Heterarchy, Weaving and Skateboarders

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Abstract

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Title
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Aim
The aim of this project is to design and craft sustainable fabrics according to slow fashion principles. Furthermore the intention is to develop these fabrics, to make them exciting and congenial for use as trouser fabric for skateboarders.

Method
As well as conducting interviews with skateboarders I have read literature concerning sustainable design, slow fashion and the skateboard scene. These methods, i.e) discourse and literature analysis, are my chosen methods in order to form an understanding of my subject matter. The design process is shaped by determining criteria, which are based on the research mentioned above and which had to be met at each successive stage of product design and development. Spinning, weaving and dyeing have been the predominant methods used in the practical realisation of the concept. The material that has been used is hemp and the equipment that has been employed is predominantly an Öxabäck floor loom and a shaft draw system. An Agteks plying machine has been used for yarn plying and a Martindale wear and abrasion tester has been used to test abrasion resistance.

Keywords
Sustainability, slow fashion, skateboarder and hand weaving.

Results
The outcome of this project is five hemp fabric patches with woven in images and one larger plain piece of fabric, all of which are woven in double weft faced twill. Reactive dyes have been used to dye the yarn and fabric. This fabric is presented as part of a concept which allows for skateboarders to be involved in the design process and to make decisions within the boundaries set out by the practical parameters I have set in place.

Preface

This project is exam work for the degree: Textile Science with an emphasis on hand weaving, which has been carried out at the Swedish School of Textiles during the spring term of 2009. This exam project is a result of 10 weeks’ work and encompasses a theoretical study which is then applied in a practical design and craft situation. I direct thanks to all the skateboarders with whom I had contact, for giving me an insight into the skateboarding scene and their relationships to fashion, without which this project would have been much the poorer. For support during the writing of this report and for giving me feedback and advice along the way I thank my tutor at the Swedish School of Textiles; Emma Häggström. I also thank the weaving technicians and Martin Ciszuk at the Swedish School of Textiles for their technical support.
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1. Introduction

In this section I present the reasons for choosing the focus areas that I have and an outline of how this project will take form.

When working with hand weaving the tendency I have experienced is to focus predominantly on the craft and production process. In this project I wish to expand the focus area to include more design. The attraction in working this way is the potential that design presents with which to achieve positive change in society. I have chosen sustainability and slow fashion as some of the key focal points in my project.

Weaving in relation to slow fashion or fashion in general is of utmost interest as it is a central production process and is crucially determinative to the nature of the end product. I perceive there to be less focus on weaving and fabric production within slow fashion than on other stages of textile production and I am interested in changing that. This has influenced my decision to specifically combine weaving and slow fashion in this project.

1.1. Project idea and aims

The aim of this project is to design and craft woven prototypes according to slow fashion principles. The fabric samples will be designed for development into garments for the target group skateboarders. I will design a product concept, which will form the basis for this weaving project. I aim to explore the possibilities for creating an interesting fabric within these boundaries.

My central question is therefore:

How can an exciting fabric, congenial for use by skateboarders, be developed according to slow fashion principles?

1.2. User group

I will design and create fabrics for a skateboarder user group. Whereas the skater image can easily be connected to environmentally sustainable principles, it seems there is lacking any apparent non conformism or subversive thinking as fundamental to this group. For example many skater labels such as Billabong and Vans already have an organic range in their collections. This begins to address the environmental waste and pollution issues which surround production yet the structures involved in producing skater fashion are often mainstream and may prove a hindrance to the full adoption of slow fashion principles. There is potential to successfully bring slow fashion and skateboard fashion together but this feat also presents a challenge and is therefore of interest to attempt.

1.3. Limitations

The choice of material I use in my project will be affected by availability, yarn delivery times in relation to the time frame of this project and price in relation to my personal financial situation. In this project, I will not take into consideration the ability of my customer groups to actually purchase the fabrics that I produce. I will also not realise the product concept practically beyond the stage of fabric production. It would be most advantageous in this project to work in an interdisciplinary manner, to work collaboratively with fashion designers etc. and to carry out a trial run to test the actual feasibility of the entire product concept. This is clearly not possible within the scope of a weaving project but would be of interest for further development at another time.
1.4. Methods

The design strategy I will follow is linear. Exploration of the subject matter will form the basis for criteria development and the criteria which are then formed, will be referred back to and be the criteria by which the practical aspects of this project can be evaluated. By taking a methodical step-by-step approach and clearly presenting the project’s development, the project may more easily be repeated and my conclusions may be more easily evaluated by others. Interview is the communication method I have chosen to obtain information from members of the user group. Literature research will also be used in order to form an understanding of the user group and the slow fashion concept. I am choosing to interview the skateboarders as this will enable me to pose follow-on questions and as a result to gain an optimal level of insight during a short period of time. The transformation of background research into criteria will take place by determining and extracting the most definitive and crucial features of slow fashion and skateboard style. This will be done by identifying the most definitive and crucial variables from the background research. Weaving will be the main practical method employed in order to realise the criteria. Methods which are necessary for a successful result, such as dyeing, spinning and after treatments, may also be employed. The specific techniques and equipment that are used, will be documented under “Crafting the Product”.

1.5. Disposition

This project includes background research, criteria development, product design and product development. I have chosen to present this report within a chronological framework, with thematic sub-headings in order to make this project easily accessible and understandable for the reader. A linear design strategy lends itself well to chronological documentation.
2. Background Research

An outline of sustainable design, slow fashion and the skateboarding scene is presented as background research for this project.

2.1. Slow fashion

Slow fashion is about sustainable development in the fashion sector and stems from the 1980s slow food movement. The resources needed to support the traditional fashion industry are consumed faster than they can be renewed, imbalances arise and the industry becomes unsustainable. Slow fashion is a reaction to the lack of sustainability in the fashion industry at large and it works to slow down the processes involved in the fashion industry to a level where individual health, societal and cultural justice and ecological sustainability are valued and supported. By slowing down the processes, time is created for people to experiment creatively, which in turn facilitates a myriad of more individual approaches which there is not scope for in the traditional fashion industry. Rather than to curtail life and its natural cycles, slow fashion allows time for reshaping the industry in order to support these natural rhythms. The following quotation from the book Sustainable Fashion and Textiles by Kate Fletcher outlines what slow fashion stands for.

Slow fashion is about designing, producing, consuming and living better. It is about combining ideas about a sense of nature’s time (of regenerating cycles and evolution), culture’s time (of the value of traditions and wisdom), as well as the more common timeframes of fashion and commerce. Its emphasis is on quality (of environment, society, working conditions, business, product, etc.). So slow in this context is not the opposite of fast – there is no dualism – it is simply a different approach in which designers, buyers, retailers and consumers are more aware of the impacts of products on workers, communities and ecosystems.

According to the article “Slow + Fashion: An oxymoron or a promise for the future” by Hazel Clark new ways of thinking are necessary in order for the fashion industry to make the shift towards slow and sustainable fashion. These are to:

- “challenge existing hierarchies of “designer”, “producer” and “consumer;”
- question the notion of fashion being concerned exclusively with the “new;”
- challenge fashion’s reliance on image;
- present fashion as a choice rather than as a mandate;
- highlight collaborative/cooperative work- providing agency especially to women.,”

To summarise, slow fashion is about slowing down fashion production to a level where human rights can be honoured and environmental biodiversity can be respected through the whole of a product’s lifespan.

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3 Fletcher, Kate. Sustainable Fashion and textiles – design journeys (Earthscan, 2008) pp 173.
2.2. Sustainable design

Sustainability is an all encompassing term which refers to balance in the interdependent state of the world we live in. Among the key variables for sustainability, when it is approached from a human perspective, are both social and environmental well-being.5 According to the UN definition sustainability is:

“Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”6

In relation to design, sustainability points to both the design process itself and the result thereof. Sustainable practice must be upheld at all stages of the product’s life cycle from before conception through all reincarnations and until after disposal. In relation to sustainable textiles there are many issues to take into consideration. Working according to sustainable principles involves taking the big picture into account as well as the details. The environment and human rights are part of this big picture, upon which details such as production practices, working conditions and goods transportation impact. It is also important to pay attention to life cycle speed, designer-user-product relationship, the product’s intended use and how all these things interact.7 Sustainable production is an important aspect of slow fashion.

The amount of waste produced as a result of industry is enormous and many sustainable approaches to production have been developed as a reaction to that and a way of combating the imbalances caused as a result. One can for example focus on waste prevention, resource recovery, recycling and reuse in order to protect the earth’s natural resources.8 One of the strictest approaches to sustainable production is the cradle to cradle approach. With this approach the beginning and end of the production cycle are the same. This can be achieved through waste prevention and resource recovery, etc. so that the production cycle can end at the “cradle” stage thus enabling new growth and life rather than curtailing it as in traditional cradle to grave resource management. This cycle can also be called a closed loop supply chain. Such a chain is a continuous cycle which renews itself without creating contaminating spill. As is pointed out in “Cradle to Cradle Design Initiatives: Lessons and Opportunities for Prevention through Design” by Ken Alston the ultimate closed loop supply chains are found in nature. What characterises these supply chains is efficiency, effectiveness, subsistence on current energy, biodiversity, local creation and waste as nutrition.9 Production cycles that work according to these principles produce only nutritious waste and recycle all non organic material.

There are no standards for slow fashion as the concept is so broad and the practical application methods so varied but there are many certifications concerned with different aspects of sustainable production. In Sweden there is a range of environmental and social certifications for textiles that appear on the market. Among these are Krav, Bra Miljöval, Eko Sustainable Textile, Global Organic Textile Standard (GOTS), Svanen, Öko-tex 100, Fairtrade or Rättvisemärkt and The EU-Flower. All of these certifications mean different things, some guarantee organic fibre production, others place demands on the production process and others are more concerned that the end product is free from chemicals.10

6 Division for Sustainable Development. UN Department of Economic and Social Affairs. (http://www.un.org/esa/sust-dev/)
7 Fletcher, Kate. Sustainable Fashion and textiles – design Journeys (Earthscan, 2008).
10 Häggström, Emma. ‘Ekosmart textilmärkning?’, Camino magazine, Nr 2 (2007) pp38
2.3. Skateboarders

Skateboarding is the act of riding or performing tricks on a skateboard and emerged as a sport, art form and culture in the U.S.A. in the first part of the 20th century when the very first boards were made by attaching roller skate wheels to a wooden plank. The sport had its break through when surfers, in California, began to train on skateboards on land during the off-season in 1958. This is when skateboards began to be made on a large scale and sold commercially. Skateboarding quickly gained popularity among urban youth and there were soon so many skateboarders on the streets that the sport became a hazard to the urban non-skateboarder population and skateboarders became labelled as criminals by the community at large. By 1968 the criminal outsider image had stuck. In 1976 skateboarding came to Sweden! At this point many skater labels had appeared on the scene and had already become an integral part of the skateboarding scene.11

Skater style is, as it is argued by Iain Borden in *Skateboarding, Space and the City – Architecture and the Body*, more about the act of skateboarding and the attitudes toward the sport itself within the scene than any specific clothing trend. Oral communication, peer-to-peer learning and anti-institutional sensitivities are said to be present in the culture. Innovation, competition and performance are highly prized but predominantly on a peer-to-peer basis. A resistance against the imposition of societal behavioural standards and rules engulfs the scene.12

“Skateboarding resists the subject’s reduction to alternately mechanistic performer, mental entity or capitalist competitor, and also resists the dissatisfaction deriving from the consumption of things and things-as-signs.”13

However, today, many talented skateboarders are sponsored by corporate skater brands, which enable them to succeed in the sport in return for brand endorsement. Skateboard fashion is now dominated by large sporting labels and specialist skateboard labels which have made skateboarding culture much more corporate as a whole. An elite few skateboarders such as Tony Hawks have even managed to become wealthy skateboard superstars as a result of this corporatism but on the flip side they have also become corporate pawns.14 This corporatism promotes homogeneity, of which one facet is skateboard trick names, which are overwhelmingly English language regardless of where they are from. Much of the corporate skater clothing style is dominated by simplicity in form with contrasting pattern/image and colours. The garment forms and fabrics are often simple, with focus being predominantly on image.15

The similar origins of the hip hop and punk cultures have led to a sort of fusion where hip hop, skate and punk subcultures draw from, add to each other and overlap.16 I will summarise punk and hip hop culture so as to provide a background from which to understand the fusion of skater styles which have emerged.

A critical view of dominant society pervades Swedish hip hop culture with special criticism (as also found in U.S. hip hop, which is where hip hop originated) directed toward institution and societal norms. Hip Hop culture is overwhelmingly personified by artists from under privileged and/or marginalised non-white minority backgrounds and is a very male dominated, hierarchical subculture with women not uncommonly being personified as sex objects.17

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Fashion is a later development in hip hop culture along with language, the club scene and music videos, but hip hop has always encompassed DJing, break dancing, graffiti writing and rapping.\textsuperscript{18}

Punk rock is also a male-dominated subculture that is described by some as a counter-culture. It is also described as a scene or a framework within which there are themes of acceptance which dictate the parameters of dress, make up and backdrop. Within this framework individuality is highly valued, mainstream is shunned, a do-it-yourself attitude is adopted and profiting from the scene is frowned upon. Veganism is common in punk culture and is an embodiment of the type of political correctness that predominates, i.e.) showing respect for things that are not valued by dominant society, something which makes alternative ideologies common. The clothing worn by typical punks is mostly black with patches or badges.\textsuperscript{19}

2.4. Interviews with skateboarders

I contacted the Swedish skater shops: Concrete, Hollywood, Core and One-Off to interview their team members and employees about their perceptions of and personal preferences concerning skater fashion. I have interviewed in total 5 skateboarders, of which 4 are employees and 1 a team member. Skateboarding is and always has been a very male dominated sport and that demographic is represented among my interviewees.

Enrico Petralia, a member of the Concrete team in Gothenberg, says that one’s identity as a skateboarder is often formed by one’s sponsor. According to Eddie Lindkvist the brands a skateboarder wears are extremely telling. From brand choice one can identify the wearer’s preferred skating style, possibly as well as their skateboard hero, music taste and wider political views. Both Martin Olsson from One Off in Stockholm and Martin Franzén from Concrete in Gothenburg highlight the different styles within skater fashion stating that there are three distinguishable styles: a hip hip skater style which is discernible by the mandatory baggy trousers, caps and influence of pure hip hop style, a rock skater style dominated by black clothing and bandanas, that draws inspiration from the punk rock scene and lastly street fashion which draws inspiration from mainstream fashion of the time. They consider skater fashion to have only begun to branch out seriously in the last 10-15 years from the traditional surfer inspired and largely practical Californian American skater style of the 1960s. Despite hearing a clear description and break down of skater fashion from all the interviewees they were very reluctant to attribute an inherent connection between the sport itself and skateboarder fashion. As Martin Olsson puts it; “I wear rock/street wear style clothes because I like the style and I skate because I like that. My clothes don’t necessarily show that I skate.” and Jessica Andersson says; “I dress in skater labels because I like the style and not to show everyone that I am a skateboarder.”

They all mentioned to some degree the importance of setting trends and being innovative but the anti-establishment anarchist sensibility described in Iain Borden’s book was non existent. Of the four skaters posed with questions regarding involvement in creating their own fashion items, three of them acknowledged having had an active part in creating their own skater fashion and all of them stressed the importance of individuality. All of them mentioned that they have specific requirements unique for either trousers/shorts, shoes or t-shirts which are the most common garments in skater fashion. All were agreed that the practicality of having strong, hardy, comfortable trouser fabric that breathes was of importance. Enrico Petralia and Martin Olsson also attached importance to having stiff fabric whilst Eddie Lindkvist and Martin Franzén mentioned stretch as being a desirable quality. An important underlying reason for these varying demands on quality was ease of movement. For t-shirts the requirements were more style dominated with less practical considerations and all agreed that the most important shoe quality was good grip.\textsuperscript{20}

\textsuperscript{19} Hannerz, Erik. ‘Hierarchy through Anarchy’ – “performing punk and the outline to a theory of scene”, MA essay, University of Lund 2004, pp 2,4,5,7
\textsuperscript{20} Bessel, Claire, Telephone interviews with skaters: Martin Franzén, Martin Olsson, Enrico Petralia, Eddie Lindkvist and Jessica Andersson, (Borås, Sweden, March 2009)
3. Design and Product Criteria

Here is presented the transformation of background research into criteria by determining and extracting the most definitive and crucial features of slow fashion and skateboard style.

3.1. Research analysis

Sustainability is a common denominator for all slow fashion approaches and covers personal, societal, cultural and ecological well being. It is important that this is reflected in the criteria. Another important point in slow fashion is that both the means and the ends are of importance.

In addition to the chosen criteria I will take into consideration the five principles quoted from the article: Slow + Fashion: An oxymoron or a promise for the future, in the section above on slow fashion.

Because of the semi-fusion of skater, hip hop and punk styles, skater style has become extremely complex and identifying one pure contemporary skater style is problematic. However, one aspect that seems to link skaters regardless of which style they wear is the creativity and innovation that has been part of the skateboarding culture from the beginning. As a result skateboarding style and culture is always evolving and setting future trends. Style is seen as encompassing everything involved in the act of skateboarding but most importantly the attitudes toward the sport itself. Clothing should not negate these attitudes but not necessarily be an expression of them either. Skateboarding style is expressed most importantly by how one skates.

As skater culture puts such a strong emphasis on individuality, trend setting and creativity I want to make use of those traits in the product I create for this user group. This will involve giving the wearer choices to individualise the product, which will make the fabric/product attractive to skateboarders across the style boundaries. The critical nature of hip hop towards dominant societal structures will also weigh in the design and craft decisions I make, as will the punk focus on anti-institutionalism, individuality and deviant idealism. These details will however be used as reference points and not absolute criteria.

All skater fashion with which I have come into contact is very much focused on trousers, t-shirts, hoodies and shoes. I am presented with the option of designing a woven fabric for one of these garments if I am to accept the existing clothing norms. As these norms do not negate the other principles I am working with, I have decided to work within one of these pre-existing focus areas. Trousers and shoe fabric lend themselves best to weaving as a textile medium and of these I have chosen to develop fabric for trousers. The focus of the interviewees, even when posed with questions concerning fashion preference or demographic was always to relate back to the act of skateboarding, which indicates how important the sport is in all aspects of skateboarder culture. As the skateboarding act itself is such an important aspect of skateboarding culture, it should therefore be brought in some way into my design.

All design and product criteria must be met in the concept and/or the product realisation stage of this project.
3.2. The criteria

- to work according to principles that promote individual health, societal and cultural justice and ecological sustainability
- to work slowly, thoughtfully and methodically

To design and weave a trouser fabric that:

- can be personally individualised by the user and that can function across the genres existent within skater style
- allows for ease of movement
- meets high standards for strength
4. Criteria Discussion

The options that the criteria present and the considerations that need to be taken during the product development, are discussed here.

4.1. To work according to principles that promote individual health, social and cultural justice and ecological sustainability

Organic natural fibres that are produced with respect for biodiversity have high utilisation potential when working according to the criteria for this project. Keeping non-biodegradable end of life products in circulation through recycling, re-manufacture, refurbishment or reuse rather than committing them to landfill is also in line with sustainable principles. Materials that rely heavily on non-renewable energy in their production or regeneration are not desirable as they contribute ultimately to the depletion of world resources.21 Materials that are produced locally with local knowledge are positive in promoting cultural justice and societal sustainability as well as ecological sustainability. This helps to strengthen routes and maintain skill in a given area which in its turn creates economic possibilities which supports social justice. This logic is applicable to all aspects of production.

4.2. To work slowly, thoughtfully and methodically

This criterion unlike the other criteria does not form a framework for what I do but rather how I do it. This forms a framework that hinders the ends from justifying the means. Slow fashion and every step involved in a slow fashion product’s realisation is designed to contribute to justice and sustainability. As slow fashion principles are currently not yet the norm this means change. In order to keep the change in line with its guiding principles, the paradigm of time scales must be rethought in order to support sustainability and to allow new design paths to emerge.22 It is therefore necessary to think carefully through decisions, have a clear goal in mind and not rush.

4.3. To design and weave a trouser fabric that can be personally individualised by the user and that can function across the genres existent within skater style

If space is given for personal individualisation of a product then the product can be attractive to a broader spectrum of skateboarders than otherwise and can be adjusted to compliment a range of clothing styles. Giving the user choice fits in well with the slow fashion ideal and paves the way for a more heterarchical approach to design which opens for new possibilities and working constellations.

4.4. To design and weave a trouser fabric that allows for ease of movement

The elasticity in an apparel fabric is a major way of increasing the ease of movement in the end garment. Tightly spun, worsted and/or crêpe yarns increase the yarns elasticity and subsequently the elasticity of the fabric. Weave technique and material type are ways to increase or decrease elasticity. Crêpe weaves are known for their ability to increase a fabric’s elasticity. Trousers fabric density dictates performance and among other things how well the fabric holds its form and whether or not it catches. Fewer floats in the weave, smoother yarns and fine, tightly packed yarns increase the fabric’s density and thereby increase the fabric’s stability. In order to cut a pattern from the fabric and successfully sew the pieces appropriately together it is an advantage for the fabric to have a reasonably high cover factor. A high fibre absorption rate is also desirable as this enables moisture to be transported away from the skin and avoids sweat causing the fabric to stick to the skin. A high absorption rate is a quality found abundantly in natural cellulose fibres.

22 Fletcher, Kate. Sustainable Fashion and textiles – design journeys (Earthscan, 2008) pp161-164
4.5. To design and weave a trouser fabric that meets high standards for strength

The kind of strength which is required for skateboard trousers is both high abrasion tolerance and to a lesser degree high tensile strength and elongation. High abrasion tolerance is necessary as skateboarders often fall when practising new tricks and this can be abrasive to the fabric. Whilst practising a new trick there is also an increased likelihood that the trouser fabric may catch. In this case the fabric will be drawn and it will require both high tensile strength and some stretch so as not to rip. The means I have at my disposal to create a strong fabric for trouser use are primarily fibre choice, spinning, treatments and weave technique. Warp yarns are often more tightly spun than weft yarns and plied so they withstand the strain placed on them in the loom. Medium to high but not over spinning and plying give both the yarn and the fabric increased strength. Weave types can also increase a fabric’s strength and durability. Weaves with more than one warp or weft system have an increased strength as do fabrics in rep techniques because of the tightly packed yarns.

Of the available strength tests, abrasion tests are the most relevant for skateboard trouser fabric and secondarily tensile strength and elongation tests. All abrasion resistance is measured similarly by abrading the fabric sample against another surface with some kind of weight applied. The Martindale abrasion testing machine is widely used to establish how much abrasion a fabric withstands. Apparel is generally tested under a weight of 9kPa (kilo pascal) / 595g and upholstery under a weight of 12kPa / 795g. The number of rubs the specimen withstands before breakage gives the fabric its rating according to the International Organization for Standardization ISO standard 12947. Each fabric producer determines how much abrasion its products must withstand before being marked for approval.

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5. Product Decisions

Based on the discussion of how the criteria can be realised I present here my product idea and sketches to give a visual representation of the ideas.

5.1. Product idea

The woven fabric, which will be created as part of this project will be designed for use as trouser details such as pockets and patches or as plain/patterned base fabric from which trousers can be cut and sewn. The user/buyer may determine the pattern, colour and size of the woven fabric within a framework shaped by the technical aspects of production. Furthermore, according to this concept, it is intended that the user be able to choose trouser style and have a tailoring service available. This means that the user may have a new pair of trousers made up for them or an existing pair altered or patched, with new details added. The details of the fashion design and tailoring contingent however, do not fall into the remit of this immediate project. It is nevertheless of interest to mention as it falls into the wider framework of this project. I will weave one piece of non-patterned fabric (1 x 2 metres) and several small (no bigger than 20x25cm) fabric prototypes with varying expression which may be used as patches or trouser details such as pockets. The fabric prototypes will demonstrate how one may choose the fabric to look but it will by no means be dictatorial or show exhaustive possibilities.

As skateboard tricks well represent the user group’s collective identity, the fabric images I will design will all derive from skateboard tricks. I have chosen to work with English language trick names as it is these that dominate the Swedish and international skateboarding scene. The skateboard tricks that i choose to work with must have potential for clear visual representation. This is neccessary when presenting prototypes for this project, in order to emphasise the connection to skateboarding. The image style i have chosen is derived from street art and grafitti which also strengthens the link between my work and the urban skater scene. An identifying feature of much urban spray painted art is the clear solid colours and fancifal style. The larger plain fabric will be in dark neutral colours, with different colours on the front and back of the fabric. Either side of the fabric may then be exposed, as wished. The plain fabric will be designed according to a collective skateboarder identity and will be created as a generic skateboard trouser fabric. Neutral colours make the fabric more versatile and appropriate for skateboarders with varying styles.

I have chosen to weave with hemp because of its strength, durability, high absorption rate and low environmental impact during fibre cultivation. Hemp is hard wearing and has high tensile strength but weakens and softens when exposed to light. Hemp can vary a lot in relation to feel; thicker yarns are often stiffer, caused by higher legnin content and finer yarns are often softer. 24 Hemp can also be grown in Sweden which is positive in promoting social and cultural justice and ecological sustainability on a local level. It is also a fibre that is stigmatised because of its drug association which may gain it popularity among a user group that is often sidelined. Hemp, as a cellulose fibre, can be dyed according to the same principles as cotton which makes acquisition of appropriate dye stuff relatively easy. In the warp, medium to tightly spun plied yarn is best to use in order to increase the fabric’s strength, durability and elasticity.

Local organic small scale production is rare in Sweden and commercial hemp production is non-existent and also rare abroad.25 It is therefore not easy to find hemp yarn to weave with. Because of this difficulty I chose to weave the initial samples with non-organic flax yarns which is readily at hand. As flax is in many ways similar to hemp, it is a strong cellulose bast fibre with a high absorption rate, low stretch and similar touch, the initial samples in flax would help determine how I would later proceed with hemp.

25 Gerstenberg, Susanne. Hampanätet, Email contact (February 2009)
Skoglund, Git. Textile historian and lecturer, Email contact (February 2009)
5.2. Product sketches

The images I have chosen to weave are based on the names of five skateboard tricks. I chose tricks with clear potential for visual representation, i.e) Scissor Flip, Big Spin, Boneless, Foot Plant and Dark Slide. The images share a similar design style but are in several different colour ways in order to show a spectrum of possibilities for colour use. They are made up of relatively simple yet strong forms, which reflect the current skateboard clothing trends.

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Adam, Bunn, Board Crazy Skateboarding, Copyright © 2005-2006 Board Crazy (http://www.board-crazy.co.uk/tricktionary.php) (accessed April 2009)
6. Crafting the Product

In this section the practical product development work is presented.

6.1. Crêpe Weave in Linen

The initial set of samples were woven in an 8 shaft crêpe weave on a tightly plied flax warp in NM 40/2 with 14 threads per centimetre. I was careful to choose a crêpe weave with floats over no more than three warp threads and a like number of stitching points in all directions. This was in order to keep the yarn tension even and to create a fabric that would endure activity without catching. The crêpe weave was chosen to create some stretch in the fabric. I chose to weave all samples in non-dyed unbleached yarn until I had constructed/developed a fabric quality that met my requirements. This was in order to keep the process as environmentally friendly and uncomplicated as long as possible. I tested yarns in NM 12/1, NM 24/2, NM 18/1, NM 36/2 and NM 17/2 in the weft. I wove in loose threads in a soft NM 12/1 flax yarn at intervals over which I later machine embroidered so as to create a pattern on the fabric.

I had intended to pack the weft in all the samples tight enough so as to create stiff sturdy fabric samples. This was unsuccessful, the fabric was not stable or dense enough, therefore letting through too much light and in all the samples the coarse weave dominated the fabric surface, which would have posed a snagging problem. The embroidery was very difficult to control and created a very uneven result and holes in the fabric, which in some cases gave an impression of a deliberately sloppy style and in other cases appeared unprofessional. The crêpe weave was however in combination with plied weft yarns successful in giving the fabric an extra element of stretch. To create a more stable fabric I then wove a sample with weft yarn in NM 48/2 and packed the weft very tightly. Instead of weaving in tassels as before I added four wefts per repeat in the patterned sections of the fabric, which would form a double faced effect in the patterned areas of the fabric. I chose to continue with the same warp to see if I could create a more sturdy fabric in the same weave by packing the weft threads more tightly. I chose to weave samples with NM 24/2 and 36/2 in the weft as I envisaged this to be a good range to help me find the right thickness, stiffness and sturdiness for the fabric. I picked up the warp threads that would bind the pattern wefts, thus creating long floats that I would later cut away. The pattern result was much more controlled and didn’t affect the fabric quality negatively as in the first samples as but the pattern threads were easily drawn out of the fabric and the pattern would need some kind of further treatment to keep the pattern threads in place. The fabric itself was more stable but still let through too much light and the weave was still too dominant, which led me to abandon this line of enquiry and proceed in a different direction.

6.2. Yarn choice

Swedish grown hemp at present can only be spun into yarns up to a yarn count of about NM 15/1 I was therefore faced with buying hemp that could not be successfully cultivated in Sweden. Using hemp yarns that could hypothetically be grown in Sweden would limit me to weaving with much thicker yarns than my practical research had deemed reasonable. Buying hemp from further a field is undesirable both from a local social and from an environmental viewpoint but was of importance in achieving satisfactory results. I proceeded with hemp after having located a supplier in Italy; Linificio. The hemp from this supplier was Ökotex certified but not organic and available in a non-plied Z spun yarn. The finest non-bleached yarn that they had was NM 24/1. I ordered this despite ideally having chosen a finer yarn, and then used an Ageks plying machine at the Swedish School of Textiles to tightly ply the yarn and create a plied yarn in NM 24/2. This yarn was however much finer than the flax warp yarn in NM 24/2 that I had woven my initial samples in. This was an unplanned yet welcome surprise. Differences in yarn density between flax and hemp may possibly contribute to this. The yarn was plied at 575 twists per meter with an S twist. This high twist caused the yarn to loop back on itself during warping and it was very troublesome to dress the loom. I then steam fixed some remaining yarn to see if that helped
oblige the yarn to twist and tangle less. This was successful but retained its full effect only so long the yarn remained dry.

6.3. Shaft draw system.

The simple picking methods I had already tested had not been successful in creating a firm fabric from which the threads making up the pattern could not easily be drawn out. I decided therefore to focus on manipulating the threads in the fabric’s base weave, where desired, in order to form a pattern. In order to allow for different colours in different samples, whilst using the same warp, I decided to weave with a dominant weft effect. The decision made as a result of these demands was to use a draw system which would allow me to pattern extensively. I chose to weave in a weft dominating double-faced twill which allowed for different colours to appear on the front and back face of the fabric and for them to change place in the patterned areas.

Setting up a draw system, applying the warp and using the system to weave with was all completely new for me. The learning process involved in setting up the draw system and adjusting it on a counter balance Öxabäck loom was challenging and time consuming. The draw system had twenty one handles and in order to allow as free patterning as possible I arranged the pattern heddle groups into thread groups of eight, with one on each shaft in direct descending order. This meant that the patterned area on the fabric would not repeat and would be only about 11cm in width. At first I wove with a very unclear shed so the weaving was difficult and took a very long time. With help I adjusted the tie up, ground shaft height, thread tension and shaft figure harness so that the shed would open sufficiently to weave in. The shed became much clearer, although not perfect, but I was able to weave successfully for a short period of time. The elastic recovery of the threads was very low and the shaft figure harness too near the ground harness, causing thread groups that were in heddles at the front of the shaft figure harness to be put under more tension than those further back and thus elongated. As I began weaving a pattern the threads became more and more unevenly tensioned, getting progressively worse as I wove.

In order to combat the problem I moved the shaft figure harness 20cm further back, moved the back beam 10cm further back and adjusted the shaft figure harness so that the shafts towards the front were lower than the ones at the back. I readjusted thereafter the tie-up and redid the tying on. The shed was much better and easier to weave in after this but nevertheless became progressively worse during the pattern weaving process. Although the threads were raised equally high above the centre point from breast beam to the warp beam as they were sunk in their resting position the tension was much greater when the threads were in their resting position. A subsequent step, taken in order to put less pressure on the threads, by evening out the tension, was to attach two new side panels at the back of the loom, which enabled moving the warp beam a further 10cm back and 5cm higher up. Again a complete readjustment of the loom was required which included raising the position of the threads in the shaft figure harness considerably. The main difficulty, that was faced, was in allowing for a sufficiently large shed to weave in that was also small enough so as not to put the threads under excessive tension as this would result in thread elongation in certain thread groups. After several adjustments this feat was achieved although the thread angle variation and uneven tension caused by using a draw system in a normal depth loom created problems throughout.

6.4. Double weft faced twill

Double weft faced twill is a weave with two weft systems and one warp system. The patterned samples were woven with a draw shaft system with double treadling in the non patterned areas of the fabric and I wove with two threads per tooth in a reed with seven dents per centimetre. In the patterned areas of the fabric the threads that were raised for the first weft of the repeat were sunk for the second and vice versa. This was repeated for every weft. In order to speed up the weaving process however I wove the first two front face wefts followed by the four reverse face wefts followed by the last two front faced wefts of a repeat. As this involved raising and lowering the threads fewer times per repeat it also helped to put the threads under less stress.
I needed to pack the weft threads tightly when weaving in order to produce a strong stable fabric and so that the differently coloured wefts on the two sides of the fabric would not affect each other. I wove several strips with different weft spacing, using the same yarn in the weft as in the warp. The samples with 28, 29 and 32 threads per centimetre in the weft all created a visually appropriate fabric quality. With twenty eight threads per centimetre in the weft a balanced cloth was created, with a like number of threads on each each fabric face in both the warp and the weft. I.e. I was working with thread blocks of eight in the warp and of sixteen divided between the two fabric faces in the weft. Weaving a balanced cloth made the task of accurately predicting the image’s dimensions much easier. With thirty two threads in the weft per centimetre, however, the fabric was more stable with a more even appearance and a smoother feel. Attempting to control weft spacing, to the same degree in patterned areas as in non-patterned, proved extremely challenging. This was due to the tension, which varied greatly depending on whether or not a pattern was being woven, which thread blocks were raised, the double treadling in non-patterned areas of the weave and the constant alternation between patterned and non-patterned areas in the weaving.

It was necessary to wet the warp when weaving so as to stop the threads from breaking and so as to enable sufficiently hard packing of the weft. Nevertheless the threads were prone to breakage due to the tension variables. After washing the samples they changed from having very stiff and coarse touch to feeling relatively soft and much better adapted to skin contact. The wefts drew together and created a more even appearance, shrinking considerably. With practice and several loom adjustments the fabric weft spacing in the samples I wove became more and more even and easier to control.

The plain fabric didn’t require the use of a draw system. I therefore removed it and changed the tie up to make it more straightforward so I would no longer have to work with 2 sheds and double treadling. The more even tension on the threads solved the problem of warp breakage but I found it very difficult to pack the yarns tighter than twenty nine threads per centimetre. This is almost certainly due to the broader weave breadth. Because of the breadth, more power was required behind each beat of the beater in order to achieve the same weft spacing as on a narrower warp. It was no longer easy to weave with thirty two threads per centimetre but nonetheless possible. Otherwise the weaving was then straightforward and unproblematic.

6.5. Quality testing

I decided to test the how much abrasion the fabric would withstand on a Martindale wear and abrasion tester. I tested two samples with thirty two weft threads per centimetre. The fabric sample that I tested under 12kPa withstood 15,000 rubs and sample that was tested under 9kPa withstood 19000 rubs. At the stage where threads began to break under the abrasive strain the back side of the fabric and the fabric’s feel was still completely intact due to the double faced weave. The weft threads that had broken were not particularly noticeable and although they did make the fabric look more worn at close range the appearance of the fabric was not affected at further than one meter’s distance. To gauge what level of standard I should require of my fabric I contacted the utility trouser company Blåkläder. Blåkläder require all their trouser fabrics, according to ISO standard 12947, to withstand 50,000 rubs under a pressure of 12kPa on the Martindale wear and abrasion tester. This is however negotiable for them according to trouser usage.27 I subsequently tested samples with 26, 28, 29 and 32 weft threads per centimetre and tested both according to the ISO standard. I then proceeded to test them until in addition two warp threads also broke. The reason for this was that when the first two weft threads in the fabric break, because of it’s double faced weave, the fabric structure is barely affected and it was more interesting to note how long the fabric could maintain its form. Worth noting is that the sample with 29 threads per centimetre in the weft had relatively low tension in the warp during the weaving process whereas the other samples had been woven on tightly tensioned warp. Generally speaking the higher number of wefts per centimetre, the higher the fabric’s resistance to abrasion.

27 Doeden, Marika. Purchaser at Blåkläder, Sweden (contacted May 2009)
The results are somewhat variable so to verify with certainty what the average result is for each sample these tests would need to be repeated several more times. For the time being however I will treat these results as certain. Given that the fabric is intended for skateboard trousers and in all samples it was weft threads that first broke, thus only minimally affecting the fabric structure, I deemed these fabrics not to be far out of the range of an acceptable standard. I decided to proceed with 32 threads per centimetre in the weft.

In order to test the fabric’s shrinkage rate I compared the fabric’s length and width before and after washing. The shrinkage rate for all the samples was relatively similar at 9.5% on average in the width and 10% on average in length.

### 6.6. Application of colour

One of the most commonly used dyestuffs for cellulose fibres is reactive dye. I chose to dye my yarns with reactive dyes because of their wide availability, broad range of colours, light fastness and wash fastness. The main sustainability issue with reactive dyes is the high percentage of dye that does not adhere to the fabric, which when discharged does not easily biodegrade. Best practice with reactive dyes is to follow dyeing with a hot rinsing process so as to avoid the use of detergents in the neutralisation step and to use bi-functional and low salt dyes which give the fabric up to 95% dye uptake compared otherwise to 50%. The dyes I used were Zenit dyes as these were the most readily available and I was behind on my time plan. Zenit is a local company to Borås, Sweden and supporting them promotes local societal and cultural justice but their dyes are not bifunctional or low salt which makes them less than ideal.

First I dyed the threads for the weft according to the colours in the skateboard image sketches I had produced. The first yarn samples were dyed in an Ahiba dying machine to test dye uptake but I was unhappy with the result because the yarn was unable to take up colour where the machines apparatus held it in place. The technique of dying in a cooking pot proved much better although constant attention was required to enable even dye uptake and the yarns needed to be left somewhat longer than the prescribed 60 minutes in order to achieve the planned colour. The natural beige colour of the yarns affected the colour outcome but achieving appropriate colours proved not to be a problem. One problem I encountered was that the yarns, even after having been steam fixed began to tangle and loop back upon themselves once submerged in the hot dye water and it was difficult to keep the yarns from knotting. Another problem was that the dyed yarns caused crocking in the fabric despite being thoroughly rinsed and washed after the dyeing process.

Whilst working to achieve a neutral dark tone for the plain fabric I was to weave, I dyed several fabric samples. The initial fabric sample took up the colour better than the bare yarns and there was of course no problem with knotting, but the subsequent samples gave varying results. The sole difference between the first sample

<table>
<thead>
<tr>
<th>Weft threads per cm on the loom</th>
<th>Number of rubs withstood according to ISO standard 12947</th>
<th>Number of rubs withstood before the breakage of 2 warp threads</th>
<th>Weight applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>19,000</td>
<td>N/A</td>
<td>9kPa</td>
</tr>
<tr>
<td>32</td>
<td>15,000</td>
<td>N/A</td>
<td>12kPa</td>
</tr>
<tr>
<td>26</td>
<td>11,000</td>
<td>18,000</td>
<td>12kPa</td>
</tr>
<tr>
<td>28</td>
<td>9,000</td>
<td>21,000</td>
<td>12kPa</td>
</tr>
<tr>
<td>29</td>
<td>7,000</td>
<td>18,000</td>
<td>12kPa</td>
</tr>
<tr>
<td>32</td>
<td>9,000</td>
<td>31,000</td>
<td>12kPa</td>
</tr>
</tbody>
</table>
and the subsequent samples was that the first sample was woven in 100% non-bleached non-dyed hemp and the subsequent samples were woven with dyed black yarns in one of the two weft systems. This was in order to achieve different colours on the two fabric faces. The dye uptake was low, even with lighter shades, thus causing much waste. It was hard to achieve darker tones as the fabric seemed to reach saturation point very early and the black colour of the threads lost its vibrancy. In order to solve this problem I tested adding extra salt to the dye bath but this had no effect. I then tested reusing the same dye bath, with added salt and soda but this was also wholly unsuccessful. This resulted in an extremely uneven dye uptake and gave a reddish tone to the colour. The third attempt involved increasing the dye percentage in the dye bath which helped but the dye uptake was so low that over 10% of dye in relation to the fabric weight was required in order to achieve a satisfactorily dark nuance. The way in which the fabric was tightly woven may have affected the dye uptake but that does not explain the high level of dye uptake on the first sample. Such fine hemp yarn, as was being used, has a very high cellulose content as most of the lignin and pectin is removed. Therefore the yarns should absorb colour without problem unless they were treated in some way unbeknownst to me. I contacted the yarn supplier Linificios customer care and quality consultant Linda Rota in order to confirm that no wax, oil or other treatments were left in the yarn after the spinning and other preparatory processes. She was able to confirm this, leaving the question of poor colour uptake unanswered.
7. Result

The technical information, which is required in order to recreate the result of this project, is presented here.

7.1. Weaving specifications and pictures

All the prototype fabric was woven in NM 24/2, Z spun, S plied 100% hemp yarns with 14 threads per centimetre in the warp. The weave was a double weft faced twill with the same yarn in the warp and the weft. All pieces with image were woven with a shaft draw system and the plain fabric was woven without on the same Öxabäck loom. The size of each thread block in the patterned prototypes was 8 threads with only one thread block hanging on each shaft figure harness in descending order, giving a pattern width of <11.5cm in the centre of the weaving breadth. I used damask shuttles throughout. The pieces were clipped to size and sewn twice around the edge with cotton sewing thread as a finishing technique. All fabric has been washed at 60°c. All the dyes used were Zenit’s reactive dyes.

![Image of woven fabric]

The Scissor Flip image was woven with 28 threads per cm in the weft, in natural and black yarns, that were dyed with dye number 46 at 8% of the fabrics dry weight.
The Big Spin image was woven with 32 threads per cm in the weft, in red and yellow yarn. The red yarn was dyed with dye number 49 at 8% of the yarn’s dry weight and the yellow yarn was dyed with dye number 40 at 6% of the yarn’s dry weight.

The Boneless image was woven with 32 threads per cm in the weft, in red, natural and turquoise yarns. The red yarn was dyed with dye number 49 at 8% of the yarn’s dry weight and the turquoise yarn was dyed with dye number 44 at 4.5% and dye number 45 at 1.5% of the yarn’s dry weight.
The Foot Plant image was woven with 32 threads per cm in the weft, in orange, natural and green yarns. The orange yarn was dyed with dye number 49 at 3% and dye number 40 at 3% of the yarn’s dry weight and the green yarn was dyed with dye number 40 at 4.5% and dye number 40 at 1.5% of the yarn’s dry weight.

The Dark Slide image was woven with 30 threads per cm in the weft, in red, blue and black yarn. The red yarn was dyed with dye number 42 at 4.5% and dye number 40 at 1.5% of the yarn’s dry weight, the black yarn was dyed with dye number 46 at 8% of the yarn’s dry weight and the blue was dyed with dye number 43 with an unspecified amount of left over colour from earlier test dying.
The plain large piece of fabric was woven alternately with natural and black yarn. The black yarn was dyed with dye number 46 at 8%. The fabric samples pictured here were then over dyed in several different nuances.
7.2 Weave drafts
The weave draft is documented according to the international drafting system. The warp and weft colours are shown so that the image may easily be seen and the weaving method better understood. When half of the shafts are left untied, single treadling results in two sheds appearing. Only in the patterned area did this occur and only then in the areas of non raised thread groups. In the patterned areas I have consistently woven in the top shed. This can be seen by observing the weave draft. Each block consists of eight threads in the warp and eight threads in the weft. The 50 – 50 design shown here shows a simple example of how the handles must be drawn in order to achieve an image in this double weft faced twill. Below is shown the draft for the plain fabric.
8. Discussion

In the discussion I discuss the degree and way, in which the stated criteria and goals have been met.

8.1. To work according to principles that promote individual health, societal and cultural justice and ecological sustainability

The concept that I have worked with, meets very clearly, the criteria for promoting individual health, societal and cultural justice and ecological sustainability, i.e. slow fashion. Individual health, societal and cultural justice is overwhelmingly promoted by allowing the user to play a determining role at the products design stage. By taking consideration to user culture and preferences, the concept and the practical result of this project works according to slow fashion principles. In the practical realisation stage of the project I have worked heavily with ecological sustainability.

Hemp as a textile material is relatively ecologically sustainable and the Ökotex certification promotes physical health. The failure to use bifunctional low salt dyes however is contraindicative to promoting ecological sustainability or individual health and is a result of a hurried decision. I did however rinse the dyed samples very thoroughly in hot water and therefore did not need to use detergents. In relation to material choice and supplier it is a relevant question to pose as to whether or not it was indeed necessary to use hemp in such a fine quality, which was only available from afar. This is a question that could be explored further if this project were to be continued.

8.2. To work slowly, thoughtfully and methodically

The larger structure within which this project took form was very slowly, thoughtfully and methodically carried out. The details involved in the practical realisation of this work were on the other hand less well planned and resulted in several rushed, unevaluated decisions. An example of this is the decision to not research warp starching methods for lack of time when the warp threads were breaking excessively and delaying progression. Another example is that I singlemindedly carried out many dyeing tests without pausing for reflection. Therefore I didn’t succeed in working according to slow fashion principles during the whole working process.

8.3. To design and weave a trouser fabric that can be personally individualised by the user and that can function across the genres existent within skater style

The concept lends itself well to the fabric being personally individualised. As one may choose design and colour themselves it is easy for this concept to work across the the different style genres existent within skater style. The technique I chose was successful in making this possible. However if one is working on the assumption of a natural non-dyed warp it is not possible to achieve very solid colours without dying the fabric itself. This is a frustrating limitation which in order to be overcome requires further investigation.

8.4. To design and weave a trouser fabric that allows for ease of movement

The fabric has a high absorption rate which allows for moisture to be transported away from the skin and this increases ease for movement. The weave I have chosen gives a smooth surface which hinders snagging. The fabric is relatively heavy at around 400g per square metre, something which may hinder ease of movement but this is also a factor that would depend largely on the way the fabric be cut and sewn.
8.5. To design and weave a trouser fabric that meets high standards for strength

The considerations taken to ensure that the fabric meet high standards for strength have been relevant and thoughtfully considered. The Martindale testing method and the choice of material, yarn type and weave were well informed decisions. The material, yarn plying and weave however have not yielded as satisfactory results as expected. The abrasion tests revealed that the fabric fell well below the standards set, for example, by the company Blåkläder for their trouser fabrics. Optimally my fabrics also would reach this standard. Working with hemp made predictions of any sort very difficult because this material was new for me. All the decisions i made concerning hemp were based on the theoretical research carried out during this project as well as my preexisting knowledge of cellulose fibres generally. These sources have limitations and this is certainly a contributing factor to my fabrics not having reached an optimal level of strength. Nevertheless the fabric is certainly strong enough for use in apparel so I have achieved an acceptable level of strength although not optimal.
9. Conclusion and Further Research

This section concludes this project and presents possibilities for further development.

The aim of this project was to design and craft woven prototypes according to slow fashion principles for skateboard trousers. I have designed a product concept, which has formed the basis for this weaving project and which is relevant for the user group in focus. I consider the fabric that I have produced to be interesting in relation to the set goals and consider that I have clearly answered how an exciting fabric, congenial for use by skateboarders, can be developed according to slow fashion principles.

The possibilities for further development of this project are vast. Within the parameters of this immediate project it would have been of benefit to repeat the abrasion tests several more times in order to verify with certainty what the average abrasion resistance is for each sample. It would also be of benefit to research other dyeing methods that may yield better and more sustainable results. I found working slowly, thoughtfully and methodically very challenging and more practice is undoubtedly needed before I can apply this principle effectively. The difficulties I encountered in weaving with a shaft draw system made the task of weaving time consuming and arduous. The disadvantages outweighed the advantages so I would be inclined, if I were to continue using the same material, to use a different system for patterning. A hand jacquard loom would be of interest as this would be faster and not put the threads under such uneven pressure and as a result cause less breakage. Another interesting line of enquiry would be to work on a machine jacquard loom.
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