A garment for the upper body with a collar and sleeves and buttons down the front:

Shirts designed through patternmaking

An Essay presented in partial fulfilment of the requirements for the degree of
Master of Design
At Massey University, Wellington, New Zealand

Julia Lumsden
2010

Abstract

While garment design traditionally starts with a sketch it can also occur through the process of making a garment's pattern. I am designing men's shirts by manipulating a basic size medium men's shirt pattern. Though this design is framed by several factors, I have adopted the criterion that the shirts created using these patterns will not create any fabric waste, often referred to as "zero-waste pattern design".

Examples of shirts that meet similar criteria exist from the early 1800's. Often referred to as square shirts they were made up entirely of rectangles. These rectangles were sized proportionally from lengths of the body and the width of the fabric hence wasting little to no fabric. Rather than making patterns to recreate shirts from a time when they were inherently fabric efficient, the purpose of this project is to design shirts through manipulating the standard shapes of a modern shirt pattern with the parameter of not creating fabric waste and the aim of discovering shirts that could not have been conceived of through drawing.

The process has evolved through designing patterns for shirts and then testing the pattern and designing the shirts through construction. Over the course of the year I have developed a process for designing the patterns using a combination of Gerber pattern design software and Adobe Illustrator. I have constructed seventeen finished toiles and four half-scale mock-ups of shirts created using these patterns. Fabric length, width, occasional mistakes and fortuitous shapes arising from what would have normally been waste have guided my designs. Ongoing research into other designers who design through pattern making and to reduce fabric waste has informed my ideas and decisions.

In this research, I am questioning the predominant method of designing fashion clothing through drawing by exploring the potential of a specific approach to design through pattern making. My findings will add to the pool of knowledge on the benefits and limitations of the use of pattern making for the design of shirts that don't create fabric waste.

Contents

Introduction

As a fashion designer my strength and interest lies in the area of tailored menswear. My aesthetic of minimalist tailoring with subtle quirky detailing has evolved through a process of discovering the boundaries that I am willing to cross and those that I am not. I am not interested in designing avant-garde menswear with a drastically different silhouette and style to what is considered normal. I am interested in breaking conventions governing the pattern shapes that make up the garment and the way they are arranged in a marker. I aim to design garments that are innovative and unconventional in their structure while maintaining my aesthetic and creating garments that are comfortable and wearable. If I am to be successful in this research I need to retain the fit, and basic aesthetic of a contemporary men's shirt but improve on and advance the style and detailing by manipulating the pattern to use all the fabric.

As a designer my interest in the relationship between garment patterns, garments and worn garments is largely aesthetic. My primary interest is in the garment pattern. Even so I still need to consider the question: Will the design still be successful when transformed into garment and then worn. For me the process of creating patterns for garments is not just a means to an end; I am finding it is the way I prefer to design.

In their book *The Business of Fashion: Designing, Manufacturing and Marketing* Bryant and Burns (2007) identify sketching and draping as the conventional methods for designing fashion garments. When I design through sketching I am designing the finished garments hanging on a rack. Making the pattern is a process of figuring out the shapes of the garment I have drawn so that I can replicate the drawing in fabric. The body that will potentially fill the garment is given little consideration and would need to be very lean so as not to distort the garment or influence the design. When I drape I am designing a worn garment. I am using fabric to design a garment as it will look on a body, with the curves of that body strongly influencing the design. By marking the fabric while it is draped the fabric can then be used to find the flat pattern pieces needed to produce the garment. When the garment has been reconstructed and arranged back on the body the design process is complete.

By designing through making the pattern I can manipulate the pieces without knowing exactly how it will translate into a garment. I can also ensure that all the pieces fit together perfectly like a puzzle, making full use of the piece of cloth that is to be transformed onto a garment.

This essay follows the development of a process for designing men's shirts through making their patterns. I am attentive to how I can re-work the fabric the sits outside of the garment "body" back into itself and I use this as my main design tool as an alternative to drawing. As practice-led research, this project has developed through the process of designing patterns for men's shirts constructing them to test the success of the design as a shirt and finally viewing them when worn by a fit model to assess their success as functioning shirts. Alongside the design process I explored the story of the shirt in a historical and contemporary context where I found examples of garments created without fabric waste. I have also engaged with the work of other fashion designers who employ process to reduce or eliminate fabric waste from the clothing they produce.

The Shirt:
Historical and Contemporary Context

In order to design innovative shirts in 2010 I first needed to set my thinking about shirts against a background of the history of the shirt and the way it has changed with different constraints involving material availability and cost, different methods and technologies, as well as changing aesthetic goals.

A garment for the upper body with a collar and sleeves and buttons down the front, the title of this project, echoes the Oxford English Dictionary (2003) definition for a shirt.

Examples of early shirts that I have found do not meet this modern definition in that they don't have buttons down the front fastening the shirt from hem to neck or a collar. *Cut My Cote* (Burnham, 1973) presents examples of some of the earliest sewn garments. A "body covering garment with neck opening, side seams and sleeves" (Burnham, 1973, p.9) could be called many things one of which Burnham argues is a shirt. Burnham presents examples of Egyptian garments meeting this description from the fourth to the twelfth centuries. The earlier examples are woven to shape with the width of the fabric increased in the middle of the length to create sleeves **[Figures 1 & 2]**. While having sleeves and a slit for the head to go through is beginning to reference the relationship between the body and the garment, I imagine this would have been a practical development in terms of keeping the fabric on the body for warmth and protection. The aesthetics of the shape and the way the garment hung on the body would not have been a major consideration, whereas the quality and decoration of the fabric used would have been largely driven by aesthetics as well as a way to communicate status and wealth (Burnham, 1973). The earliest example of a shirt with a collar shown in *Cut my Cote* is of a man's shirt, thought to be Italian from the late 16th century **[Figure 3]**. An early 19th century English shirt is very similar in form with the main difference being two small triangular pieces inserted at the sides of the T slit providing ease for the collar and strengthening the construction (Burnham, 1973, p.17) **[Figure 4]**. This style of shirt was known as the square-cut pullover style they were made up of squares and rectangles with gussets at the neck and underarm providing some shaping and room for movement (Shep & Cariou, 1999). The introduction of a collar and inserts at the neckline indicates to me an increasing importance in the aesthetics of the shape and look of the garment on the body while also moving towards the modern idea of what a shirt looks like.

Figure 1: Egyptian man's shirt, 4th century A.D.

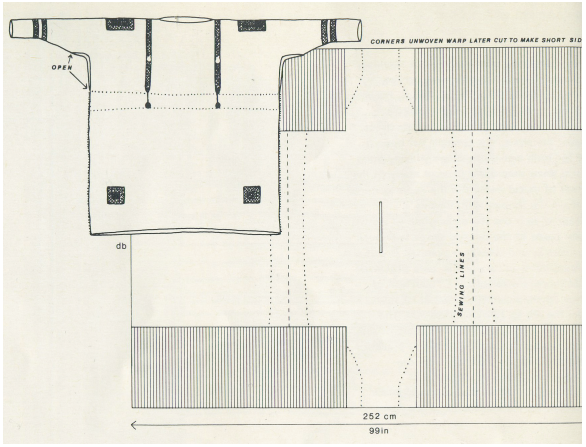


Figure 2: Egyptian man's shirt., 5th-6th century A.D.

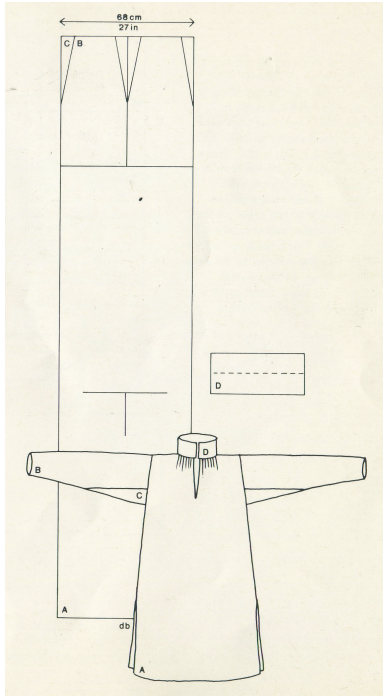


Figure 3: Late 16th century man's shirt, Thought to be Italian.

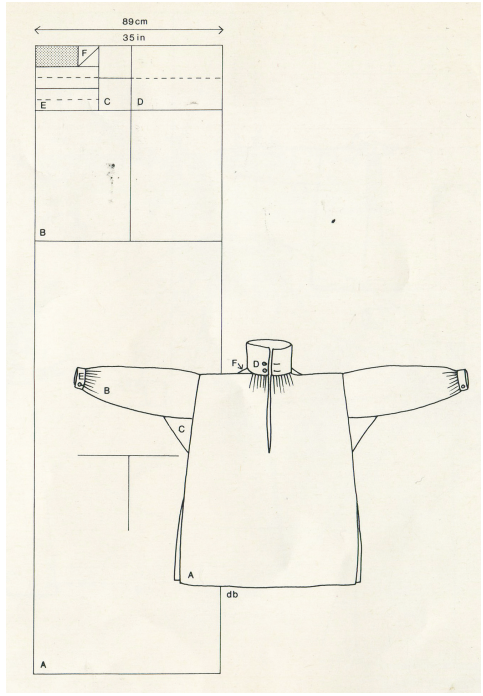
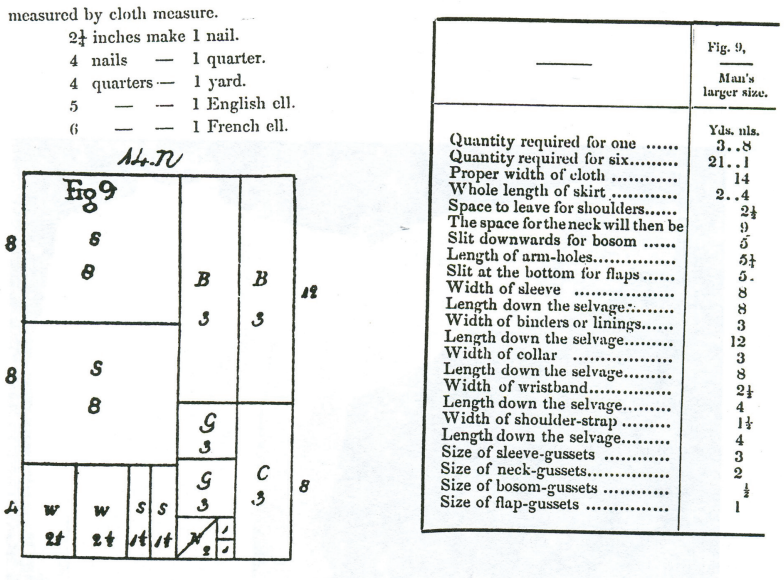


Figure 4: Early 19th century English Man's shirt.

There is no evidence of patterns for these shirts. Instead a chart of pieces required and their ratios was used, or an existing shirt was copied **[Figure 5]**. These shirts used fabric very efficiently and were often cut by the dozen to ensure the most economical layout. The method of design and fabrication of the early shirts described by Shep and Cariou (1999) shares many aspects with contemporary approaches to reducing fabric waste. In a time where fabric was very expensive and supplies limited, efficient use of fabric was expected. I find the simplicity of these early shirts very appealing in the way they are shown as drawings or photographs of the garments laid flat and diagrams illustrating how the pieces might have fit into a length of fabric. A quick experiment in trying to use the principle of these patterns to create a contemporary dress shirt highlights the difficulties of achieving a tidy durable finish and the awkward relationship these rectangles have with the body. It is worth considering that creating a shirt from rectangles that reduce fabric waste, may compromise the final fit and aesthetics.

Around the 1840's the new style of shirt began to emerge. Shirts became closer fitting with a curved armhole and neckline and shaped body. With the new style the objectives were a better fitting, more durable shirt (Shep & Cariou, 1999). The new shirts required a full size or scaled pattern. Initially, these patterns were very basic and were accompanied by complex written instructions. By the 1850's, pattern drafting methods developed by tailors were being applied to shirts (Shep & Cariou, 1999). Although shirt making was considered a separate field to tailoring, there are examples of shirt patterns published alongside trouser coat and waistcoat patterns in tailors' drafting books (Shep & Cariou, 1999). Rather than grading the pattern to different sizes (which is common practice now), it was up to the tailor to modify the pattern to fit their customer.

Between 1870 and 1900 as the shirt became increasingly close fitting around the body and under the arm, the 'coat front' was introduced. Rather than being pulled on over ones head the coat front style was open at the front and put on like a coat. This style was first introduced in Vienna but is now popular in all parts of the world and is a standard feature of contemporary shirts in the Western world (Shep & Cariou, 1999) **[Figure 6]**. An alternative was a back placket opening with either a real or simulated bib opening. With highly starched bibs becoming a feature of the shirt, this avoided creasing the bib while buttoning up ones shirt (Shep & Cariou, 1999) **[Figure 7]**. White shirts with pleated bib fronts are now seen as the most formal style of shirt, generally reserved for weddings and black tie events for those wanting to stick with tradition. They can also be seen being worn in a casual context making a statement.



measured by cloth measure.

2¼ inches make 1 nail.
4 nails — 1 quarter.
4 quarters — 1 yard.
5 — — 1 English ell.
6 — — 1 French ell.

——	Fig. 9, —— Man's larger size.
	Yds. nls.
Quantity required for one	3..8
Quantity required for six	21..1
Proper width of cloth	14
Whole length of skirt	2..4
Space to leave for shoulders	2¼
The space for the neck will then be	9
Slit downwards for bosom	5
Length of arm-holes	5¾
Slit at the bottom for flaps	5
Width of sleeve	8
Length down the selvage	8
Width of binders or linings	3
Length down the selvage	12
Width of collar	3
Length down the selvage	8
Width of wristband	2¼
Length down the selvage	4
Width of shoulder-strap	1¼
Length down the selvage	4
Size of sleeve-gussets	3
Size of neck-gussets	2
Size of bosom-gussets	½
Size of flap-gussets	1

Figure 5: A page from an 1837 workingwoman's guide showing the ratios and measurements for making a Men's square-cut shirt.

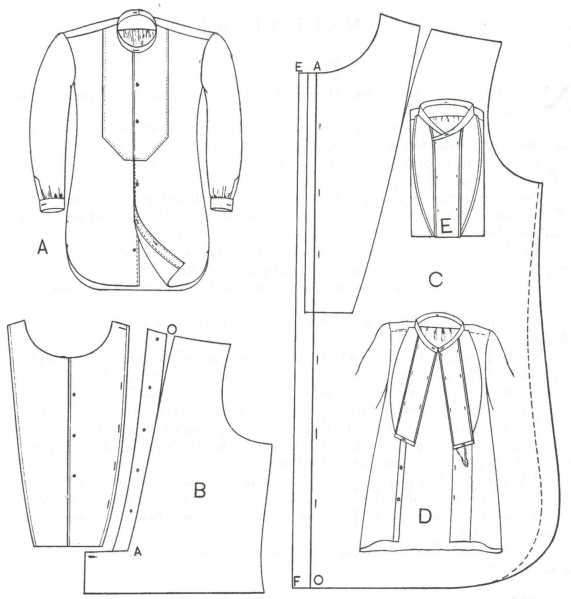


Figure 6: Shirt with bib and open front (coat front). In both double and single breasted styles.

In the early 19th century a curved hem was introduced, providing length at the front and back but curving up over the hip to reduce bulk. It had become a standard feature by the end of the century and is still a common feature of shirts today. Square cut shirts continued to feature in the 20th century for sport and leisure and short-sleeved shirts were introduced (Shep & Cariou, 1999) **[Figure 8]**. It is interesting that sports and leisure shirts that were worn as fully visible outer garments continued to be made in the loose, ill fitting square-cut style while shirts for formal wear became increasingly fitted when they were largely hidden underneath a waistcoat and jacket. The aesthetic of the shirt was not as important as the overall look with reduced bulk under the waistcoat and tucked into trousers. There was a clear distinction between casual and formal-wear that has become increasingly blurred with an overall shift toward a more casual style of dress.

While style features and detailing on shirts continues to evolve there has been considerable stability in the shirt pattern since the late 19th century and this 'new shirt' has displaced the previous standard of the square-cut shirt.

We have seen that a shirt cut entirely from squares and rectangles is one way to approach designing a shirt that doesn't create fabric waste. Literature documenting the pre 1840 square shirt acknowledges how fabric efficient the style was but as the shirt became increasingly shaped the fabric waste generation that would have occurred is not addressed. One could imagine the larger scraps might have been used as rags for cleaning and curling hair but would expect the majority would have been waste. The practice of creating a garment out of a piece of woven cloth without wasting any of the fabric seems to have been around since approximately 6000 BC however the practice of actually cutting and sewing came much later (Tarrant, 1994). While being as fabric efficient as possible has continued to be a priority in garment manufacture modern pattern shapes result in an average of fifteen percent waste (Cooklin, 1997). One would expect that current reasons for wanting to create shirts without creating fabric waste are quite different from those of the people who came up with the idea of joining a series or squares and rectangles together to produce shirt like garments. Recreating the square shirt in order to not waste any fabric while possessing the knowledge of a highly refined shirt pattern with superior fit, comfort and durability would seem to be a step backwards. Ideally the improved features of the new shirt would preserved while having the fabric efficiency of the old shirt with the result being a shirt superior to both its predecessors.

An analysis of three sources that identify the significant features of contemporary men's dress shirt reveals the diversity of shirts today. Coffin

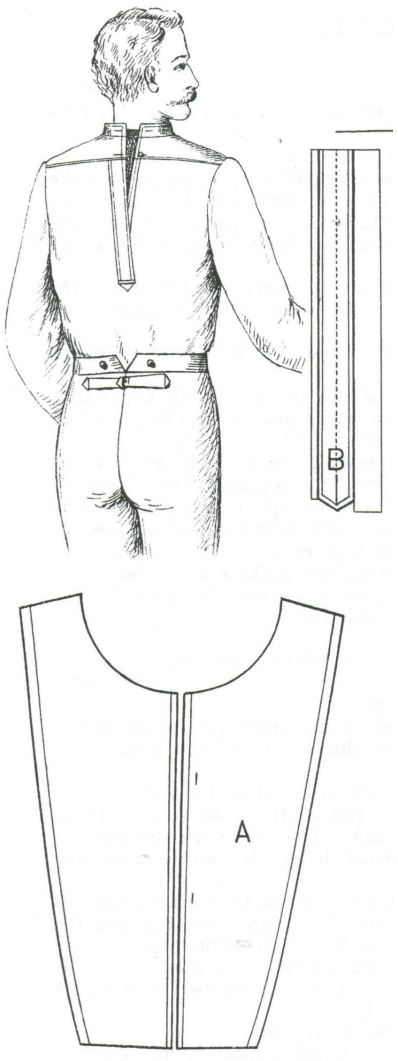


Figure 7: Shirt with a bib front and back placket opening.

Figure 8: Cricket shirt; The square-cut style of shirt continued to be worn as a sports shirt while the new style of shirt developed.

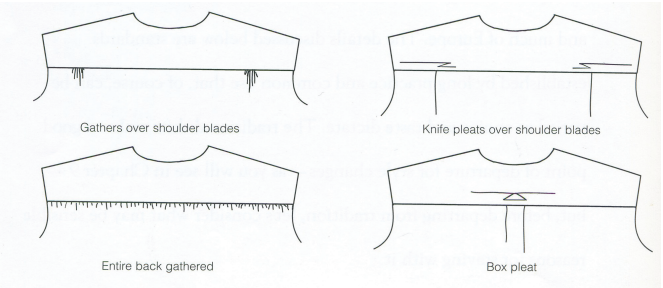
(1993) outlines the anatomy of a classic dress shirt with the first essential element being a one-piece back with ease distributed in the form of pleats, tucks or gathers **[Figure 9]**. Coffin (1993) dictates that a dress shirt must have a one or two-piece double yoke and separate from neck to hem, finished with or without a separate band. A one-piece front with a placket opening finishing partway down indicates a casual or sports shirt (Coffin, 1993). For Coffin (1993) a traditional dress shirt also requires flat felled underarm, set-in sleeve and side seams, a one piece sleeve with a placket, a collar on a stand and a rolled hem. Coffin (1993) explains that while breast patch pockets have become increasingly popular and commonplace on most contemporary men's shirts, traditionally dress shirts do not have a pocket. This quite specific definition of a men's dress shirt would accurately describe many of the standard business shirts that can be found in most menswear stores.

While the same traditional shirt back is acknowledged in Raef's (2007) book on dress shirt design, she also explores many design options including no fullness, a centre back seam and back darts. These features all achieve a slimmer fitting style of shirt, which has gained popularity in recent years. Raef (2007) also identified a one or two-piece double yoke as an essential feature though she explored many shapes that may not be acceptable for the classic, modern dress shirt. Raef (2007) suggested that a short sleeve without a cuff and placket could feature on a dress shirt and that hems were generally overlocked, turned up and topstitched. For Raef (2007) a band collar was included as an option and she embraced the popularity of shirt pockets, exploring many options.

The *Three Wise Men* guide to their shirts found on the store's website (www.3wisemen.co.nz) states that all their shirts have two-piece double yokes to ensure a perfect fit on the shoulders. Contrast fabrics in the collar and side gussets are standard features. And *Three wise men* specified their two styles of two-piece collar as being Duke of York and Windsor collars. The *Three wise men* guide indicates a pocket-less shirt as standard. All three sources identified a barrel or a French cuff as the appropriate finish for a long sleeved dress shirt.

More extreme variations on the traditional shirt can be seen in high fashion. Cosmic Wonder Light Source's double sleeve shirt **[Figure 10]** approaches the standard tailored shirt with humour and Yohji Yamamoto's long dress like shirts **[Figure 11]** are questioning the rigid codes of masculine dress (Davies 2008). With these challenges to the standard silhouette and function of the shirt I imagine that even men comfortable wearing clothing that is 'different', may find it difficult to wear these shirts. There are also several

Figure 9: Various ways of handling ease for a shirt with a yoke and one-piece back.



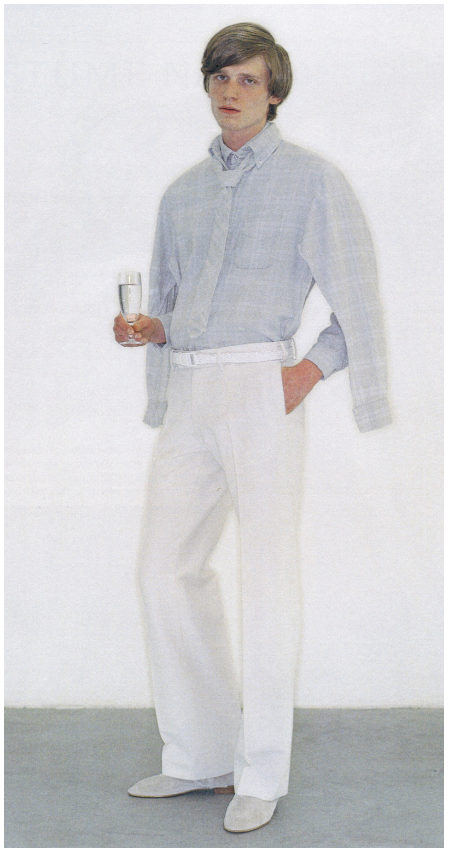


Figure 10: Double sleeve shirt by Cosmic Wonder Light Source.

Figure 11: Long dress like shirt by Yohji Yamamoto.

other designers who have experimented with the traditional shirt. Andrew Hague's Zero-waste Shirt **[Figure 12]**, which features in Kate Fletcher's *Sustainable Fashion and Textiles: Design Journeys*, as the name implies has a pattern that does not create any fabric waste. While the end product looks like a fairly standard women's shirt, from experience I know that the shapes that make up the pattern will be totally non standard to be able to use up the pieces that are normally waste without using them as embellishment. Without access to an image of the pattern or other views of the shirt it is hard to make a full assessment but from what is visible the minimalist aesthetic with the wide collar fall and cuffs subtly distinguish the design from a standard shirt. Among a whole range of zero-waste menswear Timo Rissanen has designed the Endurance Shirt **[Figure 13 & 14]**. This pattern is a totally deconstructed version of a standard shirt pattern through eliminating seams, splitting pieces up, interlocking shapes and using the rest for functional and decorative embellishments. The pattern for this shirt is totally unconventional but the shirt it produces shares many elements with a conventional shirt. Inventive darts, finishing techniques and the practical embellishment of elbow patches enhance the design of the shirt. For this pattern to be zero-waste two shirts need to be cut out at the same time with the ends interlocking and forming a rectangle. David Telfer's final collection from his Master of Design degree explores minimal seam construction for production efficiency. The underlying motivation is that fewer seams lead to faster construction and reduced production costs but by reducing patterns to one, two or three pieces a unique aesthetic has evolved. In his collection of six outfits Telfer has included two shirts **[Figure 15]**. While a standard shirt contains reasonably simple shapes, a significant amount of sewing is involved particularly when seams are flat felled and edges understitched and topstitched. While the conventional silhouette is left intact less is more in terms of stitching and detailing. In total contrast to Hague's and Rissanen's shirts, fabric efficiency is not an objective of the patterns, though perhaps lower production costs would offset the cost of fabric wastage.

These are three examples of innovative contemporary shirts that have been designed largely by approaching the pattern for the shirt in a different way rather than sketching. The external parameters of reducing fabric waste or seam elimination seem to be the driving force behind the designs, while constant decision making from the designer throughout the process directs the final aesthetic. The patterns for these shirts totally break from convention yet the shirts as garments retain the essence of a standard shirt, which I think makes them much more wearable than the double sleeve shirt or the long flowing dress like shirt. For this project my intention is to create shirts that will appeal to men who are willing to make a statement and care about the details. and the structure of their shirts. They also need to feel comfortable wearing them.

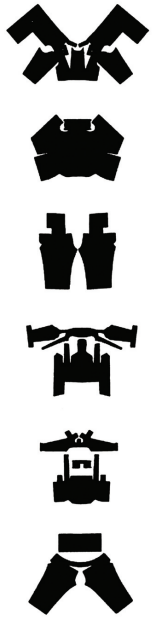
Figure 13: Key to the Endurance shirt pattern

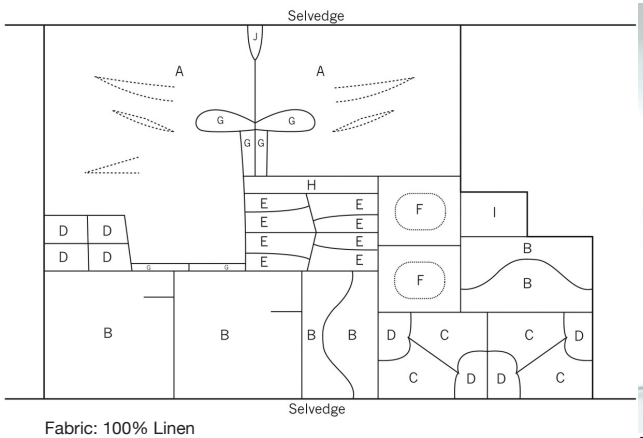
A: Body
B: Sleeve (including top sleeve lining)
C: Yoke
D: Cuff
E: Collar & stand
F: Elbow patch
G: Sleeve placket
H: Internal waist stay
I: Internal back pleat stay
J: CB Yoke appliqué

Dashed line indicate darts and dart-tucks
Dotted lines indicate fold lines

Figure 12: Andrew Hague's Zero-Waste Shirt.

Figure 15: Two outfits and their corresponding patterns by David Telfer.





Fabric: 100% Linen
Fabric width: 135cm
Yield: 176cm

Figure 13: Pattern for Timo Rissanen's Endurance shirt.

Figure 14: Endurance shirt by Timo Rissanen

Creating Garments without creating Fabric Waste

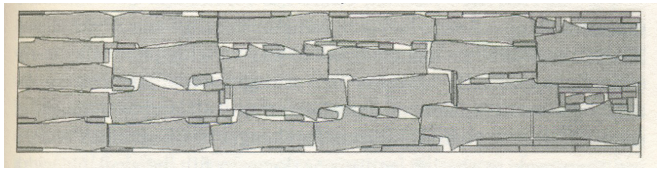
The process of designing fashion garments generally begins with a sketch. It is a quick way to make ideas visible to the designer and anyone working with them. Ideas for silhouette, design features and detailing can be resolved before the more lengthy and costly process of pattern making and prototyping (Rissanen, 2008, p.190). As a designer I find the process of sketching stifling, as my sketching ability is inadequate at communicating my ideas. My strength is in patternmaking and being able to understand how changes to a two dimensional pattern piece will translate to a three dimensional garment on a body. Wanting to further explore the design potential of the pattern making process, I came across the idea of eliminating fabric waste from my garment designs.

Research into modern patterns and cutting techniques has shown that on average 15% of the fabric used to create garments is wasted (Cooklin, 1997) **[Figure 16]**. Approximately 50% of the cost of producing a garment comes from the fabric so getting a high yield out of that fabric is of great benefit to the manufacturer (Cooklin, 1997). A high yield is achieved through effective marker making, shuffling sometimes hundreds of pattern pieces around so that they fit together in the most efficient way. The fabric wastage is a result of the irregular shape of garment pattern pieces and the gaps left between them. It is often possible to get a better yield through small pattern manipulations that won't affect the overall aesthetic of the design (Cooklin, 1997). However, this would involve sending the pattern back to the pattern maker to make the changes, who would also need to get them approved by the designer. Whether or not this happened would depend on the company and the amount of fabric that could be saved compared with the cost of altering the pattern. If the designer is serious about reducing fabric wastage the way in which the pattern pieces are going to fit together needs to be a major consideration throughout the design and patternmaking process. Reducing costs is not my motivation for eliminating fabric waste in this project. Placing the parameter of not creating fabric waste on my work was a tool to direct my designs and would push me to design patterns for garments that I could not have conceived of through drawing.

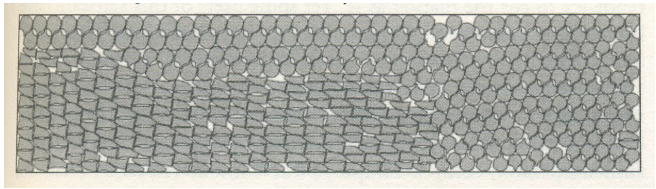
The desire to create garments without creating fabric waste is not new. The square-cut shirt is an example of this and two other examples of traditional garments that produce little to no fabric waste are the Kimono **[Figure 17]** and the Sari **[Figure 18]**. The Kimono dictates the width of traditional Japanese

Figure 16: Typical pants and intimate apparel markers.
The pants marker uses 89.66% of the fabric and the intimate apparel marker uses 81.43% of the fabric.

Width 59.75 in, Length 268.69 in, Pieces 108, Efficiency 89.66%



Width 52.00 in, Length 249.12 in, Pieces 508, Efficiency 81.43%



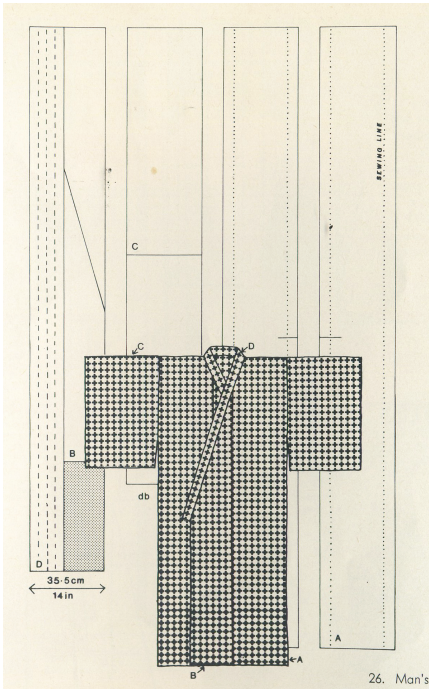
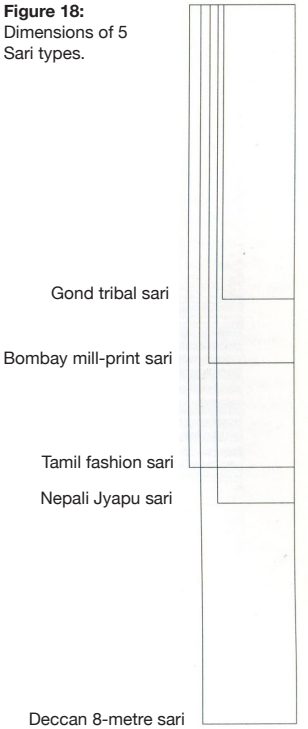


Figure 17: Early 20th century Japanese man's coat (Kimono)

Figure 18:
Dimensions of 5 Sari types.



cloth. The cloth is cut to set lengths and adjusted to fit the individual using tucks rather than further cutting (Liddell, 1989). The sari is an untailored length of cloth, which is pleated and draped around the body. The length and width of the sari varies between regions and the design of the fabric is a highly structured vocabulary, which indicates information such as family and social standing and wealth (Lynton, 1995).

From 1919-1920 Ernesto Thayaht of the Futurist movement created the Tuta, a one-piece outfit not dissimilar to American overalls of the time (Stern, 2004) **[Figure 19]**. It was designed as a garment for all occasions, making any other clothes unnecessary. It was based on the principles of simplicity, comfort and hygiene and was simple enough to be made by the home sewer (Stern, 2004). The pattern appears to have little waste with the triangular piece between the legs becoming a facing for the front placket. Without the trousers its composition is very similar to the square shirt. While the Tuta did not succeed in replacing all other fashion-clothing items there is evidence to suggest that within a few days of its release over 1000 patterns for the Tuta were sold (Stern, 2004). Disposable overalls designed by David Telfer made from a protective unwoven fabric called Tyvek offer a contemporary counterpart **[Figure 20]**. His most efficient design used 98.13% of the fabric and had fewer seams than the existing Tyvek overall. They have the feeling of an ultimate garment in terms of efficiency and practicality although these were not designed with the intention of replacing all other clothing. While the utilitarian minimalist aesthetic of these overalls is in line with my own design aesthetic the aim of this project is not to design the shirt to replace all others. It is to see if I can produce smarter designs that are not only efficient but also desirable and appealing.

American fashion designer Claire McCardell's signature was clean-cut comfortable clothing in which form followed function. She was most noted for her designs between the 1930's and the 1940's (Kohle, Yohannan & Nolf, 1998). While she did not restrict herself to rectangles, she did design several dresses and skirts that were made from two rectangles sewn together, elasticated at either the shoulder, under the bust or at the waist and often worn with a belt **[Figures 21]**. These dresses and skirts were not experimental; they were designed for the mass market and sold well (Rudofsky, 1947). McCardel's rectangle based dresses and skirts look stylish and desirable and would be comfortable and practical for certain situations. The elasticated areas would give the garments shape when off the body somewhat disguising their simplicity from many potential consumers. These designs show that skirts and sleeveless dresses that don't have a structured necklines can be successfully made from basic geometric shapes. It is the creation of areas

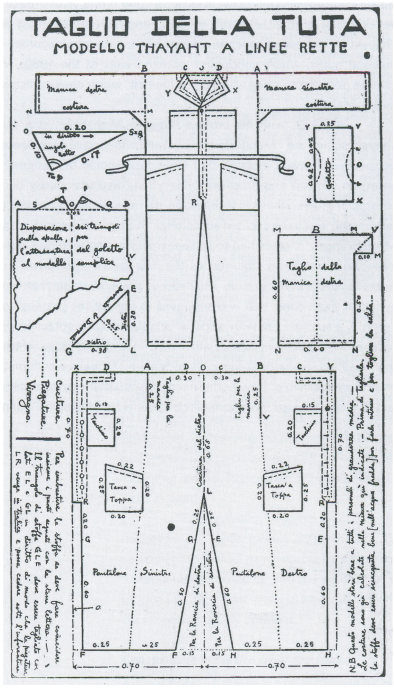


Figure 19: Ernesto Thayat (Michahelles) Tuta 1918 - 1919

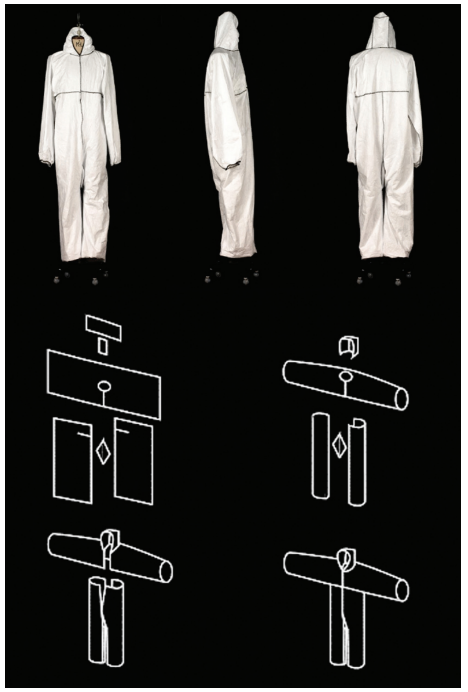


Figure 20: Photos and diagram of Tyvek overalls by David Telfer.

Figure 21: Dresses and skirt by Claire McCardell.

of fit around the arms, legs or neckline that tends to make these garments awkward and bulky.

In the 1950's Bernardo Rudofsky's designs for women's separates were produced **[Figures 22, 23 & 24]**. The garments consisted of rectangles and were produced in only one size, a first for industrially produced garments. The garments were given shape through drawstring cords and belts so could be adjusted to essentially any size. (Bocco Guarneri, 2003). The absence of pockets and buttons made them easy to care for and their geometric shape made them easy to fold and store. The use of uncut lengths of fabric gave potential for specifically designed printed and woven textiles. Despite all the benefits of care, cost and practicality, the garments did not sell well and production was soon halted (Bocco Guarneri, 2003). One could argue that aesthetically Rudofsky's separates were not particularly stylish or flattering. They appear to rely on a slim hourglass figure to gain their shape while many people use clothing to improve or disguise an imperfect figure. For me, Rodofsky's separates lack desirability as pictured on models and I imagine they would be even less appealing when displayed on a coat hanger.

The square shirt, the Kimono, the Sari, the Tuta, David Telfers overalls, Claire McCardell's dresses and skirts and Rudofsky's separates are all based on squares and rectangles and they are largely one size fits all. The kimono and the sari involve the least amount of sewing and are the most complicated to put on. As the traditional dress of their respective cultures they have stood the test of time and have stayed much the same in their components and the way they are worn. While the square shirt had a long reign the new style of shirt did eventually take over. The excess bulk and issues of comfort and durability caused by the square-cut shirt neither conforming to the body nor clothing worn over it were seen as its main detriments. This could explain why the popularity of the Tuta and Rudofsky's separates was only brief. While the use of rectangular pattern pieces is an effective way of reducing or eliminating fabric waste, there will inevitably be more bulk than in a tailored garment. The waste created by a basic tailored garment essentially is the excess bulk removed from the garment. I think the fabric is better off in the garment than on the work-room floor. Rather than reducing the pattern pieces to rectangles I am going to use the shapes of standard contemporary shirt pattern and the spaces in-between to create highly unconventional shirt pattern-markers that when constructed into shirts are transformed into shirts that at first glance appear 'normal' and wearable but on closer inspection are totally innovative in their structure and detailing.

Figure 22: "allinone" from Bernard Rudofsky's separates collection

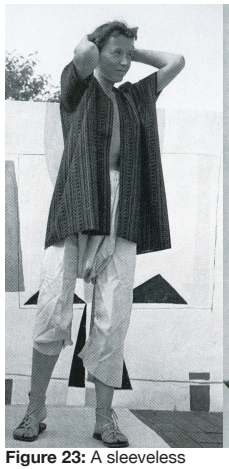


Figure 23: A sleeveless coat and trousers from Bernard Rudofsky's separates collection

Figure 24: Bernard Rudofsky's separates

Figure 25: Hand stitched quilt by Alabama Channin

Figure 26: "Skull Dress" Dress with appliqué skull design by Alabama Channin

An analysis of contemporary fashion designers who eliminate or reduce fabric waste from their designs has shown that there are two main groups, which are zero-waste-fashion and zero-waste-patterns. These two groups are not mutually exclusive, the zero-waste-patterns are creating fashion and the zero-waste-fashion requires patterns. One way to approach zero waste fashion is to use fabric that would have normally been wasted to embellish garments, with the intention of adding desirability and value to the garment. Alabama Channin employs local artisans from where the label is designed and produced in Florence, Alabama. The label uses a combination of new organic and recycled materials and any excess is used in hand crafted embellishments such as weaving, patchwork and appliqué **[Figures 25 & 26]**. The finished garments are one-of-a-kind or limited edition and are signed by the artisan who worked on them. The negative space in-between the base pattern of Mark Liu's garments is laser cut into intricate designs becoming an extension of the seam allowance which when opened up on the outside becomes a delicate, textural embellishment **[Figure 27]**. While both these examples are using waste as embellishment Alabama Channin's work is zero-waste fashion because the garment pattern is not being altered to eliminate waste while Mark Liu's designs are zero-waste patterns because the pieces that make up the garment are using the entire length of fabric. By digitally printing and laser cutting the fabric for his zero-waste designs Mark Liu achieves a very clean sophisticated finish which can be reproduced. Alabama Channin's designs require more handcraft work so that the exact same garment will be slightly different each time it is made.

Another approach to zero-waste design is to integrate what would normally be waste into the structure of the garment. This can be achieved through manipulating basic pattern pieces for a particular garment so that all the pieces interlock and share cutting lines thus creating areas of fullness, panel lines and other style features. These patterns have not been reduced to straight lines and rectangles, curved lines and elements of a 'regular' pattern stay intact, preserving fit with the manipulations creating the style. For his zero waste jacket, Sam Formo specifically chose a fabric that wouldn't fray, eliminating the need to finish seams providing more freedom in the construction process. The front fastening method is integrated into the garment pattern eliminating the need for additional materials. **[Figures 28, 29, 30]**. Holly McQuillan uses digitally printed fabric for some of her zero-waste designs and allows the print she has developed to inform the development of the design alongside manipulating the pattern pieces to fill any negative space **[Figures 31, 32 & 33]**.

Figure 28: Sam Formo's zero waste jacket on model

Figure 27: Digitally printed and laser cut zero waste dress pieces, detail and zero waste dress by Mark Liu

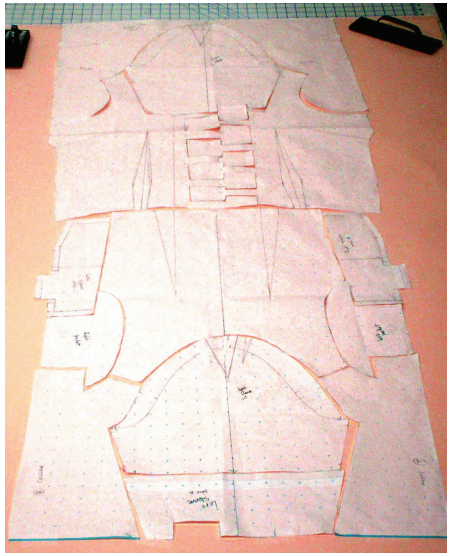


Figure 29: Pattern for zero waste jacket by Sam Formo

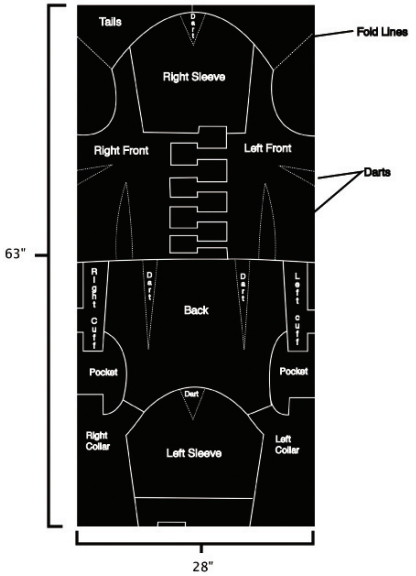


Figure 30: Diagram of pattern for zero waste jacket by Sam Formo

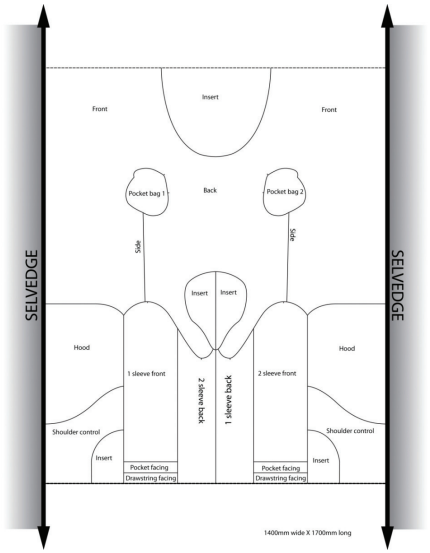


Figure 31: Wolf / Sheep jacket pattern by Holly McQuillan

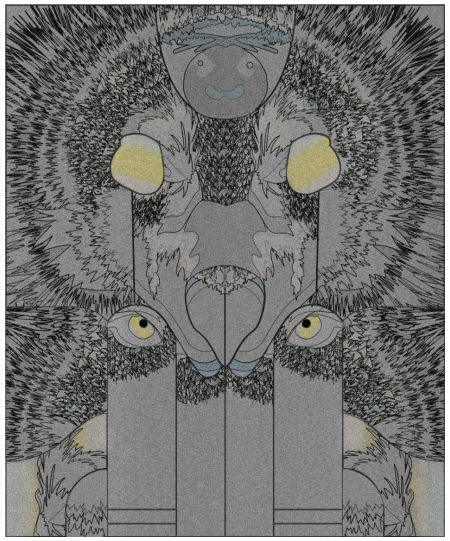


Figure 32: Wolf / Sheep jacket digitally printed textile

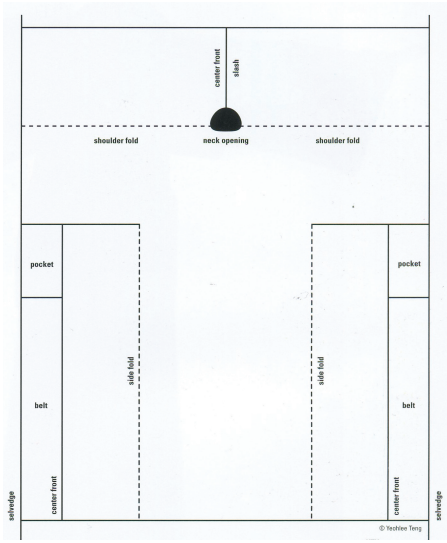


Figure 34: Pattern for "one piece coat" by Yeohlee Teng

Figure 35: One piece coat" Displayed on Mannequin by Yeohlee Teng

Figure 33: Wolf / Sheep jacket image from photo-shoot

Yeholee Teng's zero waste one-piece coat has many similarities to a kimono and goes back to the idea of rectangles **[Figures 34 & 35]**. Much of her other work is shaped with clever dart placement but retains a loose fitting elegance. While Yeohlee keeps waste to a minimum there is some fabric wastage. With elegant, unadorned designs being key to her aesthetic this would be difficult to avoid. Another recurring theme for Yeohlee is one size fits all, which can significantly reduce wastage of unwanted sizes (Major & Teng, 2003). I have discussed some key designers who reduce or eliminate fabric waste that have been most influencial to my work. A more comprehensive list of other designers who also reduce or eliminate fabric waste can be found in the appendices, p.96.

An analysis of the evolution of the modern shirt and both historical and contemporary examples of garments without fabric waste have informed my design decisions by revealing what has already been done, which ideas have been successful and which haven't. The aesthetic expectations of what a shirt is have changed a lot since the square-cut shirts of the 1800's and contemporary fashion designers have shown that creating garments without creating fabric waste does not necessarily mean simplifying patterns into basic geometric shapes, although some designers have had success with this technique. While developing my no fabric waste shirts for 2010 I need to consider where the shirt has come from and the technological possibilities available to me in order to achieve successful contemporary shirt designs.

There are significantly more contemporary examples of zero-waste womenswear than menswear. It could be argued that this is in part due to zero-waste menswear being harder to design because of men being less open to shifts in silhouette, drapery and embellishment. By choosing to design men's shirts that would appeal to a significant proportion of the menswear wearing population I have placed quite strict constraints on the aesthetics of the shirts I design. I am not trying to find a new silhouette or make any major modifications to what is generally accepted as the way a shirt looks. I am experimenting with alternative ways of structuring the components of the shirt and using the patternmaking process to produce functional and decorative areas of detailing that I would not have thought of if I had designed the shirts through sketching.

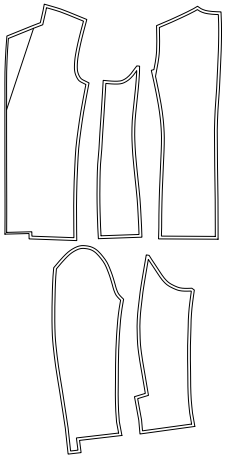
Previous Work which has informed this Project

My first venture into designing garments through making patterns was through a series of jackets **[refer A]**. I experimented with a pattern-making tool used in the fashion industry to alter patterns to fit individuals: a garment customisation technique often referred to as made-to-measure (MTM). After mastering the use of this tool in its conventional application I set about finding a way to subvert it for garment design. What I came up with was a process of altering a pattern until the pieces used up at least 95% of the fabric required by the pattern. The idea behind this was that I was continuing to alter the patterns to be MTM but rather than being MTM for a person they were MTM for the piece of fabric. The process began with a basic three-piece men's jacket pattern that I was familiar with from my undergraduate degree. The pattern consisted of a front, back, side body, top-sleeve and under-sleeve. I simplified the pattern by making all the curved lines straight only leaving a few key points to anchor the pieces into angular versions of their former selves **[refer B]**. These pieces made the singular finished jacket pattern from which the final six jacket designs were altered and created.

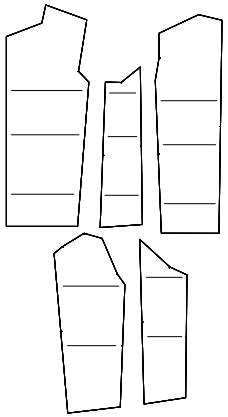
I then took this pattern through to a marker, which represented a folded rectangle of fabric (half the width of the final garment fabric - 75cm) and enough length for me to shuffle the pieces around in.

I preferred to work with half the pattern on the fold as I found that when I arranged the whole pattern on a single layer of fabric I still designed symmetrical patterns. Consequently working on the fold made this process quicker and more accurate. Next, the pattern pieces were arranged, flipped, rotated, overlapped and placed within the rectangle defining the fabric width. At this stage I was designing the patterns by arranging the pieces until I had an aesthetic I was happy with. Once I had an idea of where the pieces were going to go I started altering them. The ways in which I could alter each piece was governed by rules created in the alterations menu. With this I could move whole lines to change the length or the width of a piece or move a point along a line or at a corner to create a new angle or extension. I performed these alterations with the objective of filling the gaps while also being aware of the relationships the pieces had with each other when sewn together.

I initially found it difficult to alter the length of one seam and then not apply the same alteration to the corresponding seam because it challenged industry methods taught at undergraduate level and my own perception of what is "right". By conceding to the design process I found that through

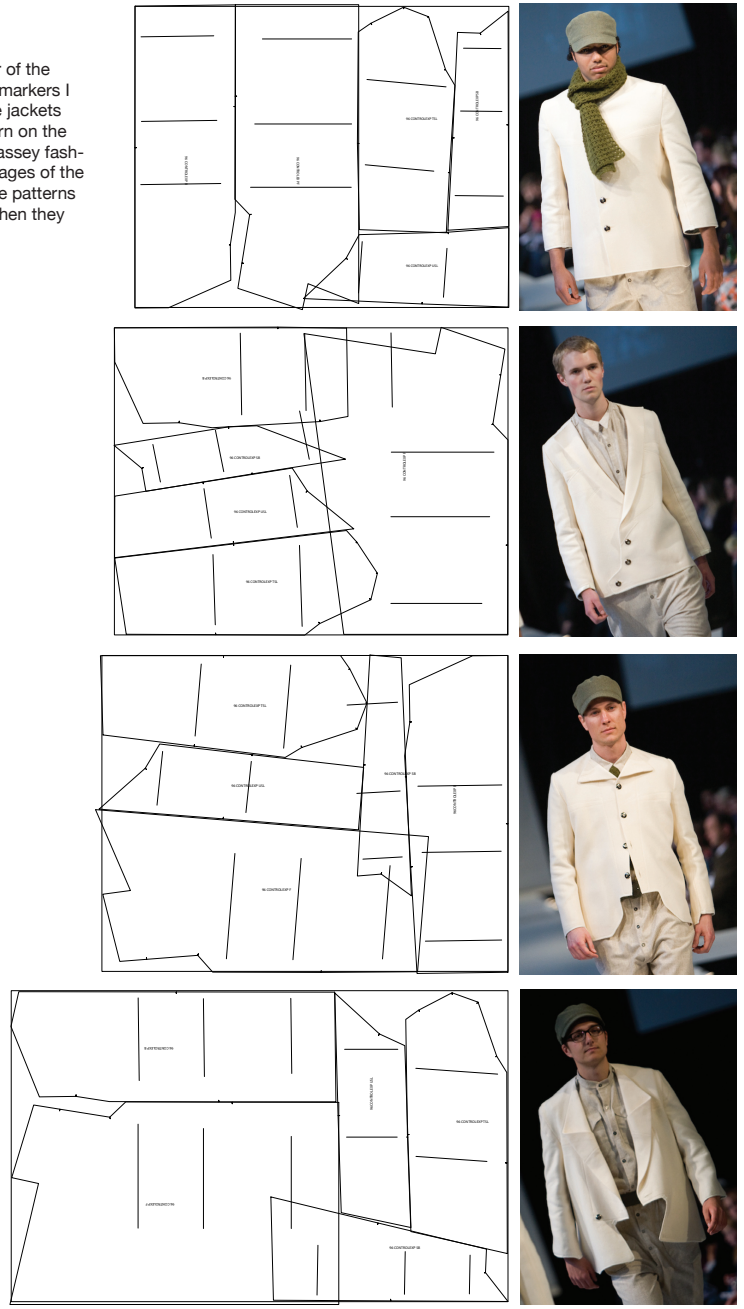


A: The basic men's three-piece jacket pattern that I started with.



B: The simplified version of the basic men's three-piece jacket pattern that was the starting point of all the final jacket patterns.

C: These are four of the five final pattern-markers I designed and the jackets they produce worn on the catwalk at the Massey fashion show. The images of the patterns show the patterns as they looked when they were plotted off.



construction, the patterns could work with corresponding seams of different lengths if I were flexible about the way the garments were constructed and finished. This became part of the process and the risk of unknown design outcomes. I altered seam lengths according to the spaces available within the final marker pattern pieces. Where possible, I endeavoured to keep the same seam lengths but also attempted to forgo the perceived notions of patternmaking conventions for the purpose of experiment.

Using this process I designed six jacket patterns, which achieved over 95% of the fabric yield. The gaps, which made up the last 5% or so of the pattern, were left attached to the pattern pieces most able to accommodate them. The final stage of developing the pattern was carried out by hand to produce hard copies. To do this the marker that I had made was plotted (printed) off and then backed onto Kraft (pattern paper). By hand I drew in extra lines to divide up the negative spaces between pattern pieces and used arrows to indicate which pattern piece each extra bit of fabric belonged to. I then removed thin strips of paper and kraft to create a template that outlined the pattern shapes leaving connecting tabs so that each pattern piece remained in one big rectangle.

The marker template was then placed onto fabric and the outline spaces marked through with tailors chalk. In comparison to traditional tailored pattern shapes the final interlocking geometric pieces look particularly alien at this stage with their 'extra bits' attached.

The first step in preparing the separated fabric pieces was to fold the 'extra bits' into the inside of each section and anchor them into position with two rows of stitching. After preparing the singular pieces, sewing them together into a jacket was relatively straightforward with the basic structure of the jacket still intact.

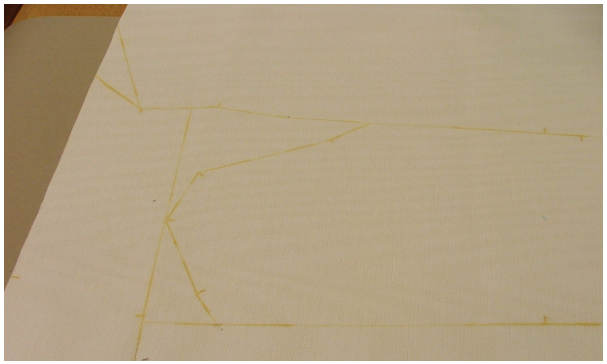
The design process continued into the finishing of the jackets, where essentially the whole outside edges of the jackets were bound and then the front edges were folded back and stitched in various ways to create facings and lapels that highlighted the different style elements of the jackets. I did this by putting each jacket onto a mannequin and playing around with the excess fabric, folding it until I was happy with the final look.

On reflection I can see I was subconsciously normalising the jackets taking an alien jacket shape and playing with it until it resembled a more familiar style of jacket.

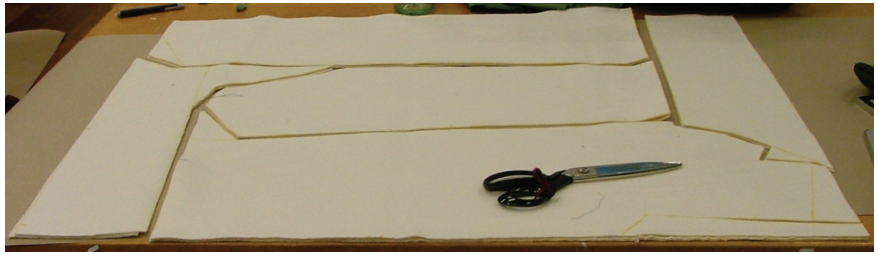
The jackets had a sculptural aesthetic dictated by the fabric I used and the way I prepared it by fusing it all with two layers of coat fusing. The unusual way they were finished with the entire edge bound rather than using a lining or facings also added to their intrigue. Apart from all these aesthetic details I could see that I had stumbled upon something interesting with this idea of MTM patterns. The process was to design a series of totally different jackets through arranging the pieces in an aesthetically pleasing way and then altering them with the primary objective of using up all the space. The "extra bits" which make up the last 5% of the pattern are not necessary for the pattern to function; they are largely decorative. Even so this decoration improved the aesthetics of the jackets and also stabilised areas like the shoulder and sleeve crown creating the appearance of a shoulder pad.

The hand drawn and hand cut areas of the patterns were only necessary because I didn't know how to carry out the whole process, using computer-aided design (CAD). Crisp, accurate, easily reproducible patterns are some of the main benefits of pattern making with CAD and taking the pattern making process through to completion using CAD was one of the first issues that needed to be resolved to develop this process of designing through pattern making.

The fused final Jacket fabric with the outlines of the pieces of one of the jackets marked with tailor's chalk.



The pieces for one of the final jackets cut out but still in their jigsaw puzzle arrangement.



Developing a Process

A brief Introduction to the Software I use and how I use it

AccuMark. Pattern Design, Grading and Marker Making Software by Gerber Technology

The AccuMark Software allows me to digitize full-scale pattern pieces into the system that I can then edit and name. This allows me to group all the pieces for one garment pattern together as a model. A model contains all the pattern pieces to complete a garment. These pieces will all have the same style name and different piece code names that identifies what the individual pattern pieces are, for example the piece code name for a sleeve is generally SL. I can now open the model in the pattern design screen and assign point identification numbers around the perimeter of the pieces.

Using the Alterations menu I create rules that refer to the point identification numbers that I assigned to the pattern pieces allowing me to move singular points, lines or sections of the pieces.

Using the order editor I can place an order for a garment model. Here I specify the width of fabric I am using, how many copies of the pattern I need and the sizes I need. For this project I worked with a size '3' or medium and ordered one or two copies of the pattern per marker. By placing an order I also create a marker.

The Marker Making Screen has all the pattern pieces from the model specified in the order and a rectangle the width of the fabric I specified in the order and as long as I need. The pattern pieces can then be tiled into the fabric area and arranged to make a marker using the computer mouse. If multiple copies and sizes of the pattern have been ordered these are all mixed up and arranged to get the maximum utilisation of the fabric yield. In the marker-making screen the grainlines of the pieces are set to match the grain of the fabric. In industry it is standard practice to tilt the pieces up to three degrees to get a higher yield (Cooklin, 1997). In this project I have disregarded standard marker making practice, tilting the pieces as much as I need to make them fit. In standard garment manufacture making the marker is the final process the pattern goes through. For this project this is the first stage in the design process.

The marker is exported as a Data Exchange Format (DXF) file that can be opened, and further manipulated in Illustrator. DXF files can also be imported back into the AccuMark software. The file needs to be converted

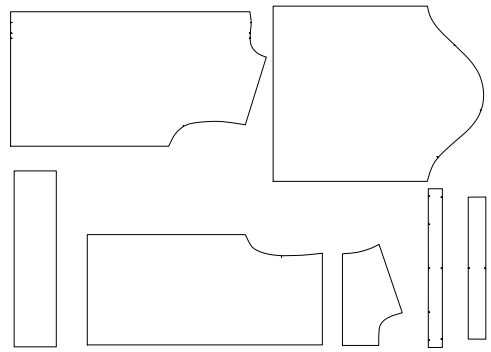
using the DXF converter from the AccuMark software then the marker / pattern can be opened in the Pattern Design Screen as a single piece. By this stage the patterns just need to be cleaned up by deleting any unnecessary lines and adding drill holes and notches where needed.

Now the pattern can be plotted off full scale ready for construction. From shirt 12 onwards, I went back to the final patterns after I had constructed the shirt to add or move any drill holes and notches that were moved during the construction process

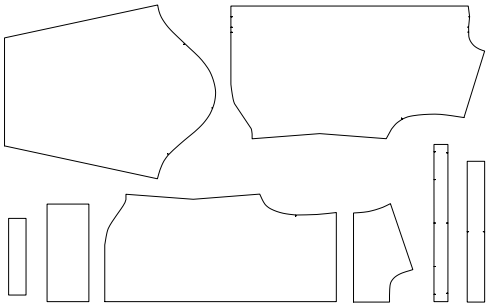
Adobe Illustrator

Illustrator is a vector graphics editor that allows me to create or edit my shirt patterns as vector graphic images. The shirt markers / patterns are opened in Illustrator as Drawing Exchange Format (DXF) files. The patterns are scaled up to full size and the lines of the marker can be deleted or modified. Shirt 6 was the only pattern that didn't start from a marker; I drew the pattern for shirt 6 using the pen tool. Initially I only used Illustrator to bring the marker / pattern back to full scale but as the process developed I started using Illustrator to perform more major modifications on the pattern pieces. Once I have finished modifying the pattern in Illustrator it is exported as a DXF so that it can be imported back into AccuMark.

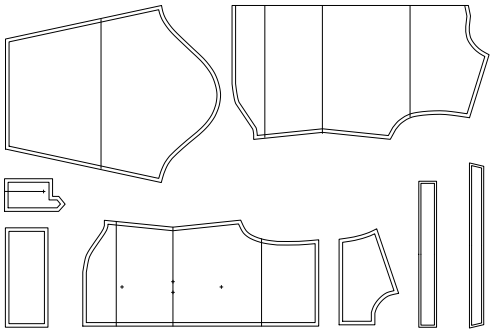
The Process



Base pattern 1



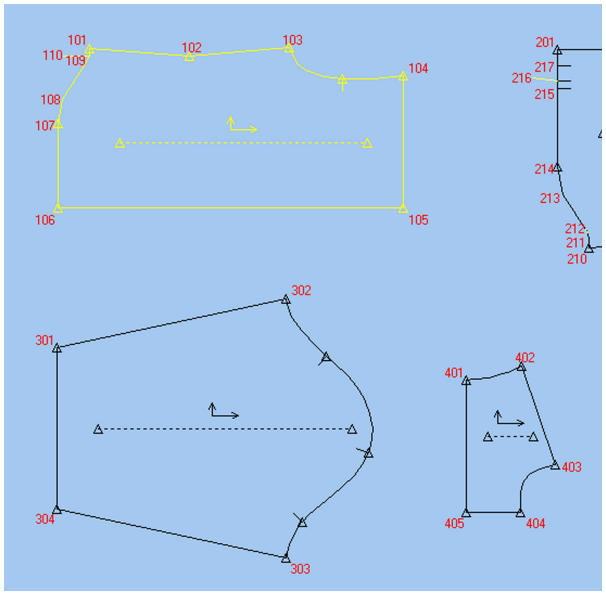
Base pattern 2



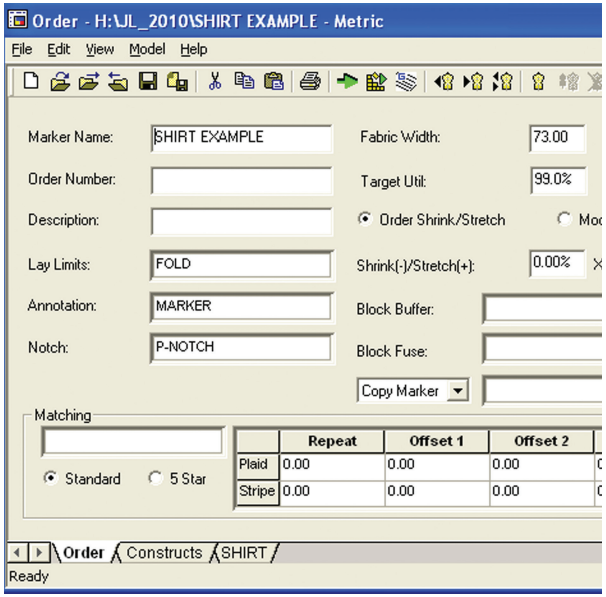
Base pattern 3

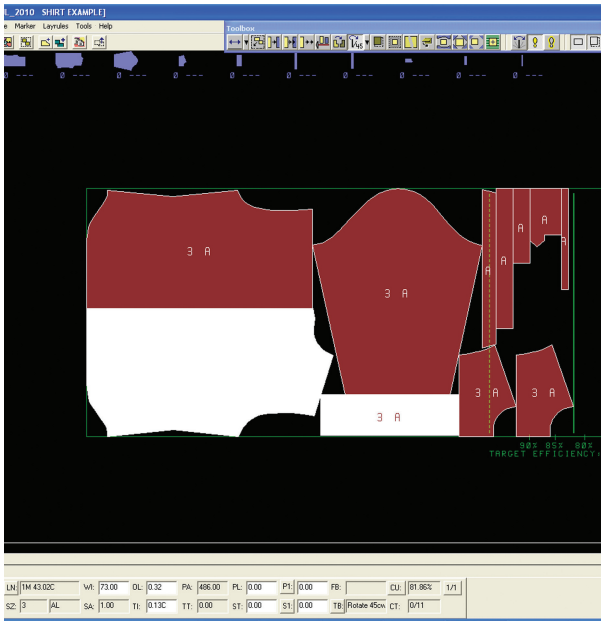
1. The process began with a base pattern. I created the first base pattern by simplifying a basic men's size medium shirt pattern that I had digitized into the AccuMark system. This involved making the hem and side seams straight, making the side seams of the main body parallel to the centre front and centre back and the side seams of the sleeve parallel. I also extended the cuff so that it was the same length as the end of the sleeve and turned the collar stand and fall into rectangles.

2. Next I assigned numbers to key points around the pattern pieces and use these numbers to create a series of rules, which I can use to alter the pieces when they are in a marker

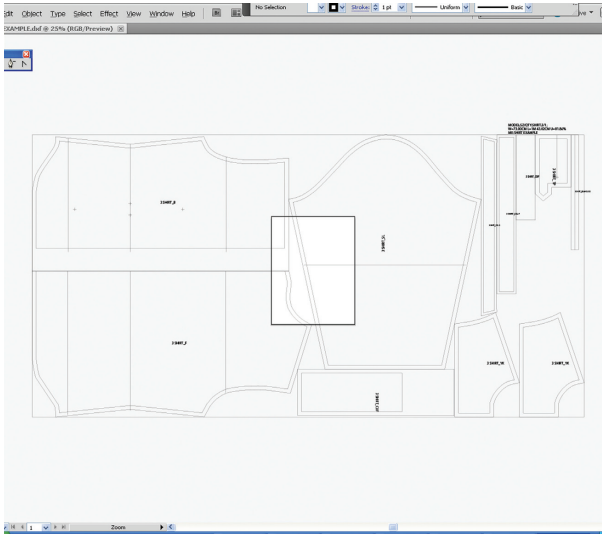


3. For each new shirt I placed an order for the base pattern under a different name. This is where I specify the fabric width.



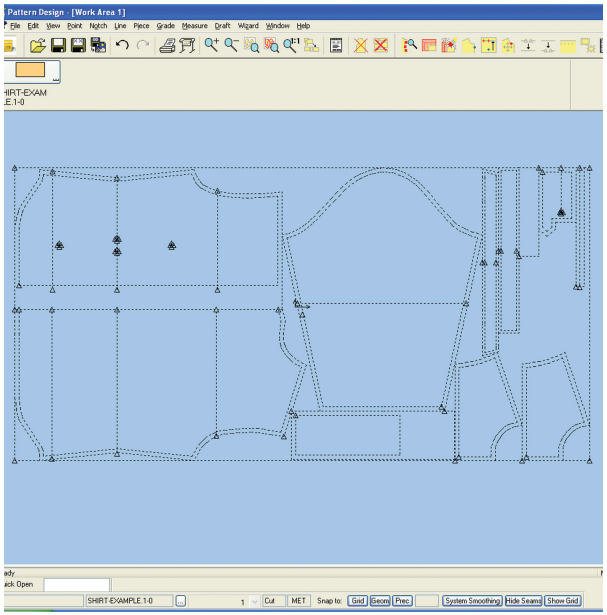


4. Placing an order creates a marker which contains the pieces you ordered and a rectangle to place them within which is the width of the fabric specified in the order. This is the stage where alterations can be applied to the pieces, which will change the dimensions of the pieces as requested on the screen.



5. Next the marker is imported into Illustrator for further manipulations and is scaled up to full size.

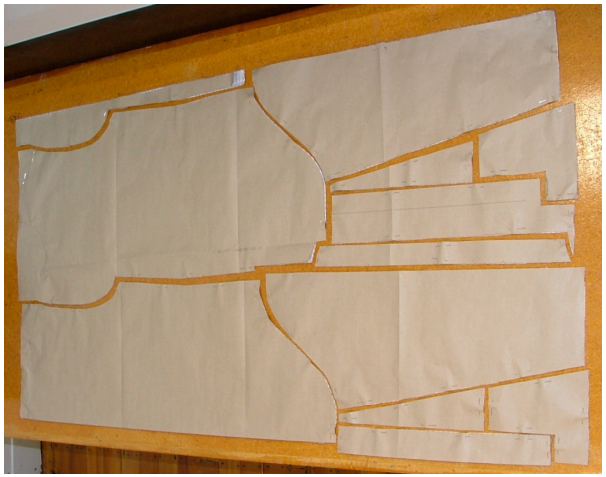
6. The pattern can now be exported back to AccuMark and opened in a pattern design screen as a single piece. Further adjustments can be made to the pattern at this stage such as adding notches and lines and deleting any unnecessary lines.



7. The pattern-marker is now plotted off, pinned onto a folded length of fabric and cut out with shears.

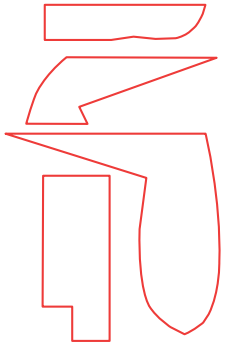
Constructing the shirts was directed by my existing knowledge of conventional construction techniques, experimentation and trial and error.

All of the shirts excluding Shirt 6 were created using this basic process but the way that I approached each step and the way I used the software developed throughout the project.

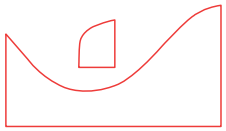


Shirt 1:

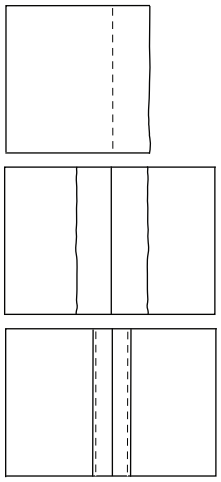
- The base pattern was not altered in the marker. This was to test the pattern and see how the pieces fitted into the space as they were.
- A cut length of fabric was used restricting the length of the pattern
- The front and back body were merged at the sideseams and the yoke and back pieces were combined.
- The spaces in-between the pattern pieces became ‘new pieces’ but it wasn’t decided what these pieces were until I began constructing the shirt.
- The ‘new pieces’ were used as pockets and appliqué. Because the pattern was on the fold I had pairs of these pieces to make faced pockets and a mirrored appliqué piece.
- The shoulder seams are normally finished with a faced yoke but as I had joined the yoke and back pieces together I also eliminated the facing. Instead, I opened the seam, folded the edges under and topstitched them down.
- I decided to reduce the extra length at the hem of the sleeve by gathering the whole length rather than the standard tucks. This added a slightly feminine aesthetic.
- The extra length of the cuff was wrapped around the wrist fastening in a double breasted style.
- I had not planned for or included a piece for a placket opening at the end of the sleeve, instead I opened up the sleeve seam about 5 cm securing it with stitching at the top.
- 1.5cm ease in the sleeve crown proved to be too much to finish the armhole with a standard flat felled seam. Instead I used a clean-finish seam finish where the edges of a plain seam are turned under and topstitched
- The narrow collar fall was largely an aesthetic decision of my own preference
- The centre front placket, cuffs, collar stand and collar fall are all fused as is standard. For this shirt I already had a short length of fusing leftover from a previous project that I used. I still have to make a final decision as to whether fusing will be included in the parameter of not creating fabric waste



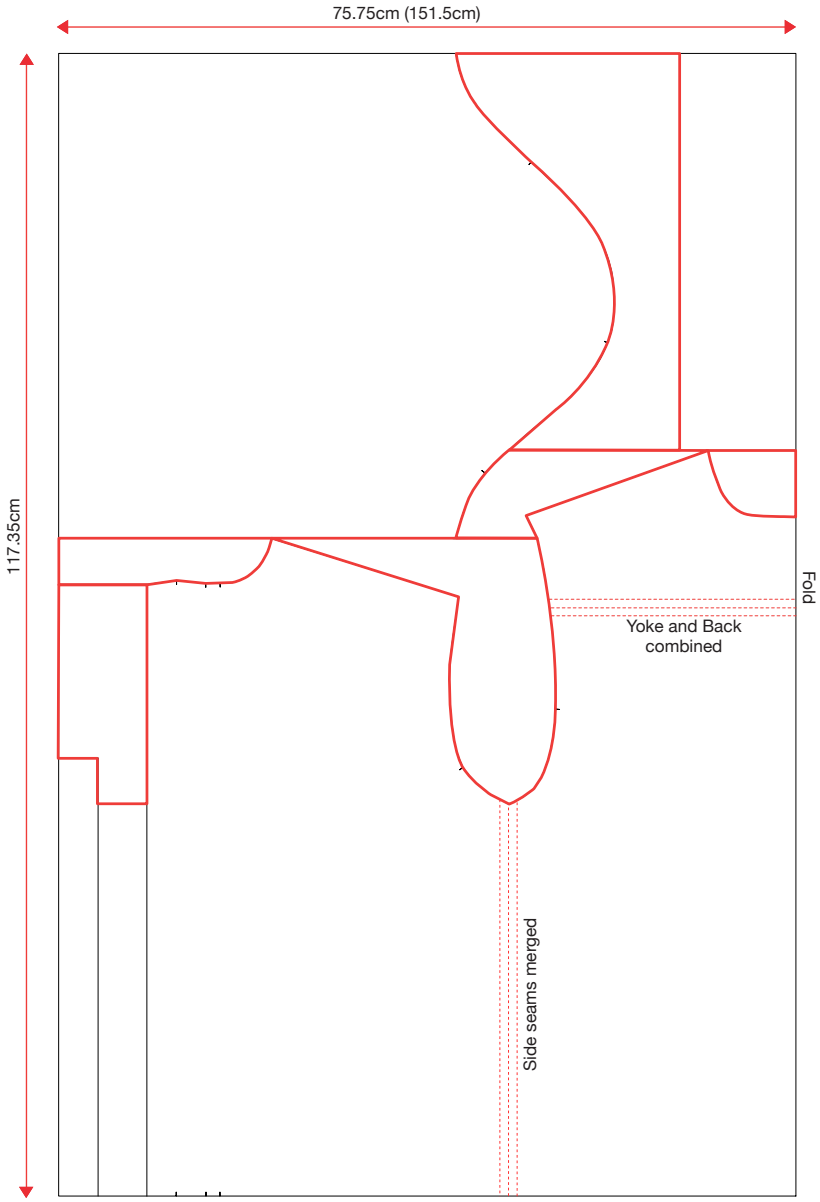
The pockets



The appliqué

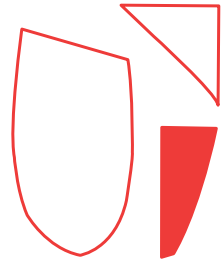


Clean-finish seam finish

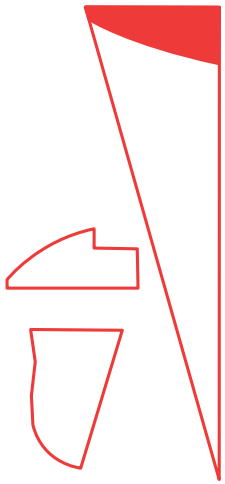


Shirt 2:

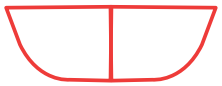
- I started from the same base pattern as shirt 1
- A cut length of fabric was used, restricting the length of the pattern.
- The front and back body were merged at the sideseams and the yoke and back pieces were combined.
- I applied alterations to increase the width of the front and back pieces so that they would fill the width of the fabric when side-by-side.
- I altered the sleeve, reducing the length of the hem so that the angle of the seam matched the shoulder.
- I had planned a placket opening but having not included a placket piece I finished the slit with bias binding.
- The sleeve crown, back shoulder and cuff overlapped. Which pieces would remained whole and which would have cut-outs was decided when it came to cutting the pattern out
- The 'new pieces' were used to patch the areas with cut-outs, for faced pockets and for appliqué.
- I used the long triangular piece to patch the shoulder turning the narrow end back to create the epaulets. A portion of the wide end was cut off so that the edge would follow the curve of the arm hole. This piece became a small pocket on the sleeve.



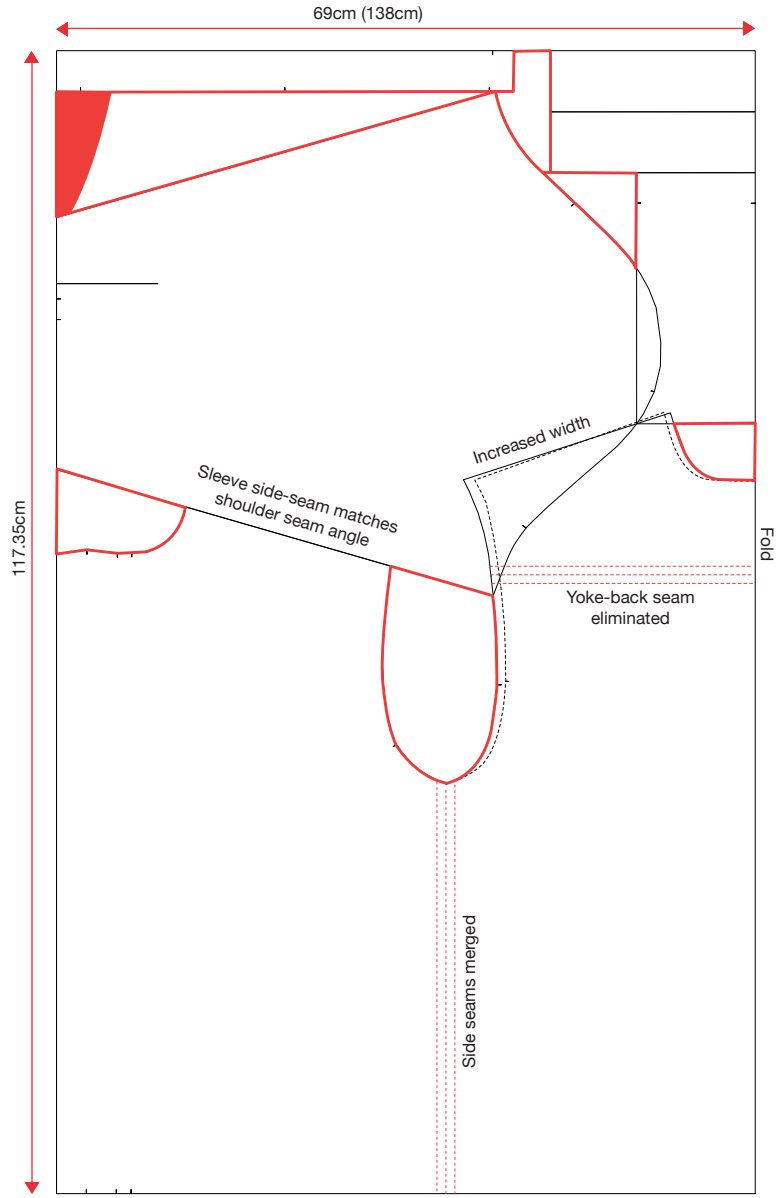
The pockets



The patches



The appliqué

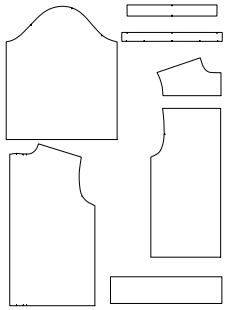


Shirt 1

Shirt 2

Shirts 1 & 2:

In his paper *Creating Fashion without the Creation of Fabric Waste* Timo Rissanen states, “In zero-fabric-waste garments, rectangular pattern shapes dominate because it often seems easier to achieve interlocking with these”. I already rejected rectangles for the main component of my shirts but by simplifying the shirt base pattern I had essentially turned the pieces into rectangles with the curved lines creating the ‘new pieces’. I like the minimalist aesthetic that comes from the boxy silhouette and not having side seams or a yoke however I think I have simplified too quickly, I need to see what the shapes from the original base pattern might lead to. Viewing these shirts on my fit model also highlighted that the base pattern was too short in the body and the sleeves by modern standards. The base pattern was lengthened in the body and the sleeves and I re-curved the lines that I had straightened. The starting point needed to be a standard shirt with a standard fit before the design could be developed any further.



Base pattern 1.

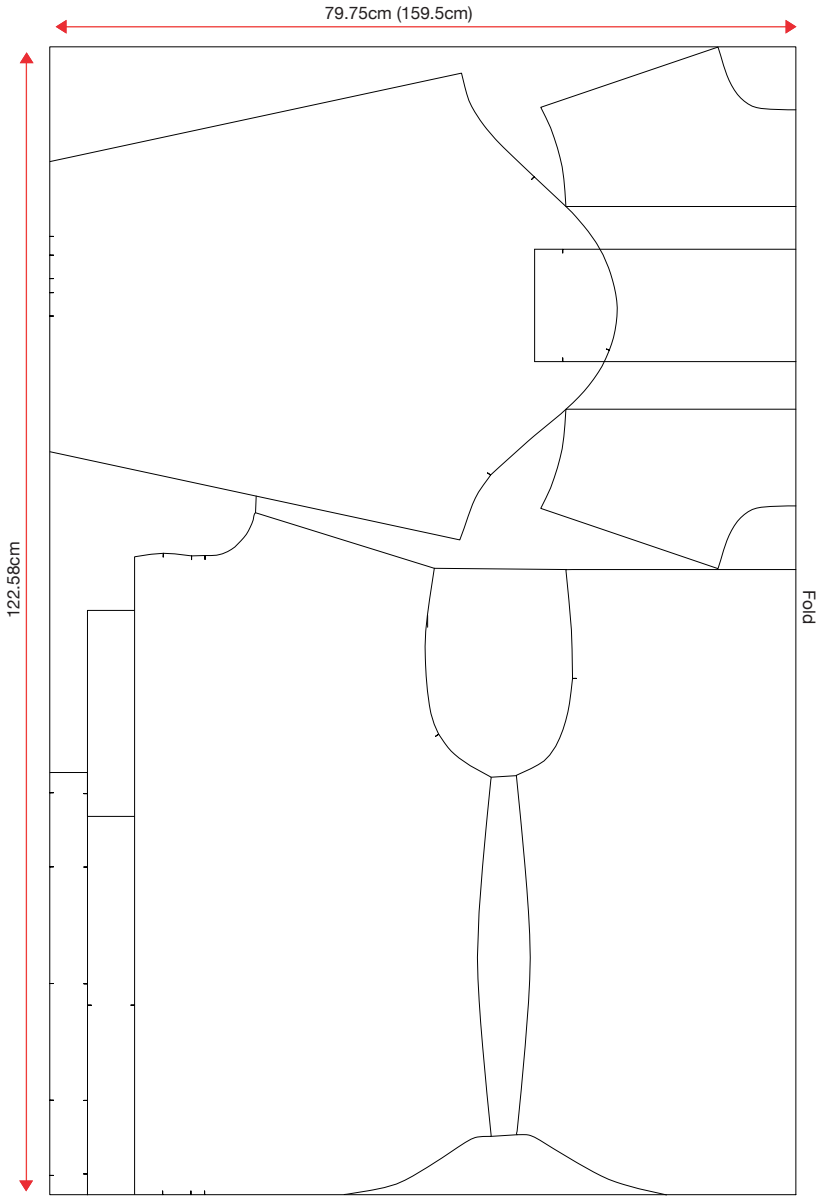
Shirt 3:

The updated base pattern led to more new pieces to find uses for and some more complicated appliqué shapes. On this shirt I left the edges of the appliqué pieces raw and applied them with 2 rows of stitching, one right at the edge and one 5mm in. My concern with this technique is its washability, in some places the appliqué slipped through the first row of stitching during the construction process and I wasn't convinced by the aesthetic either.

In response to feedback from the previous shirts I didn't use any fusing in this shirt. Instead some of the new pieces became interlining pieces. I had two long strips to stabilise the front placket; the cuff patch also functioned as interlining. The piece used to stabilise the collar stand was half interior and half exterior making the collar stand somewhat of a feature

With less ease in the sleeve I was able to attach the sleeve with a flat felled seam. I also created a placket piece for this shirt; this is just a 5x20 cm strip that is folded in half and attached as a continuous bound placket.

While I had measured the width of the fabric I was using before creating the marker for this shirt I did not measure the length of it. I ended up with a pattern 123cm long and a piece of fabric 120cm long. This just meant that one of the appliqué pieces became a patch for the shoulder neck point on one of the yoke pieces.



Shirt 4:

Despite having new alteration rules ready for this shirt changes to the pattern were minimal. A reasonably wide piece of fabric allowed me to add the standard 3cm box pleat at the back of the shirt. While having a back yoke and no pleat has seemed a little redundant to me from the point of functionality on comparing shirts 3 and 4 I conceded that the yoke can be an attractive feature of a shirt and should strengthen the area if the yoke is faced. While the pleat allows for more movement across the back the 6cm extra in the body of the shirt results in a significantly looser fit. A potential solution could be securing the pleat below the waist maintaining the fit while allowing extra room where it is needed at the cross back as suggested by Coffin (1993) **[Figure 36]**.

I had planned to finish any appliqué pieces with the baby overlocker and secure them with a single row of topstitching. In the end there was no appliqué on this shirt as the pieces not suitable for pockets were used as interlining for the cuffs, collar and front placket. The new pieces were particularly small and scrappy but suitable for interlining. The subtle stitch detailing adds a unique aesthetic that I think could become an important feature in future shirts.

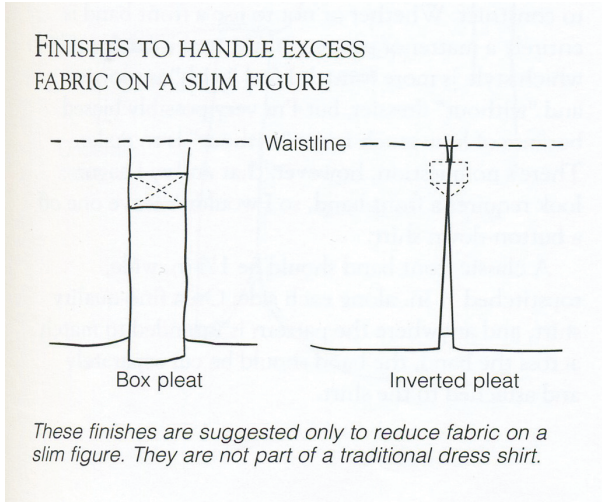
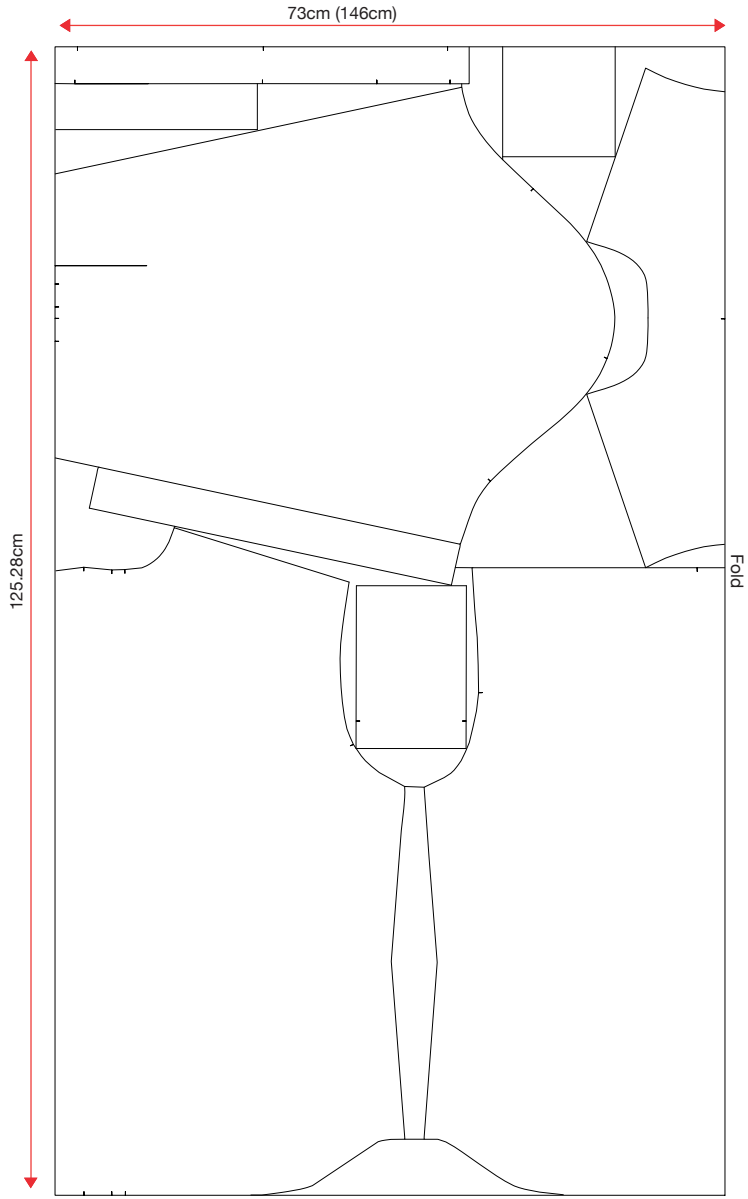


Figure 36

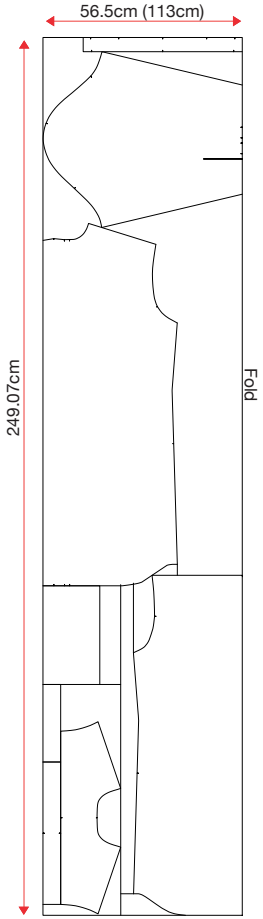


Shirt 3

Shirt 4

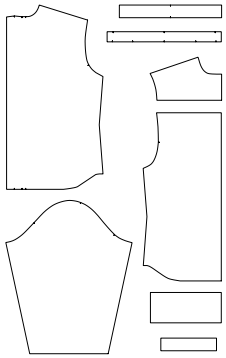
Shirt 5:

Before I had made any shirts I bought one metre each of a selection of shirting fabrics. If laid out in a conventional way the shirt pattern that I created my base patterns from requires about 140cm of fabric (depending on the width) for one shirt. My reason for buying one metre lengths was that if I was going to eliminate waste from the pattern I would also ideally like to reduce the total amount of fabric used. The actual lengths of the pieces of fabric I bought were around 120cm. At 113cm wide the last cut length of fabric I had that I used for Shirt 5 was considerably narrower than the other fabrics I had used so far which ranged from 138cm – 159cm in width. I asked and paid for 150cm of this fabric but because of flaws in the fabric I was given 250cm. Because it was so narrow this wasn't enough for two shirts as I could not fit the front and back body pieces side by side so instead I decided to use the entire length for one shirt. The main alteration I applied was increasing the length of the front and back so that the pattern would stretch the full length of the fabric. I also shortened the sleeve so that it could fit in the width of the fabric; to counteract this I made the cuff wider so that the complete sleeve would be the same length. I liked the shape of the piece that was forming beside the front so consciously avoided disturbing it with any other pieces. I ended up applying this piece to the back of the shirt like a huge pocket. Topstitching up the centre and fastening it with buttons to the top of the shirt contributed some aesthetic appeal and the extra weight made this long shirt feel more like an over-shirt. The breast pocket has multiple styling options and I attached a small rectangular piece on the inside sides of the shirt which could be buttoned onto the outside bunching up the length of the shirt. One of the most interesting features of the shirt came from a mistake. When I shortened the sleeve by two cm I should have made the cuff 4cm wider as it would be folded in half but I only made it 2cm wider. I had two rectangular pieces, which I hadn't decided what to do with which turned out to be the perfect size to extend the sleeve and create an attractive embellishment. Increasing the length of the shirt was a very obvious and easy way to incorporate the extra fabric and could be seen as questioning the codes of masculine dress as Yammamoto did with his long dress like shirts **[Figure 11]**. Questioning and pushing the boundries of the accepted masculine dress codes was not one of my aims of the project. Rather, my aim was to create wearable shirts which for most men would not include dress length shirts. After making shirt 5 I decided that while I would not restrict the length of fabric I could use I would not signifigantly increase the length of the shirt to use more fabric than was needed.



Shirts 3, 4 and 5:

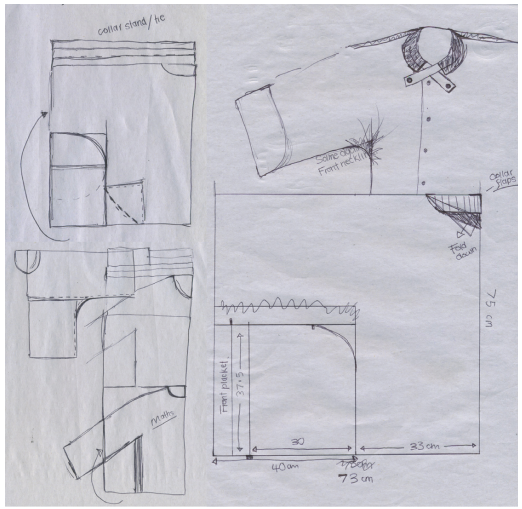
The adjustments to the length of the base pattern and returning to the more standard pattern shapes was a step in the right direction. I was now seeing what the spaces in-between of a standard shirt pattern looked like and the design potential these could have. Using the 'new pieces' to stabilize the areas which would normally be fused meant that I eliminated the need for the extra component of fusible interlining and the stitching from attaching the interlining pieces became subtle intriguing detailing on the finished shirt. I wondered whether using the 'new' pieces as appliqué and the odd shaped pockets was really an effective way of using the 'waste' and would the shirts be better if it wasn't there. While they were initially appealing and added a slightly comical quirkiness to the shirts only a few of the pockets would actually be useful so all I was doing was using the waste as embellishments which had not previously been a part of my clean, tailored design aesthetic. I had got lost in not creating waste and had forgotten the main reason I was doing this, which was to explore patternmaking as an alternative way to design and to come up with designs that I could have not conceived of through drawing. While I could not have conceived of the pockets, appliqué and applied interlining through drawing, embellishments are not normally the focus of my designs. I had found an easy way of turning a standard shirt into a zero waste shirt but what I needed to do was manipulate the standard shirt pattern piece shapes integrating the 'waste' into the original pattern pieces.

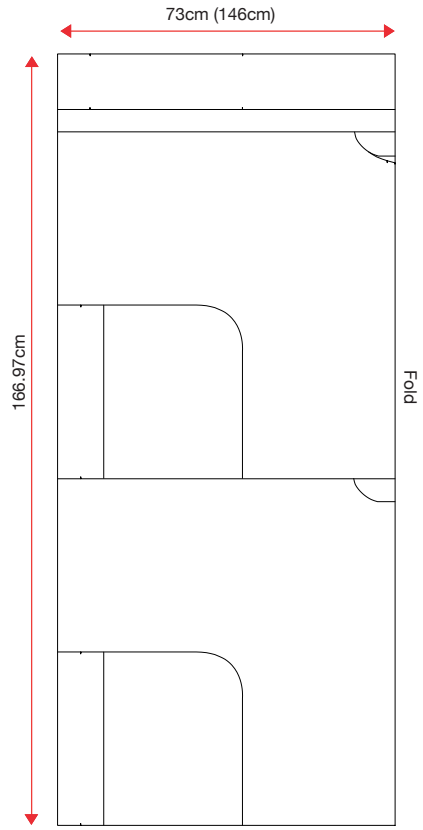


Base pattern 2.

Shirt 6:

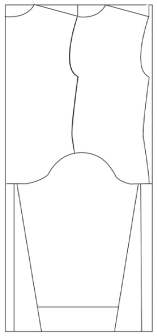
I had earlier dismissed the idea of using squares and rectangles to produce a contemporary shirt that didn't produce fabric waste. However, after revisiting my research into early fabric efficient garments such as the kimono, square cut shirts and Yeohlee Teng's one piece coat I came up with shirt 6, influenced by the square-cut shirt, Kimono and the kimono sleeve. This shirt involved a totally different design process. I started by sketching ideas for the pattern then drawing the pattern freehand in illustrator rather than be guided by a base pattern. I then took the pattern as a piece into a Gerber pattern design screen where I traced the neckline from the base pattern onto the pattern for shirt 6 and plotted it off. I constructed this shirt using French seams rather than flat felled so that I could keep the curve at the end of the sleeve even. The finish was a tidy finish but a little bulky in this fabric. I had intended on using the cutouts from the neckline as a mini collar fall but the pieces were smaller than I had anticipated and looked akward. When I tried the shirt on a mannequin it was sitting better when crossed over more at the top than the bottom so I decided to use the neckline pieces as little re-enforcement patches for the buttons. While I could see that pursuing this idea could have led me to some innovative new shirt silhouettes, pushing the standard accepted silhouette was not the aim of this project and it was a huge shift away from the design process which made my project unique. I needed to make this shirt to move on from the pattern that I was stuck in but further developing the idea needed to be left for a different project.

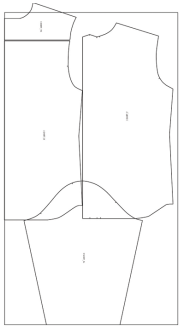


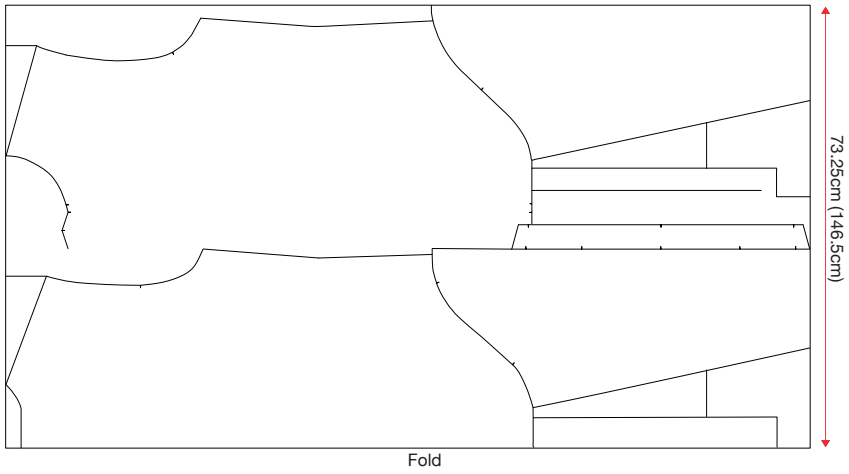


Shirt 7:

Shirt 7 came about by experimenting with tessellation. While the final pattern is only loosely connected to tessellation, it pushed me to think about how the shape of the edge of one piece directly affects the shape of the piece next to it and how I could use this to my advantage. I wanted to move away from having new pieces fill in the gaps and have the core pieces sharing lines. Through this shirt I found two key techniques that have now become somewhat of a signature design feature of the shirts. These were using the shape of the sleeve crown to create the shape of the hem curve and the piece that would normally be cut off to create the front neckline to create the look of a bow tie. For this shirt the design process began in Illustrator by creating a tessellating shape and developing that into an idea for a pattern. The final pattern started with the base pattern in a marker. The marker was significantly modified in Illustrator to create the final pattern compared to the first 5 shirt patterns, where Illustrator was just used as a tool to turn the makers into pattern pieces. Three new pieces were created in the development of this pattern but I knew what each piece was and there was no excess to figure out how to incorporate during construction. How the pattern was going to sew together was not totally clear and certain elements such as the facing, front placket and bow tie were figured out during construction.

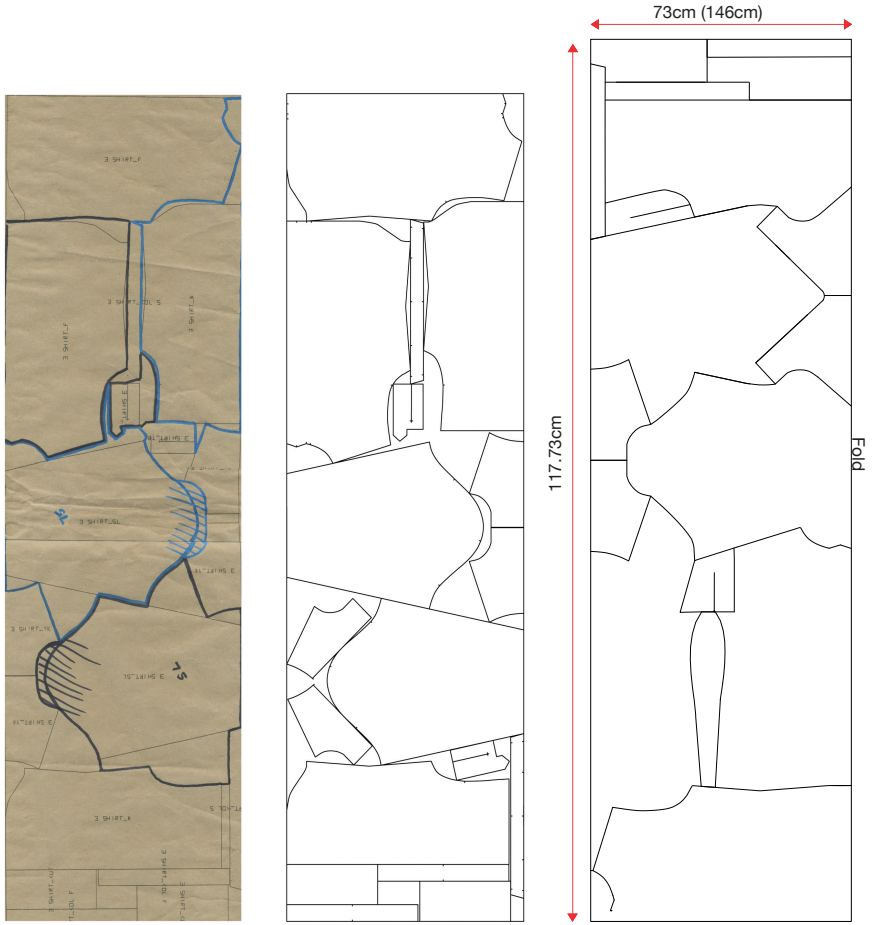






Shirts 8 & 9:

For the next pattern I decided to try combining two shirts in one pattern to see how this affected the process. With twice as many pattern pieces to place in the marker I had a lot more options of how to fit the pieces together and was able to achieve a yield of 95% leaving me very little excess to incorporate. These pieces were small and awkward, however, so couldn't really be used as new pieces. Through drawing on the marker, I came up with the solution of letting the main pieces take on the shapes surrounding them. This meant that I didn't create any new pieces and the shape of the original pieces was significantly altered. I wasn't totally confident that I would be able to construct these shirts and had no idea of what the final outcomes might be. While constructing these two shirts was challenging, particularly finding ways to finish the interior of the shirts tidily, it surprised me how 'normal' the shirts turned out. To be able to construct the shirts I had to make seams that sewed together the same length so the challenge was finding the best way to do this in each area. Tucks or gathers worked in areas where one seam was just too long but in areas where the shape of the corresponding seams was also considerably different another solution was to cut into one seam and insert the protruding shape. This process led to protrusions that didn't conform to the shape of the body. While I found the protrusions interesting and amusing I do not think they were an improvement on the design of the shirts and were also pushing the limits of wearability. However more subtle and considered protrusions would definitely be a possibility for future shirts. I was really pushing my personal boundries with this pattern by letting pieces become asymmetrical and completely letting go of matching accurate seam lengths. The fact that I could construct shirts from such distorted pieces and create in many respects 'normal' looking shirts inspired me to loosen my control over the shapes of the pattern pieces.



Shirt 8

Shirt 9

Shirts 6, 7 and 8 & 9

With these four shirts I was starting to loosen my control over the designs and let the process drive them. Shirt 6 was a tangent off from the process that was being developed but was necessary to move on from the pattern I had been stuck in for the first five shirts. It also confirmed for me that rejecting the use of rectangles had been the right thing to do in terms of staying true to my design aesthetic and exploring the potential of design through pattern making. While it may seem like quite a leap from shirt 6 to shirt 7 it was the almost identical front and back body pieces that sparked the idea that the front and back pieces could be a tessellating shape. While shirt 7 appears quite embellished the 'waste' has largely been integrated into the original pattern pieces and feels more purposeful. Shirt 7 gave me the confidence to try the pattern for shirts 8 & 9 and between these two patterns I planted the seeds for the final techniques. Making a feature of the tailored plackets is what I would call a functional embellishment and fits better with my design aesthetic. With these four shirts I haven't used fusible interlining or 'waste' as applied interlining. It makes sense not to re-introduce fusible interlining now that I don't have 'waste' for applied interlining as the use of fusible interlining was just another shirt convention there to be broken. I am not totally convinced by the aesthetic of the soft collar and cuffs however.

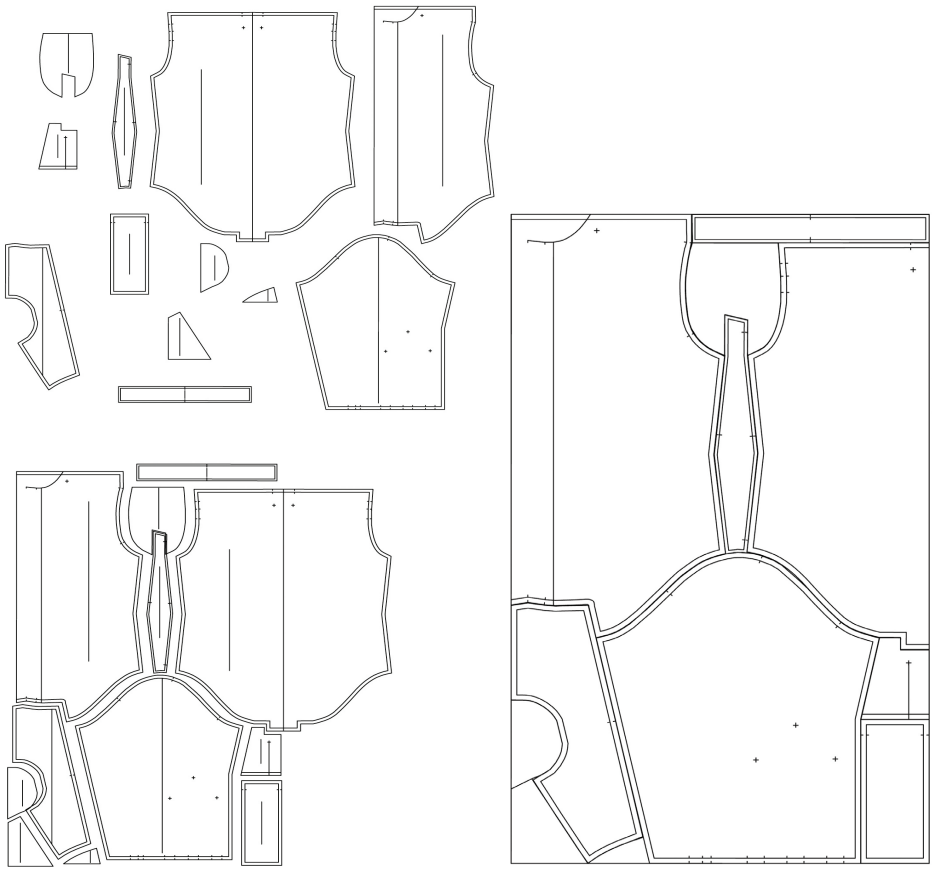
Shirts 10, 11 & 12:

For shirts 10 & 11 I decided to get the patterns digitally printed onto the shirt fabric. Rather than just print the outline of the pattern pieces I decided to use this as an opportunity to illustrate the relationship between the flat pattern and the finished garment. On shirt 10 I marked in the grainlines and balance lines in red and colour coded the edges of the seams to indicate which seams sewed together. On shirt 11 I only marked in the centre back line in red and colour coded the seams with enlarged notches. I find the more subtle use of colour on shirt 11 more effective but the red balance lines and grainlines on shirt 10 are a subtle but striking reference to pattern making process. On shirt 10 I labeled the pieces 'shirt' which is the name of the model and the code for the name of the piece. The pieces of shirt 11 are labelled with their full name. For both shirts I used a dashed outline of the font. I thought that I would like the smaller font size on shirt 10 better but the dashed line is more effective in the much larger size font on shirt 10. The dashed line was a reference to the dashed line that indicates a seam allowance in the AccuMark pattern design software but I imagine others might see it as a reference to stitching. Although I had decided prior to developing the patterns that shirts 10 & 11 would be digitally printed I added the text and colour after both the patterns were completed so the print did not feed into the process of designing the patterns. I think these shirts may have been more successful if the text and colour had been added earlier because, while the print adds another dimension to the shirts, it feels like it has been tacked on. In any event what I am really interested in is the result of the new patterns I have developed.

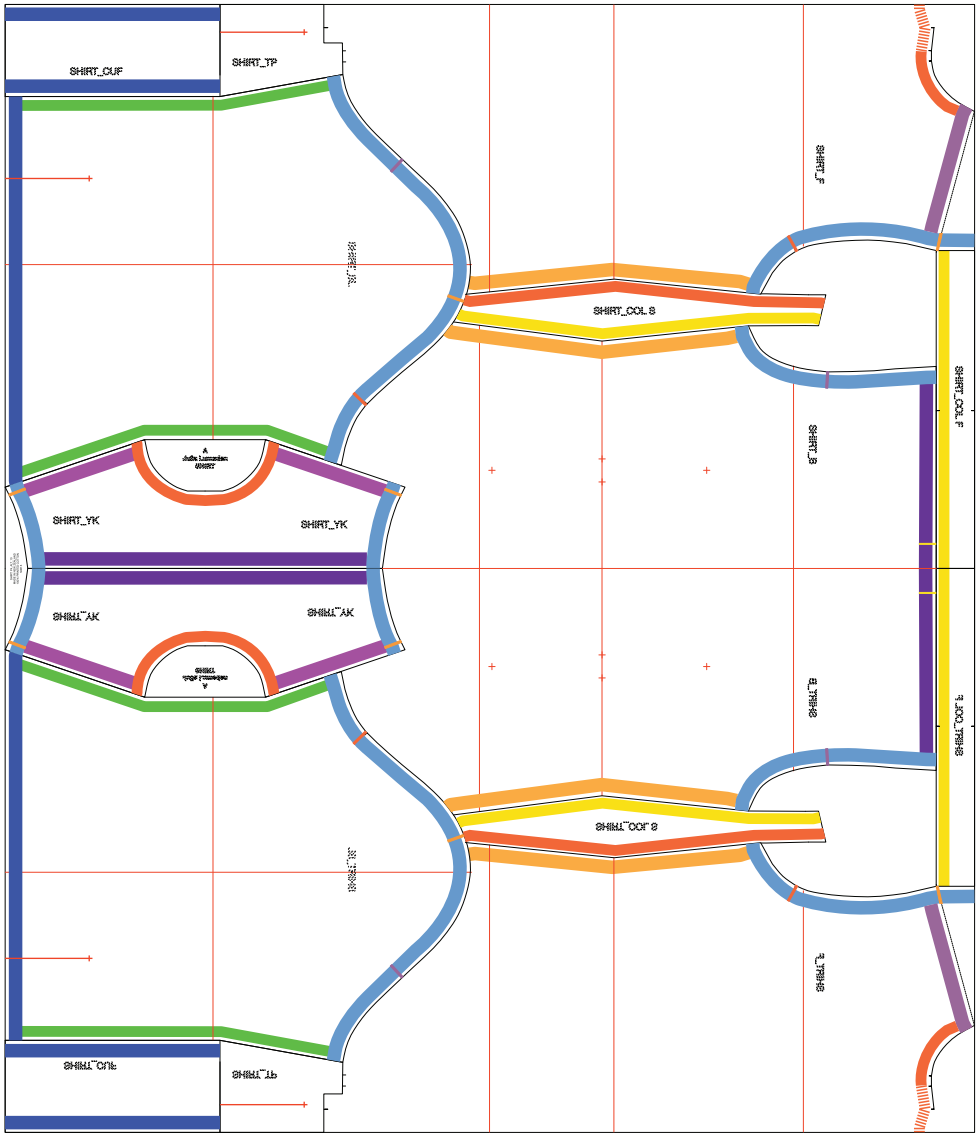
The patterns for shirts 10 and 11 develop the ideas seeded with shirt 7 and Shirts 8 & 9. The two patterns are very similar with the key features being the sleeve crown creating the hem curve, the collar stand being shaped by the side seams and the front neck piece staying attached to the body and becoming a bow tie. A different arrangement of the yoke, cuff and tailored placket pieces result in variations in the hem and sleeve shape and an asymmetrical yoke on shirt 11. In the bottom half of the patterns, two 'new pieces' have been created, which is something I'm trying to avoid as the aim is to include the 'waste' in the new pieces. However, knowing that these patterns were going to be printed I saw an opportunity to include a brand logo and size and style information.

Shirt 12 comes from the same pattern as shirt 11 and was an experiment where I traced the individual pieces and added seam allowances and notches resulting in separate pieces that fit back together like a puzzle in a marker. This exercise also confirmed my suspicions that the patterns for 10 & 11 had been slightly stretched during the printing process causing some unexpected discrepancies in seam lengths. That shirt 11 made up in plain white fabric was a stronger design than shirt 11 in the digitally printed fabric also confirmed for me that while the digitally printed shirts were successful and appealing it was not a road I would continue to pursue with this project. The colour and text on the digitally printed shirts gave them quite a gimmicky feel that became the focus and drew attention away from the design. The details on shirt 12 that make it strong, such as the external topstitched darts on the sleeve and shoulders stand out as an understated embellishment and are not overwhelmed by the print.

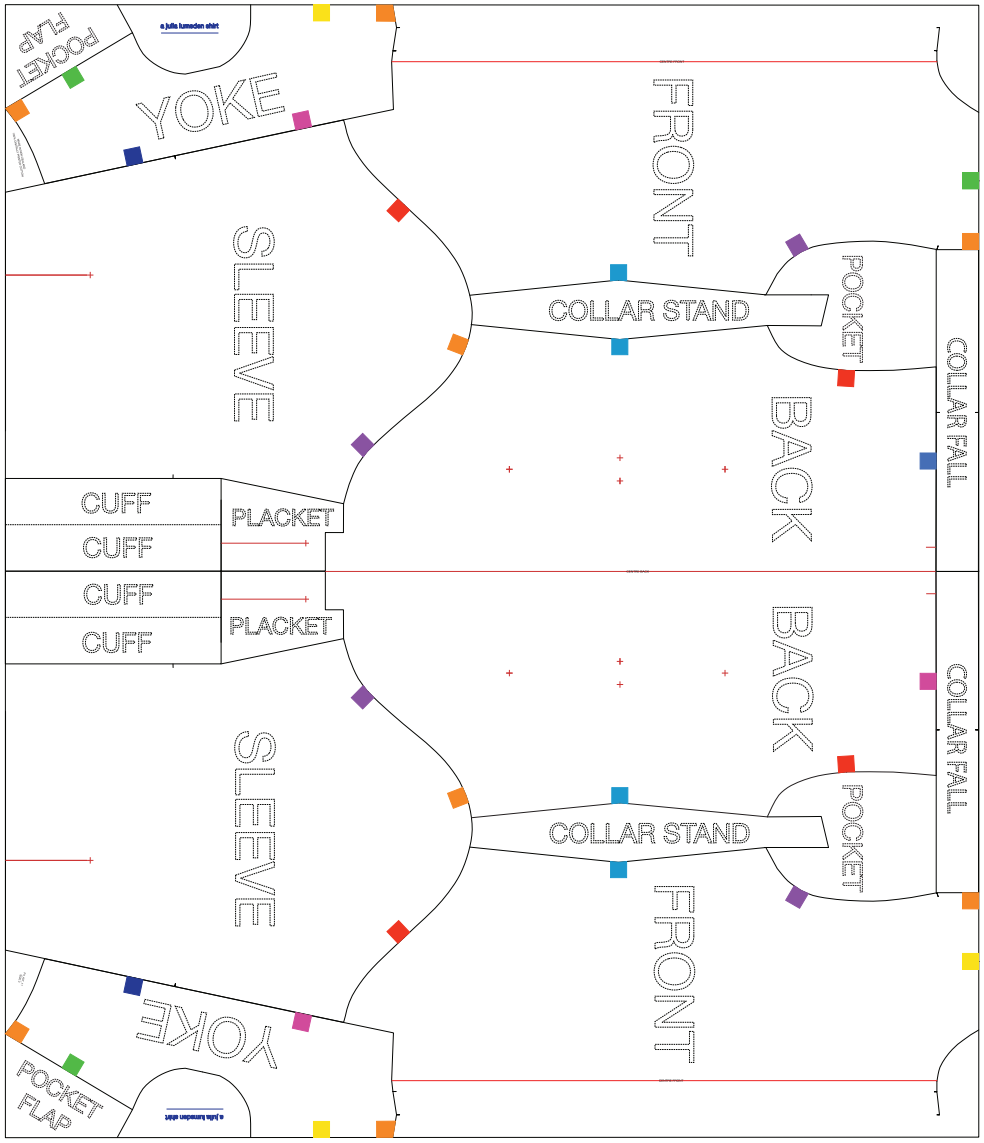
Shirt 12



Shirt 10



Shirt 11



Shirt 10

Shirt 12

Shirt 11


Front
Shirt 10
Shirt 11


Front
Shirt 11
Shirt 12


Back
Shirt 10
Shirt 11


Back
Shirt 11
Shirt 12

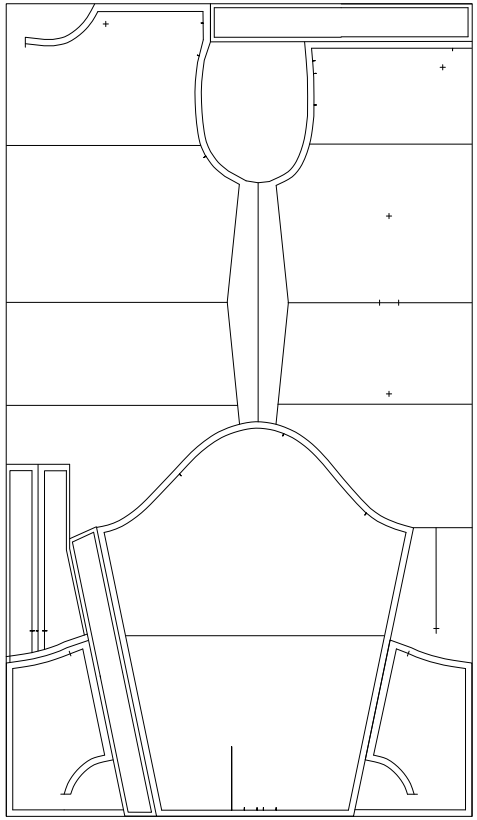
Shirts A, B, C & D

Shirts A, B, C & D were all designed one after the other as patterns and then quickly constructed in half scale. The main advantages of working in half scale was being able to try out ideas quickly and using considerably less fabric, (the four half scale shirts used the amount of fabric it would have taken to make one full-scale). These shirts have been named with letters rather than numbers because the patterns were tested through half scale mock ups while the numbered shirt patterns have been tested by constructing full scale finished toiles. I decided at the beginning of this project, before I started designing that I would finish my toiles to prototype level. For me this means that the garment needs to be as tidy inside as it is outside with no visible raw edges or overlocking and all elements of the garment, including fastenings must be complete. The level of finishing that I required of my shirts is higher than that of many shirts currently retailing where the seams are overlocked rather than flat felled, self finished or bound and the hem is overlocked and turned up rather than double rolled. The shirts I am designing are experimental so I am not yet at the stage where I am worrying about production costs or target market. The shirts are the design outcomes of my research and also a reference to the techniques I have discovered and the relationship between pattern and garment. While the shirts have not been fully resolved by finishing them to this level they can still be worn and enjoyed as garments while also being a resource for future reference. Time did start to become an issue as the year progressed and new ideas and patterns were developing faster than I could make them. This is where the half scale mock-ups came in, clearing the idea backlog and enabling me to refine my ideas.

Shirt A:

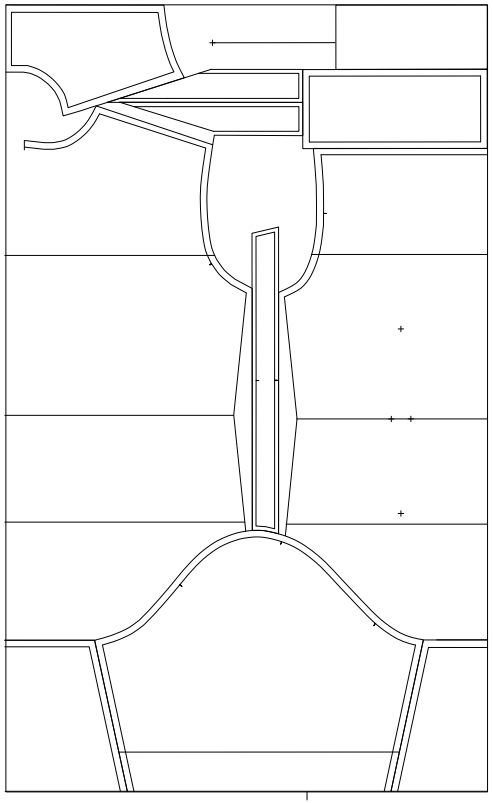
This shirt was my first test of working with visible seams on the pattern. I stopped working with visible seams when I started altering patterns in their marker because the alterations I apply only affect the perimeter line not the seam allowance and can cause problems when reducing the size of pieces. However as I was only performing minor alterations in the marker and would be able to fix the seams up later in Illustrator I tried working with them on and it was a success. What it means is that when I send my pattern to the Gerber pattern design program as a piece I can split the seam allowance lines at the corners and measure the seam lengths. Knowing the lengths of the seam lines allows me to plan the construction on the pattern with notches and drill holes. Shirt A is a further refinement of the ideas that surfaced in shirt 7 with tessellation and were continued in the digitally printed shirts 10 and 11.

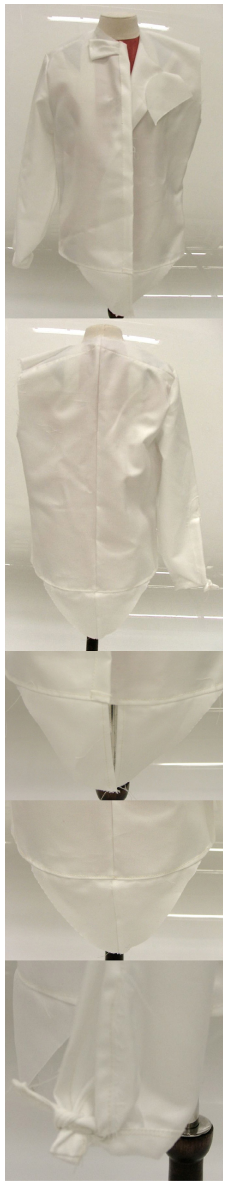
The piece above the front neckline becoming a bow tie and the sleeve crown creating the hem curve have become the standard features of this approach. The armhole creating the breast pocket is repeated from shirts 10 and 11 although not having the collar stand between the front and the back means that it doesn't have the distinctive kink in this pattern. Instead of having the collar stand in-between the front and the back they are joined at the side seam but the sewing line indicates that the sides are taken in and shaped. My intention is that this would be taken in on the outside of the garment pressed open and topstitched but this area could be altered to suit individuals. The area of this design that still needs to be resolved, is the protrusion at the back of the neck. It could be folded back, the collar stitched on over the top. It is then possible to add a buttonhole and button it down on to the yoke. It is difficult to assess at half scale whether it would improve the design or not.



Shirt B:

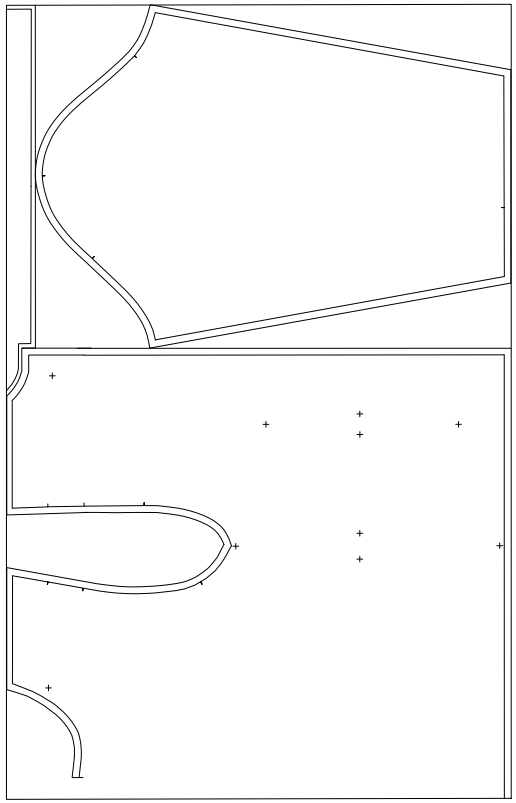
This shirt employs the standard techniques discussed in the previous shirt and tries out some new ideas. The collar stand is once more between the front and back creating the kink in the pocket but the width of the seam allowance is increased at the waist allowing for future alterations. The lopsided kink in the collar stand that was created by the waist shaping is quite effective in shirts 10 and 11 so it would depend who the shirt was for as to whether the quirky collar or extra seam allowance at the waist was more appropriate. I discovered the trick of splitting up the sleeve and folding it back on itself with this shirt and while it does create extra sewing it is a subtle but effective embellishment for the sleeve. In terms of construction, the split collar fall was very difficult but may not be a problem at full scale. The back neck curve adds to the bow tie resulting in a more three dimensional effect.





Shirt C:

This shirt looks back to the ideas of the first two shirts, merging the side seam and the yoke seam and creating one big piece for the main body. Balancing and raising the shoulder line is a technique I first tried in shirt 7 but by not fully letting go of the original shoulder line, the feeling was of an extra bit being tacked on rather than being confident of the horizontal shoulder being given its slope by a strategically placed dart. The sleeve is also encased in a square with the triangles from the sides creating the cuffs and the curves above the crown providing a curved extension for the hem. The front neckpiece will again become a bow tie and the armhole curves create the tailored placket. I am not totally convinced that the band collar with extension will look effective with the bow tie and the piece was too small to properly test in half scale.

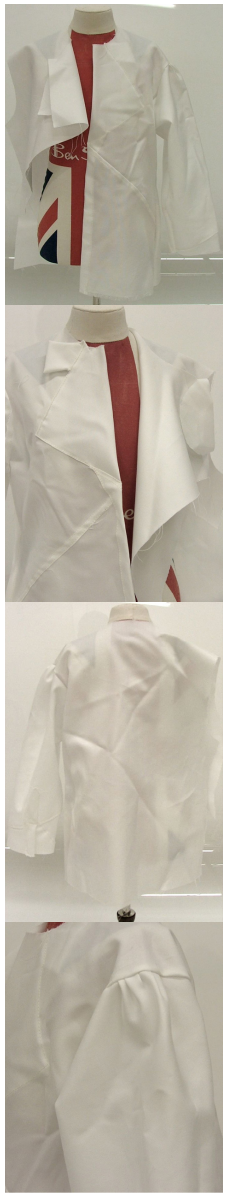


Shirt D:

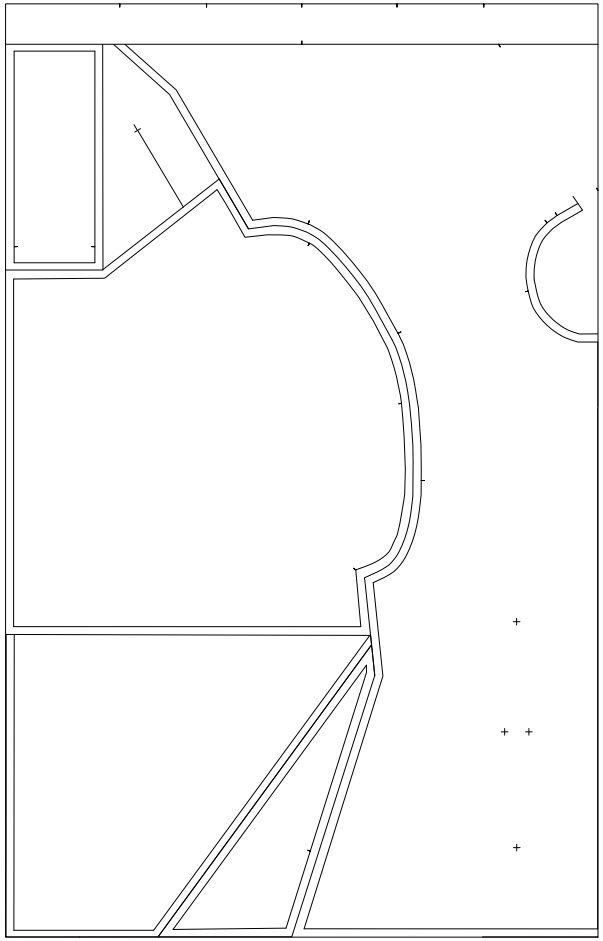
This shirt uses a combination of the blending ideas from shirts 8 & 9 and the piecing idea that started with shirt 7 and continued with shirt B. This was the first time I joined the front and back at the shoulder creating an ideal space for the sleeve to blend into. I decided to keep the sleeve as a separate piece so that I could take some of the length that had been added into the sleeve crown out with darts or pleats before inserting it back into the armhole. The rest of the front piece was cut off and slotted in underneath the main part of the sleeve with the remaining end piece fitting in beside. Apart from the pattern for shirts 8 & 9, these were the most drastic modifications that I had made to the base pattern. A combination of merging the back, yoke and front, blending the sleeve crown and piecing the bottom of the front and the sleeve resulted in much more considered forms without somewhat random protrusions. I thought the pattern was complete until I realized that I didn't have a collar of any kind, while a collar is one of the essential components of a shirt as stated in my title. I added a rectangle onto the end the full width of the fabric and twice as wide as I wanted the finished collar to be. This long thin band would act as a collar and a tie. The half scale toile of the shirt indicates that the pattern can be constructed successfully but I will need to construct a full-scale shirt and try it on my fit model before I can make a proper assessment of whether these major pattern modifications have been effective.

The Techniques

Over the course of designing and constructing these shirts I have developed five key techniques for designing men's shirts through pattern making that don't create fabric waste. I have named these techniques *Merging*, *Piecing*, *Nesting*, *Blending* and *Creating*. These techniques have been refined over the course of designing and constructing the shirts and became clear to me in shirts A, B, C, & D. Merging involves joining the pieces together eliminating seams. This is the technique I used in the first two shirts with a more sophisticated application of the technique in *shirt C*. Piecing involves cutting the pieces up and slotting them into gaps. I have applied this technique to the sleeve several times and once to the collar and front. Nesting involves sharing curves such as the sleeve crown and the hem, the front and back side seams and the collar stand, the armhole and the pocket or tailored placket. This is the technique that I have refined the most with the first example of it in *shirt 7* and the latest examples in shirts A & B. Blending involves letting the perimeter line of the pattern pieces blend into surrounding gaps. The first example of this was in the pattern for shirts 8 & 9 and the most recent in *shirt D*. I have been using the technique of creating since the first shirt. Creating is



when a new piece is created in a space between the original pieces. After the first five shirts I endeavored to reduce the number of pieces I created and focus on developing the original base pattern pieces. In shirts A, B, C and D I started to approach creating new pieces in a more considered way. They either needed to be a practicaql addition such as a functional pocket or a quirky feature like the bowtie rather than simply letting odd shaped spaces become new decorative pieces.



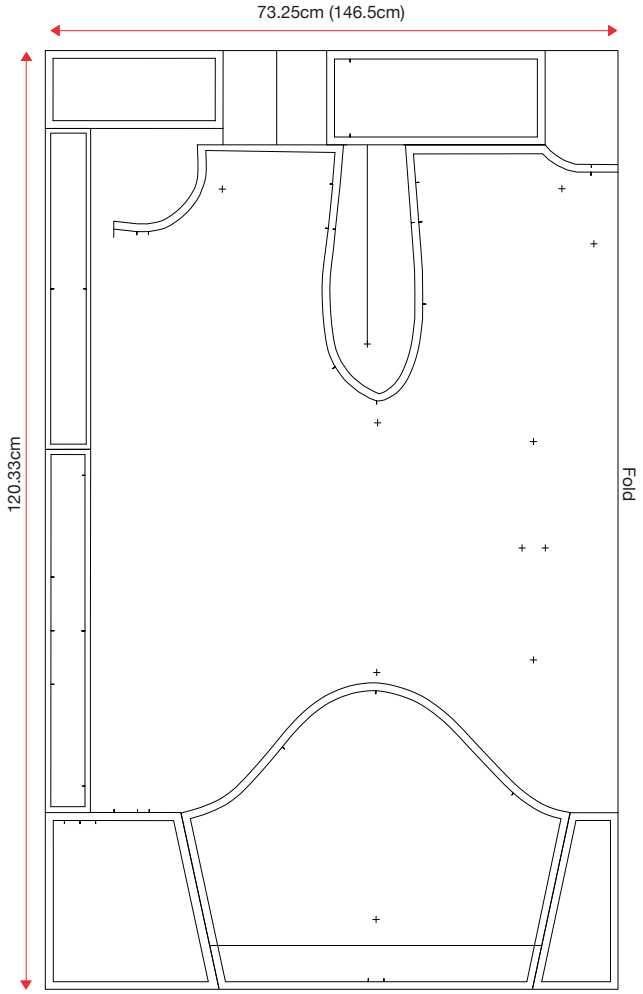
The Final Shirts

These final five shirts show an advanced application of the five techniques I have identified for designing men's shirt that don't create fabric waste and demonstrate my mastery of the design process I have developed over the past year. While these 5 shirts are the final design output for this project they are not a final product. They are prototypes for a collective of experimental shirts of which a few more may be made to order but will always be a reference point for my future design work.

The aesthetic of these shirts is more resolved than the previous 12. The fabric buttons and stitching have all been carefully considered and link the shirts as a collective. They reflect my personal design aesthetic while also encapsulating the aesthetic ideals imbedded in this research. The almost clinical whiteness of these shirts illustrates the scientific way I have approached this project and tend to approach fashion design in general. The pearl and grey shell buttons begin to reveal my personal aesthetic of minimalism with an appreciation of timeless tailoring mixed with a subtle quirkiness. The pearl shell buttons are quite subtle on their own but mixed with the odd grey one they start to give the garments some personality. The red stitching down the centre front and centre back of some of the shirts was inspired by the red grainlines and balance lines on the digitally printed shirts. I had intended to stitch in the balance lines as well but as I had not actually been using balance lines actively in the pattern making process I decided not to include these. On shirt 13 the red stitching down the centre front is only visible on the underside of the front placket because I stitched it before I folded back the placket forgetting that the true centre front line is hidden by the reverse folded placket. While I quite like the idea that this hidden detail is a personal secret for the wearer I think it is better shared.

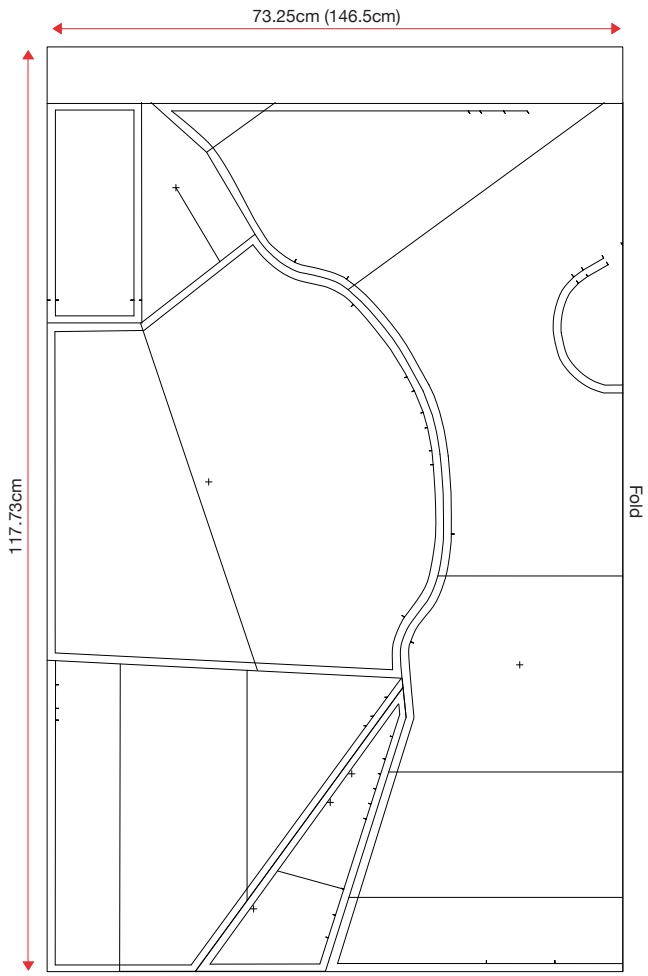
The way that I have approached constructing the shirts has evolved over the course of the project and is a combination of using the standard method when it is possible, figuring out the best alternative when it is not and experimenting with structure as embellishment. I used flat felled seams wherever possible because I like the aesthetic and they do their job well. When a flat felled seam was not possible I used what I call a self-finished seam where I press open a 1cm seam turn the edge of each side under and topstitch it down. I also used this technique when sewing together a piece that has been split up. The result is an accurate 1cm seam with a tidy finish and no added bulk. A feature that is prominent in the final shirts is the topstitched external darts. I first tried this technique on shirt 11 and was drawn to the structural aesthetic as a detail on the fabric and the more tailored structure that controlling the suppression of fullness gave to the silhouette as opposed to the softness of fullness released from a pleat or tuck.

Shirt 13



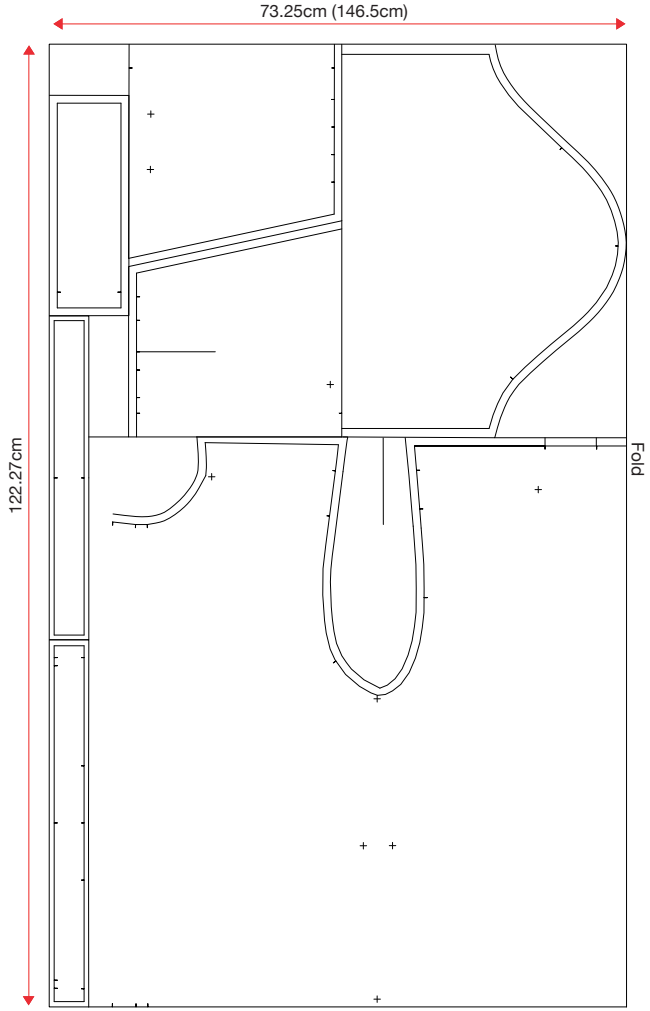
Shirt 13 combines all five of the techniques with the front and back *merging* at their side seams, *nesting* into the sleeve to which I have applied *piecing*, the tailored placket *blending* into the armhole gap and a pocket has been *created.*

Shirt 14



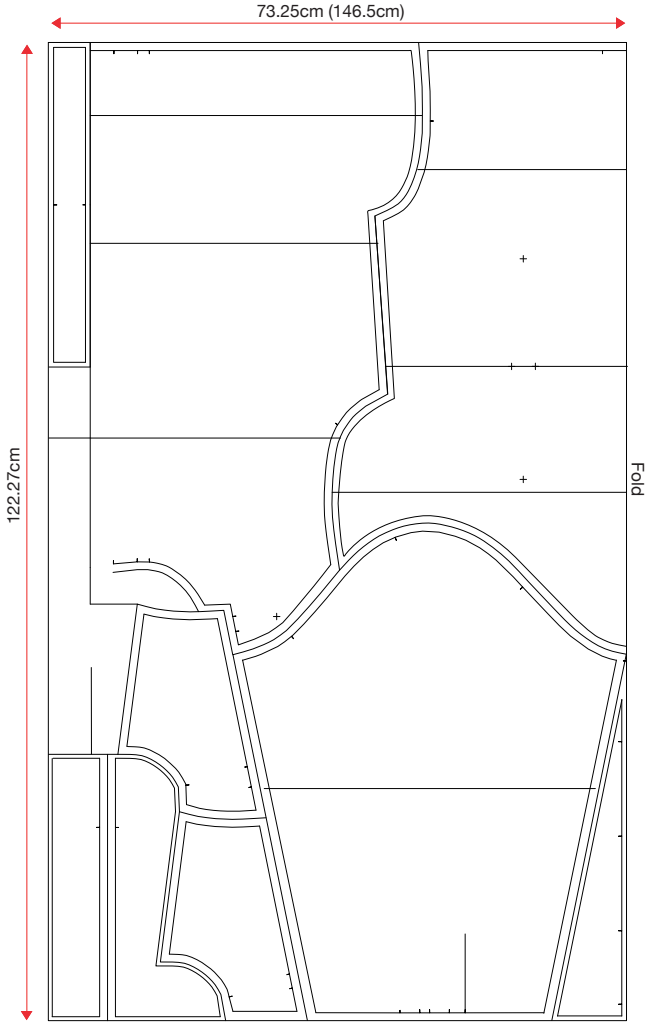
Shirt 14 uses *merging, piecing* and *blending.* The back and yoke have and the front and back shoulders have been *merged*. The front and sleeve have both been *pieced* and *blended* and the collar-tie has been *created*

Shirt 15

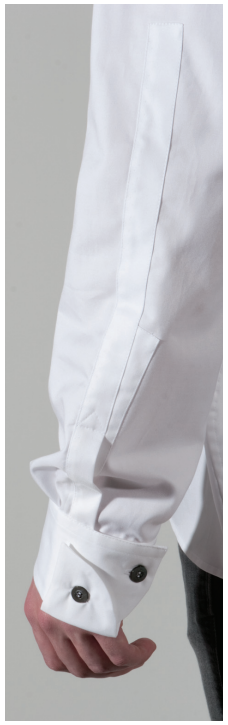


Shirt 15 has been *merged* at the side seams; the sleeve has been pieced with the sleeve crown *creating* front and back hem extensions. The tailored placket blends into the armhole and a pocket and bow tie extension have been *created.*

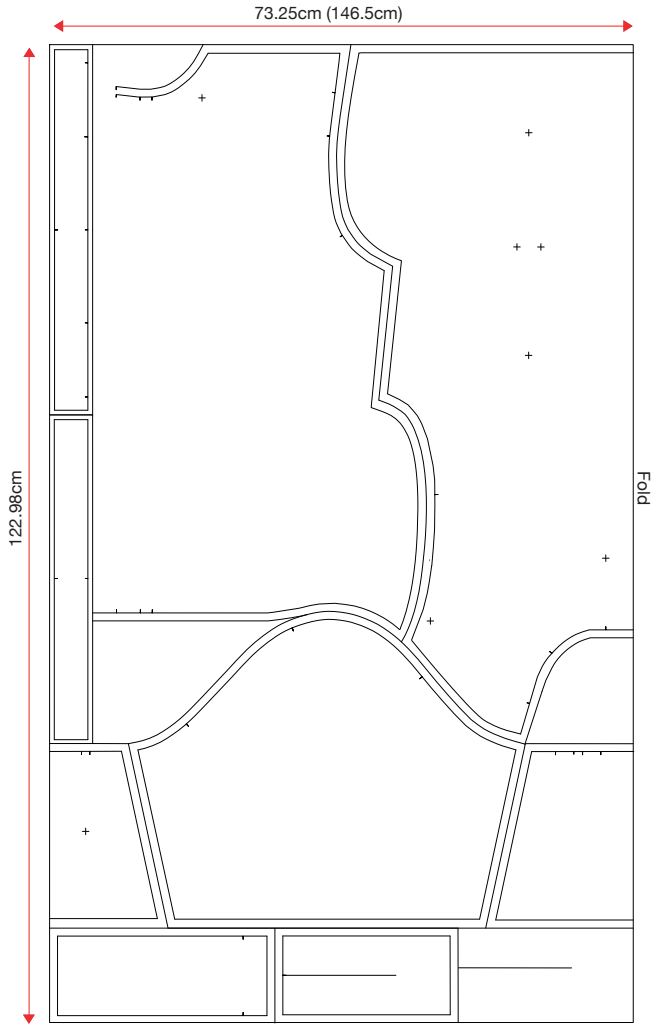
Shirt 16



Shirt 16 combines *nesting* and *blending* with the front, back and sleeve pieces. The yoke, cuff and tailored placket pieces have all been blended and a collar fall attachment and a bow tie extension have been *created*.



Shirt 17



Shirt 17 combines *nesting* and *blending* with the front, back and sleeve pieces. The sleeve has also been *pieced* and a pocket and hem extension has been *created.*

Sizing and Grading

The shirt pattern that I based my base pattern on was labeled as a size medium (M). From my experience of working in menswear retail a size medium shirt would typically correspond to a size 40-41 shirt. This number indicates that when the top button is done up the collar should fit comfortably around the neck of a man which measures 40-41cm in circumference. However if the shirt is sized with a letter rather than a number it generally indicates that the shirt is not a formal or business shirt so is not intended to be worn with a tie and the collar won't have been graded as carefully as that of a business shirt or have the same level of stiffening fusing in the collar. The shirt pattern I am using would qualify as a generous size medium in most menswear stores and I have assigned it the more international size of '3' where '1' is equivalent to a extra small, '2' a small and so on. Sizing and fit was not a top priority for me for this project. I had a fit model, which I adjusted the pattern to fit so that I could view and photograph the shirts while being worn. This research only takes me so far within the parameters of zero waste designing but opens up further opportunities to test the methods by addressing grading. One option would be to simply scale the whole pattern up or down. To continue with not creating fabric waste I would need to source fabric that could be woven in widths increasing by 4cm which is the amount that menswear generally grows per size in the body of the garment. However this form of grading would also increase the length of the neckline, collar, length of the sleeves and body of the shirt would increase by more than usual resulting in potentially strange proportions. I imagine the sleeve crown, which has had ease carefully distributed to sew into the armhole would be distorted losing the accuracy of the pattern. Another option would be to extract the pieces from the pattern as I did with shirt 12 and grade them all separately. The problem with this technique would be fitting the pieces back onto a marker. While I expect the pieces would fit back together quite efficiently, only the size the pattern was developed in would be zero waste and the width of the fabric would need to increase with the larger sizes in order to stay true to the original pattern layout. In my opinion, the best way to approach sizing for these shirts would be a made-to-measure approach. The tailor made or made-to-measure option is now readily available and becoming increasingly affordable particularly on-line. *Shirts My Way* and *Pick a Shirt* are two examples of internet sales based businesses that specialize in custom made men's shirts where the customer can choose from a range of fabric and styles, choose specific design details and have the size adjusted to fit their measurements or measurements from a shirt that fits them. If provided with key measurements such as the neck, chest, cross back and arm length the base pattern could be adjusted to the individuals size then manipulated to their choice of a selection of styles. This process would be considerably more involved than the standard made-to-measure process and I wouldn't be able to compete with the prices. Each shirt would be a one-off original designer shirt with an accompanying print of the pattern and information on the process involved.

Conclusion

In this design-led research project, I have developed and applied a unique process for designing zero-waste men's shirts through patternmaking and prototyping. With an increasing number of fashion designers reducing or eliminating fabric waste from their designs, this research offers five key techniques for designing tailored zero-waste men's shirts. By designing tailored menswear I am contributing to an area of zero-waste design where very little research had previously been undertaken. By not challenging the basic silhouette of a standard contemporary Men's shirt I have shown that designing through patternmaking can result in shirt designs that are wearable and desirable, and do not create any fabric waste. The process focuses on finding an innovative new structure for the standard shirt pattern and subtle quirky detailing, which I could not have conceived of through drawing.

By focusing my research on designing men's shirts I have been able to discover, develop and refine the five techniques which I have called merging, nesting, blending, piecing and creating. The next step is to experiment with applying the techniques I have identified for designing no fabric waste shirts to other tailored menswear garments.

My aim for this project was to use AccuMark pattern design software in conjunction with Adobe Illustrator software to develop an original process for designing zero-waste men's shirts through patternmaking that are wearable and compliment my personal design aesthetic. My motivation for developing this process was to find an alternative way to sketching to develop and express my design ideas

The resulting patterns and shirts have been structured around the limitations that I find drawing has as a design process. I have focused on my skills as a patternmaker to develop an alternative method that subverts patternmaking with computer patternmaking software and results in shirt patterns that do not create fabric waste. The patterns have an unconventional structure yet retain the essence and wearability of a conventional shirt while also displaying original ideas for structural elements and design details. This method relies on the external constraint of not creating fabric waste to drive the patternmaking process. More research is required into the role of drawing in the fashion design process and the relationship between the sketch and the pattern for a fashion garment. This element of my project was explored in relation to my personal experiences in designing fashion through drawing and the limitations that I find it poses.

Through this project I have become a stronger designer and have developed my aesthetic. I have pushed the boundaries of conventional patternmaking methods and have been able to overcome my own preconceived ideas of what is right and possible in patternmaking. I have explored and developed an unconventional approach to design and shown that having difficulty in communicating ones ideas through sketching need not limit the scope of the designer's creative potential. I can also see that, rather than a blank page creativity approach to fashion design, relying on external constraints to prompt adaptations that can lead me in new directions, is an effective way for me to produce unexpected designs that are both exciting and innovative in their aesthetic and structure.

The pattern design techniques I have discovered, refined and demonstrated through the final five shirts that I have constructed are an original contribution to the area of zero-waste Men's shirt design. With design becoming increasingly reliant on technology I am offering an alternative design tool to sketching that utilizes the technology currently available to assist in fashion design.

Appendix 1

Glossary

Technical Terms

Unless otherwise stated the definitions of these terms are from:
Shaeffer, C. (2001). *Sewing for the Apparel Industry*. Glossary p. 407-415
New Jersey: Prentice-Hall

armscye: The garments armhole

binding: Narrow strip of material or trim that finishes the edge by enclosing the raw edges. It is visible on both the face and the wrong side.

Clean-finish seam finish: A seam finish for plain seams in which the raw edges are folded under and edgestitched with a lockstitch machine.

double-turn hem: A hem made by folding the edge two times.

draping: A method used for making patterns using muslin on a dress form

fall (collar): Part of the collar that turns down over any stand.

fit model: A model with a figure type of the target customer who is used to develop and check the fit standards for the manufacturer.

flat-felled-seam: A complex seam made with all raw edges turned under so that the finished seam is attractive on both the face and wrong sides of the garment.

flat patternmaking: A system of patternmaking that is dependent on previously developed patterns. The working pattern is manipulated by using the slash or pivotal method to create design patterns (Joseph-Armstrong, 2006, p.5)

French seam: A complex seam in which both raw edges are enclosed. Generally French seams are on the inside of the garment with no visible stitching lines on the face side, but the can be used as a trim on the face side.

grading: Method for increasing or decreasing patterns proportionally from one size to another in order to make a complete range of sizes.

grainline: The grainline is a line drawn on each pattern piece (from end to end) to indicate how the pattern should allign with the lengthwise grain of the fabric. Regardless of where the grainline is drawn on the pattern, it will always be placed on the fabric so that the grainline is parallel to the fabric edge (Joseph-Armstrong, 2006, p.17)

interlining: Support material used to stabilize and support the design.

lining: Lightweight material used to hide all or part of garments' wrong side.

made to measure: A system for making garments using the client's measurements.

marker: Plan that indicates how all the pattern pieces of the garment are arranged on the fabric to achieve the most efficient layout (Brown & Rice, 1998).

notches: Work indicators on the edge of garment components.

overlocking (or overlocked edge): Edge finish made on an overlock machine. Generally used as a utilitarian finish on seams to prevent raveling.

prototype: The sample garment for a new style in the company's base size made in the intended fashion fabric or afacsimile fabric. If made in muslin the prototype is usually called a toile (Burns & Bryant, 2007, p. 599).

raw edge: The cut edge of the fabric.

straight grain: lengthwise grain of the fabric.

topstitching: A row of stitching that shows on the face side of the garment. Generally topstitching is sewn with the face side up.

toile: A French term whose literal translation means cloth; refers to the muslin trial or sample garment (Burns & Bryant, 2007,p. 603).

understitch: The stitch used on enclosed seams to prevent the seam rolling to the face.

Definition of Terms as used in this Essay

model: In this essay, the term model refers to the way all the pattern pieces that make up one garment style are grouped together and stored in the AccuMark pattern design system.

wearable: A garment that is reasonably practical and comfortable to wear and suitable for its intended use.

Appendix 2

List of Designers who reduce or eliminate Fabric Waste

This list has been collated from Timo Rissanen's blog, Fashion Creation Without Fabric Waste Creation.
Rissanen, T. (2010, 19 July). Updated zero-waste and less waste designers. Retrieved 14 December, 2010 from http://zerowastefashion.blogspot.com/2010/07/updated-zero-waste-and-less-waste.html

Timo Rissanen's blog directed me to most of the contemporary zero-waste designers I have looked at during this project. This list covers all the major zero-waste designers who I am aware of and whose work I have looked at in my research for this project.

The pioneers:

Dorothy Burnham
Claire McCardell
Bernard Rudofsky
Zandra Rhodes
Yeohlee Teng
Julian Roberts
Materialbyproduct
Alabama Chanin

More recent, in no particular order:

Holly McQuillan
Timo Risannen
Carla Fernandez/Taller Flora
Mark Liu
Tara St James/Study NY
Jennifer Whitty
David Telfer
Andrew Hague
Caroline Priebe
Samuel Formo
August
Tiffany Ouyang
Fiona Buckingham/Kyotap

Also important:

Thayaht's tuta.
Madeleine Vionnet

Appendix 3

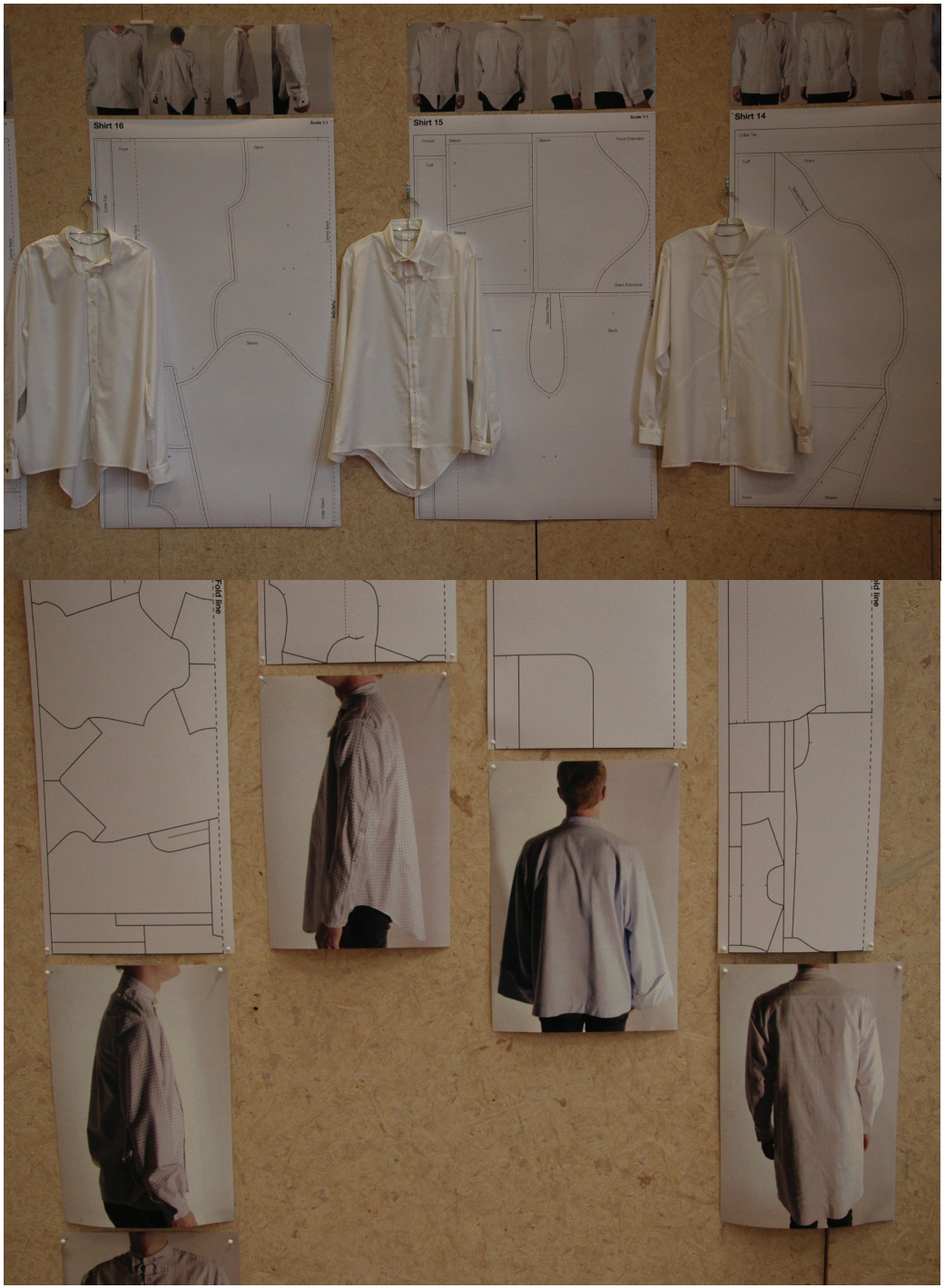
Ethics

"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher Julia Lumsden is responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than Julia Lumsden, please contact Professor John O'Neill, Director (Research Ethics), telephone 06 350 5249, e-mail humanethics@massey.ac.nz".

Appendix 4

Images of the work exhibited in the Massey Univesity 2011 Master of Design exhibition, “THIS WAY UP”.



Appendix 5

Massey University
COLLEGE OF CREATIVE ARTS

Thesis DECLARATION

Author's Name (student):	Julia Lumsden
Title of Thesis:	A garment for the upper body with a collar and sleeves and buttons down the front: Shirts designed through patternmaking
Student number:	04173317
Degree:	Master of Design
Year:	2011

Except where specific reference is made in the main text of the thesis, this thesis contains no material extracted in whole or in part from a thesis, dissertation, or research paper presented by me for another degree or diploma and has not been submitted for the award of any other degree or diploma in any other tertiary institution.

No other person's work (published or unpublished) has been used without due acknowledgment in the main text of the thesis.

Availability of Thesis

I hereby consent to the above report being consulted, borrowed, copied or reproduced in form time to time in accordance with the provisions of the Library Regulations made by the Academic Board. (underline) YES NO

The Assistant Vice-Chancellor (Research) has approved an embargo for this thesis. (underline) YES NO

Note: The period of the embargo will not exceed two years from the date on which the thesis is presented in its final format. During the period of the embargo the thesis will be treated as confidential and access restricted to supervisors, examiners and student. The Library will hold the completed thesis securely until the end of the agreed period; it may be released earlier with the approval of the Post Graduate Director or nominee.

Candidate name: Julia Lumsden

Candidate signature: JLumsden

Date: 25/02/11

Bibliography

American Psychological Association Fifth Edition.

Primary Sources

Compact Oxford English Dictionary. (2003). New York: Oxford University Press.

Abernathy, F. H., & Dunlop, J. T. (1999). *A stitch in time. Lean retailing and the transformation of manufacturing - Lessons from the apparel and textile industries.* New York & Oxford: Oxford University Press.

Brown, P., & Rice, J. (1998). *Ready-to-Wear Apparel Analysis.* New Jersey: Merrill.

Burnham, D. K. (1973). *Cut My Cote.* Toronto: Royal Ontario Museum.

Burns, L. D., & Bryant, N. O. (2007). *The Business of Fashion: designing, manufacturing, and marketing* (3rd ed.). New York: Fairchild Publications.

Coffin, D. P. (1993). *Shirt Making. Developing skills for fine sewing.* Newtown, CT: The Taunton Press.

Cooklin, G. (1997). *Garment technology for fashion designers.* Oxford: Blackwell Science.

Davies, H. (2008). *Modern Menswear.* London: Laurence King Publishing.

Fletcher, K. (2008). *Sustainable Fashion and Textiles Design Journeys.* London: Earthscan.

Friendship, E. (2008). *Pattern cutting for men's costume.* London: A&C Back Publishers.

Guarneri, B. (2003). *Bernard Rudofsky. A humane designer.* Wein & New York: Springer -Verlag.

Joseph-Armstrong, H. (2006). *Patternmaking for Fashion Design.* (4th ed.). United States of America, NJ: Pearson Prentice Hall

Kohle, Yohannan, Nolf, N. (1998) *Claire McCardell: redefining modernism.* New York: Harry N. Abrams.

Liddel, J. (1989). *The story of the KImono.* New York: E. P. Dutton.

Lynton, L. (1995). *The Sari. Styles - patterns -history - techniques.* London: Thames and Hudson.

Major, J. S., & Teng, Y. (Eds.). (2003). *Yeohlee: Work*. Mulgrave: Peleus Press.

McQuillan, H. (12 October). *Images.* Retrieved July 6, 2010 From http://precariousdesign.wordpress.com/images

McQuillan, H. (01 March 2010). *Mens Hoddie / T'shirt process.* Retrieved July 6, 2010 from http://precariousdesign.wordpress.com/

McQuillan, H. *Risk, design and beautifl things.* Retrieved July 6, 2010 from http://precariousdesign.wordpress.com/

The 3 Wise Men guide to shirts. *Number 1: Detailing.* Retrieved July 6, 2010, from http://www.3wisemen.co.nz/shirtguides.asp

Raef, M. (2007). *Dress Shirt Design.* Atglen, PA: Schiffer Publishing.

Rissanen, T. (2008). Creating Fashion Without the Creation of Fabric Waste. In J. Herthorn & C. Ulasewicz (Eds.), *Sustainable Fashion Why Now? A conversations about issues, practices and possibilities.* (pp. 184 - 206). New York: Farchild Books.

Rissanen, T. (2009, 6 July). Sam Formo's zero-waste jacket. http://zerofabricwastefashion.blogspot.com/2009/09/sam-formos-zero-waste-jacket.html

Rissanen, T. (2009, 11 August). *some more photos from Fashioning Now.* Retrieved 15 November, 2010 from http://zerofabricwastefashion.blogspot.com/2009/08/some-more-photos-from-fashioning-now.html

Rudofsky, B. (1947). *are clothes modern?* An essay on contemporary apparel. Chicago: Paul Theobald.

Shaeffer, C. (2001). *Sewing for the Apparel Industry*. Glossary (pp. 407-415) New Jersey: Prentice-Hall

Shep, R. L., & Cariou, G. (1999). *Shirts and men's haberdashery 1840s to 1920s. A tribute to Betty Wiliams.* Mendocino: R. L. Shep.

Stern, R. (2004). *Against fashion. Clothing as art, 1850 - 1930.* Cambridge and London: The MIT Press.

Telfer, D. *1. Collection, 1.2 Collection Patterns.* Retrieved 15 November, 2010 from http://davidtelfer.co.uk/index.htm

Yoneda, Y. *Mark Liu's Zero-Waste Designs Use Every Last Scrap.* Retrieved 6 July, 2010, from http://www.ecouterre.com/5048/mark-lius-zero-waste-designs-use-every-last-scrap/

Tarrent, N. (1994). *The development of costume.* London: Routledge.

Secondary Sources

Chanin, N. (2009). *Sustainable Life - Sustainable Style.* Retrieved 6 July, 2010, from http://alabamachanin.com/about-us

Clarke, H. (2008). SLOW + FASHION - an Oxymoron - or a Promise for the Future...? *Fashion Theory,* 12(4), 427-446.

Dimasi, S., & Kirby, C. *Biography.* Retrieved July 6, 2010, from http://www.materialbyproduct.com/biography/

Dunn, J. (2008). *ReFashion ReDunn.* Massey University, Welington.

Fletcher, K. T., & Groggin, P. A. (2001). The Dominant Stances on Ecodesign: A Critique. *Design Issues*, 17(3), 15-25.

Kries, M., & Vegesack, A. v. (2001). *A-POC making.* Issey Miyake and & Dai Fujiwara. Berlin: Vitra Design Museum.

Priebe, C. *Designer statement fall winter 2008.* Retrieved July 6, 2010, from http://www.ulurunyc.com/bio.html

Rhodes, Z. (2005). *Zandra Rhodes. A lifelong love affair with textiles.* Suffolk: Antique Collectors' Club.

Rhodes, Z., & Knight, A. (1984). *The Art of Zandra Rhodes.* London: Jonathan Cape.

Rissanen, T. *Types of fashion design and patternmaking practice.* Unpublished paper. Univerisity of Technology, Sydney.

Rissanen, T. *From 15% to 0: Investigating the creation of fashion without the creation of fabric waste.* Unpublished paper. University of Technology, Sydney.

Rissanen, T. (2007, 6 July). *why not waste?* http://zerofabricwastefashion.blogspot.com/2007/06/why-not-waste.html

StJames, T. (6 July). *Making a dress.* http://4equalsides.com/2010/03/19/

Tilke, M. (1974). *Costume patterns and designs. A survey of costume patterns and designs of all periods and nations from antiquity to modern times.* New York: Hastings House.

Supplementary Sources

Breward, C. (2003). *Fashion.* Oxford: Oxford University Press.

Brough, D. (2008). *Neo-Dandy. Wearability, design innovation and the formal white dress shirt for men.*, Queensland University of Technology, Queensland.

Deonarain, J. I. (2008). *Not what we are: The (co)re-creation of self.* Massey University, Wellington.

Diller, E., & Scofidio, R. (1994). *Flesh: Architectural Probes.* New York: Princeton Architectural Press.

Ed., N. R. (1984). *Four hundred years of fashion.* London: Victoria and Albert Museum.

Faud-Luke, A. (2009). *The eco-design handbook. A complete sourcebook for the home and office.* (3rd ed.). London: Thames & Hudson.

Forty, A. (1986). *Objects of desire. Design and society sine 1750.* London: Thames and Hudson.

Fuad-Luke, A. (2009). *Design Activism: beautiful strangeness for a sustainable world.* London: Earthscan.

Gwilt, A. (2009). Generating sustainable fashion:opportunities, innovation and the creative fashion designer. Paper presented at the *Fashion & Well-Being?* Conference

Ledbetter, N. M., & Lansing, L. T. (1981). *Tailoring Traditional and Contemporary Techniques.* New Jersey: Prentice-Hall.

Pye, D. (1968). *The Nature and Art of Workmanship.* London: Herbert Press.

Pye, D. W. (1964). *The nature of design.* London: Studio Vista.

Pye, D. W. (1978). *The Nature and Aesthetics of Design.* London: Barrie and Jenkins.

Reilly, A., & Cosbey, S. (2008). *The Men's Fashion Reader.* New York: Fairchild Books.

Schwebke, P. W. (1965). *How to Tailor.* Milwaukee: The Bruce Publishing Company.

Sherwood, J. (2007). *The London Cut. Savile Row. Bespoke Tailoring.* Florence: Fondazione Pitti Discovery.

Walker, S. (2008). *Resurgence.* Auclkand University of Technology, Auckland.

Zimmerman, P. D. (1981). Workmanship as Evidence: A Model for Object Study. *Winterthur Portfolio,* 16(4), pp. 283-307.

Image Sources

Unless otherwise stated all images are by Julia Lumsden and all photographs of The Shirts were taken by Matthew Beveridge excluding photos of shirts A, B, C, D, taken by Julia Lumsden.

Figure 1: "Man's shirt. Egyptian, Coptic. 4th century A.D. Linen with tapestry woven decoration in purple wool" The Walter Massey Collection.
Source: Burnham, D. K. (1973). *Cut My Cote.* (p. 9). Toronto: Royal Ontario Museum.

Figure 2: "Man's shirt. Egyptian, Coptic. 5th-6th century A.D. Linen with tapestry woven decoration in purple Wool. The Walter Massey Collection."
Source: Burnham, D. K. (1973). *Cut My Cote.* (p.10). Toronto: Royal Ontario Museum.

Figure 3: "Man's shirt. Thought to be Italian. Late 16th century. Plain white linen. The People's Museum of Zadar, Yugoslavia."
Source: Burnham, D. K. (1973). *Cut My Cote.* (p.15). Toronto: Royal Ontario Museum.

Figure 4: "Man's shirt. English. Early 19th century. White cotton. Part of the wardrobe of Thomas Coutts (Died 1822), founder of Coutts Bank. Gift of Mr. Francis Coutts."
Source: Burnham, D. K. (1973). Cut My Cote. (p.17). Toronto: Royal Ontario Museum.

Figure 5: A page from an 1837 workingwoman's guide showing the ratios and measurements for making a Men's square-cut shirt.
Source: Shep, R. L., & Cariou, G. (1999). *Shirts and men's haberdashery 1840s to 1920s. A tribute To Betty Williams.* (p. xxv) Mendocino: R. L. Shep.

Figure 6: Shirt with open front (coat front)
Source: Shep, R. L., & Cariou, G. (1999). *Shirts and men's haberdashery 1840s to 1920s. A tribute To Betty Williams.* (p. 113) Mendocino: R. L. Shep.

Figure 7: Shirts with bib front and back placket opening.
Source: Shep, R. L., & Cariou, G. (1999). *Shirts and men's haberdashery 1840s to 1920s. A tribute To Betty Williams.* (p. 95) Mendocino: R. L. Shep.

Figure 8: Cricket shirt; The square-cut style of shirt continued to be worn as a sports shirt while the new style of shirt developed.
Source: Shep, R. L., & Cariou, G. (1999). *Shirts and men's haberdashery 1840s to 1920s. A tribute To Betty Williams.* (p. xxii) Mendocino: R. L. Shep.

Figure 9: Various ways of handling ease for a shirt with a yoke and one-piece back.
Source: Coffin, D. P. (1993). *Shirt Making. Developing skills for fine sewing.* Newtown, CT: The Taunton Press.

Figure 10: "A double sleeve shirt adds humor to the Cosmic Wonder jeans' Autumn/Winter 05/06collection."
Source: Davies, H. (2008). *Modern Menswear.* (p. 43). London: Laurence King Publishing.

Figure 11: "Yamamoto has always questioned the idea of an acceptable code of masculine dress. In his Spring/summer 04 collection, he put the models in long shirts that appeared like dresses."
Source: Davies, H. (2008). *Modern Menswear.* (p. 203) London: Laurence King Publishing.

FIgure 12: Andrew Hague's Zero-Waste Shirt
Source: Fletcher, K. (2008). *Sustainable Fashion and Textiles Design Journeys.* London: Earthscan.

Figure 13: Pattern for Timo Rissanen's Endurance Shirt
Source: Rissanen, T. (2009, 11 August). *Some more photos from Fashioning Now.* Retrieved 15 November, 2010 from http://zerofabricwastefashion.blogspot.com/2009/08/some-more-photos-from-fashioning-now.html

Figure 14: Photo of Timo Rissannen's Endurance shirt at the Fashioning Now Exhibition
Source: Rissanen, T. (2009, 11 August). *Some more photos from Fashioning Now.* Retrieved 15 November, 2010 from http://zerofabricwastefashion.blogspot.com/2009/08/some-more-photos-from-fashioning-now.html

Figure 15: A montage of two outfits from David Telfer's Final year collection with their corresponding patterns. Original images modified by Julia Lumsden.
Source: Telfer, D. *1. Collection, 1.2 Collection Patterns.* Retrieved 15 November, 2010 from http://davidtelfer.co.uk/index.htm

Figure 16: "Typical pants marker" and "Typical intimate apparel marker"
Source: Abernathy, F. H., & Dunlop, J. T. (1999). A stitch in time. Lean retailing and the transformation of manufacturing - Lessons from the apparel and textile industries. (p. 137) New York & Oxford: Oxford University Press.

Figure 17: "Man's coat. (Kimono) Japanese. Early 20th Century. Indigo blue cotton with warp and weft ikat pattern reserved in white. Gift of the Toronto diocesan Anglican Church Women"
Source: Burnham, D. K. (1973). *Cut My Cote.* (p. 31) Toronto: Royal Ontario Museum.

Figure 18: Dimensions of 5 Sari types.
Source: Lynton, L. (1995). *The Sari. Styles - Patterns -history - techniques.* London: Thames and Hudson.

Figure 19: Ernesto Thayat (Michahelles) Tuta & Woman's Tuta 1918 - 1919
Source: Stern, R. (2004). Against fashion. Clothing as art, 1850 - 1930. (p. 43) Cambridge and London: The MIT Press.

Figure 20: A montage of photographs and an Illustration of Tyvek overalls by David Telfer. Original images modified by Julia Lumsden.
Source: Telfer, D. *2. Industrial Project - Tyvek.* Retrieved 15 November, 2010 from http://davidtelfer.co.uk/index.htm

Figure 21: Dresses and skirt by Claire McCardell.
Source: Rudofsky, B. (1947). *are clothes modern? An essay on contemporary apparel.* (p. 202) Chicago: Paul Theobald.

Figure 22: "Bernard Rudofsky. Friend in Nivola's solarium, wearing Bernardo Separate "allinone" and Bernardo sandals 1951(?)"
Source: Guarneri, B. (2003). *Bernard Rudofsky. A humane designer. (p. 80)* Wein & New York: Springer -Verlag.

Figure 23: "Bernard Rudofsky. Friend in Nivola's solarium, wearing Bernardo Separates. (A sleeveless coat made with "Si & No" fabric and trousers) and Bernardo sandals 1951(?)"
Source: Guarneri, B. (2003). *Bernard Rudofsky. A humane designer. (p. 79)* Wein & New York: Springer -Verlag.

Figure 24: Bernard Rudofsky's separates. "From left to right: evening tube dress, long-sleeved top, skirt, drawstring shorts and sleeveless coat."
Source: Guarneri, B. (2003). *Bernard Rudofsky. A humane designer. (p. 85)* Wein & New York: Springer -Verlag.

Figure 25: Hand stitched quilt by Alabama Channin
Source: Fletcher, K. (2008). *Sustainable Fashion and Textiles Design Journeys.* London: Earthscan.

Figure 26: "Skull Dress" Dress with appliqué skull design by Alabama Channin
Source: Fletcher, K. (2008). *Sustainable Fashion and Textiles Design Journeys.* London: Earthscan.

Figure 27: Digitally printed and laser cut zero waste dress pieces, detail and zero waste dress by Mark Liu
Source: Yoneda, Y. *Mark Liu's Zero-Waste Designs Use Every Last Scrap.* Retrieved 6 July, 2010, from http://www.ecouterre.com/5048/mark-lius-zero-waste-designs-use-every-last-scrap/

Figure 28: Sam Formo's zero waste jacket on model
Source: Rissanen, T. (2009, 6 July). *Sam Formo's zero-waste jacket.* http://zerowastefashion.blogspot.com/2009/09/sam-formos-zero-waste-jacket.html

Figure 29: Pattern for zero waste jacket by Sam Formo
Source: Rissanen, T. (2009, 6 July). *Sam Formo's zero-waste jacket.* http://zerowastefashion.blogspot.com/2009/09/sam-formos-zero-waste-jacket.html

Figure 30: Diagram of pattern for zero waste jacket by Sam Formo
Source: Rissanen, T. (2009, 6 July). *Sam Formo's zero-waste jacket.* http://zerowastefashion.blogspot.com/2009/09/sam-formos-zero-waste-jacket.html

Figure 31: Wolf / Sheep jacket pattern by Holly McQuillan
Source: McQuillan, H. (12 October). *Images.* http://precariousdesign.wordpress.com/images

Figure 32: Wolf / Sheep jacket digitally printed textile
Source: McQuillan, H. (12 October). *Images.* http://precariousdesign.wordpress.com/images

Figure 33: Wolf / Sheep jacket image from photoshoot
Source: McQuillan, H. (12 October). *Images.* http://precariousdesign.wordpress.com/images

Figure 34: Pattern for "one piece coat" by Yeohlee Teng
Source: Major, J. S., & Teng, Y. (Eds.). (2003). *Yeohlee: Work.* (p. 94). Mulgrave: Peleus Press.

Figure 35: "One piece coat" Displayed on Mannequin by Yeohlee Teng
Source: Major, J. S., & Teng, Y. (Eds.). (2003). *Yeohlee: Work.* (p. 95). Mulgrave: Peleus Press.

Figure 36: A curved double-turn hem.
Source: Coffin, D. P. (1993). Shirt Making. Developing skills for fine sewing. (p. 26). Newtown, CT: The Taunton Press.

Acknowledgements

Holly McQuillan, Lilian Mutsaers and Antony Pelosi
For the support, understanding and critical supervision you have given me throughout the year.

Julieanna Preston
For your guidance and assistance in all areas of the Masters Program.

Matthew Beveridge
For taking wonderful photographs of my shirts.

My Partner
For being my muse and model and for your ongoing support and enthusiasm in my project.

My Father
For thorough and accurate editing and proofreading, and advice with regards to the essay.

My Mother
For counseling and encouraging me and your ongoing support.

Thank you.