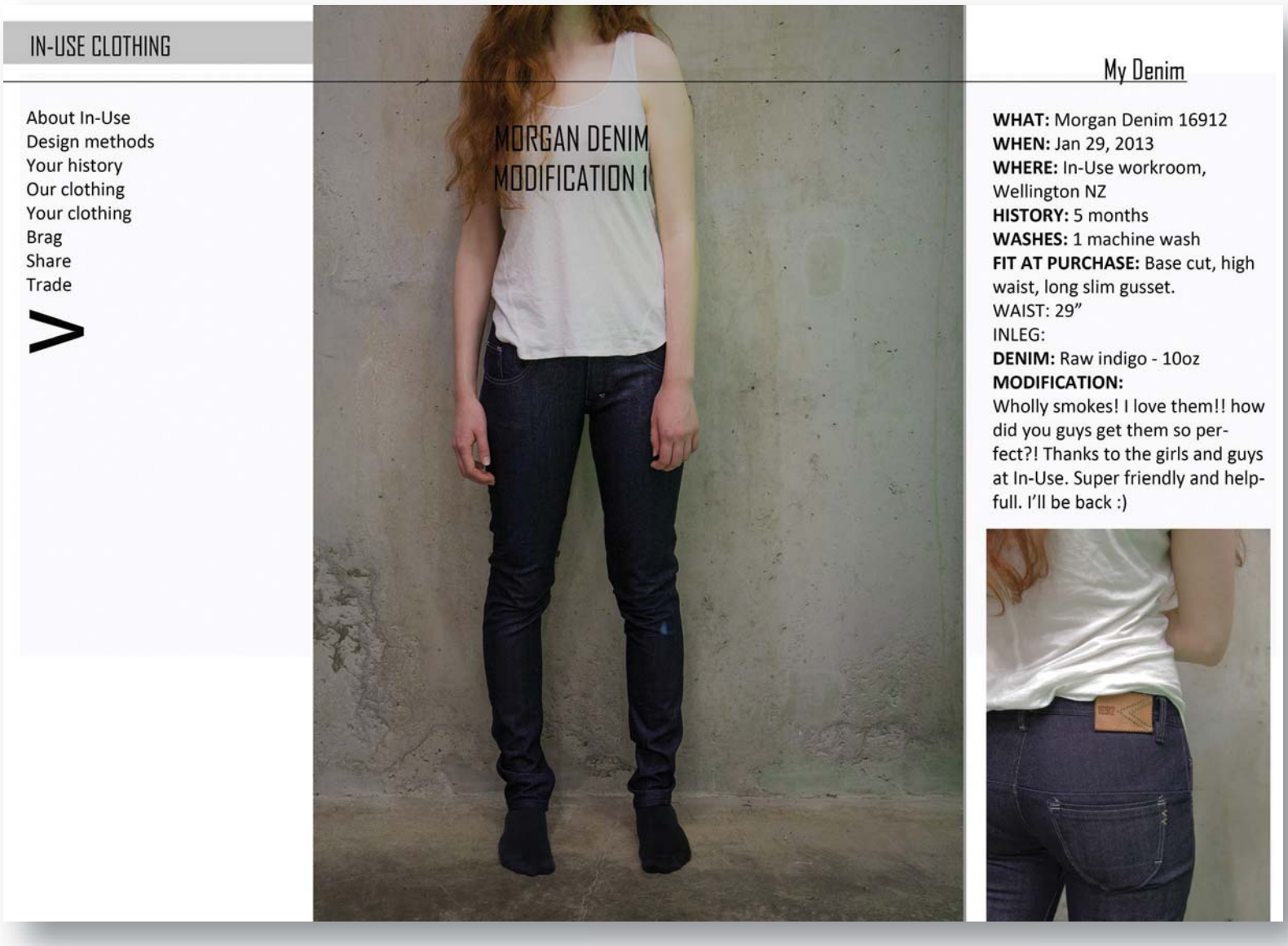

Figure 3Figure 5 - Your item page, created on the date of the first modification (In-Use Clothing, 2012)

haring user stories and images of fade enables other user to decide n their own product care and maintenance in accordance to the vear results they desire. Niinimaki and Hassi (2011) suggest that nanufacturers could provide consumers with information about ow long the garment is intended to last, to increase use satisfaction. ach newly purchased In-Use garment will come with basic care nstructions and guidance on how to achieve basic wear patterns. In me 'Famed Fades' will be generated by users sharing their images and n In-Use panel will decide on the top fades to display.

Users can either choose to mimic the routine that developed the articular fades or, specific instruction, from the In-Use team, will be upplied to users of how they can imitate these fades using a sand aper and soak process. Participation allows the user to be involved n the bespoke design throughout the life time of the garment. Kate letcher's (2012) Local Wisdom Project focuses on the craft of using arments, a process she has coined The 'Craft of Use'. She explains as "increasing the quality of people's fashion experience within the mits of the clothes they already have, it has the potential to promote elf reliance and a more satisfying and engaged use of recourses" Local Wisdom section, para. 1).

Under the 'our clothing menu' is an option of choosing Current Collection or Archive. Whilst In-Use does not particularly do seasonal anges, a range of In-Use will always be in production and can be urchased on line from the Current Collection page or in store. One f the main request alteration specialists get from users is to copy a avorite but worn garment because it is no longer available from the nanufacturer. On the archive page is a record of all In-Use garments ver manufactured, the user is able to search through the archive, rder an archive item and it will be made to order. Another aspect of he In-Use sustainable apparel model is that over production does not esult in waste. In-Use aims for none of their garments to end up in the andfill, all un-sold stock is return to the manufacturer and the retailer ets a percentage of credit to be used toward their next wholesale urchasing order. D4re allows the unsold stock to be disassembled fficiently, restyled and resold as new garments but with a pre-existing istory. All reassembled In-Use denim comes with the first notch pre-mbroidered and information of re-assembly is automatically added to he user's personal 'your item'.

he Trade and exchange page on the In-Use website

he Trade and Exchange section within the concept offers a platform or consumers/members to exchange or on-sell their garments if they ave not managed to make a connection with the item. This reduces he chance of garments being disposed of before their useful life time s over. Users are also able to sell faded Inh-Use jeans to consumers who perhaps don't have the lifestyle or patience to create the desired ade. Certain fades will fetch various prices, the item in the 'Famed ades' section is likely to sell for a premium. An example of consumers urchasing worn denim can be seen in the A.P.C Denim Butler range. Users bring in their worn and faded A.P.C jeans and trade then in or 50% off a new pair of A.P.C Jeans. The 'Butler' or original owner nitials the worn jeans, A.P.C then washes and mends the jeans and ells them in store as part of their butler range (Hypebeast, 208; Yu, T, 008)

Lending within the In-Use community, particularly in the case of outdoor clothing or evening wear, will be trackable and logged on the user's personal page. This gives the user the chance to grow the history of their garment and create stories around clothing. Listed on line, it also gives the user the opportunity to trial garments they may b interested in owning without cost to the company. Lending will run on a user beware and borrower repair basis. Lending between consumer of the same manufacturer, offers the opportunity for users to trial products at no expense to the manufacturer. The lender benefits by wa of adding to the history of their item as all stories and adventures will be logged by the borrower.

About in Use – The In-Use website menu bar

To describe the In-Use concept to the market a very casual but informative description of the concept of can be found by exploring the web space. Below is the text found on the website explaining the concept to the user.

About In-Use

How you and In-Use begin: You're at the store and itching to find a new pair of jeans. You're ready for commitment, you want a second skin, you choose well, you choose In-Use. The In-Use leather tab is branded on the spot and you will become part of the on line In-Use community. The brand is your date of purchase; you'll be wearing these for the next two years, three years, four years or more. Every crease and fade mark is a representation of your routine, your body, your experiences. When people think of you they see you wearing In-Use Denim. Your social media site is bursting with pictures of you and your denim In-Use.

Design for re-assembly lets In-Use repairyour jeans without looking like they've been repaired. The fatal crotch blowout should not signify the end of an era. Nor should the end of an era be the end of your jeans. The In-Use crotch gusset allows discreet repair in the in-leg by replacing the whole gusset, we match the fade so it's invisible. The gusset also allows for change in shape. Even the most classic of design change, and In-Use allows for that without having to bid your faves adieu. You can re-create your denim to how you want it, our base cut is altered through the gusset, if you've worn skinny and want to go straight we can make that happen. Collect notches every time you repair or modify your garment and every four months you've spent together.

By tracking your jeans on-line you keep a journal of how they are developing. Either shooting images from home or in store, as often as you like, they are logged on to your In-Use web page meaning you ca watch your fade develop. You are archiving your history, keeping a log of your denim history and sharing your hard work with others. Becaus your fade is a representation of your adventures, your adventures should be represented. From your In-Use page you can link to albums on social media sites and display how your fade was created, and vice versa.

D4re construction methods mean we can take advantage of the global actory. You buy mainstream and create bespoke. We deconstruct to econstruct, to suit your needs. We are committed to sustainability nd believe sustainable garments don't need to look any different than vhat you are wearing now.

n-Use aims to help you hold on to your items for as long as possible, ve have goals of not letting our products end up in a landfill. We ever over produce we re-assemble.

Philosophy

Clothing grows with you, it contains your history - we want to make to nake both last longer.

Your routine and escapades give your clothing life; every wear mark, epair and fade represents you. Growing with your garments means olding on for longer, logging that growth creates a library of who re, who you have been and what you've done. Our goal is to provide lothing that becomes a part of you and represents you: a self-made espoke.

We know quality craftsmanship and classic design is worth its weight n gold. One well crafted item you connect with replaces many ow quality trends that you don't. We've developed innovative ways f using traditional construction techniques, blended with quality meless style, allows us to mend to look like there was never an issue, nd modify so you evolve together. All aspects of In-Use is brought ogether and packaged in a web space, here your items become your wn. See all the In-Use clothing you own in 'Your Drobe', add to your istory and keep a record as you and your clothing evolve.

Sustainability

Design should not be restricted and innovation can't go backwards. tyles change and so do we. We're all about sustainability we even ave our own Re-'(re-assembly), but we do it first so you can think bout it second. We believe sustainable clothing starts with us, as esigners it is our responsibility to provide considered apparel.

nnovation is something to be excited about, sustainable design hould not be restricted by materials or yield; it's how you continue to se those resources that count. If you're already seeking sustainable lothing great but, we know due to style, price and availability, the ajority of consumers don't. We know because that was us, that's how n-Use was born.

Consumption rates and the speed of fashion are two of the main auses of the mess the apparel industry is leaving behind and we're retty keen to slow it down. There is a lot of clothing on offer at a heap price that looks good the first time it's worn, but doesn't last nuch longer. In the current cycle of fast fashion, consumption and roduction work in tandem. As consumption rates increase production rates increase further. Masses of over produced, unsold stock traverse locations until the price has dropped so low it starts to cost the retailer This coupled with low price apparel being seen as 'disposable' is how thousands of tonnes of apparel goods end up in landfills every year.

WHAT WE DO

In-Use Denim doesn't get left behind

In-Use Denim doesn't get left to the retailer to deal with. It is our responsibility as practicing sustainable designers to be accountable for any waste. We recall our unsold items, disassemble then reassemble into our new style. To find out if your IN-Use Denim has been re-assembled look it up on your 'your denim' page where you can find the history of your jeans. To find out in store if you're looking at a virgin In-Use pair, check out the tab. If there's a notch your denim's story has begun.

We don't leave our clothes to retailers to dispose of and we don't leave you accountable either. If you aren't getting along with any of your In-Use items, log in to the trade and exchange page on the In-Use website and find someone who will. Find pre-worn items with embedded history waiting for you to carry on the journey. As soon as you purchase a worn in, In-Use item from another wearer, owner-ship changes and the item is placed in your 'drobe, under your name with the DOP (date of purchase). When you are ready, find your local In-Use hub and get your picture taken. Otherwise print of the footprint take your own pic' and send it to us, we'll load it for you.

How we do what we do – Design methods

D4re –Design for reassembly

Styles change and so do we. That's why we've come up with the base cut that can be modified to fit your style as it develops and evolves. Our D4re (design for reassembly), enables invisible repair and modification, not to mention less risk of waste. You choose how to modify, repair and alter. The maturation of you with your clothing builds natural patina and a fit tailored to you: you create bespoke.

Gusset

We didn't create it we just made it better. Originally for cowboys and action pants, the gusset is now a popular feature in trendy cycling jeans and hiking pants. We cut it on the bias of the fabric which mean it has slightly more stretch to make it easier to move. We can replace this bad boy so you can keep wearing your denim long after you've had a crotch blow out. We modify the gusset to alter fit and style. You change, so should your clothes. Chat to us, and then collect your next notch.

The Chain stitch

Garments like denim jeans already utilise the chain stitch, we take it further. It's tougher than the usual plain sewn, lockstitch seams, and is used in areas that are under pressure, generally the in-leg and centre back seam. We're fans of the stitch because it's authentic, it's tough and it's easy to disassemble.

We use the so called 'negative' properties of this stitch, it unravels easily and it uses more thread thana plain sewer, to our advantage in In-Use Clothing. Easy unraveling equals' clean disassembly, and long lengths of thread that we re-use in re-assembly.

When we disassemble, we do it clean

We don't rip seams; broken stitches are messy and risk tearing your fabric. The chain stitch un-does clean, it's tough and you have to know how to unravel it to take it apart. It uses more thread but that's how we use less. The chain stitch unravels leaving one long piece of thread, and another even longer. We re-use these pieces in our fly fronts, back pockets, side seams and notches.

Figure 4 - In-Use short slim gusset (In-Use 2012)

Accountability

Manufacturer and user

n-Use ensures it is accountable for everything it produces. Design for eassembly not only allows for repair and modification, it allows for verproduced unsold items to be re-called and re-designed. Should he company be wholesaling to retailers, In-Use would offer a certain ercentage of credit to the retailer and re-call unsold stock to be re-istributed after redesign. By keeping a record of every item purchased he manufacturer is able to track everything it produces, and ensure its roducts do not end up in a landfill.

The 'ownership' of each item after purchase is transferable, allowing sed items to be sold, accountability to be transferred and ensuring the em is still in use. The Trade and Exchange section within the concept ffers a platform for consumers/members to exchange or on-sell their arments if they have not managed to make a connection with them. his reduces the chance of garments being disposed of before their seful life time is over.

Lending within the In Use community will be track-able and logged on the user's personal page. This gives the user the chance to grow the history of their garment and create stories around clothing. Listed on line, it also gives the user the opportunity to trial garments they may be interested in owning without cost to the company. Lending will run on a user beware and borrower repair basis. In the case of a multi-company In-Use initiative lending between consumers of the same manufacturer, offers the opportunity for users to trial products at no expense to the manufacturer. The lender benefits by way of adding to the history of their item as all stories and adventures will be logged by the borrower.

In-Use Venture Concept

Production and service

Niinimaki and Hassi (2011), explain that business models are still linked to the volume of sales and profit alone. Therefore, even if manufacturers are following sustainable production models and using renewable resources, all efforts are made futile by the increasing rate of consumption. Currently, sustainable consumption is viewed as leading to reduced profitability and reduced profit. They convey that strategic innovation looks at who the customer is, what products and services should be offered and how they should be offered. Creating new consumption patterns "is not merely about rethinking the fundamentals on the supply side, but also redesigning the business on the demand side, e.g. in the form of user experience and rethinking value creation" (Niinimaki & Hassi, 2011, p. 1876).By introducing

Product Service Systems (PSS) "Businesses may compensate for lost revenue from material goods by selling unique services that support their products" (Armstorng and Lehew, 2011, p.50). The characteristics of PSS are direct and enduring contact between manufacturer and user, collaboration of companies and support networks (Van Halen, Vezzoli & Wimmer, 2005).

The In-Use concept is presented for the case of this masters project as a singular brand this is to be seen as an example of how the concept will work. The concept itself is not limited to a single company; It is intended to be a collective of manufacturers all taking part in the In-Use endeavour. A large part of the In-Use concept is making sustainable clothing available and desirable to a wide range of users. In-Use clothing is mass produced on a production line and the 'bespoke', or product services, begin post purchase. To keep costs low and quality high, In-Use manufacturing does not directly involve the consumer the way bespoke tailoring does. Cramer 2011 suggests that consumers of participatory design, such as bespoke products, naturally feel a "connection with items they have had a hand in designing" (Cramer, 2011, p.437). While this statement holds true many users can not afford the time, money or patience that purchasing bespoke requires. Co-creation or involvement in the growth of a product create a bond between product and user, increasing the rate of care and repair and making disposal more difficult (Niiniamaki & Hassi, 2011; Chapman, 2009; Van Nes, 2010). In-Use offers lifetime contact with the user as all garments are logged on the In-Use website and on-going involvement by way of repair and modification of garments. Loss of revenue from finished product are made up through the cost of repair and modification by the consumer, it is also replaced by the continued relationship between user and manufacturer which is likely to result in added and repeat purchase. As well as remaining connected on-line users are able to connect with the In-Use community in person

oth locally and internationally. In-Use offers repair services by way f the user coming into the local store and discussing their request r, if the user is not in travelling distance, reverse logistics and Skype ppointments are arranged by the In-Use representative at the retail te. By having a local space and being able to physically communicate ith staff about their personal items, users get a sense of consuming ocally. If the company is small being local may already exist as anufacturing is likely to be taking place on site or at least in the ountry of origin. As the company experiences growth the advantages f offshore production will be taken advantage of. In-Use garments etain the benefits of being local as all repairs, retail and manufacturing akes place locally. In-Use retail and repair can be said to be a globally ocal system. In-Use hubs are located internationally wherever an In-Use item is retailed. In-Use hubs consist of outworkers who are trained, nd supplied with the necessary equipment, to carry out repairs and odifications in accordance to the manufacturers requirements. If emand is high in store service sights will be developed. Retail staff ill be skilled to assist with fittings and advice or Skype meetings an be set up in store directly with the manufacturer. Global hubs upply the user another pathway to log their travel and enhance their dventure. The In-use global passport is a means of connecting the user ith In-Use international and creating desire to visit In-Use hubs when avelling. Stamps will be added to user's specific repaired or modified ems on the web space and a notch added to the item itself. All items urchased have the country of purchase stated on the item's web pace, adding proof to the anecdote.

The singular In-Use denim company was created as an example of how the system works. The In-Use concept itself is designed to be made up of a collective of existing manufacturers. Manufacturers will choose their brands, if they have multiple, to be a part of the In-Use company. The benefits to the manufacturer is the relationships they are able to form with the end user and their outward efforts to sustainability are visible to the public by offering repair ad PSS. All repair and PSS is organised and carried out by the In-Use company which stands a separate entity from the manufacturer. In-Use consists of a web space, and repair faculties around the globe taking charge of repairs. The user's online In-Use wardrobe will contain garments from all participating manufacturers. Repairs, and reverse logistics wil run out of this joint 'in use' company. Trade and exchange becomes an invaluable source of market information as users will discuss lend, share stories and trade clothing. Links to official manufacturer web pages and fade searches within the In-Use web space will serve as advertorial and as an introduction to users of brands they may have otherwise not known of. It is an affordable means for small and large companies alike to broaden their global market share. Very minimal alterations need to be made to existing manufacturing processes and garment specifications, in order to successfully create easily disassembled products for re-assembly. Manufacturers choose a range of garments to become In-Use, if they desire they can set specific guidelines for repair and modification and the In-Use company will comply.

Conclusion

he apparel industry is no stranger to waste. Low quality, over roduction, and transient trends are all factors that make up the egative effect the apparel industry has on the environment. Traditional ethods of dealing with negative impacts are deemed to be symptom ased (Chapman, 2005). It is now understood that the main factors hat will lead to a more sustainable apparel industry are a reduction n consumption rates and increasing the lifetime of apparel products. VRAP (2012) states that approximately 30% of clothing in an average onsumer's wardrobe has not been worn for a year and extending the verage life of clothing by just three months would lead to a 5-10% ecrease in each of the carbon, water and waste footprints. A shift n value from novelty to use, focusing on emotional attachments to arments, creates user-product bonds which increases product care, epair and reduces the rate of replacement (Capman, 2005; Armstrong nd Lehew, 2011; Van Nes, 2010; Niinimaki & Hassi, 2011).

ims were achieved in this project in the creation of the In-Use ustainable apparel design business model. The website allows for the acking of In-Use garments and consequently the tracking of one's wn history. Recording garment use opens pathways for emotional ttachment to the products; by tracking garment, lifestyle and dventure the user creates a history of themselves and the garment. ervice systems such as repair and modification become integral arts of the characteristics and lifetime of garments. Repair represents ommitment (proof of which appears on the user's personal In-Use ebpage and physically on the denim jeans in the form of notches), nd modification deals with changes to style and fit. The design for eassembly (D4re) sustainable apparel design created for this project uccessfully allows for repair and modification to be possible at any cale of production. The enhanced use of existing technology makes 4re sustainable apparel design accessible to manufacturers of all cale, from micro ventures to global proportion. The In-Use venture roject as a whole encompasses clothing D4re, the In-Use website nd the In-Use venture concept. All aspects were developed through ndings from the literature, my own design and quantitative research nto current forms of continued user experience; users are creating of heir own accord. The In-Use sustainable apparel concept is a complex ombination of all aspects of sustainable design method and theory. have developed a coherent, comprehensive integrated model that pens the sustainable apparel market to a wider range of consumers f fashion and mainstream apparel. The In-Use concept can be used s an integrated model either by a stand-alone company or as part of collective of manufacturers. Alternatively, companies wishing to test he waters of sustainable business practice can use certain aspects of he model that fit in with their company ethos.

esearch intended for future study is research into own history of users ith garment; how bonds are formed and emotional attachments re made to first owner garments. Niniimaki & Koskinen (2011) and letcher (2010) explain that the garments with the highest emotional ttachments are items that come with a pre-existing history; however, arments with pre-existing history are for the most part gifted, found or ought second hand. There is scope for further research to be carried out regarding first owner attachments to garments. This project carried out three semi- structured, in-depth interviews at the respondants home that discussed the items in their wardrobe. Future research will cover a wider study on the own history and user attachments to garments. The research will develop a deeper understanding of the latent and manifest factors that determine garment attachment. Such research will be a rich source of information to develop future sustainable apparel design and sustainable apparel businesses with the focus being on a longer in use lifetime.

The apparel design aims for this project were achieved and successful. Research and experimentation was thorough, and considered both the user and the manufacturer. D4re (design for reassembly) was developed for this project. D4re takes into account many different aspects of sustainable design and accountability in niche markets and references research that has covered the user's level of use satisfaction (Fletcher, 2012, Gam et al, 2011; Hypebeast, 2008; Niinimaki & Hass 2011; Niinimaki & Kosinen, 2011; Van Nes, 2010 & Wang, 2010). In the design requirements for D4re garments, my aims were: garments need to be able to be repaired in economies of scale as well as at sma local companies, repairs need to be inconspicuous and the styling of the garments need to be classic in design, for longevity, but need to modifiable when styles inevitably change. By using the chainstitch machine on a higher percentage of seams than usual, garments can be rapidly disassembled and the thread (depending on weight) can be re-used. Reassembly is made easy with pre- determined modular panels, in particular the crotch gusset and yoke. These panels enable ease of repair in areas of high wear; they also make modification of fit and style possible. The restrictions I faced when carrying out design research were the ability to measure the manufacturing time and cost differences in the construction of In-Use denim jeans compared to current manufacturing practices of denim jeans. I am convinced the cost of manufacturing In-Use jeans will not be higher than current production methods, but cost is difficult to measure without delving into large scale production of the jeans. Time measurements were difficult to gauge per unit. I constructed the denim using flat bed machines instead of free arm, I made whole garments as opposed to piece-work and each step was a new and innovative method that until practiced slowed down production speeds. Overall the In-Use denim jeans are a very successful outcome of the design research and experimentation that has made up this project. Alterations to the final design are minor and consist of seam direction particularly at the back gusset seam. The seam direction needs to be flipped so that friction and wear happens on the gusset seam not the garment.

The In-Use model as a whole has achieved the aims of this project. It is intended to be an example of sustainable apparel design that is available to all users rather than the traditional sustainable apparel niche markets. It is achievable, affordable and explains an advance theory of user-product and user-manufacturer relationships. I intend to develop the research further and turn the In-Use model into a functioning In-Use Clothing business.


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Appendix

Market - Developed for this project the table below is a description of the In-Use clothing market

DEMOGRAPHIC	**Age:** 20 – 50 **Sex:** Male and Female **Income:** Disposable income or not they are willing to spend/ invest in clothing that suits a personal perception of quality. Such perceived quality may involve a blend of aesthetics, place of manufacture, fit, future experience and involvement in products of choice. Consuming with conscience, especially in regards to the environment, will assist this consumer to justify purchasing decisions and will only happen if it does not compromise their personal style.
DOMINANT BENEFIT SOUGHT	**Convenience:** The consumer is aware of environmental issues and interacts in one way or another, whether it be recycling, buying local produce etc, but is less likely to negotiate when it comes to sense of style. Generally justifying clothing purchasing decisions by including 'vintage' items in their wardrobe, the target consumer is style conscious and willing to spend money on brands that relate to their individual style. **Value:** The consumer perceives value in the overall styling, whether it relates to their desired image, status of brand or personal sense of style and sense of quality – where and out of what it's made and the attachment they feel to the item. **Status:** If the item has a story to tell, this consumer likes to share it. It is an added bonus if the story is an example of their 'effort' towards sustainability. Personal history and length of ownership are bragging points for this consumer. Quality, style, innovation and exclusivity of purchased products are seen as examples of personal character. Having personal input into their clothing helps this consumer indentify with their garments. They are opinionated and like to share ideas, experiences and critique and appraise the products they use. Offering insight and involvement into the company and or brand is added value to this consumer and likely to result in repeat purchasing and loyalty.
PSYCHOGRAPHIC	Urban dwelling, social, likes to be noticed and part of a scene. Is influenced by popular/underground urban culture, domestic and global, but also takes part in the growing popularity of outdoor recreation, such as, mountain biking and running. They are aware of environmental issues and are active if efforts are tangible, fulfilling and require little commitment e.g. buying local and cycling to work. They view work life balance as being of great importance. They will blend leisure activities together as a representation of self, i.e. goes to a late night gig and mountain biking in the same weekend and is proud to talk and display both as being an integral part of their identity. Sub cultures are no longer so strictly defined; the increase of active lifestyles within urban culture is creating a blend of markets that this consumer is a part of.

Qualitative research

The purpose of this qualitative research is to gain a stronger understanding of product and consumer emotional attachment. This project uses semi structured in-depth interviews to explore the latent and manifest factors that determine garment attachment, and long-term ownership of first-owner garments. The interviews helped develop an understanding of factors that contribute to why we form bonds with our first owner clothing.

This research does not delve into consumer views on sustainable clothing. Existing literature and research is in-depth and the data is readily available for me to draw from. As I believe, and subsequently translate into my concept, sustainable clothing should not rely on environmentally focused consumer behaviour, manifest motivation for users purchasing or not purchasing sustainable products is not crucial to my research at this point. There has been research done in regards to long-owned clothing and emotional attachments. I consider a gap to exist in the research about user attachment to new/first-ownership garments. Many of the respondents in Niinnimaki's 2009 survey identified a strong emotional bond to the oldest garment by way of a connection to another person, "they could be inherited, a present, or simply represent someone close, be they mother, grandmother, another relative or friend" (Niinimaki and Koskinen 2011, p. 169). Likewise in Kate Fletcher's Local Wisdom project user stories, delivered on the website under the title Users' Craft and Wisdom, are overwhelmingly dominated by attachment to garments stemming from links to other people. Grouped into umbrella categories such as My community, Transfer of ownership, Connections, and many more users explain their love for the garments are due to the history embedded into it by previous owners, whether the owners are known to the user or not. Whilst garments with a pre-existing history are a definite factor in product attachment and an example of the strength of emotional attachments, it does not explain how attachments are created to new items; the bulk of what we consume. I would like to explore first-owner attachments to garments. By first-owner I refer to garments the user has selected of their own accord at time of purchase, or at a minimum has personally chosen to utilise the garment, and why/how they became attached to the product. I would like to explore this topic further and uncover any latent factors that determine a garments life-time with the user. As the research is exploratory it makes sense to carry out qualitative research, in the form of in-depth interviews. The reason I wish to do interviews is to gain an insight into how attachments are made. Nicole Van Nes' (2010) research about product replacement uses qualitative research "aimed to develop a well-defined list of factors that contribute to the motivation to replace a product". Van Nes carried out 20 interviews with people who had recently replaced a product. The interviews where semi-structured and in-depth allowing Van Nes to "uncover a chain of reasoning for replacing the product". The qualitative research was done to define the factors that influence product replacement, followed by quantitative surveys to determine the importance of these factors. Inspired by Van Nes' research I will be using similar research methods.

Due to time restraints on this project, qualitative research was carried out and will be furthered in a future study. Three respondents were chosen; as the research is exploratory, the methodology used was in-depth interviews. This project uses semi structured in-depth interviews to explore the latent and manifest factors that determine garment attachment, and long-term ownership of first-owner garments. The interviews helped develop an understanding of factors that contribute to why we form bonds with our first owner clothing. Interview notes were recorded but future data analysis will be carried out in accordance with Rubin & Rubin's Qualitative interviewing: the art of hearing Data (2012). Findings and interview notes can be found in the wotkbook.