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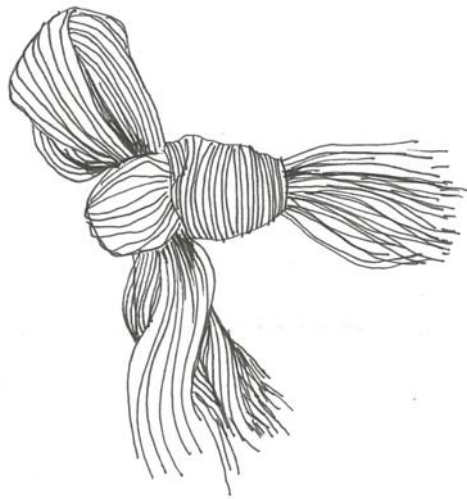
The
REVITALISATION
of a
WEAVING MILL

By Hannah Webster, 2015.



(Cover) Figure 1. Weaving on the dobby loom, utilising existing technology with an innovative use of yarn and colour.

(Opposite) Figure 2. Webster, H. 2014. Woollen yarn from the mill. Pen on paper.



The
REVITALISATION
of a
WEAVING MILL

The manufacture of commercially viable textiles through the revitalisation of a weaving mill; integrating traditional weave processes and modern technologies with a focus on practical learning and experience.

Hannah Webster 2015

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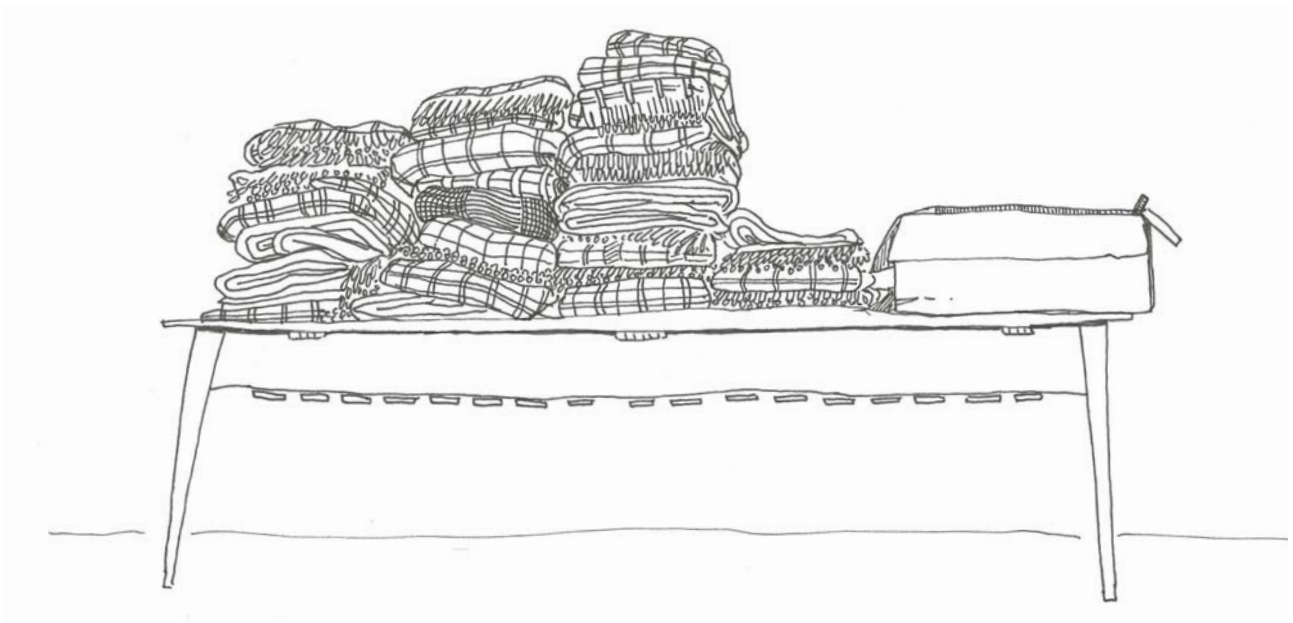
Robyn George-Neiche for your business advice.

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A

NOTE

This exegesis is presented as partial fulfillment of the requirement for the degree of Master of Design, Massey University Wellington, 2015.

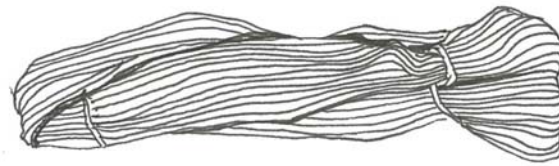
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(Above) Figure 3. Webster, H. 2014. Pile of woven blankets on an old wooden table at the mill. Pen on paper.

CONTENTS



Project [6-7]

Scope / abstract

Context [8-15]

Place: An introduction to the weaving mill
Adding value

Materials [16-21]

Wool by the numbers
Wool in weaving

Practice [22-31]

Self: Methodology
Drawing
Weaving
Weave operations illustrated

Design [32-73]

Barkers travel rug commission (interiors)
Contemporary throw collection (interiors)
Zigzag client collection (apparel)
Heritage menswear collection (apparel)

Conclusion [74-88]

Conclusion and Reflection
Reference list
Bibliography
List of figures
Appendices
Originality declaration



Figure 5. Webster, H. 2014. Looking down through the weaving shed of the mill. Pen and pencil on paper.

SCOPE / ABSTRACT

An introduction to the project

This master's project guides the revitalisation of the Wool Equities' weaving mill in Palmerston North through the use of innovative, creative and industry-led design. It begins with research into the current state of New Zealand's wool industry, value chains, vertical markets and export potential for high quality, luxury woollen products. Global trend research and identification of luxury niche markets provide the international context for the design work. These establish areas of demand for original products that are able to be manufactured viably at the mill, both for interior and apparel fabric exports.

Fusion of old and new technologies along with the properties and behaviour of wool go hand-in-hand with weaving knowledge and technical design to form the constructive design basis of this project. Historical and heritage aesthetics are explored through drawings and colour studies at the mill. Motifs are translated into weaving patterns to create unique and original textile pieces that are both contemporary and authentic, with a story behind the design. The project takes an immersive, hands-on approach to learning all the operations at the mill and extending my own knowledge of weaving processes; adapting small-scale samples to commercially viable fabric.

The outcome of this project is a range of luxury woollen woven product designs that can be sold to both local and international markets. This will offer long-term commercial opportunities for the mill and promote further development of the business. It will highlight the mill's capabilities to function as a specialty New Zealand weaving company and create innovative new designs. This in turn increases the value of wool and creates a sustainable business practice with a positive future.

PLACE

An introduction to the weaving mill



Figure 6. Webster, H. 2015. The West Street facade of the Town and Country Ltd. weaving mill in Palmerston North, NZ. Watercolour on paper.

PAST

The mill has undergone many changes in its time to adapt to client demand. Martin Townend and his father, Jack (who came to NZ from the mills of northern England), first established the mill in 1968 as Ringa Tuia Tweed, working with Harris Tweed handlooms¹ and producing fine woollen cloth on a commission basis for sports jackets and other apparel fabric uses in NZ.

In 1977 the company reformed as Town and Country Textiles Ltd with local investors and Martin as the manager, building the business up over a period of years with redundant old and new machinery² from retired weaving companies. The two remaining rapier dobby looms at the mill today, for example, were purchased as a group of six from an Auckland terry toweling business in the 80s.

A further two companies were created, Lana Spinning and Farbe Dye Ltd, in close proximity to the mill to enable a complete manufacturing unit from scoured wool to finished cloth within Palmerston North. By 1983 the company had complete autonomy and the weaving mill had over 30 employees at its peak. Unfortunately, demand for woollen woven fabric dropped rapidly with the rise of inexpensive synthetics and overseas imports, causing the closure of the yarn spinning and dyeing businesses, and a major reduction in staff at the weaving mill.

1. The handlooms, originally bought from Christchurch workshops for returned servicemen rehabilitation after World War 2, have since travelled the country and are now in Oamaru after client demands for wider fabric could not be met with the narrowness of the looms. Power looms that produce a wider cloth were then bought from the Wellington Woollen mill in Petone after its merger with Kaiapoi Mill in the mid-1960s to become Kaiapoi Petunia Group Textiles Ltd, which Martin's father became manager of in 1970.

PRESENT

Today pressures are on the global textile industry to produce low-cost, on-trend fabric for fast fashion turnarounds. This has resulted in a reduction of business for the mill and others like it in NZ. Such businesses find it difficult to compete with the cheaply made and available replicas from overseas; now more freely available as a result of the 2008 free-trade agreement with China. The mill has an unclear understanding of the actual demand for woollen fabrics, with the overall effect being fewer orders manufactured at the mill. The product output now consists mainly of tartan travel rugs (figure 10) and client work such as durable apparel fabric and a current order; heavy-weight blankets (figure 9). While this keeps the business running, it is not enough to sustain or revitalise the mill long-term and keep its production in NZ. With no online presence or selling platform, there is little to show the extensive weaving capabilities of the company and promote interest. With only Martin on site to execute most of the mill's production tasks, his role has become very time-consuming and labour-intensive.

FUTURE

Until recently, the mill looked set to follow the redundancy trend. However, it was purchased by Wool Equities in 2012 to become Town and Country Textiles NZ Ltd, who saw potential to revive and expand the business into a competitive NZ textile manufacturing company. New technologies³ at the mill provide an opportunity to create high quality, luxury woollen products to sell in to higher-value international market. Historic original weave 'recipes,' hidden away in old books (figure 11), are of great sentimental and technical value, and could be utilised to provide priceless intellectual property (IP) for weave design development. In addition to these assets, the heritage foundation of the company adds emotional value and a sense of authenticity, which when used as a brand and identity, will increase the mill's worth and customer connection to the product. Targeted marketing plans, contemporary design approaches and increased technological knowledge will place this mill at the forefront of specialised industrial NZ woollen weave manufacturing, and add to our country's export values.



Figure 7. The old label used at the mill when it started out as Ringa Tui Tweed in 1968.

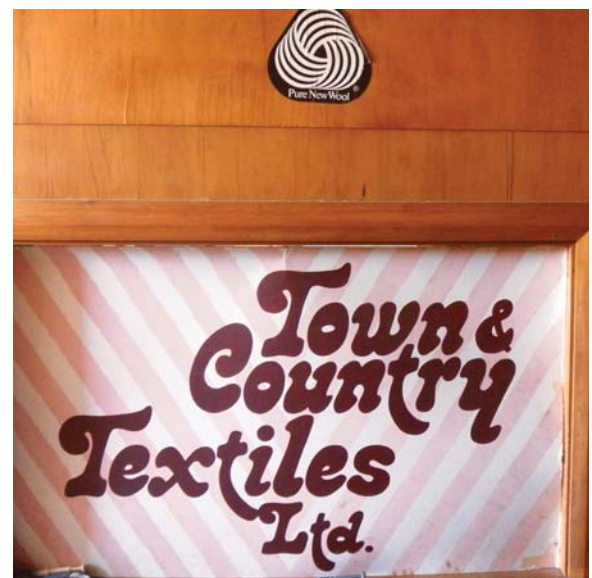


Figure 8. The Town & Country signage used currently.

2. Machines include a warping creel, warp mill, punchcard-driven Rapier dobby weaving looms, a boiler, tentering machine, steam presser, raiser, piece-dye vat, yarn winder, sewing machines and a mending table. New machines include an Italian combined milling/scouring machine, a hydro dryer and Swiss software-driven weaving looms.

3. Wool Equities recently purchased ex CSIRO equipment for the mill from Australia, including three high-tech, computer software-driven weaving looms, which, when functional, would allow the mill to produce fine cloth with improved fabric construction qualities. These require skilled technicians to set up, for which funding is needed.



Figure 9. The blankets utilize remnant carpet yarn that would otherwise be discarded and shredded. They are produced at a very low cost and sold similarly for a charity organisation. The mill's capabilities for finishing fabric after it has been woven have enabled them to transform these blankets from a rough surfaced product to a soft, light blanket by raising the fibres to give the brushed effect; an added level of manufacturing sought after in high-quality interior products.

ADDING VALUE

The need for design and innovation;
an introduction to the project.

“You can invest in all the technology that you like, and all the equipment and all the facilities, but if you don’t have the creative drive, the passion, the brain power to achieve it, you won’t... it’s not about the hardware, it’s about the heartware.”

- Richard Taylor, Wool to Weta interview.
(Callaghan, 2009, p53).

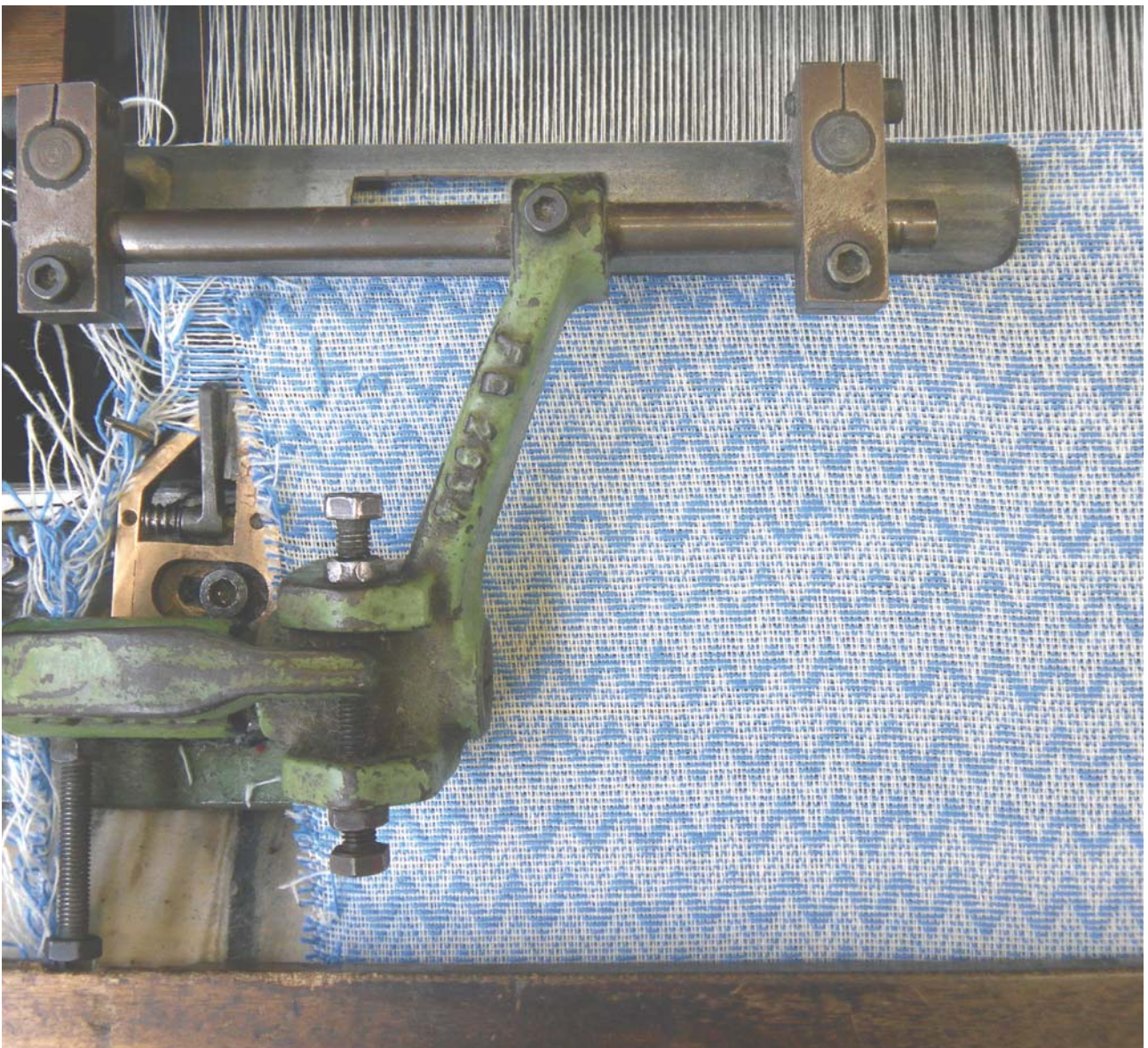


Figure 12. Weaving contemporary fabric using traditional weaving processes and technologies, innovating through use of colour, yarn selection and pattern.

INTRODUCTION TO THE PROJECT

This quote from Richard Taylor resonates with me when identifying the importance of this project to revitalise the Town and Country weaving mill through textile design solutions. Without creative local manufacturers and thinkers, Callaghan remarks that New Zealand stands to become an economy based on raw agricultural product exports, natural resources and tourism alone. In his book *Wool to Weta* (2009), the author argues that in today's world there is a need to go beyond these commodity sales, to generate NZ products of great value to sell to the world. Innovation based on technology and research is the key to increasing our prosperity and improving our economy, whilst giving creative people here local jobs and showcasing New Zealand's talent on the world stage. It is important that our country's young history is preserved and priceless knowledge and skills are not lost from our textile industry.

The mill presents a fantastic opportunity to become part of this shift towards an innovation-based economy, as it provides a level of manufacturing to wool that increases the value and export potential of this agricultural product. Wool as raw fibre is not a high-value product on its own, although over 80% of New Zealand wool is exported in this form before it can be processed further into yarn or other final woollen products (Burt, 2014). One of the main reasons for this missed opportunity is the lack of communication between NZ manufacturers and wool producers, and little awareness of global markets and trends in which to produce products. In the mill's case, no online presence, design team, marketing strategy, brand identity, resource catalogue system or vision, has resulted in a business full of potential but little awareness of its existence by the outside world. The mill has all the physical components needed for it to manufacture woven products viably in NZ, but they are only worth what they are being used to produce.

A need for outside perspectives, innovative design approaches and an enthusiasm for change are the key to revitalising this business. To give a point of difference and unique selling point for their products and expand their export potential in to niche markets is imperative.

MY INVOLVEMENT

I was approached for this project both as a creative textile designer with an interest in weave and its traditional and contemporary processes, and as an illustrator who appreciates details and stories in visually rich environments. I also have a passion and loyalty for quality New Zealand made products, strongly valuing craftsmanship and its authenticity.

Throughout the year I have made many visits to the mill, created drawings, observed and been involved with all its weave operations, and learnt a great deal about every aspect of its existence first-hand with Martin as my mentor. Working with industry has been one of the largest factors in the direction of this project, as constant adaptation and compromise to meet different requirements has resulted in a number of design and manufacturing challenges.

I have extensively built upon my own weaving knowledge at the mill; transferring skills learnt at university using handlooms, to industry-scale technical weaving machinery for commercial applications. Through my research, design work and presence on-site, the mill will start to acknowledge the possibilities of positive change, encourage investment in technology, staff and ideas, and utilize their pre-existing assets to become a thriving, innovative New Zealand specialty textile manufacturer with a local and international audience. These are the opportunities I have identified for them.

“(Innovation is) where businesses and the people they employ are producing and selling new and improved goods and services in new and improved ways.”

- Ministry of Business, Innovation and Employment, 2015.

Revitalisation of historic woollen weaving mills by fusing heritage with innovation is occurring globally. Passionate industries are keen to hold on to local knowledge and expertise whilst meeting modern consumer demands, connecting a product to a place in the creation of something new. Leomaster (Italy) for example was formed in 1991 to take on the assets and knowledge of the Capritex mill (est. 1958), a situation similar to Town and Country. The successful revitalisation of this Italian company saw it branch out from menswear to create the ‘Nalya’ womenswear brand in 2007, producing “unique fabrics with creativity and research by adding innovative technical details to a product full of history.” (Leomaster, 2015). Bonotto (Italy) promote their heritage by branding themselves as a ‘slow factory’, using old technologies to produce contemporary yet authentic apparel fabrics, “The new luxury is time, industrial artisan craftsmanship.” (Bonotto, 2015). A more recent establishment, the London Cloth Company, use heritage in a modern context by creating bespoke 100% UK woollen apparel fabric on traditional weaving looms recently acquired, juxtaposing traditional patterns and nostalgic colours with playful fabric names from popular culture such as ‘Laundry Bag Tweed’ and ‘Space Invader 2/2 Twill.’

An innovative use of design and yarn blends is the key for weaving companies to compete globally. Focusing on their heritage aspects alone, when the technology around the weaving process has not dramatically changed over the years, is not enough. There are many examples of innovative weaving companies. Dashing Tweeds in London differentiate themselves from other woven apparel manufacturers by using innovative yarn, texture and colour choices to create their menswear collections, bringing an element of fun and vivacity to heritage weave patterns. They weave retro reflective yarn with merino to create ‘Lumatwill’ reflective tweed for their urban wear, suitable for cyclists in the city (Dashing Tweeds, 2015). Stansborough in Wellington use a combination of wool from their own ‘Stansborough Greys’ sheep with alpaca yarn to create unique woven apparel and interior products. They are recognized internationally for their innovative products and environmental awareness (Stansborough, 2015). Manawatu Knitting Mills, although not a weaving manufacturer, has used innovative possum blend yarn and contemporary design aesthetics to support its recent revitalisation as an innovative, progressive company.

In addition to innovative design approaches, following international trends forecasts for sought-after colour palettes and yarn selections that will be in demand in future seasons is important for companies such as Town and Country. Key sources for trend identification are internationally-acclaimed Dutch trend-forecaster Lidewij Edelkoort’s TrendTablet online resource and the publication Textile View Magazine, which predict future interior and apparel trends respectively. Alternatively, Pantone online colour forecasts provide up-to-date colour schemes up to two seasons early of what customers will want. Foxford (Ireland) and Johnsons of Elgin (Scotland) produce contemporary colour throw collections alongside their heritage tartan ranges, selling in luxury retail stores such as Kirkaldies and Stains and through their own websites. Faribault in the US have taken a similar approach, expanding their woven throw range by following fashion trends and creating modern woven wool capes to extend into the fashion market.

All of the companies mentioned above have successfully identified niche markets and produced for these accordingly. They have worked innovatively within their limitations and capabilities to create something of great value. Niche market opportunities suit speciality-weaving manufacturers. Their small scale allows for a variety of orders and easy collaboration that mass-production companies cannot compete with. Advantages of heritage, design innovation and creativity make their products sought-after and original. I aim to identify niche markets for which Town and Country can manufacture for to become a speciality weaving company.



Figure 13. A range of heritage apparel fabrics showcased in Textile View Magazine. Fabrics are from brands such as Bonotto and Leomaster.



Figure 14. London Cloth Company's 'Laundry Bay Tweed' made from 100% UK wool using traditional weaving looms.



Figure 15. Dashing Tweeds 'New dandy blue' menswear fabric; 99% wool and 1% Lumatwill yarn.



Figure 16. Johnstons of Elgin's latest range of woollen throws in contemporary colours and designs, using a traditional twill weave.

MATERIALS

A case for wool



Figure 17. Cones of woollen spun yarn against the mill wall.

AN INTRODUCTION TO WOOL

Wool is a protein fibre from the fleece of a sheep. It is described in Walsh's *The Yarn Book* (2006) as being the 'ideal fibre' for its boundless natural characteristics and high-performance properties. In terms of construction of cloth, wool yarn* is ideal for weaving as the fibre has great tensile strength, meaning it can stretch far before it breaks under tension in the loom. Its sustainable composition, production methods and lifecycle mean it ranks highly amongst the most desirable textile fibres available worldwide. New technologies and research are helping to expand its potential in both New Zealand and global textile industries.

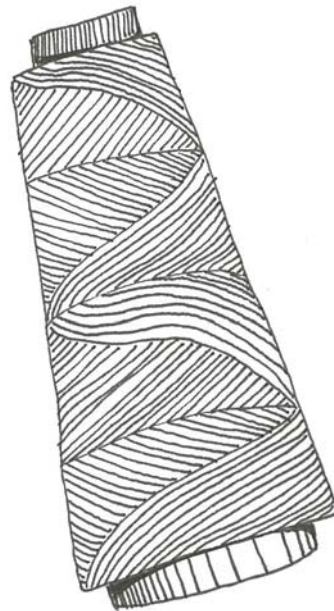
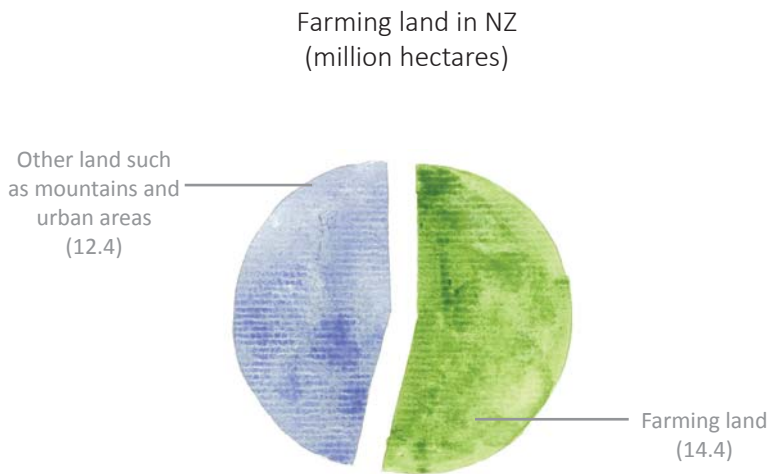


Figure 18. *Yarn is the basic unit of textile construction. It is either the combination of repeated twisting and stretching of a bundle of fibres in to a continuous line, or producing and twisting a continuous filament. Woollen yarn is created by drawing out short lengths of fibres whilst being twisted under tension. The higher the twist, the stronger the yarn (Walsh, P. 2006).

WOOL BY THE NUMBERS

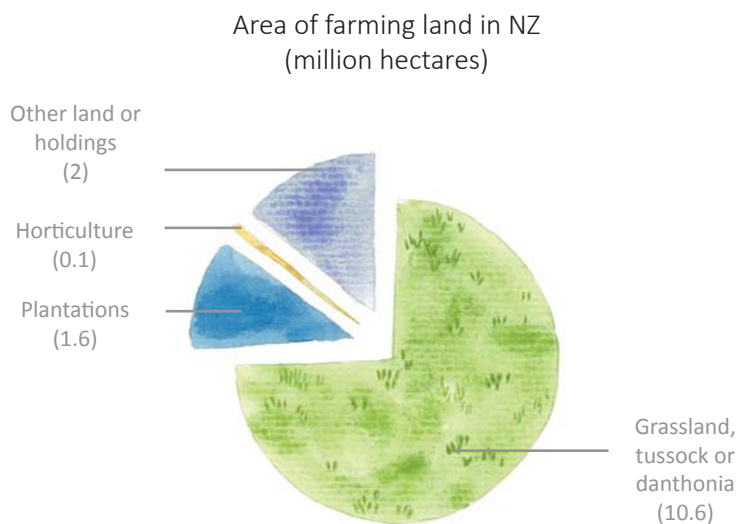
Fig. 19



NEW ZEALAND

With our fertile land and temperate climate, New Zealand lends itself to wool production. Most of NZ's land is used for farming and most of that land is grazing grass. The bulk of our farming is sheep and beef, with sheep dominating as the animal farmed (MacPherson, 2014). In fact, there are nearly seven times as many sheep as there are people living in New Zealand, with close to 30 million animals grazing on our land today.

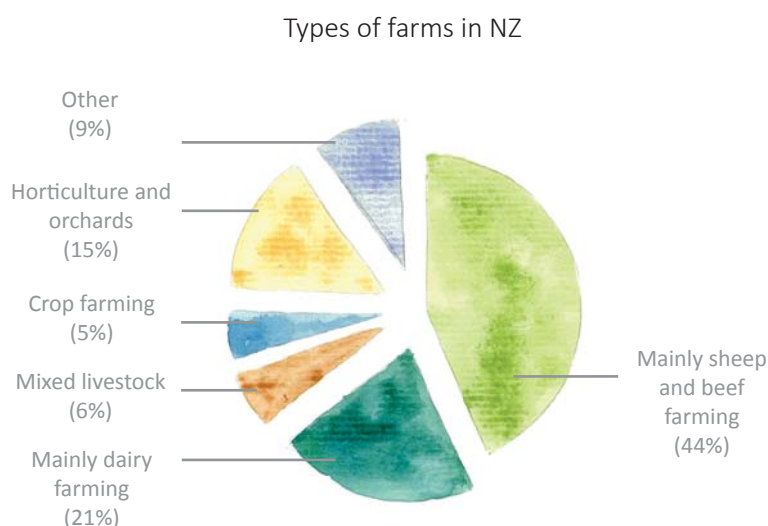
Fig. 20



SHEEP

Sheep were first introduced to NZ from England in 1773 by Captain Cook (Ministry for Culture and Heritage (MCH), 2014). They now make up nearly half of NZ's revenue sources in the agricultural sector, with wool adding a further 10% to this total (Beef and Lamb NZ, 2014). In 1982 the sheep numbers in NZ peaked at 70 million (MCH, 2014), however over the past decade the number of sheep in New Zealand has dropped by 22%, a result according to Beef and Lamb NZ's Stock Number Survey (2014) of "competition for farm land from the expanding dairy industry, and disappointing farm gate prices for sheepmeat and wool."

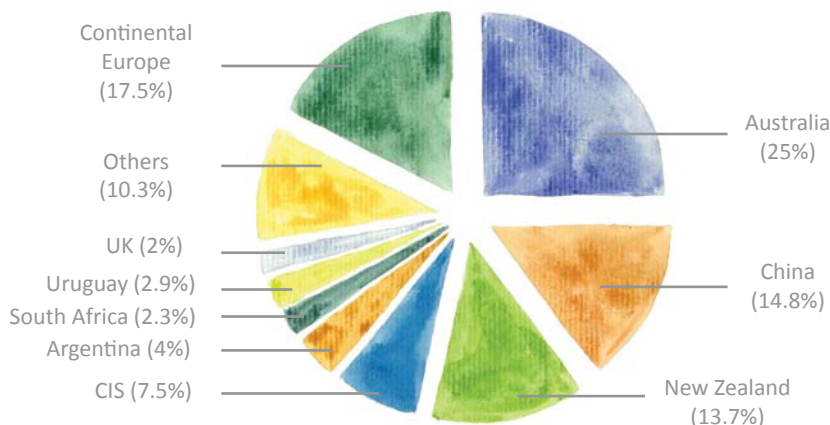
Fig. 21



In New Zealand, nearly half of our sheep breeds are Romney which produce meat and strong, high micron wool. In comparison, only about 5% of our wool comes from Merino (Beef and Lamb, 2014) which produce the fine, soft fibre often used in apparel yarns and fabrics.

The falling value of sheep in New Zealand, and especially the wool of Romney breeds, has promoted a much needed opportunity for research and development. This may save and expand this industry, so central to our economy, and allow us to better utilise our existing wool assets.

Fig. 22

World wool production 2010: clean
(% share)

PRODUCTION

New Zealand is the fourth largest global producer of wool on a “clean” basis, meaning no shortage of supply (Beef and Lamb NZ, 2014). That production is expected to grow slightly according to the IWTO national committee report on world wool production (ASI, 2014). The global production of wool remains at a 60 year low, however, as synthetic fibre production continues to grow and dominate the global fibre market. In 2010, world polyester production was over 35 times that of wool (Fletcher, K. 2014).

EXPORTS

Most of the wool we export is in raw fibre form instead of finished products, as there has been little research or investment into further processing opportunities for strong wool in New Zealand. However, using innovative design and IP-to-manufacture models could increase the value of our exports and wool’s profitability.

Currently, woven apparel accounts for only 0.2% of our total wool exports (Beef and Lamb, 2014), compared with raw wool fibre which accounts for over 80% of our wool exports.

Fine wool (<24.5 microns) is \$15,224 per tonne, whereas Strong wool (>35.4 microns) is just \$6,292 per tonne. Fine wool is more valuable, but according to Beef and Lamb NZ’s Stock Number Survey (2014), strong wool’s price increased over 20% from 2013 to 2014.

Instead of sending wool offshore in raw fibre form, we could add more levels of processing and design to this resource and increase its value on our own shores.

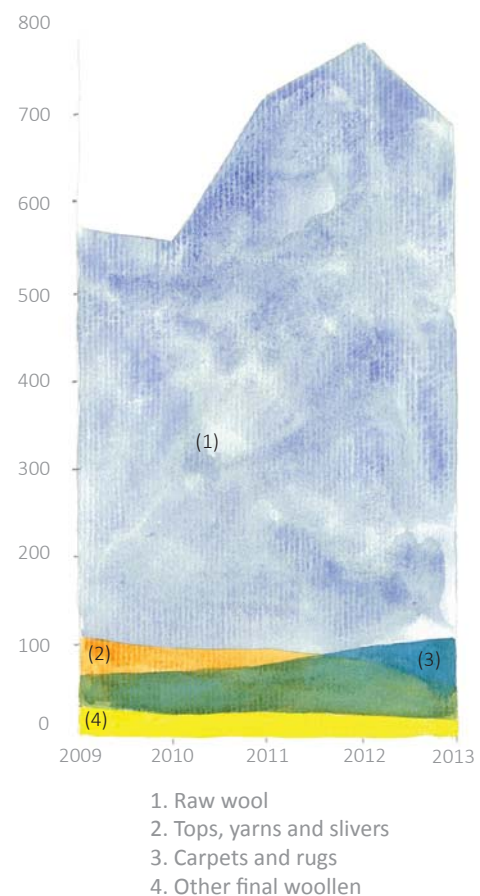
Value of NZ wool exports 2014
(\$million)

Fig. 23

WOOL IN WEAVING

Performance and sustainability of wool



Figure 24. Hoguet's model of factors affecting the sustainability of a fibre.

Sustainability is a key focus for wool, as sustainable fibre is both beneficial for the environment and for a brand's reputation. Deidre Hoguet speculates that wool is one of the few fibres to be high-performance and good for the environment, in her article 'Sustainability and performance in textiles: can you have it all?' (2014). The more durable a fabric is and its resistance to deterioration, the higher its performance is ranked (Hoguet, 2014). Often when a fabric is considered high-performance, it is detrimental for the environment as many chemicals are needed in its production.

Many fabrics, for example, require halogenated flame retardants to be added for fire safety, though in doing so they "jeopardise human health" (Hoguet, 2014) by entering the blood stream. The chemical additives also make the fabric difficult to dispose of at the end of life. Wool on the other hand, is naturally flame retardant and provided it has not been treated with chemicals, will biodegrade later. Hoguet suggests four main factors that contribute to the sustainability of a fibre (figure 24), ranking wool highly for its renewable, recyclable and durable characteristics.

Kate Fletcher extends on this model of sustainability, arguing in her book *Sustainable fashion and textiles* (2014), that these factors have become areas of opportunity for companies to innovate. Wool, for example, is rapidly renewable making it sustainable in the initial material selection and production stage of the chain. New innovations can further add to its sustainability, such as combining other fibre types to reduce demand pressure on one fibre source. Fletcher believes it is important to focus on minority fibres such as wool that have the potential for innovation. This will reduce our dependency on limited resources such as petroleum-based polyester.

The combination of wool as a resource and weaving as a practice creates luxury products. This increases wool's export value. Callaghan mentions in his book *Wool to Weta* (2009) the ideal for a complete 'value chain' in NZ. It is the ability for a company to carry out all aspects of production, from Intellectual Property (IP) creation to product manufacture, in vertically integrated businesses. This involves an investment in technology and research to turn innovative ideas into valuable products.

BENEFITS OF WOOL

Adding value to New Zealand wool through innovation has proved successful with Peri Drysdale's companies- Snowy Peak, Merinomink and Untouched World. Each brand encompasses a different feel or focus, but it was important in all three to "...ensure that the New Zealand values, which are priceless, are leveraged into the global market" (Callaghan, 2009, p. 46). Peri works on innovative new yarn blends such the recent 'Kapua' blend of cashmere, silk and possum, to create a unique product and aims for luxury international markets. She believes distinctive design and brand development "...will grow awareness of us [New Zealanders] as original thinkers and original designers." (Callaghan, 2009, p. 47), thus growing local business and prosperity. Even last year Barrack Obama was seen wearing an Untouched World possum-merino blend jumper.

NATURAL

Renewable, sustainable, biodegradable, has low carbon impact and is energy efficient in its production.

SAFE

Flame resistant, UV protective, reduces static electricity and has a high thermal resistance.

HEALTHY

Breathable, controls humidity around the body, is low allergy, absorbs toxic chemicals in the atmosphere and is a great sound absorber.

Source: International Wool Textile Organisation (2010).



Figure 25. Woollen spun yarn used at the mill.

SELF

Methodology and approach to research

I spent most of the past year learning, and of that learning half was observational and interactive; assisting Martin with jobs at the mill and researching context and technical design solutions. The other half consisted of a more interactive heuristic approach, finding things out for myself from initial drawings through to weave design. The latter provided new insights and discoveries in my project, and helped to spark new enquiries in different directions of research. When combined with existing tacit knowledge, it provided a chance to experiment and imagine possibilities beyond what I could see.

One of the largest challenges this year was the need to stray from my systematic approach to design to adopt a more flexible, adaptable attitude. My limitations and restrictions at the mill appeared malleable, undefined and unrestrained. Any restrictions that did occur were met along the way rather than being set at the beginning. For this reason, I have separated my exegesis in to stories that do not necessarily follow each other chronologically, but overlap in context and time.

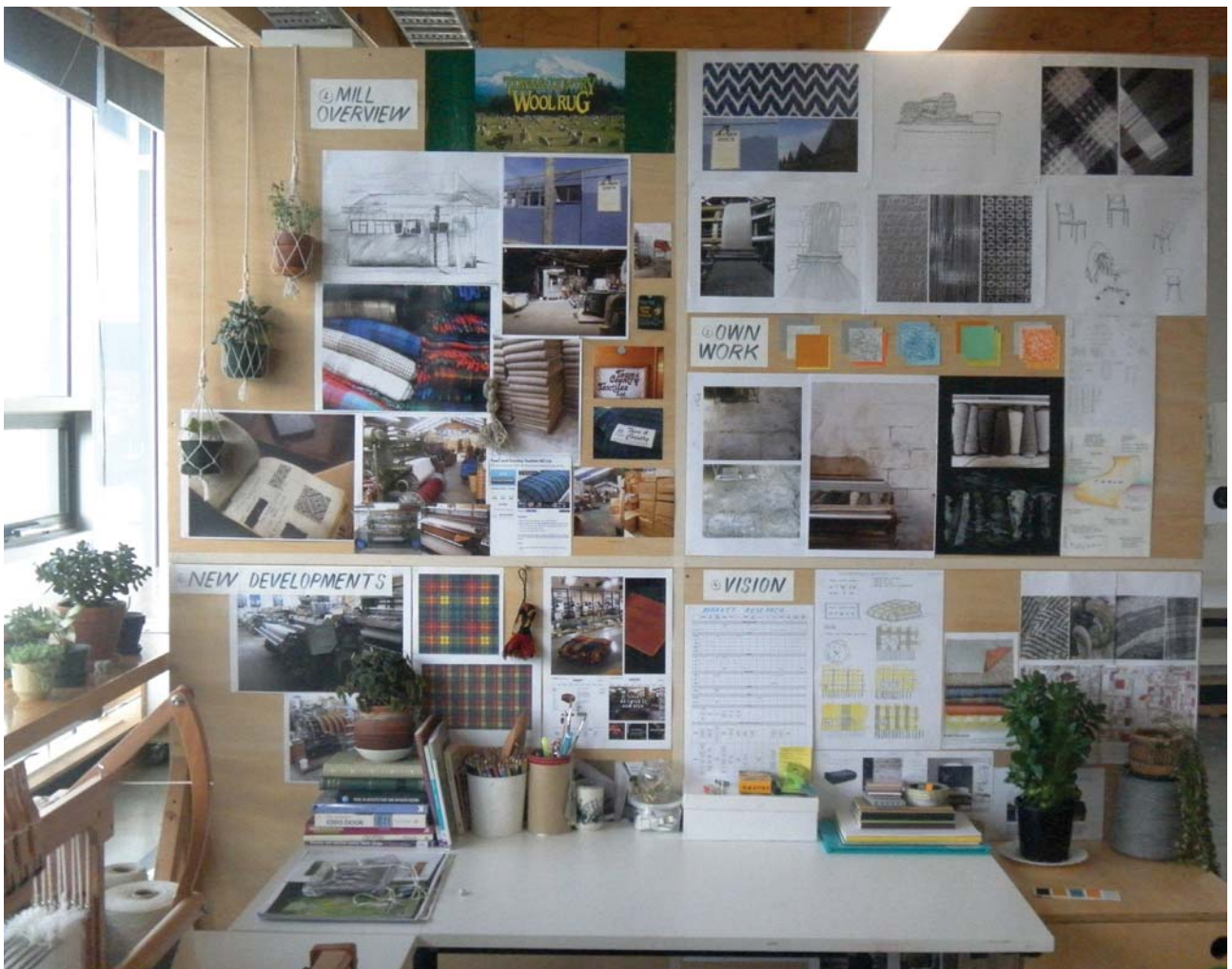


Figure 26. My workspace at uni, with a board to visually organise my ideas, reflect on design decisions and visualise research directions.



Aside from being a set of skills, research is “...a way of thinking... looking at your practice... inquisitively, critically and analytically” (Kumar, 2014, p. 2). To aid in this inquisitive investigation, I created an imaginary research space in my head; a bare white room that provided a clear, uncluttered hideaway in which I could focus on one problem at a time. As my high school biology teacher taught me, everything can be questioned and challenged, and the more this is done, the more concise your research investigations become. With this attitude in mind, I would place one object in that room and question everything about it, then question the answers. Using this analytical method helped me discover the real root of my inquiries, from which I could then answer systematically from the beginning until the question was exhausted.

For example, the first weave sample I made for the Tibetan Yak co. involved this method of investigation before I could progress. Why did I make it? To test whether a zigzag pattern I drew and then transferred to grid paper can be then created in to a weave whilst still retaining its original aesthetic and perform well as an apparel fabric. Why do I need to know? To avoid designing something that can’t be used later or that doesn’t meet its requirements. It also shows potential for subsequent designs. Why avoid this? Because the weaving process is too lengthy to get wrong from the beginning. So I really created that sample to prevent future design failures down the track, which would cost the mill time and money. Sometimes I know the answer from past experience, other times I call on knowledge from Martin or technical weave design books.

If something in the room changed or became something else, I would put in outside and bring it back in to see it with fresh eyes. The new perspective adjusted my view of how it fits in to my research, and helped me to decide how its changes affected what I was trying to develop. This constant re-evaluation was important for maintaining a clear research direction, regardless of how often the process or system changed. This skill proved vital when working in an industry environment, when an ability to compromise and adapt to fluctuating priorities was necessary for keeping ahead and moving on.

Once an idea or solution was solid, I would leave it in the room (which in physical form became my workbooks) and bring in the next idea. This opened a chance to find links between the ideas and how they fit together in the research space. Once all the items are in the room and connected, I can understand the whole sphere and point of the project, and how everything fits together. Organising all my work in folders makes tangible these items, or subjects as they became, and gives me the freedom to re-assemble ideas as I go along.

Figure 27. Light casting over the factory floor at the mill.

PRACTICE

Drawing as an observational approach.

In terms of visual research, I always start by drawing. I find it the fastest process to understand what I see, an observational approach to collecting inspiration to generate original ideas and a design aesthetic with tacit knowledge. It's almost at the opposite end of the scale to logical systems like weaving, but the freedom to draw in an uninhibited manner allows for unexpected findings and an emotive connection to the project.

Additionally, drawing helps to isolate the subjects I find most interesting at the mill, a similar approach to Julia Griffiths Jones (figure 28), whose drawings from the collection of The National Wool Museum in Wales “describe parts of the museum that fascinate me” (Jones, 2015). Jones used her drawings to inspire site-specific digital prints that “visually combine the ongoing manufacturing process of the working mill, Melin Teifi, with the historic textile collection.” Similar to Jones, I have used drawing to tell a story of my site, making palpable what I cannot explain in words, and convey a sense of the place to the viewer.

Rather than extending these drawings to print, I use the imagery to inspire motifs for weave design and colour palettes, retaining the character of the mill whilst instilling my own design aesthetic and style. Holly Berry, a weaver from the UK, takes a similar approach to mine, by using drawing as a method of gathering information and translating it to weave designs, giving the user of her designs an emotional connection to the product (figure 29).



Figure 28. Jones, J. 2007. Drawing from collection of The National Wool Museum. Pen on paper.



Figure 29. (Series of three, above). Berry, H. (2014). Farmers' market inspiration. Photograph to drawings to weave designs.



Figure 30. Drawing in the weaving mill. Photograph.



Figure 31. Webster, H. 2015. Drawing of the ribbon table done at the weaving mill. Pen on paper.

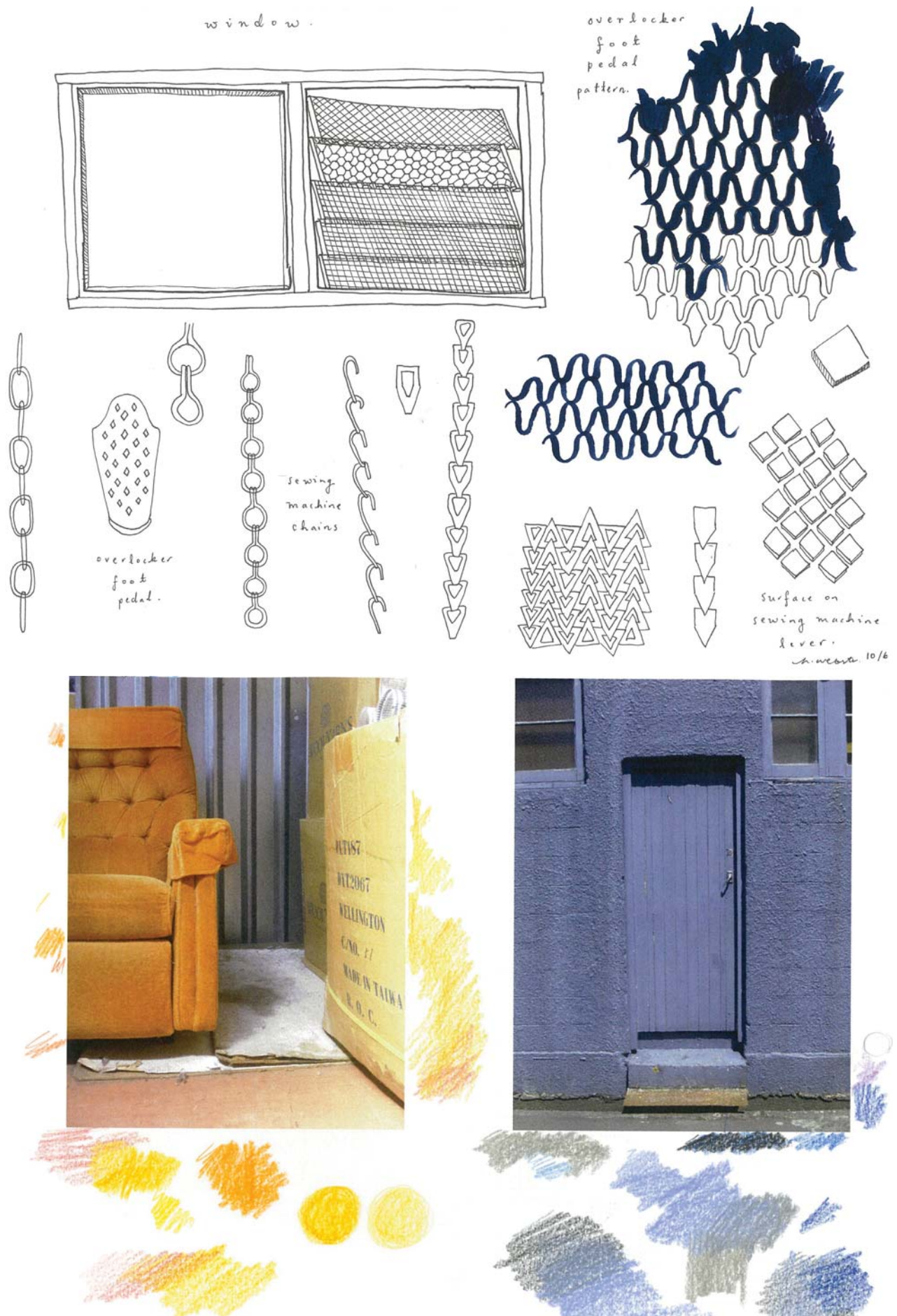


Figure 32. Webster, H. 2015. Gathering shape, motif and colour inspiration from the mill. Pen and colour pencil on paper.

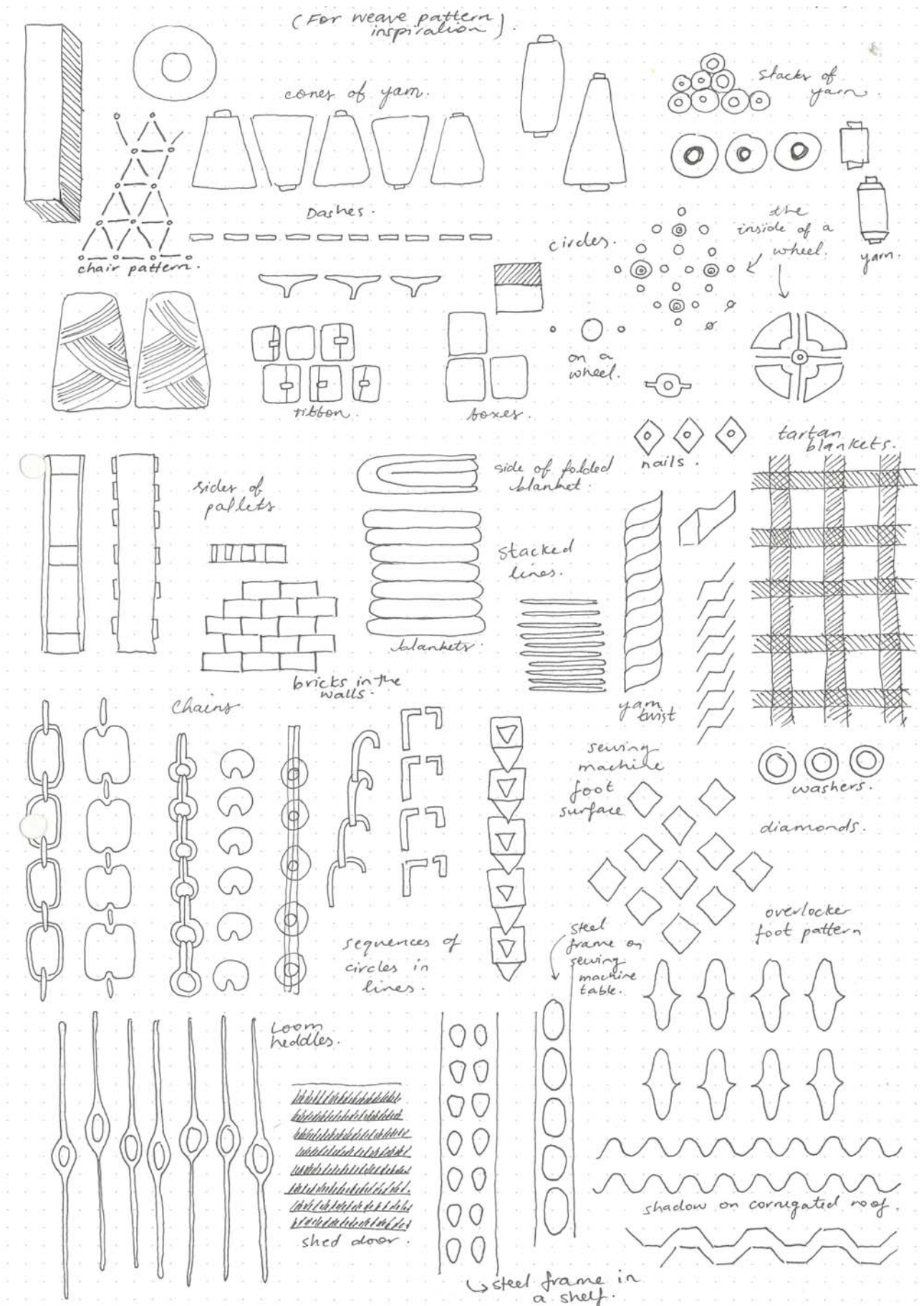


Figure 33. Webster, H. 2015. Motifs from drawings at the mill, simplified into isolated shapes. Many of these patterns and motifs were used as inspiration for the patterns in my personal apparel collection. Pen on paper.

PRACTICE

Weaving as a physical design practice

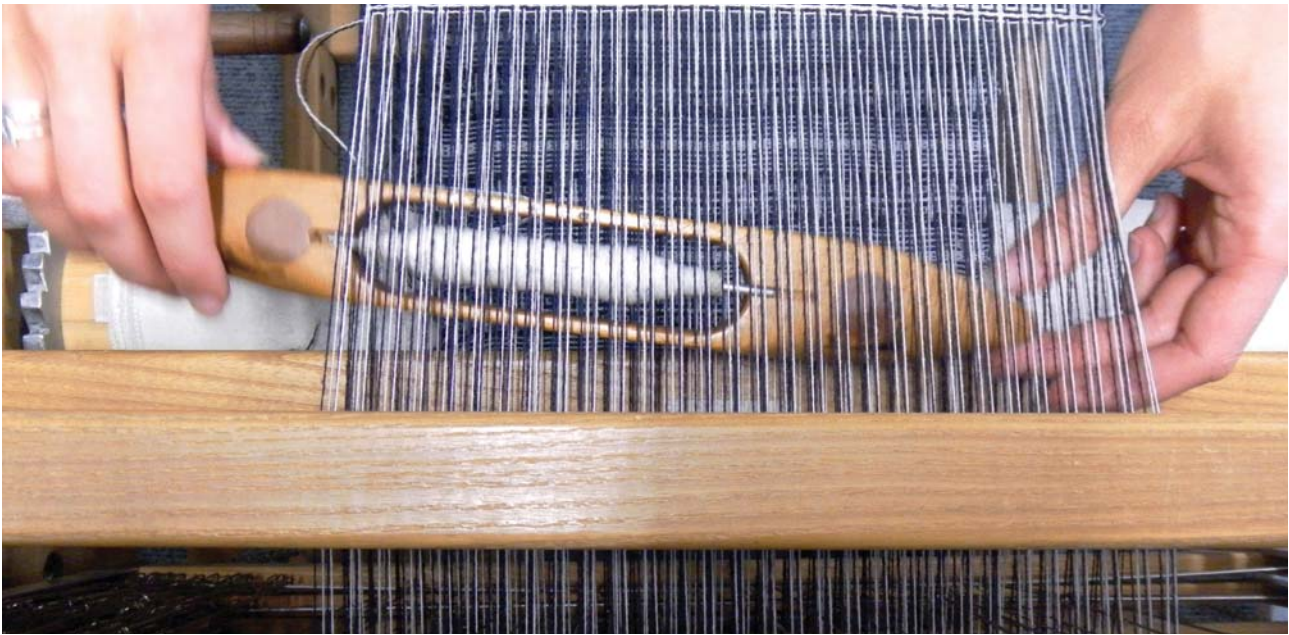
“The basic principles of weaving is the passing of a thread called a weft (filling) through tightly stretched threads called the warp.”

(Burt, 1973, p. 7).

My research methodology and way of organizing is relevant to why I enjoy weaving; it's systematic, logical and pertinent. The interlacing of yarn in repetition forms a whole; a solid result. It's creating a design with sequences of numbers and patterns that are brought to life through the weave's construction and made permanent as finished cloth.



Figure 34. Weaving on the industrial Gunne rapier dobby loom at the mill. Photograph.



Weaving is a very formulated, manufactured process; it requires foresight and planning before any physical form can even take shape. Sometimes it is difficult to predict what a finished woven piece of cloth will look like, as there are so many factors that affect its appearance and performance. These include yarn choice, weave density and final finishing effects. The best approach for a weave designer, therefore, is to first understand what the cloth will be used for after it has been woven and work backwards from there.

In 1973 Burt remarked that “hand-woven articles came to be highly valued” over mechanically produced items after the industrial revolution (Burt, 1973, p. 2). Today however, we are beginning to see a renewed interest in industrial themes. Mass-production and the handmade have become so opposite that an interest in the in between has arisen; a reintroduction of the product to its maker, even if the maker is a machine. Li Edelkoort, an internationally recognised textile visionary, observed this shift in her trend forecast statement of 2011. “ Suddenly we turn away from our affection for the hand-made... to look towards the industrial and the serial, a fresh fascination with that which is proud to be produced by machine.” (Edelkoort, L. 2011).

Chetwynd segregated industrial weavers from hand weavers in her book *Simple Weaving* (1969). She claimed the freedom for ideas is limited with the industrial, and hand weaving lends itself to creating “...exciting fabrics that cannot be woven by machine...” (Chetwynd, 1969, p. 7). I find myself in an interesting middle ground between these two practices, as I hand-weave to design for industrial scale. Both are limiting in their own ways, and both have a lot of freedom to try to new ideas.

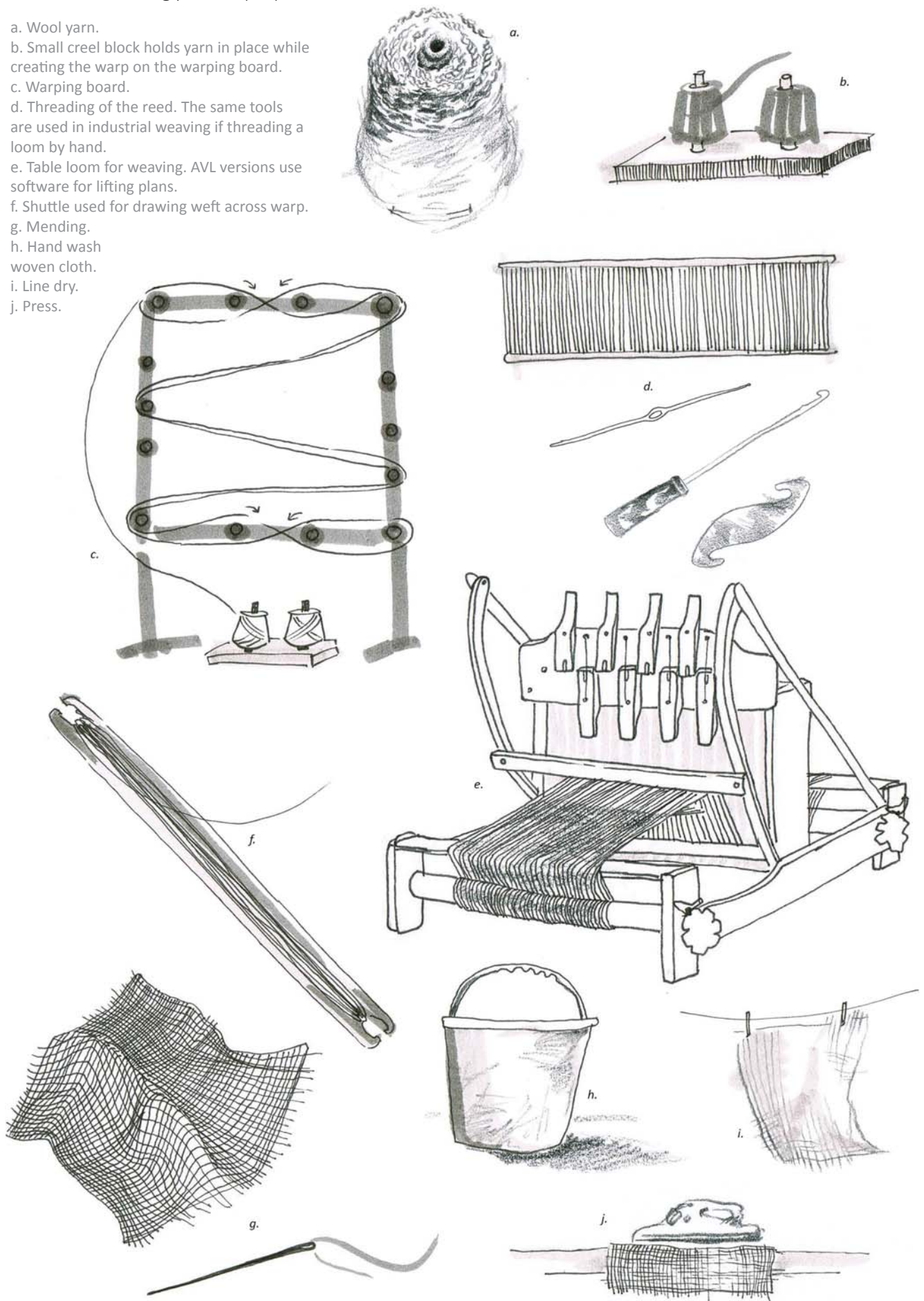
The smaller scale of the mill offers a chance to work with quality rather than quantity. New Zealand is a small country and cannot compete with the mass-production of larger countries. The solid form of business, as Richard Taylor quotes in Callaghan’s *Wool to Weta*, is “...the IP development, the technical know-how, the creative and technical challenges that New Zealand companies are so very good at solving, that will be the building blocks of the economy...” (Callaghan, 2009, p. 7). I value quality and authenticity over most other things, and the chance to be so involved in the creation of woven textiles at the mill has increased my appreciation of industrial systems on the smaller scale, and the careful decisions taken along the way.

In the design chapter of this exegesis, I will delve into my creative process behind woven fabric design and construction.

(Above) Figure 35. Hand weaving on the software-driven AVL loom, creating samples that can be adapted for industrial weaving processes at the mill in the future.

Hand loom weaving process (uni).

- a. Wool yarn.
- b. Small creel holds yarn in place while creating the warp on the warping board.
- c. Warping board.
- d. Threading of the reed. The same tools are used in industrial weaving if threading a loom by hand.
- e. Table loom for weaving. AVL versions use software for lifting plans.
- f. Shuttle used for drawing weft across warp.
- g. Mending.
- h. Hand wash woven cloth.
- i. Line dry.
- j. Press.



Industrial weaving process (mill).

- a. Wool yarn.
- b. Large creel racks hold yarn in place whilst creating the warp.
- c. Warp mill used for sectional warping.
- d. Threading of the reed.
- e. Gunne rapier dobby loom.
- f. Rapier used for drawing weft across warp.
- g. Mending table.
- h. Scouring/ milling machine.
- i. Hydro for spinning water out of fabric.
- j. Tenter for drying fabric.

Other operations:

Raising/brushing
Fringing
Pressing
Raising

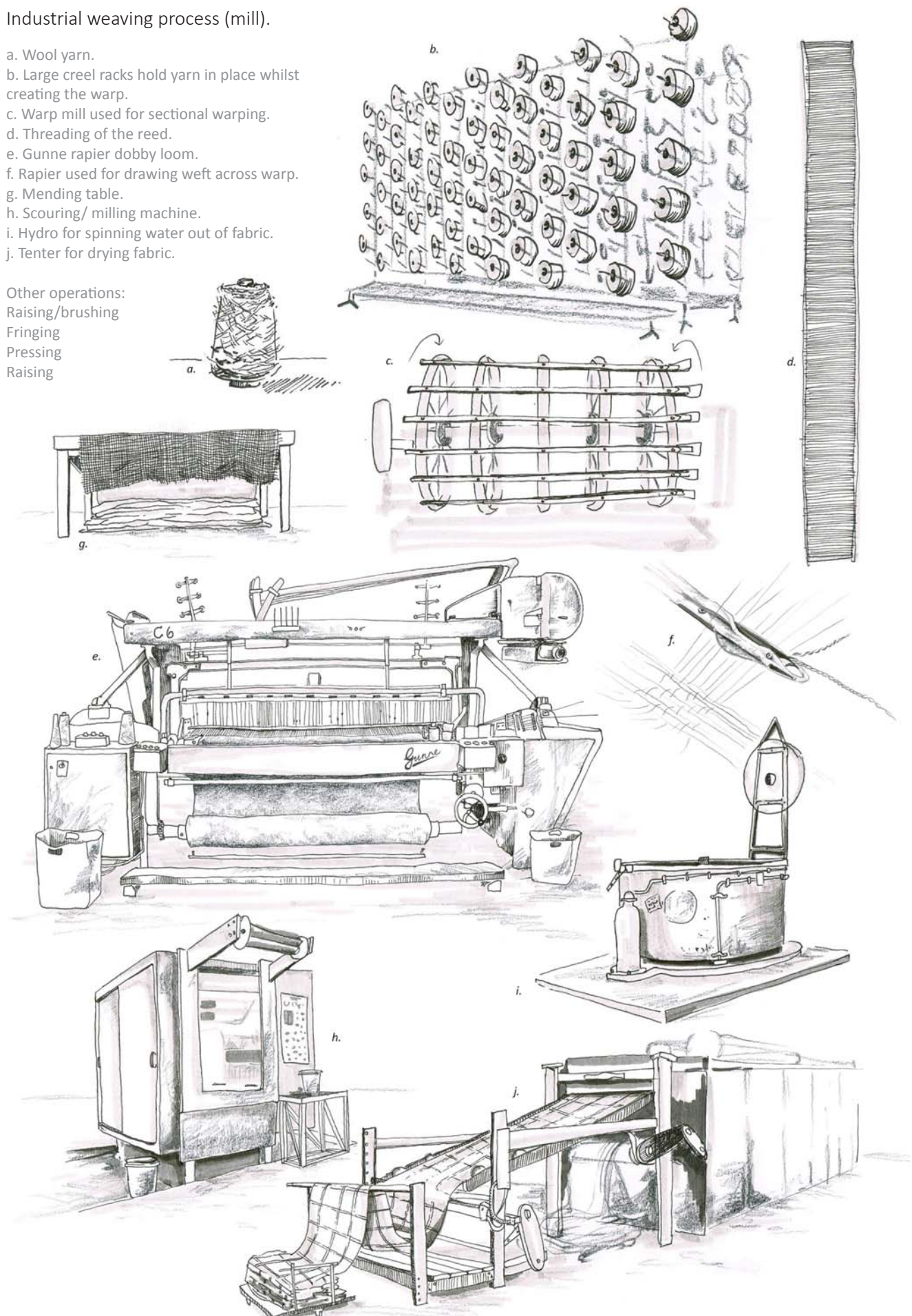


Fig. 37



Figure 38. There is plenty of inspiration and ideas at the mill, such as this sun-bleached wall of calendar pictures.

The
DESIGNS

INTERIOR COLLECTIONS

Barkers travel rug (client work)
Throw collection (personal work)

APPAREL COLLECTIONS

Zigzag collection (client work)
Heritage menswear collection (personal work)

BARKERS TRAVEL RUG

Client task, woven design commission



Figure 39. Webster, H. (2015). Creating the warp for the woollen tartan travel rug, using an adapted traditional Buchannan pattern.

DESIGN FOCUS

Barkers approached the mill for tartan rug designs for their store, ones that fit in to the classic Barkers image but do not look dated. The focus was a quality New Zealand made woollen product with contemporary market appeal that could be produced to a commercially high standard. The mill specialises in tartan cloth design and construction, and this commission presented an opportunity for myself to be involved in the weave production first-hand.

THE FINISHED PRODUCT



Figure 40. The completed Barkers woollen Buchanan travel rug, as sold in stores and online in 2014.



Figure 41. The completed travel rug, on sale in Barkers stores.

TARTAN

An introduction to a classic

TARTAN AND THE MILL

Tartan is a classic and globally recognisable design. According to Faiers in their book *Tartan* (2008) it can show the topographical alliance to its place of creation and reflects the local production methods. In the mill's case the designs link the business to its UK heritage roots and the weaving skills that were brought over to New Zealand in the 1930s by Martin's family.

Since its beginnings, the mill has specialised in creating tartan fabric, especially as it was in demand for school uniforms in the 1950s. But with the cheaper cost of production in China and the rise of synthetic fibres, the competition grew. The mill discontinued manufacturing woollen tartan apparel fabric as it became too costly. Tartan travel rugs, as a finished product, have now become the main product output for the mill. However, there is an economic dilemma about tartan rug manufacture worldwide. This universally recognised pattern has been adapted to saturation point in numerous fibre types and at a range of price points.

TARTAN CONSTRUCTION

The construction of woven tartan design is relatively straightforward. It focuses on the mix of colours and the dominance of tones through the interweaving of the warp and weft setts*. The more colours used, the more subtle the overall tartan becomes (Faiers, 2008). Wool is the traditional choice of fibre for tartan and the mill has continued this.

The mill follows the traditional twill weave construction for their tartan rugs for its durable structure and diagonal parallel line effect (M. Townend, personal communication, May 2015). This provides an extra benefit that only becomes obvious after the finishing processes at the mill. The combination of larger floats in the twill weave, and the coarse nature of woollen spun yarn creates a soft handle after the rugs have been through the raiser and the fibres are brushed out from their place. This takes the weave from a relatively flat, coarse fabric to a softer, lighter one and allows more heat to be trapped in the air around the raised fibres for warmth whilst creating a more condensed and stabilised cloth.

TRENDING TARTAN

There is an international 'tartan invasion' occurring according to *Textile View Magazine* (2014, v. 104), as its versatility for context and colour changeability makes it an extremely adaptable design that "endures regular revivals and never really goes away" (Machin, 2014). Companies such as Harris Tweed use tartan to evoke a sense of heritage. As the mill does a lot of client orders that they cannot advertise as their own products, the tartan rugs enable them to produce something of their own, attracting business to the mill with this classic, timeless design.

*A sett is the number of yarns of each colour required to produce a particular sequence. These are repeated across the warp (vertically), and if exactly the same sequence is interwoven at right angles in the weft (horizontally), the finished woven design is called a tartan.



Figure 42. An end piece of a woven tartan rug conveys a sense of age and tradition in the mill.

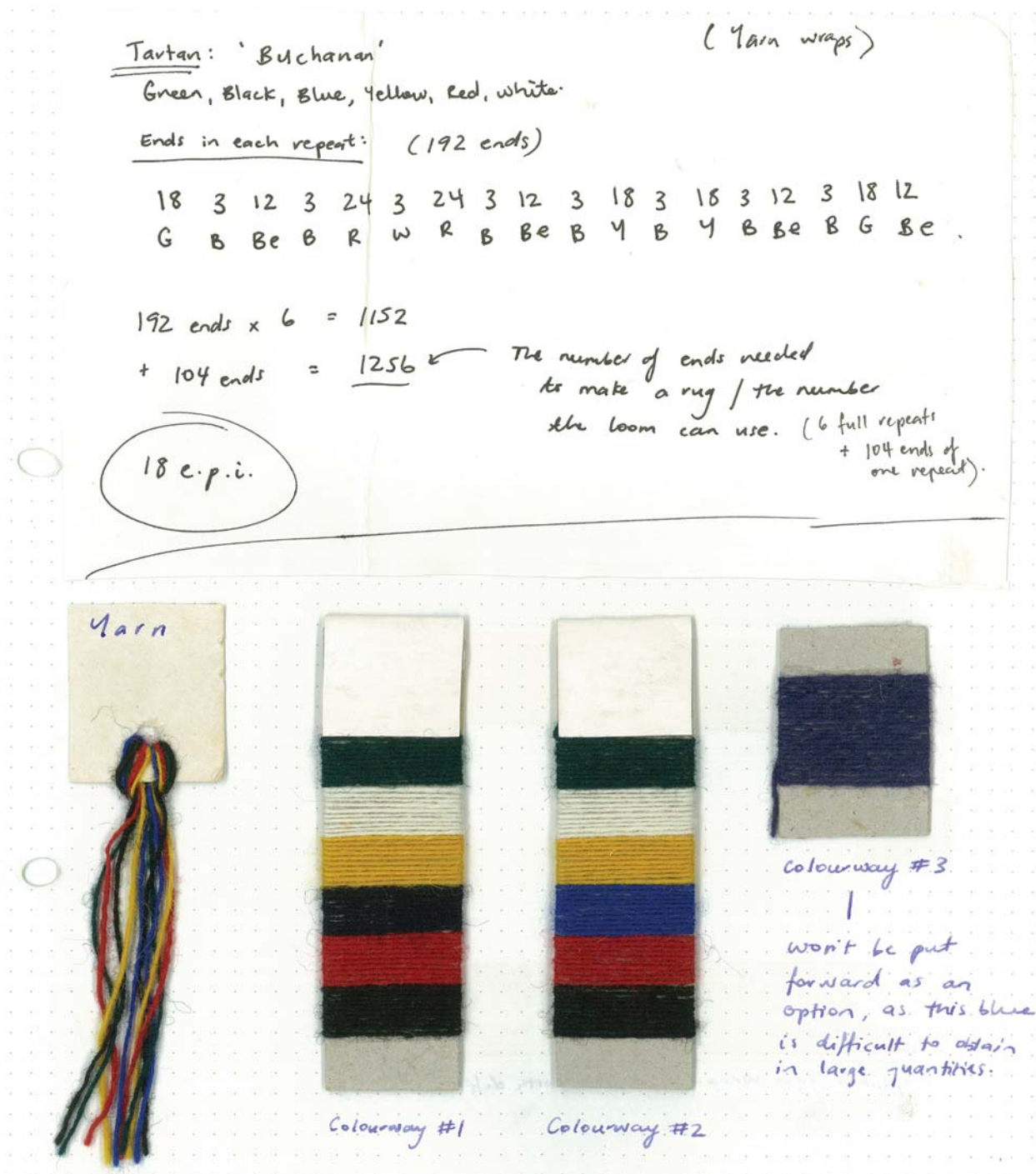


Figure 43. A workbook page from the Barkers travel rug design commission, including colourways and sett technicalities.



Figure 44. A yarn wrap showing the sett repeat and colour proportions for the client, using 220 tex woollen spun yarn.

DESIGN PROCESS

Creating the Buchannan tartan design for Barkers

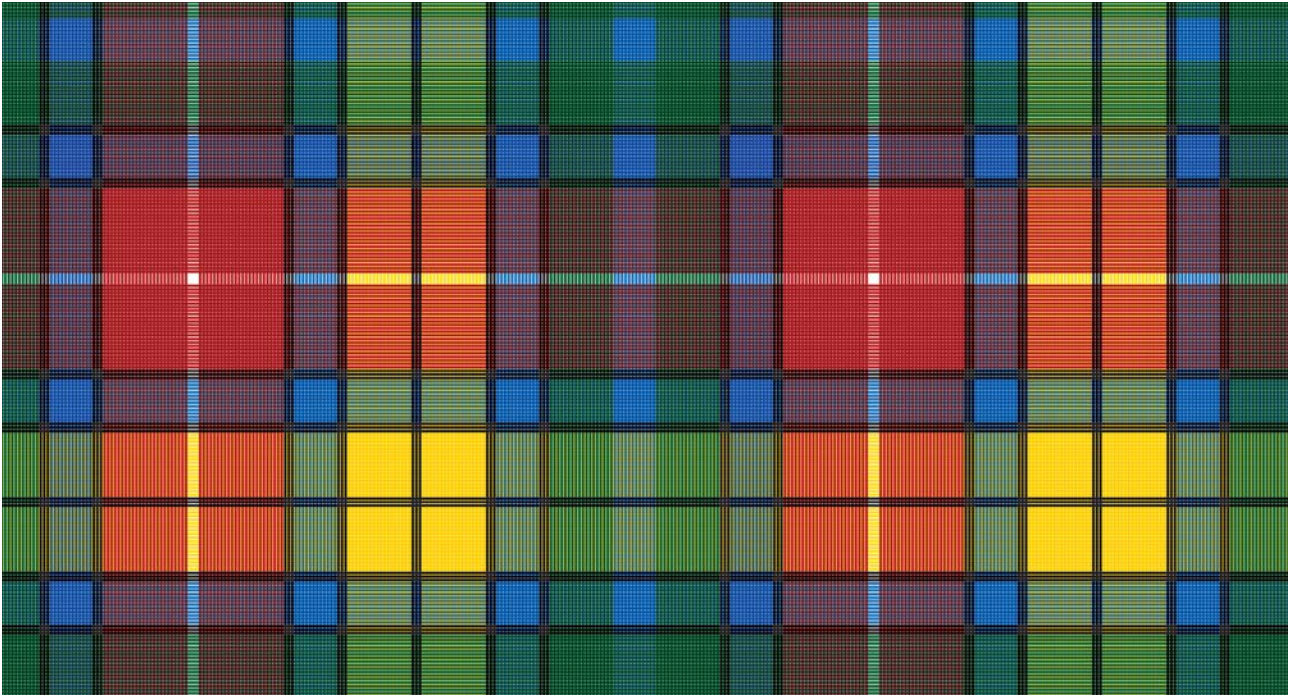


Figure 45. Webster, H. (2015). Digital visualisation of Buchannan tartan weave design for client. Illustrator digital file.

DESIGN

Barkers provided the mill with a rough idea of the Buchannan rug design that they would like to commission for their winter 2014 collection. As weaving is a long and laborious process of construction, a preliminary 'sketch' of the product was needed to convey to Barkers what the finished rugs would look like after they had been manufactured at the mill.

I worked with Martin to create a sett of the traditional Buchannan tartan that would work on the mill's loom when in repeat. A yarn wrap and possible colour ways aided in colour proportioning and visualising scale for the client (shown opposite). In addition to these I also created a digital representation of a completed rug (above) using Illustrator and Photoshop design software, a technological process not used by the mill before but important for visually conceptualising a product for a client before manufacture.

Based on these preliminary visuals, Barkers successfully placed an order for 150 rugs in the Buchannan tartan and a few tartan coordinate designs. Larger orders are ideal on a commercial scale as they are more time and cost efficient, and the mill aims to secure these (M. Townend, personal communication, September 2014).

The Barkers rugs gave me an excellent opportunity to be immersed in some of the weave construction processes at the mill first-hand. From smaller tasks such as re-winding yarn and knotting ends together to larger processes such as setting up the warp creel, I was able to start understanding and taking part in industrial weave manufacturing processes and learn how best to design viably for this type of industry with my own designs throughout the year.

THROWS

Personal design range

DESIGN FOCUS

An extension of tartan, simplified and deconstructed, this collection utilises existing loom technology with an innovative use of colour, design and yarn combination in the cloth. It provides the mill with a unique product of its own to promote its design, weaving and finishing capabilities to local and international audiences. Using 100% NZ wool and being manufactured entirely in NZ, these throws project an optimism for the future for local wool and textile industries, a lift reflected in the summer hues and bold colour blocking.



Figure 46. Webster, H. (2015). Stack of woven rugs at the mill. Rugs are slightly larger and heavier than throws, and do not have as much of an interior appeal.



Figure 47. Cut selvage edges of throws as they are woven on the looms at the mill, utilising a single warp with a range of designs.

COLOUR

Initial design stage of the throw collection



Figure 48. Textile View, issue 104, win '15. 'Bright Shetland' trend is described as consisting of "... striking oranges and teal blues bringing new life to country looks." Although this colour forecast is for apparel, it can cross over in to the interior market with products like throws that are easy to change with the seasons.

The colour palette for the throw collection was one of the focal design decisions for this product range, as any intricate patterns in the design would be lost with the brushed finishing effects at the mill which raise the fibres and distort the cloth's surface to give the soft handle. As this range aims to simplify and contemporise tartan, the use of colour was very important. Faiers believes in his book *Tartan* (2008) that the use of colour is one of the most recognisable and unique characteristics of tartan, as the design relies on the relationship between the overlapping colours to blend tones and create an individual aesthetic of the specific combinations. In Harris Tweed tartans (figure 49), colours are inspired from the surrounding landscape to evoke a sense of place and create an emotive connection to the product for the user.

I aimed to create this connection in my own designs by drawing on colours at the mill site. In addition to this, trend forecasts were analysed to identify market trends, as these throws are to be produced with the intention to sell. I chose to create a blend of natural, grey tones observed at the mill with bright tangerine, celulean and iris blues to add a point of difference whilst appealing to current interior trend markets and break away from the traditional tones that the mill currently uses. The combination of these points to a tartan origin of design with a contemporary, more minimalist aesthetic.

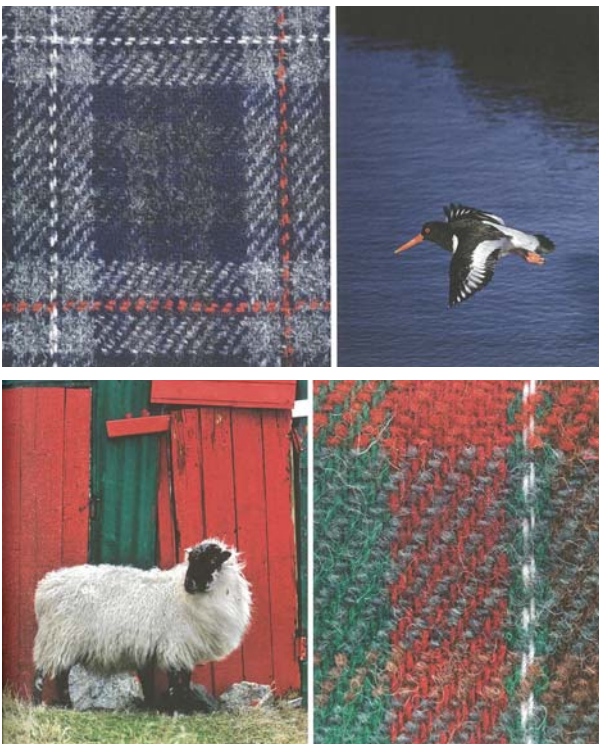


Figure 49. Harris Tweed colour connections from woven product to surrounding landscape.

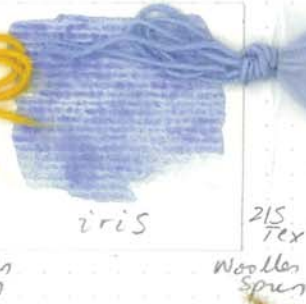
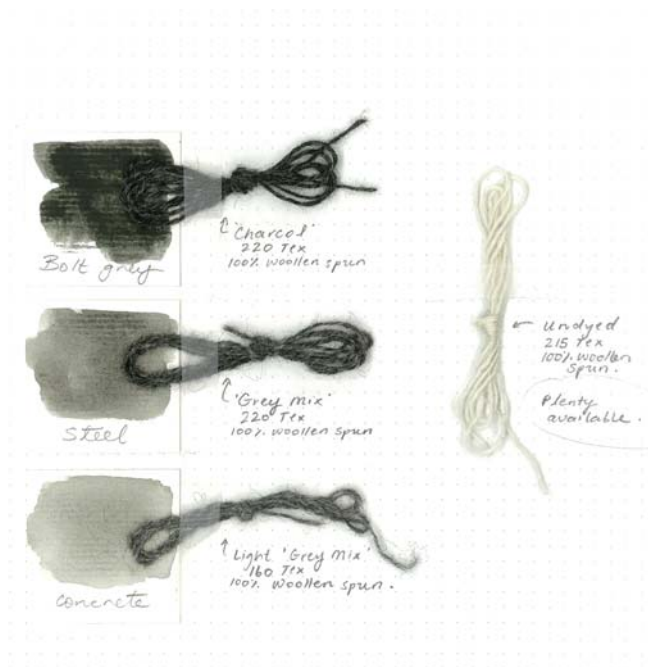


Figure 50. Colour swatches with corresponding yarn selections are inspired from objects at the mill.



GREYS AND NEUTRALS

The use of greys and natural tones is a symbolic gesture in the design. In both traditional and modern tartans, colour choice is typically connected to topographical features (Faiers, 2008) and often displays a local dyestuff or natural colour of an animal's fibre. In the case of the throw, the grey tones are drawn from the concrete foundations of the mill, realised through colour studies I have created of the site (above). In addition to the site specificity of the design, the undyed wool is evocative of the naturally sombre tones of the NZ landscape and an acknowledgement of our heritage wool industry. The neutral grey tones are described in Edelkoort's *Ode All'Industria* (2011) as providing a "backbone" for other colours to sit with, and expresses "a need for dialogue, consensus and osmosis." (Edelkoort, 2011, p.15). By using naturally coloured fibre, the risks to the environment decrease as well (Fletcher, K. 2014).



(At top) Figure 51. Webster, H. (2015). Grey layers of the weaving mill's factory concrete floor. Coloured pencil on paper.
(Above) Figure 52. Painted colour swatches with corresponding yarn selections.



Figure 53. The bright yarn was specially dyed at the Bruce woollen mill in Milton, a partner company also taken over by WEL recently. It is hoped that wool spun and dyed at the mill would pass to local manufacturers such as Town and Country to allow the continued weaving of high-quality, NZ-made wool products (FWplus, 2013). Wool dyes well because of the porous surface of the fibres (Walsh, 2006).



Figure 54. *The mill uses woollen yarn over worsted wool yarn for their rugs as there are key differences. Woollen yarn's fibres are not parallel but cross in all directions, whereas worsted yarn's are. This gives worsted yarn a more lustrous, smooth surface ideal for apparel fabric but does not provide elasticity in the weave. Woollen yarn is very elastic on the other hand, and air is trapped around the fibres making it warmer. (Walsh, 2006). It is ideal for using with brushed finishing effects as the fibres can be more easily brushed out of the surface of the cloth, giving it a soft spongy texture.

YARN

Wool and alpaca

The use of woollen yarn* fits logically into the creation of the throws, because of its thermal properties and durability. Wool is considered a poor conductor, which is why it feels warm, unlike fibres such as linen which have great conductivity and feel cool (Walsh, 2006). Wool even lowers humidity around the body (Hibbert, 2006) and is an effective insulator; providing over six times the insulation of any textile fibre (IWTO, 2010). This is due in part to wool fibre's natural crimp which is partly retained in the spun thread, trapping in air and increasing its warmth. (Walsh, 2006).

Aside from warmth, wool is naturally fire resistant (Walsh, 2006) and has inbuilt UV protection (Hibbert, 2006). This property is highly sought after in New Zealand homes with our strong sun and its ability to fade everything. According to the International Wool Textile Organisation (IWTO, 2010), wool "does not promote the growth of bacteria or dust mites" making it a favourable choice in damp New Zealand homes when the sun does not appear. It is also a favourable quality for export, as wool's durability will see it reach global destinations with little damage.



Figure 55. In addition to wool, a selection of throw designs contain alpaca yarn, alternating in the weft with coloured wool. Alpaca adds an extra dimension of warmth and appeals to luxury markets for its soft handle and textural qualities.

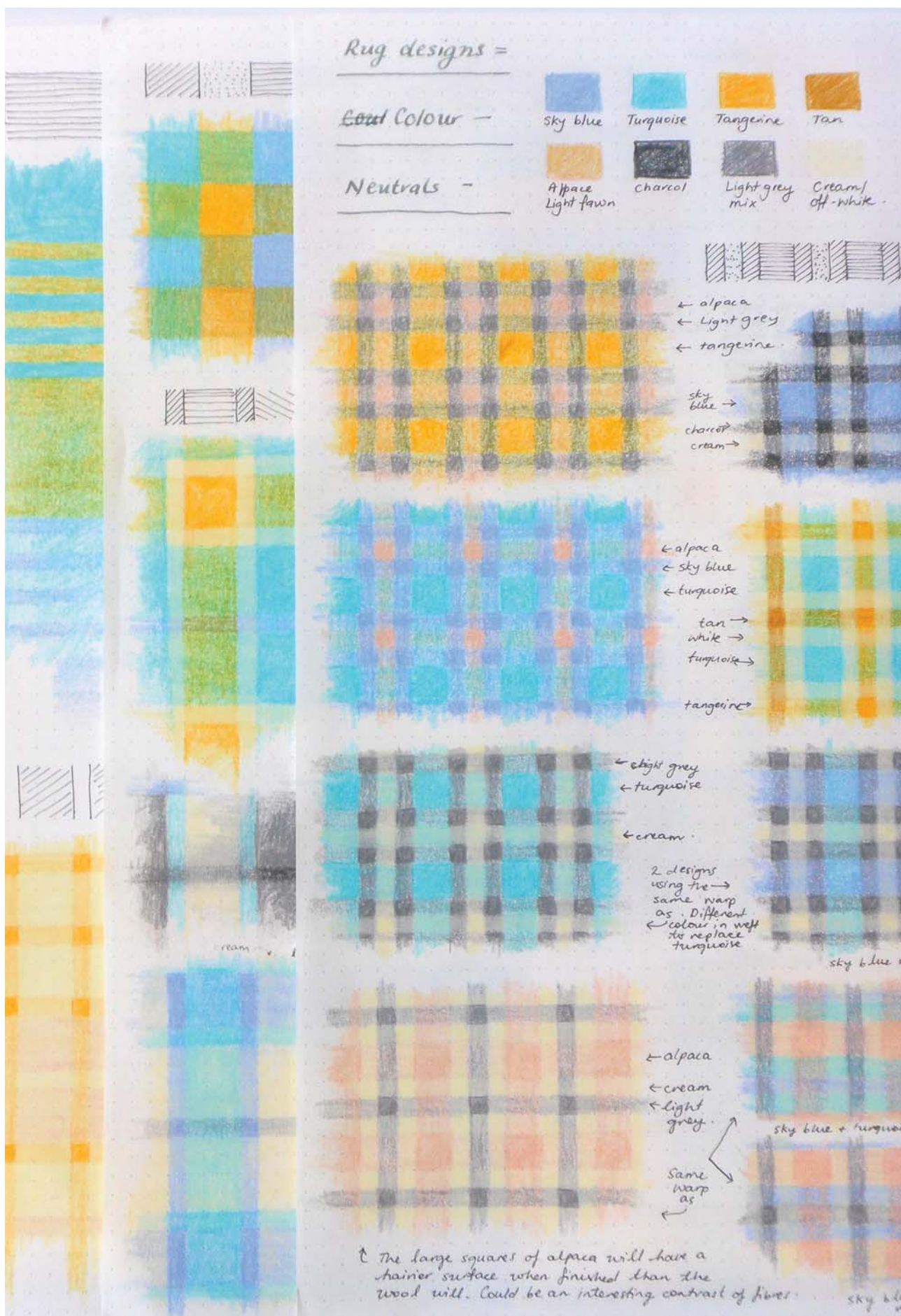


Figure 56. Webster, H. (2015). Exploration of contemporary colour relationships in traditional tartan setts and compositions.

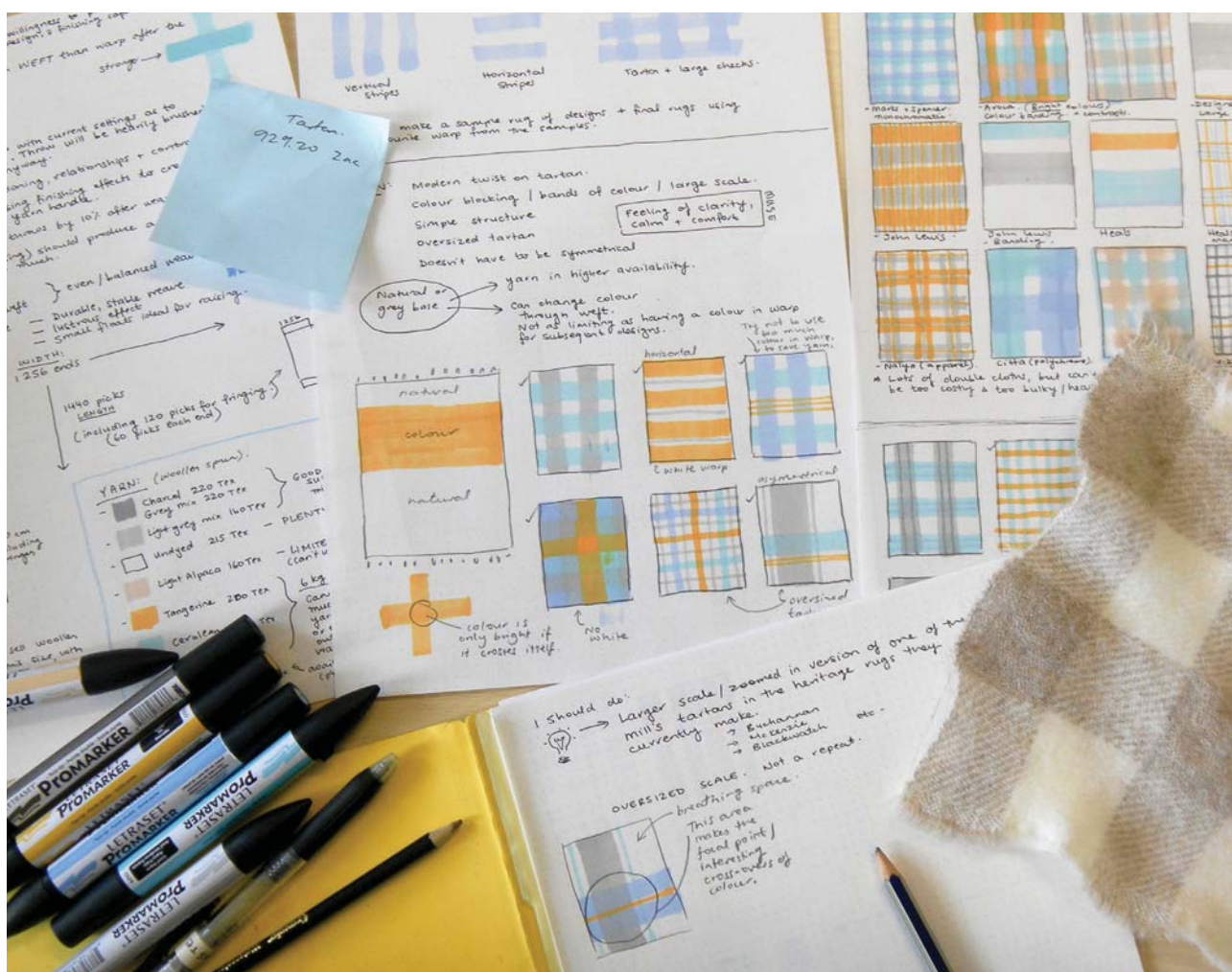


Figure 57. Development of throw range using established colour palette and minimalistic design.

DESIGN

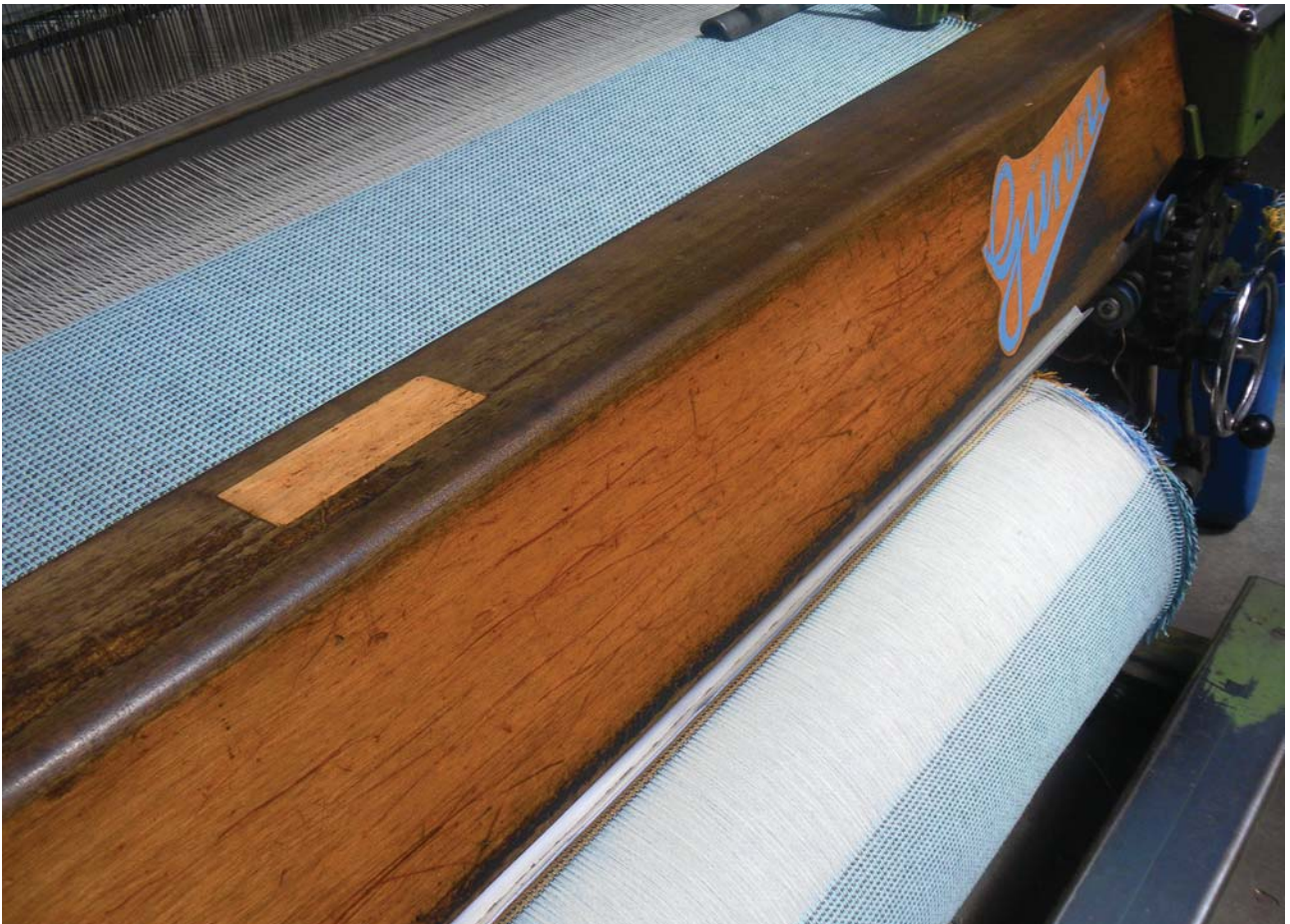
When designing the throws, the main factors that had to be taken into consideration were time, yarn availability, maximising warp use with a range of designs and relationships of colour.

As the yarn was specially dyed for this collection in limited quantities (6kg of each shade) it was vital that my throw designs were carefully considered in their use of the colour. As a contemporary take on aspects of tartan, I wanted to explore the blending of colours without committing to a coloured warp. I experimented with blending on paper first using coloured pencils and pens. A lot of yarn is wasted from the warp during the loom set up, and including colours can limit the range of designs produced, as every throw includes the yarn used in the warp.

For this reason, and with time restrictions, I designed a warp using undyed white wool that I could then blend colours into through the weft to create horizontal bands. Martin and I decided to use an existing punch card of a throw that was based on a 2/2 weft pick system, whereby colours could be alternated in the weft. This proved beneficial when weaving the designs, as I was able to evenly mix my dyed yarns together in different combinations to create new shades and tonal variations, rather than relying on the warp and weft cross over for this result like traditional tartans and checks. After weaving out the throws, the finishing process of raising the fibres to create a soft handle furthers the blending process by brushing the coloured fibres together on the surface of the fabric.



(Above) Figure 58. Creating the warp for the throw collection by arranging the creel with 215 Tex undyed woollen spun yarn.
(Below) Figure 59. Winding the warp on in sections. We tied in two narrow bands of grey warp for the last tenth of the warp to create a border design for a small selection of throws.



(Above) Figure 60. Weaving the throws out using the colours I had selected, in woollen spun yarn with an average count of 215 Tex.
 (Below) Figure 61. Winding the warp on in sections. We tied in two narrow bands of grey warp for the last tenth of the warp to create a border design for a small selection of throws.



Figure 62. Construction of Zigzag apparel fabric using merino and woollen yarn on a loom usually used for tartan rug production.

ZIGZAG

Client apparel collection

DESIGN FOCUS

The production of contemporary geometric-inspired woollen apparel fabric. The collection arose from an enquiry into the weaving capabilities of the mill for patterned fabric using yarn finer than the mill's current travel rug range. A very technical and labour-intensive design investigation for industry manufacture and commercial application.



Figure 63. Fabric inspiration from Textile View's 'Colour Geometry' trend that expresses a move for geometrics from black and white to "...bright hues" for this year's winter season.

INTRODUCTION

The origins of the collection



Figure 64. Urban outfitters zigzag duvet cover. Printing a design on the surface of the fabric instead of weaving it in as part of its structure is a common practice among mass-manufacturers who value fast production times. This method can result in fading or wear down of the print imagery, unlike woven design.

COLLECTION INTRODUCTION

This collection arose from a client's inquiry into the contemporary design capabilities of the mill for apparel fabric. The Tibetan Yak's (a Christchurch company) search for New Zealand weave manufacturers lead them to the mill, though with only the tartan rugs to show for the mill's design capabilities, there was a need for a new line of work. I was tasked with creating a range of designs based off a few images provided by the client (below) which could be taken to industry-scale weave manufacture at the mill and result in a collection of woven samples that could be marketed to such clients in the future.

CLIENT IMAGERY

Defining an aesthetic

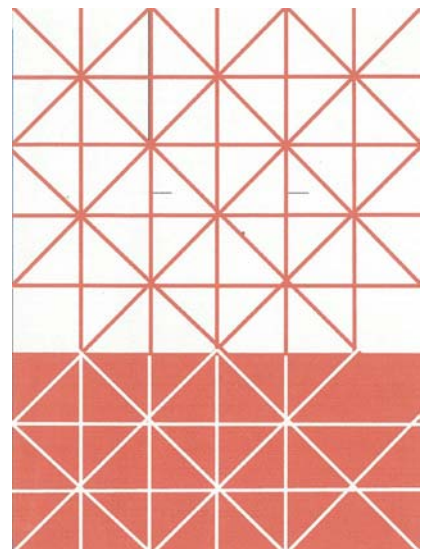


Figure 65. Inspiration provided by client for contemporary geometric aesthetic.

CONCEPTS

Initial stage to translate imagery to weave design



Figure 66. Previous weave design work that incorporated a zigzag pattern and provided a foundation for which to base this collection's warp structure.

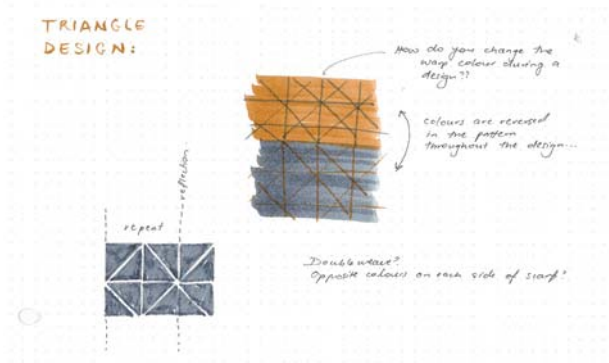


Figure 67. Sketching out ideas for creating triangular motifs and patterns in a weave structure.

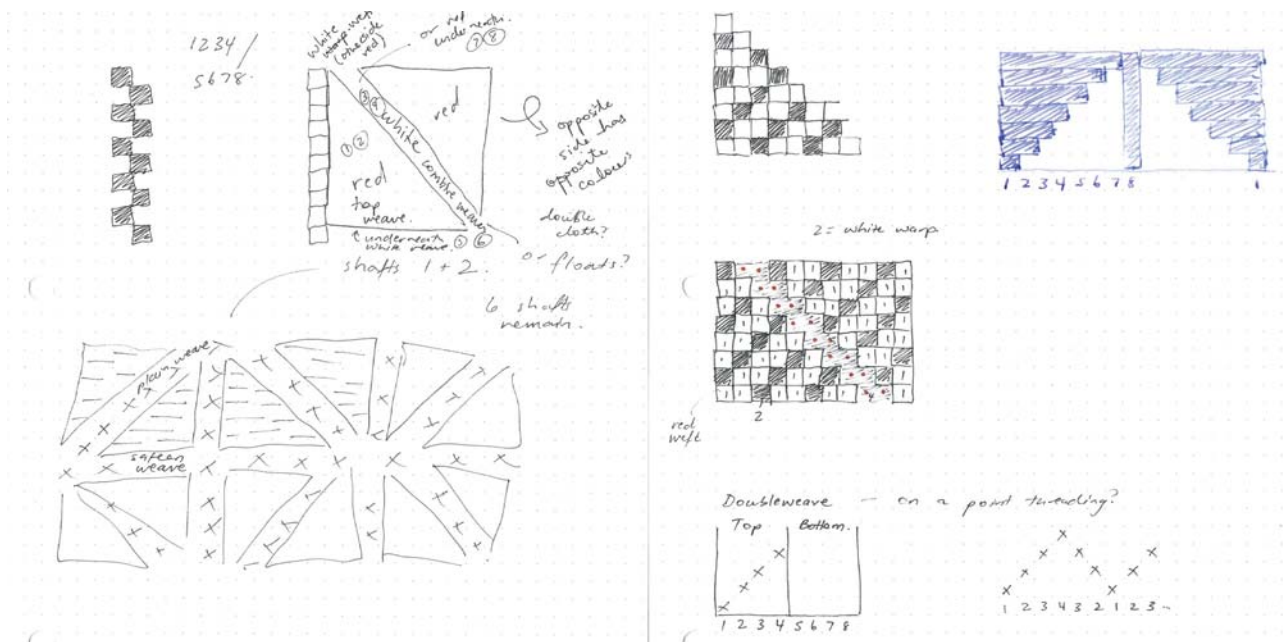


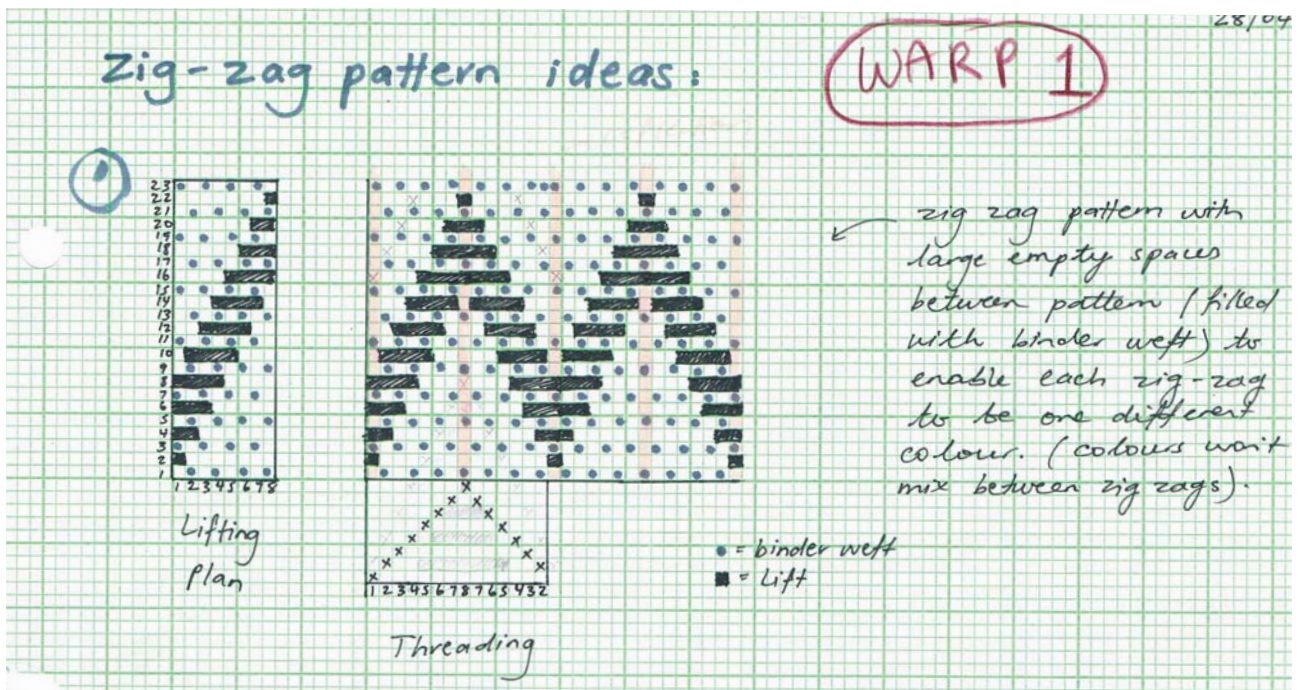
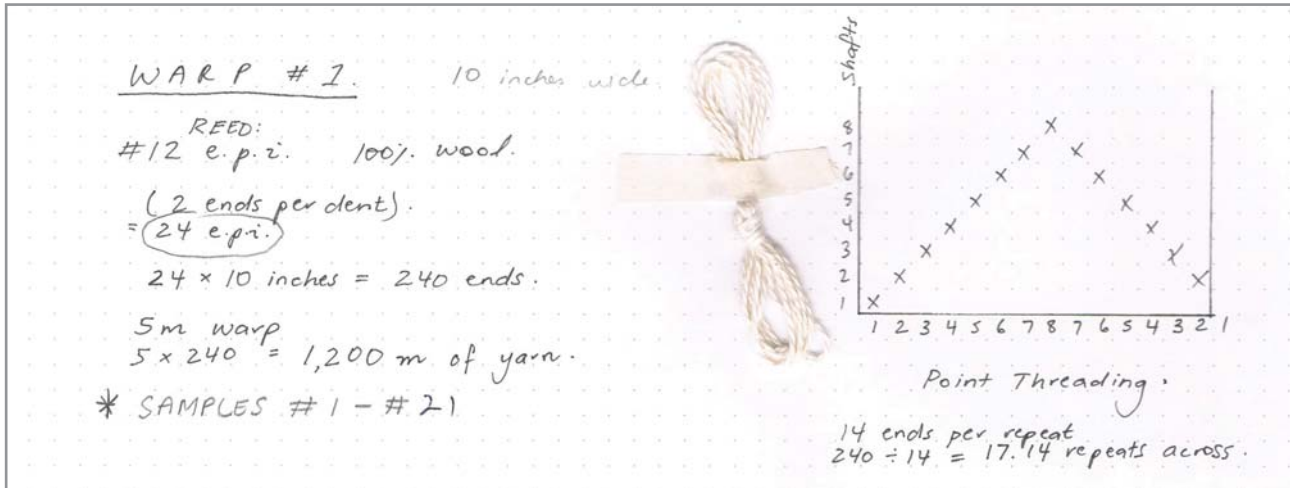
Figure 68. Applying sketches and imagery to initial grid compositions for translation to weave structures.

STAGE ONE

The first stage of designing the collection involved gathering information and roughly sketching ideas for how to create the geometric motifs in weave form. I used information from a past project (top left) for creating the foundations of the zigzag pattern, and explored triangular motifs on grid paper using the similar arrow head structure.

DESIGN

Secondary stage to translate concepts to weave design



STAGES TWO and THREE

The second stage of the design process was to create a warp and corresponding lifting plans to begin design exploration and development. I used a binder weft (a plain weave) in between each row of design to stabilise the cloth in all of my designs. In the developmental (third) stage of the process, the challenge was to create a zigzag design that could incorporate multiple colours without crossing into neighbouring repeats, whilst avoiding floats of yarn on the fabric's reverse side that would be unsuitable for commercial apparel application (as floats catch and tear the fabric). Once the samples were resolved, they were taken to the mill to begin translation to industrial production.

Figure 69. (Top). Creating a warp threading plan for the zigzag collection samples using 24 ends per inch to create a dense weave.
Figure 70. (Below). Initial lifting plan for zigzag pattern trials.

SAMPLING

Tertiary stage to develop weave designs into fabric

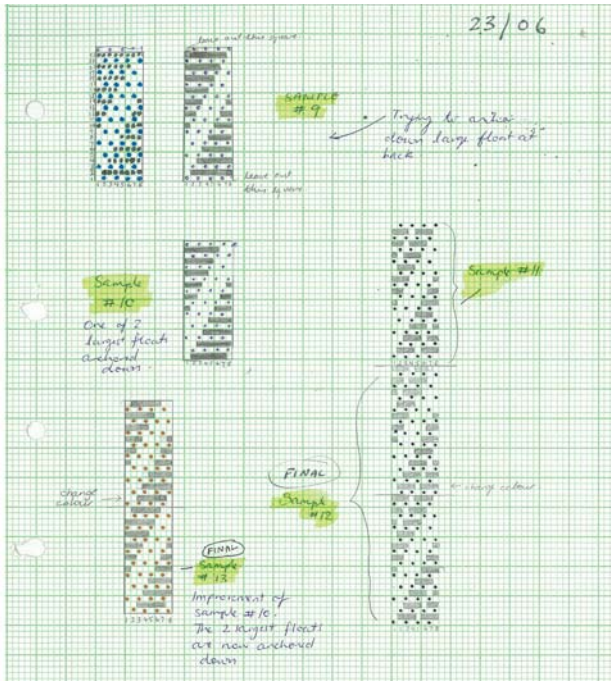


Figure 71. Design development for weave samples.



Figure 72. Reverse side of fabric showing large 'floats' of yarn (top) with resolved design (below) showing the anchoring down of the largest floats.

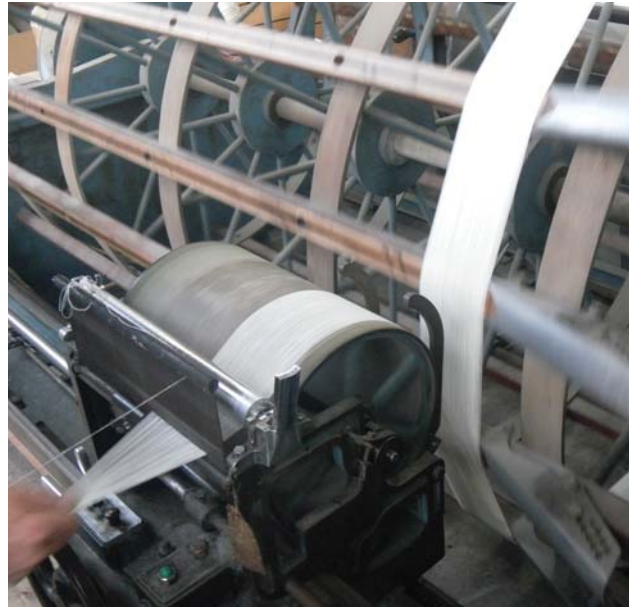


Figure 73. Creation of design concepts and developments on the hand looms at uni. Each sample sought to solve a challenge the previous sample presented, with the aim to resolve all problems before taking the designs to industry.

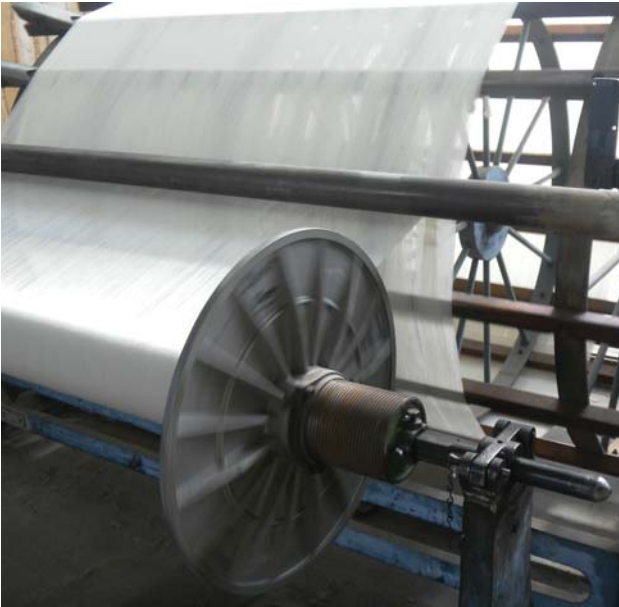
1.



2.



3.



4.



5.



WARPING UP

FIRST STAGE OF INDUSTRY WEAVING PROCESS

1. Setting up the warp creel with 80 tex woollen spun yarn.
2. Winding the yarn on to the warp mill to create a warp in sections.
3. Winding the warp off on to a back beam.
4. Threading an industrial version of cross sticks through the warp.
5. Arranging the heddles.

Figures 74-78

6.



7.



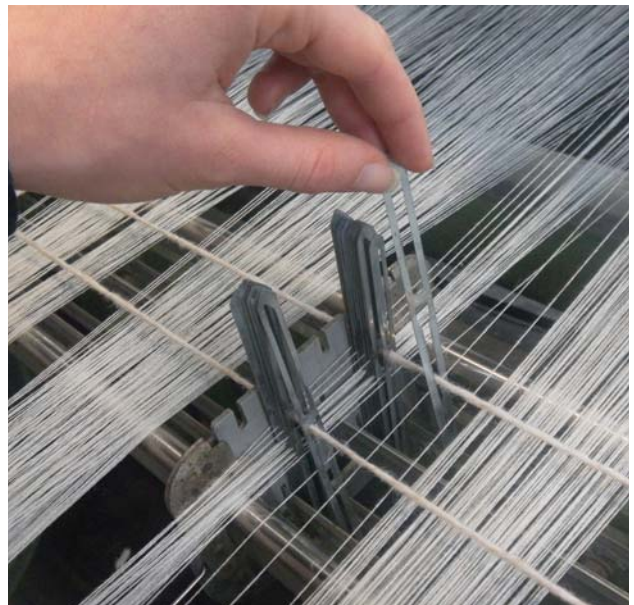
8.



9.



10.



6. Individually threading each of the 1, 668 heddles over 8 shafts in a point formation.
 7. The 8 shafts fully threaded.
 8. Threading the reed with 2 ends per dent.
 9. Putting the completed threaded shafts and reed in to the dobby loom.
 10. Placing individual 'droppers' on to each warp end. These communicate to the loom if a yarn breaks while weaving.

Figures 79-83

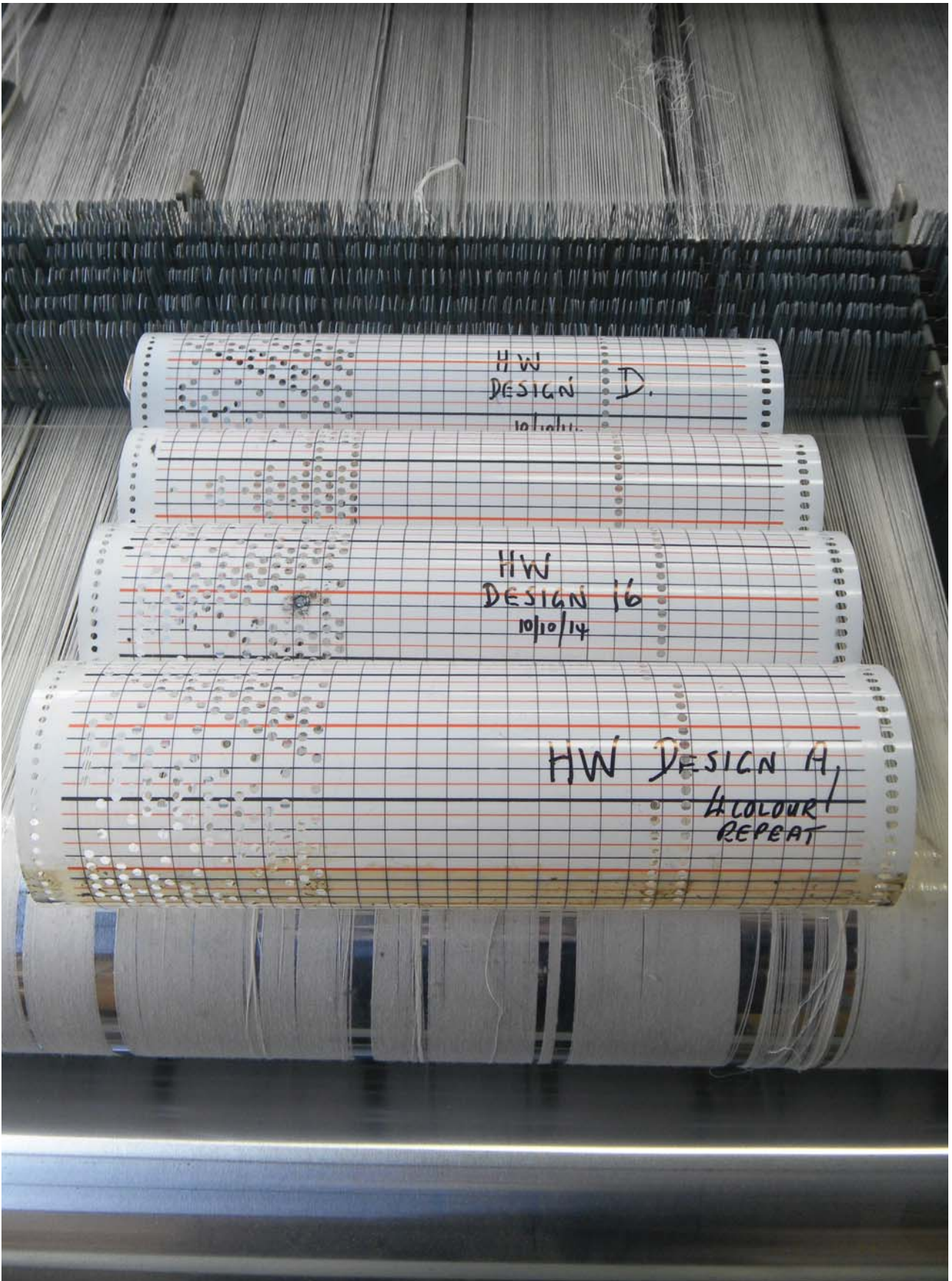
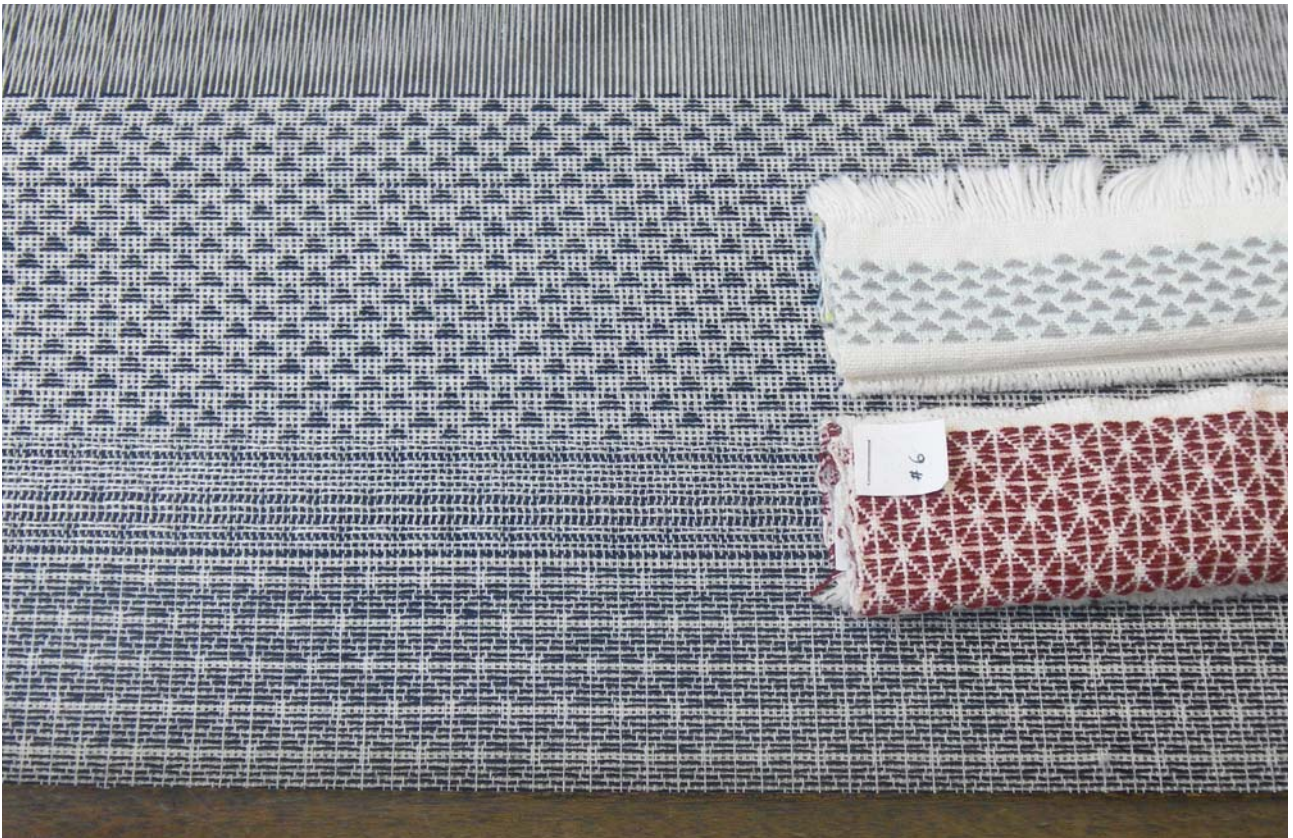


Figure 84. The dobby looms use punchcard technology for their lifting plans to instruct the loom which shafts need to be lifted during the weaving process for each pick of weft yarn.

INDUSTRY WEAVING

Adapting resolved designs for industrial weave manufacture



PROCESS

The largest challenge for this collection was in selecting yarn to weave with at the mill that was both an appropriate fineness for apparel and in a colour range that was in line with current fashion trends. This involved sorting through the mill's own yarn stock on-site to select a warm and cool colour palette in a range of suitable colours and compositions, such as Romney mix wool, merino and possum blends that would work well together to form a collection.

The old dobby looms are tuned to handle strong woollen yarn around 200 tex for the durable travel rugs. Weaving with finer yarn around 80 tex proved difficult, but perseverance and many adjustments to the loom resulted in the successful completion of a range of fabric samples in the designs I had produced. These fabrics were then washed in the combined milling/scouring machine at the mill, dried in the tenter and pressed.

Creating this collection using existing technology at the mill and innovating through design and yarn selection provides an original body of work for the mill to showcase their capabilities. It provides a range of designs that can be obtained using a single warp, and creates an opportunity for the mill to expand their market.

Figure 85. (Above) First trials showing the translation of hand-loom sample designs to industrial dobby loom production using the punchcard technology.



Figure 86. Final fabrics in colourway one.



Figure 87. Final fabrics in colourway two.



Figure 88. Webster, H. Heritage menswear apparel collection, hand-woven on an AVL loom using advanced weave software and fine wool yarns.

HERITAGE

Menswear apparel collection.



Figure 89. Mood inspiration from Pantone's 'Into the Woods' fashion forecast for menswear apparel aw 15/16.

DESIGN FOCUS

Authentic and intricate design with high quality craftsmanship. This hand-woven woollen menswear collection gives a sense of place and timelessness, based on a combination of imagery from the mill and historic weave patterns to convey a story behind the design. The navy and warm greens are in line with future colour trends and fashion forecasts. It is appropriate for industry adaptation and commercialisation.

HERITAGE INSPIRATION



Figure 90. Webster, H. Facade of Town and Country mill. Calligraphy ink on paper.

The heritage of Town and Country provided the inspiration and context behind this menswear collection. Before rugs, the major production output at the mill was apparel fabric. Looking through the archaic leather books from the 1930s (figure) shows the enormous breadth of weaving knowledge for suiting, uniforms, jacketing and smart woollen fabrics with intricate details and classic patterns; the complexity of which are unmatched in today's fast-fashion industry where speed is held in higher regard to quality and craftsmanship. To value these patterns is to understand the commitment taken to create them, and the patience to construct them. Even the script is artfully composed on the pages.



Figure 91. Historic weave pattern book belonging to the mill, containing invaluable IP weave 'recipes' and original designs.

A RETURN TO QUALITY

Recently, a current trend towards casual style garments has contributed to a drop in demand for woollen apparel fabric, aided by the emergence of low-cost synthetics. “The trend is wool content slowly coming down and synthetic content increasing.” (Textile Source, 2014). In higher-end markets, however, wool is making a comeback with consumers demanding quality products with meaningful associations.

In Peri’s brand Snowy Peak, the story associated with NZ and the farm she grew up on is the selling tool for the garments. “The international market loves that heritage and authenticity” said Peri in her interview with Callaghan on creating an emotive connection between the user and the product (Callaghan, 2009, p.44).

In addition to using NZ wool, the design aspect of this collection increases its value by creating a visual connection to a site. I have incorporated the mill’s heritage by combining the archaic weaving patterns with motifs drawn from the site; an emotive connection for the user to the product.

According to David Shah, publisher and editor of Textile View magazine, the international womenswear market for apparel is saturated, though there is an emerging market now for menswear. Young urban men are coming in to an age of luxury, with more money available to spend on themselves and a revived interest in fashion trends. (Textile View, v. 108). This evolving menswear market offers a chance to aim towards these luxury consumers with a high quality, IP-to-manufacture product.

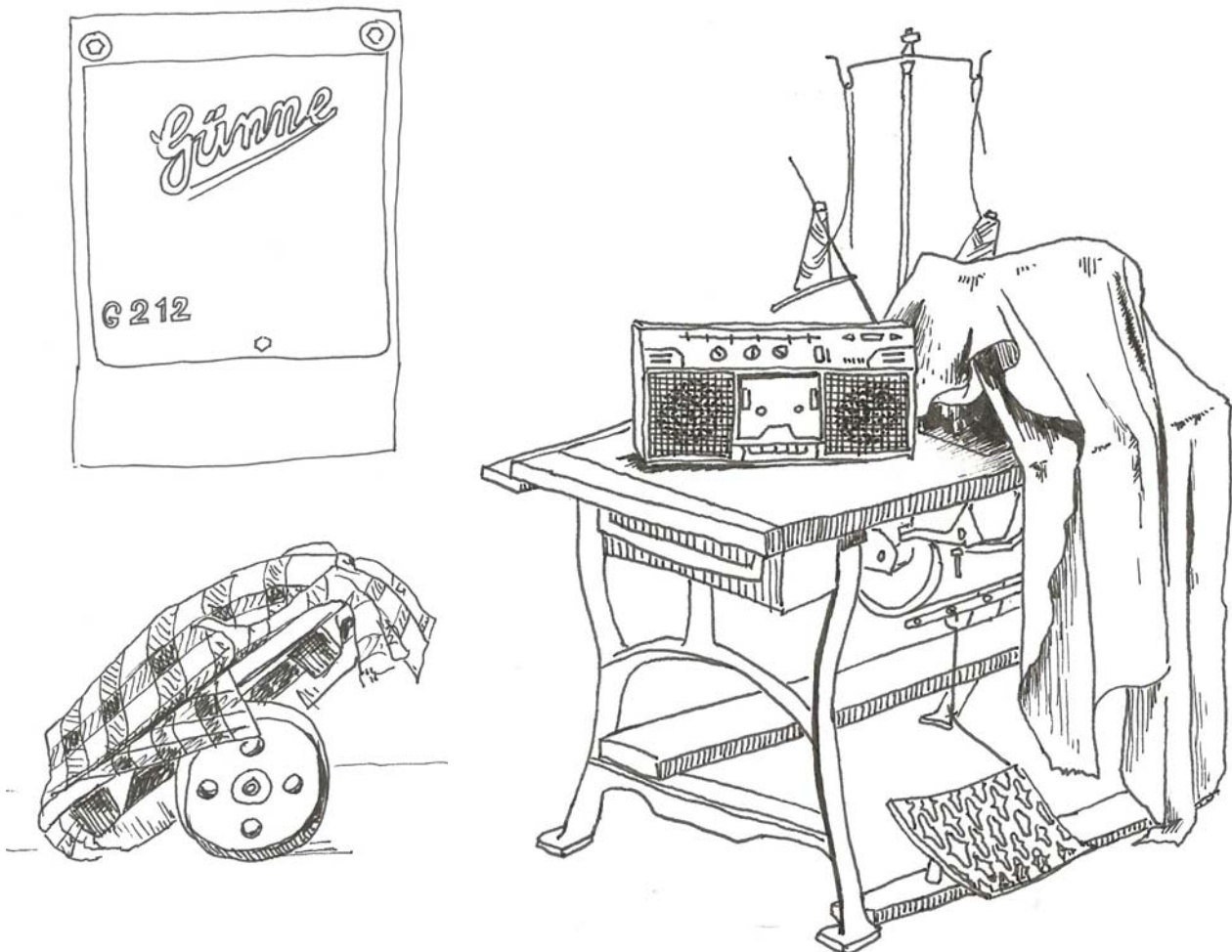


Figure 92. Heritage pieces at the mill.

COLOUR AND YARN SELECTION

Trends from Pantone and Textile View were the central inspiration when designing the colours for this heritage collection, as the forecasts convey what the international fashion houses and designers will be using in the near future, and what will be in demand. It gives the collection an international appeal and export potential.

The Pantone 'Into the woods' trend for next winter encourages the revival of greens and mottled tones, whilst Textile View acknowledges the persistence of darker blues that were favoured by Japanese designers in the 1980s (Textile View, v. 107). The combination of blues and greens with whites and blacks for contrast formed the colour palette for this design range; authentic, sophisticated and classic.



Figure 93. Mood inspiration from Pantone's 'Into the Woods' fashion forecast for mens apparel aw 15/16.



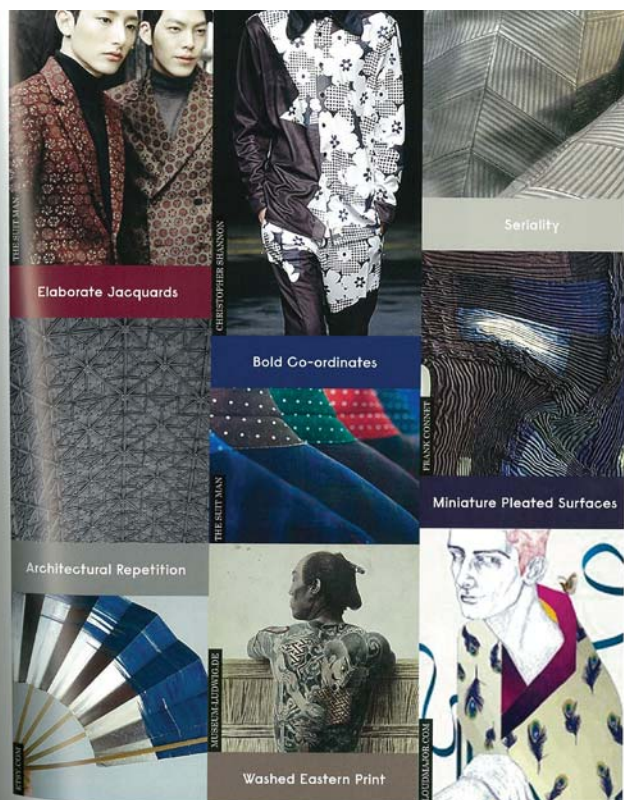
INTRICATE SURFACES

"Life is an intricate pattern of simple designs; we see the intricacy, but once awareness is raised, we can then see simplicity in all things!" - Cheryl Batton

De-saturated tones are applied to surfaces through woven textures, mottled finishes and patch worked intarsias. Outerwear, knitwear and oversized scarves carry the more elaborate of pattern, whilst wovens lend themselves to exploring more delicate, intricate jacquards. Layers of classic, Western tailoring are given new dimension through the layering of Western inspired pattern and print.

1 MISSONI 2 ANTONIO MARRAS 3 ETRO/COM 4 PHENOMENON FW14

208



209

Figure 94. Textile View #108. 'Intricate Surfaces' trend identifies a resurgence in detailed, elaborate design and heritage colour combinations for menswear: winter 15/16.

YARN FOR APPAREL - MENSWEAR.

(Based on colours from Pantone's Spring 2015 + A/W 15/16 colour forecasts).



Figure 95. Selection of appropriate yarn available for use in my collection. I chose to use a limited palette of navy and green yarns to keep the design sophisticated and clean. As the looms at the mill are currently unable to use fine yarn, I designed the collection for construction on the AVL looms at uni, using wool yarns that are suitable for luxury apparel. These designs can be used in the future for industry adaption.

DESIGN

Menswear apparel design process

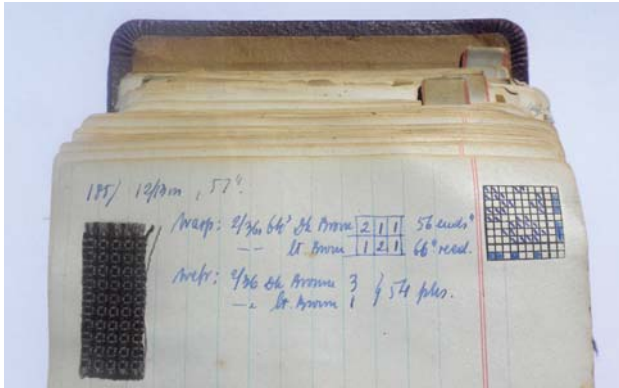


Figure 96

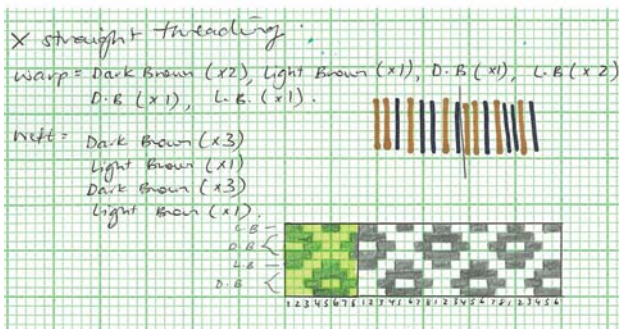


Figure 97



Figure 98

STAGE ONE

To create an original design, I first selected fabrics from the historic weave pattern books that had some similarity to motifs I had drawn from the mill. The pattern on the left provided a detailed geometric design that I could see working with the ribbon and box shapes I had identified in my drawings.

STAGE TWO

After selecting designs from the book that had potential for development, I sought to recreate these on our modern looms. After referencing old weave books such as Watson's Textile Design (1940), I was able to interpret the threading and lifting plans and translate these into understandable weave plans.

STAGE THREE

Many of the designs I had selected from the mill's old pattern book were woven using different warps and threadings to each other. In a commercial sense, creating a single-warp collection is a time and cost efficient method of designing as it means you are able to achieve a range of fabrics without having to change the loom. In response to this, I wove my translated weave patterns on seven different warps at the same time (figure 98), changing lifting plans and weft colours. By doing this, I was able to see which warp showed the most potential for its ability to produce many designs. The warp containing the small squares design from the first stage was selected for weave design development in to this heritage collection.

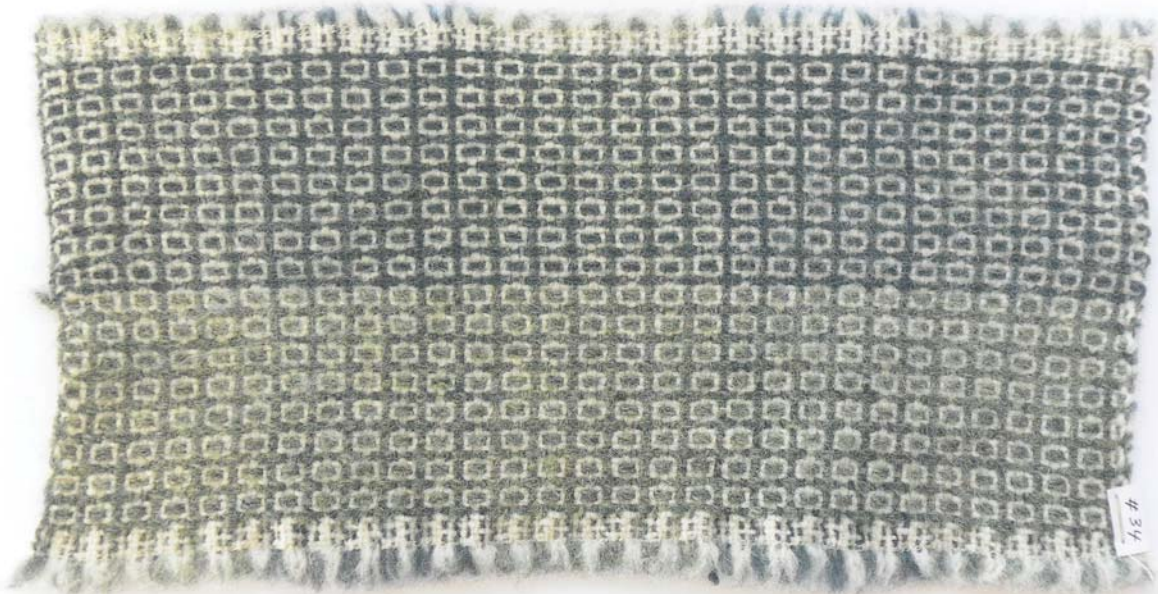


Figure 99

STAGE FOUR

After identifying the most promising warp and threading sequence from the previous three stages, I began sampling and experimenting with patterns on a wider warp using a table loom. The sample above was successful in technical construction. However, the woollen spun yarn used was too heavy for the design and softened the detailed imagery. To rectify this, I designed a final warp for my collection that included a combination of worsted and finer woollen yarn that would give a more defining line.

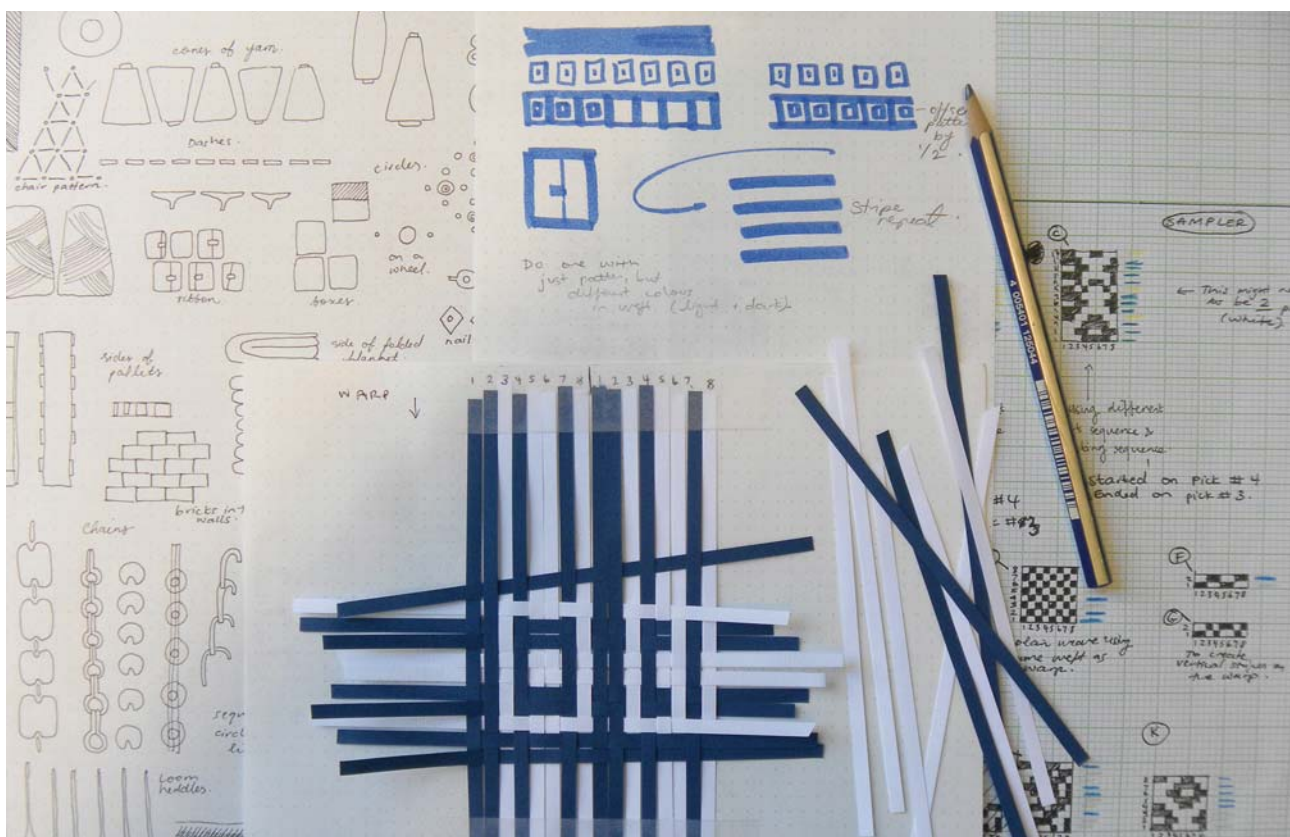


Figure 100

STAGE FIVE

Creating a range of designs using a single warp. This image shows the design process behind creating subsequent weave patterns, including construction of a paper warp that mimics the set up of yarns in the loom.

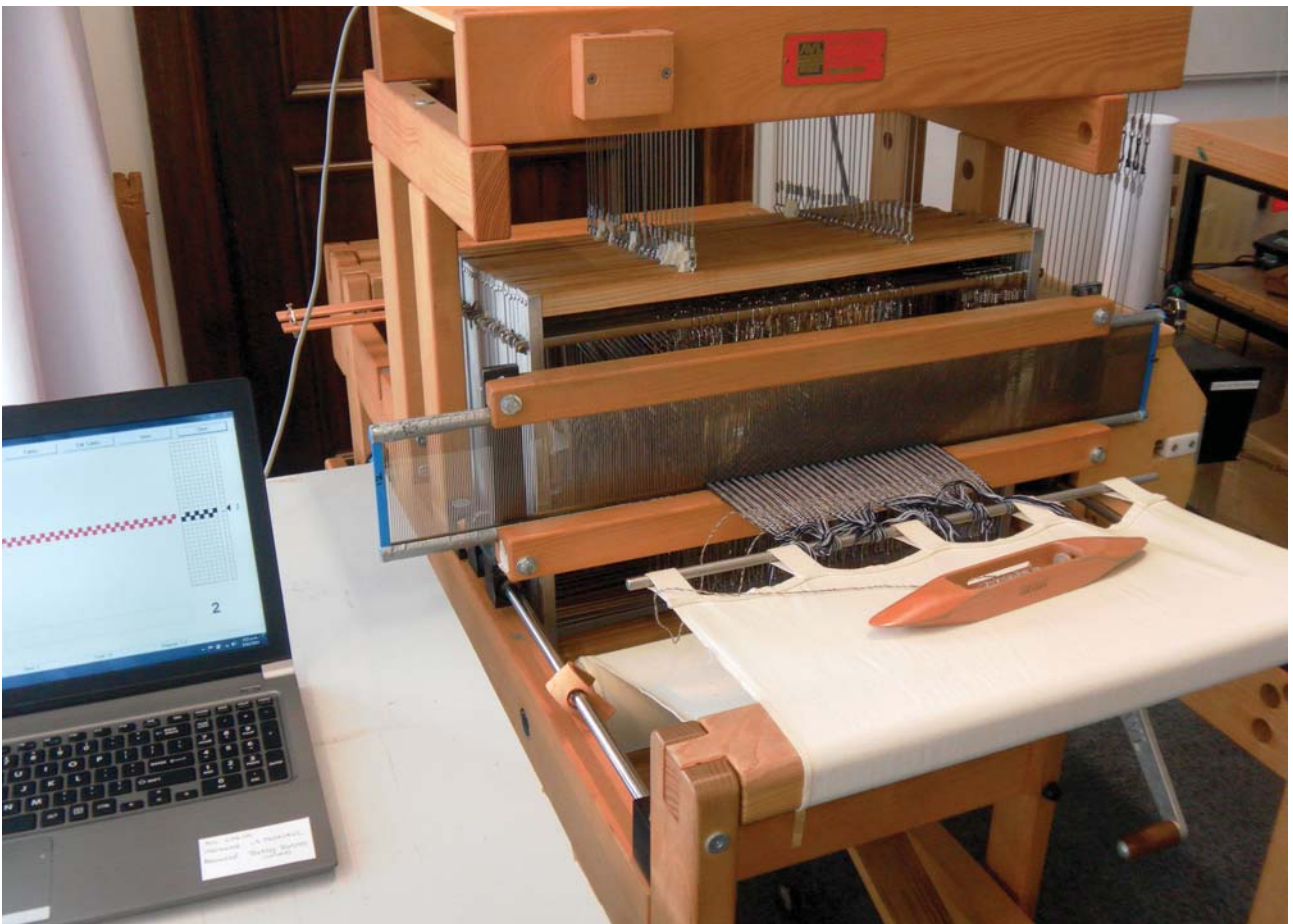


Figure 101. (Top) Setting up the AVL loom ready for weaving the final collection. The warp is set up at 24 ends an inch to ensure a stable and even cloth.

(Below) Figure 102. Lifting plans for the designs are entered into a software system that controls the rising and lowering of the shafts for each weft pick.

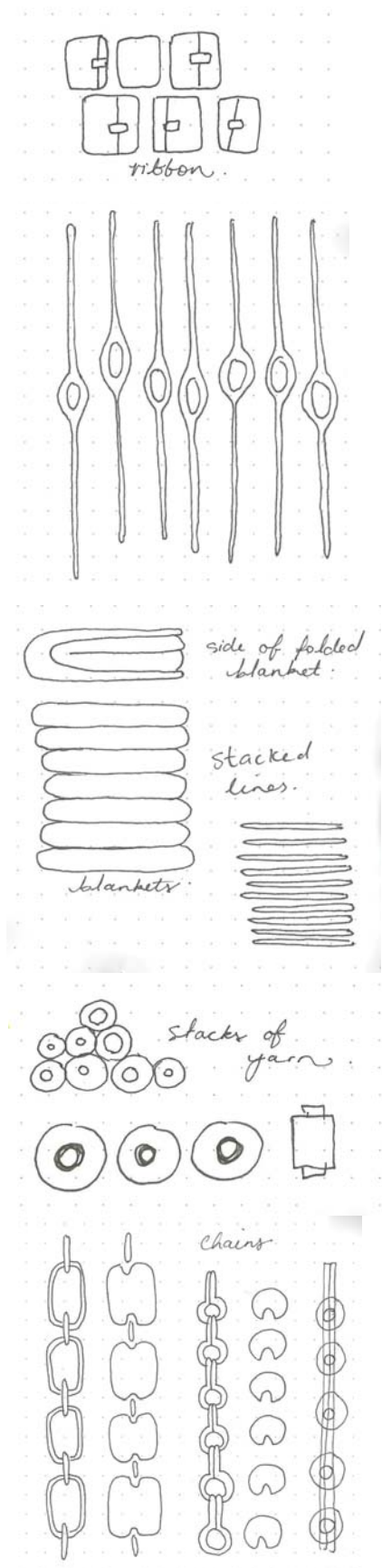


Figure 103 Initial test sampler showing the range of patterns capable of being woven out on the same warp. Alongside these are the initial motifs drawn from the mill that inspired the weave designs (figure 104).

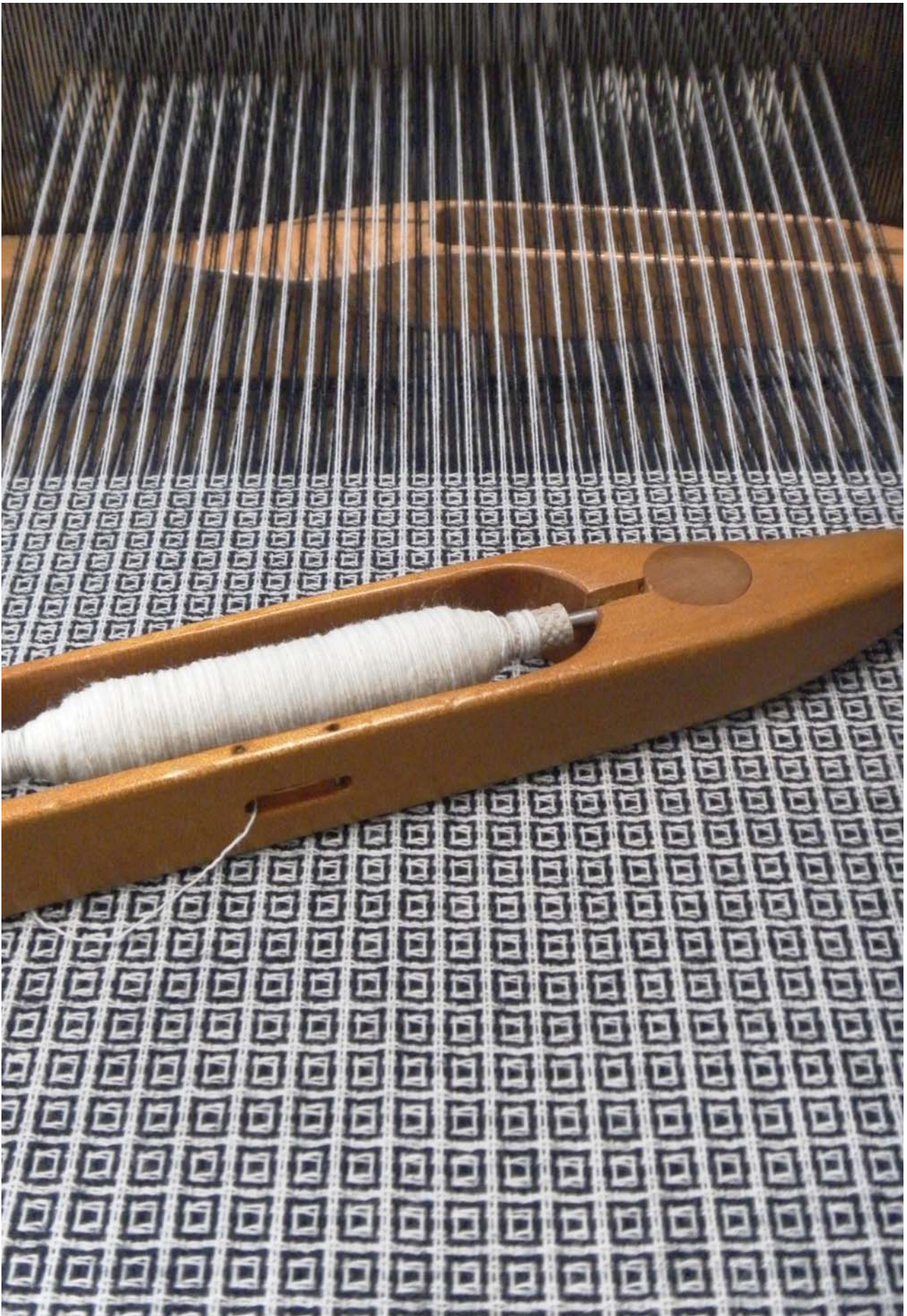


Figure 105. Webster, H. Weaving a final sample on the AVL at uni, using flying shuttles with 80 Tex undyed woollen spun yarn and coloured merino worsted yarn.



Figure 106. Webster, H. Final collection pieces for the Heritage menswear collection, straight off the loom. Yarns include the green 'Deep Twig' 100% lambswool woollen spun yarn, navy and black merino worsted yarns, and undyed 80 tex woollen yarn.

CONCLUSION

This master's project has successfully guided the revitalisation of the Town and County weaving mill through textile design solutions and creativity. I have presented the mill with innovative woven design work with which the mill can now use to enter into luxury, niche international markets and confidently showcase their contemporary manufacturing and design capabilities.

The completed woven pieces encompass a production value chain, whereby a system of design and manufacturing stages has taken wool from a raw, unprocessed form to an elaborately transformed finished product. It increases the export value of this primary NZ agricultural product and promotes the generation of local IP. In addition, the value chain supports local manufacturers and encourages collaboration between companies to add levels of processing to our exports, creating a prosperous economy for New Zealand in the future.



Figure 107. One of Town and Country's old chairs in the mending room.

MARKETS

New market opportunities have been discovered for the mill this year through the use of innovative design approaches and materials in my woven designs. I have expanded the market potential for the mill from tartan rugs to luxury interior and apparel.

For the throw collection in this project, selecting a colour palette that reflected the mill site and was in-line with colour trend forecasts created an international luxury market appeal, of whose consumers value sophisticated design and authentic product origins. This approach to colour portrays an ability to design for contemporary tastes and had not been used at the mill before. When advertised alongside the mill's traditional tartan rug range, the throws increase the breadth of design aesthetics the mill is capable of manufacturing and broadens their potential client base.

In addition to colour, the use of alpaca yarn in the weft of select throws further increases the value of the product. In a recent article about New Zealand possum products and their export potential (Philp, 2014), the blending of luxury fibres in products is described as a catalysing innovation for entry into high-end international markets, especially in an industry dominated by unremarkable polyesters. The alpaca yarn adds an extra dimension of warmth, softness and tactility to the wool-base designs and increases the mill's worth by expressing their adaptability to working with a range of fibre types other than wool.

Aside from luxury interiors, the creation of the Zigzag collection this year has opened the opportunity for the mill to enter into the apparel fabric market. As there is little woven apparel fabric produced in New Zealand, it was imperative to develop a collection of designs that showcased the mill's capabilities to potential clients. Utilising existing technology at the mill with an innovative use of colour, yarn weight and pattern proved successful in designing a collection that appeals to contemporary markets and can be advertised to generate bespoke orders for the mill in the future.

In a focused niche market approach, the Heritage menswear collection I created aims for luxury international apparel markets. The intricate motifs inspired by drawings and heritage patterns at the mill gives an instant connection of the product to the place, and the place to the user. The deep, intellectual colours are in-line with current trends and the integration of pattern into the fabric through the warp and weft structure creates a stable and commercially viable cloth. The combination of these elements with the fine worsted and woollen yarn content of these fabrics creates a high quality design that the mill can produce using the new looms in the near future and sell into luxury menswear markets.

With identification of niche markets to sell into, the next step for the mill in the future will be to create a brand identity and market their 100% NZ wool, 100% NZ made image with the heritage aspects and innovative design examples. An online presence and selling platform will help to promote their progressive and exciting new journey in the global textile industry as a specialty weaving company. Further funding into research and development and an investment in staff will ensure the skills and knowledge from this mill are not lost from New Zealand's textile industry.

REFLECTION

Working with industry

This year has been the most physically hands-on, practical learning experience I have ever had. Making over 15 visits to the mill, I have been involved with every part of the weaving process first hand and learnt a great deal about how to design woven fabric for construction in industry manufacturing, such as the advantages of using a single warp for multiple designs to reduce wastage of yarn and time.

Many of the limitations and restrictions of the looms and designs were discovered during the weaving process, and adapting to changing conditions and machine abilities called for creative problem solving, organisation and speedy designing on-site; I overcame challenges of time, resources and mill conditions.

Martin has been an incredible mentor to me at the mill and his vast technical knowledge of weave construction has contributed to the development of my own design abilities and thinking during the year. It's an experience I'll always be grateful for. I now fully appreciate how much effort goes into woven cloth construction thanks to this hard-working little weaving mill in Palmerston North.

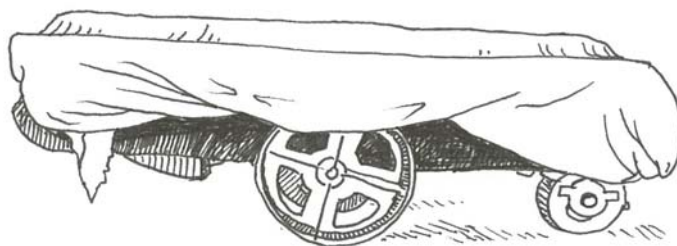


Figure 108. The warp beam mover.



(Top) Figure 109. Scrounging through boxes for appropriate yarn for the Zigzag collection.

(Middle) Figure 110. Setting up the creel with warp yarn for the Zigzag collection.

(Below) Figure 111. Weaving on the loom with Martin.

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Figure 112. Objects in the mending room.

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LIST OF FIGURES

All of the figures in this exegesis are personal photographs and drawings (Webster, H. 2015), unless referenced otherwise below:

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Figure 65. Images provided by client. Source unknown.

Figures 89 and 93. Pantone (2015). Mood images for 'Into the woods' trend. Retrieved from <http://www.pantoneview.com/fashion-view/mens-apparel-forecasts/aw-15-16-forecast>

Figure 94. Shah, D. (2015 Winter). Intricate Surfaces trend, Textile View Magazine, (108), 208.



Figure 113. An old stool covered in a remnant of a tartan cloth.

APPENDICES

'WOOL BY THE NUMBERS' DATA

Figure 19.

Farming land in NZ (2012).

- Total area of NZ = 26.8 million hectares.
- Total area of farming land = 14.4 million hectares.
- Remaining land in NZ = 12.4 million hectares.

Source: Beef and Lamb NZ. (2014). Compendium of New Zealand farm facts. (38th ed.). Retrieved from <http://www.beeflambnz.com/Documents/Information/Compendium%20of%20New%20Zealand%20farm%20facts.pdf>

Figure 20.

Area of farming land in NZ (2012).

- Grassland, tussock or danthonia = 10.6 million hectares.
- Plantations = 1.6 million hectares.
- Horticulture = 0.1 million hectares.
- Other land or holdings = 2.0 million hectares.

Source: Beef and Lamb NZ. (2014). Compendium of New Zealand farm facts. (38th ed.). Retrieved from <http://www.beeflambnz.com/Documents/Information/Compendium%20of%20New%20Zealand%20farm%20facts.pdf>

Figure 21.

Types of farms in NZ (2012).

- Mainly sheep and beef farming = 44%
- Mainly dairy farming = 21%
- Mixed livestock = 6%
- Crop farming = 5%
- Horticulture and orchards = 15%
- Other = 9%

Source: Bascand, G. (2012). Agricultural Production Statistics: June 2012. Retrieved from http://www.stats.govt.nz/browse_for_stats/industry_sectors/agriculture-horticulture-forestry/AgriculturalProduction_final_HOTPJun12final.aspx

Figure 22.

World Wool Production: Clean (%share)

- Australia = 25%
- Continental Europe = 17.5%
- China = 14.8%
- NZ = 13.7%
- Others = 10.3%
- CIS = 7.5%
- Argentina = 4%
- Uruguay = 2.9%
- South Africa = 2.3%
- UK = 2%

Source: International Wool Textile Organisation (2010). 100% Natural, renewable, sustainable: wool, change to a healthier and safer environment. Belgium.

Figure 23.

Value of NZ wool exports (2014) in \$ Million.

- Raw wool: 569.7 (2009), 552.1 (2010), 716.9 (2011), 776.3 (2012), 678.3 (2013).
- Tops, yarns and slivers: 111 (2009), 96.8 (2010), 99.3 (2011), 85 (2012), 49.5 (2013).
- Carpets and rugs (70 (2009), 74.3 (2010), 79.9 (2011), 100.6 (2012), 109.6 (2013).
- Other final woollen products: 36.4 (2009), 27.3 (2010), 29.1 (2011), 26.8 (2012), 19.2 (2013).

Source: Beef and Lamb NZ. (2014). Compendium of New Zealand farm facts. (38th ed.). Retrieved from <http://www.beeflambnz.com/Documents/Information/Compendium%20of%20New%20Zealand%20farm%20facts.pdf>

	Exquisite Blankets	Jane Henry Merino	Shear Warmth NZ Wool Blankets	NZ Wool Blankets	Stansborough	Coast	Masterweave	Baby Kiwis-Swannidri	Baby First	Cariboo	Foxford	Johnstons of Elgin	Citta Design	TOWN & COUNTRY (currently)	TOWN & COUNTRY (vision)
PLACE OF MANUFACTURE															
NZ		✓	✓	✓ Wool spun in AUS	✓	✓	✓		?					✓	✓
Overseas	✓ UK							✓ China			✓ Ireland	✓ Scotland	✓		
PRODUCT															
Blankets	✓		✓ limited	✓	✓	✓ limited					✓	✓	✓	✓	✓
Throws	✓			✓	✓		✓				✓	✓	✓	✓	✓
Baby Items		✓		✓	✓			✓			✓	✓	✓		✓
Scarves/shawls		✓			✓		✓				✓	✓	✓		
Cushions	✓			✓	✓						✓	✓	✓		
MATERIAL															
Wool	✓ NZ		✓ NZ	✓ NZ and AUS	✓ NZ	✓ NZ		✓ NZ	✓ NZ		✓		✓	✓	✓
Merino		✓ NZ		✓							✓	✓			
Mohair							✓ NZ				✓				
Other				✓ Angora, Alpaca			✓ Alpaca					✓ Cashmere			✓ Alpaca
PLACE OF SALE															
Retail Stores	✓	✓	✓ boutique local stores	✓	✓	✓	✓	✓	✓	✓	✓ Kirks NZ	✓ Kirks NZ	✓		✓
Online	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓		✓
Custom/on site			✓		✓		✓				✓ visits to the mill too			✓	
PRESENCE															
Online/Facebook	✓	✓	Only fb. Website coming.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
DESIGNS															
Contemporary	✓	✓		✓	✓	✓	✓		✓ colours	✓	✓	✓	✓		✓
Traditional		✓	✓ satin edge	✓	✓		✓	✓	✓		✓	✓		✓	✓
AFFILIATIONS															
	Campaign for wool The Woolmark Company New Zealand wool	Campaign for wool	Campaign for wool	NZ Made 100% NZ owned and operated.	Campaign for wool New Zealand wool	Campaign for wool New Zealand wool									
Extra Notes/ What makes them different															
Key selling point	"The most diverse colour range of woolen blankets ever to be seen in NZ"	"Manufacturers of ultra fine, naturally coloured merino products"	"The only 100% traceable back to farm wool blanket! 100% all NEW ZEALAND product! Family owned company est2011"	Blankets that last a lifetime.	"Timeless, environmentally friendly heirloom treasures"	LOTR	"Luxury textiles based on natural fibres"	"New Zealand's premier mohair weaver"	Traditional check tartan. Long lasting.			"Where master craftsmans hip means modern Irish design"	Cashmere and fine wools. Made in Scotland.	Scandinavian design	
Extra info	Contemporary tartan designs, bright colours - use Hainsworth Mill in UK, promote their history. - wool from Yaldhurst Wool in ChCh. - 'lifetime purchase' - promote the advantages of wool on website.	- promote natural colour of wool - sustainable farming practices - use eco-dyeing for colours - promote advantages of wool and merino on website.	- promote advantages of wool	- Wool spun at Waverley Woolen Mills in Australia. - Use NZ and AUS wool. - A few contemporary and traditional tartans - promote their history - promote advantages of wool	- Colours are all very grey. - Wellington Mill.	- Can embroider initials on blankets	- Waiarapa - specialist mohair weavers - 40 colours of mohair					Est. 1892. Re-vitalised in 1999, modernized 2007. Promote their history. - have contemporary design alongside their traditional ones.			

Figure 114. Market research of similar companies to identify gaps for niche manufacture.

INTRODUCTION TO PROJECT:

Hannah Webster

Full time

REVITALISATION OF A WEAVING MILL

Vision:

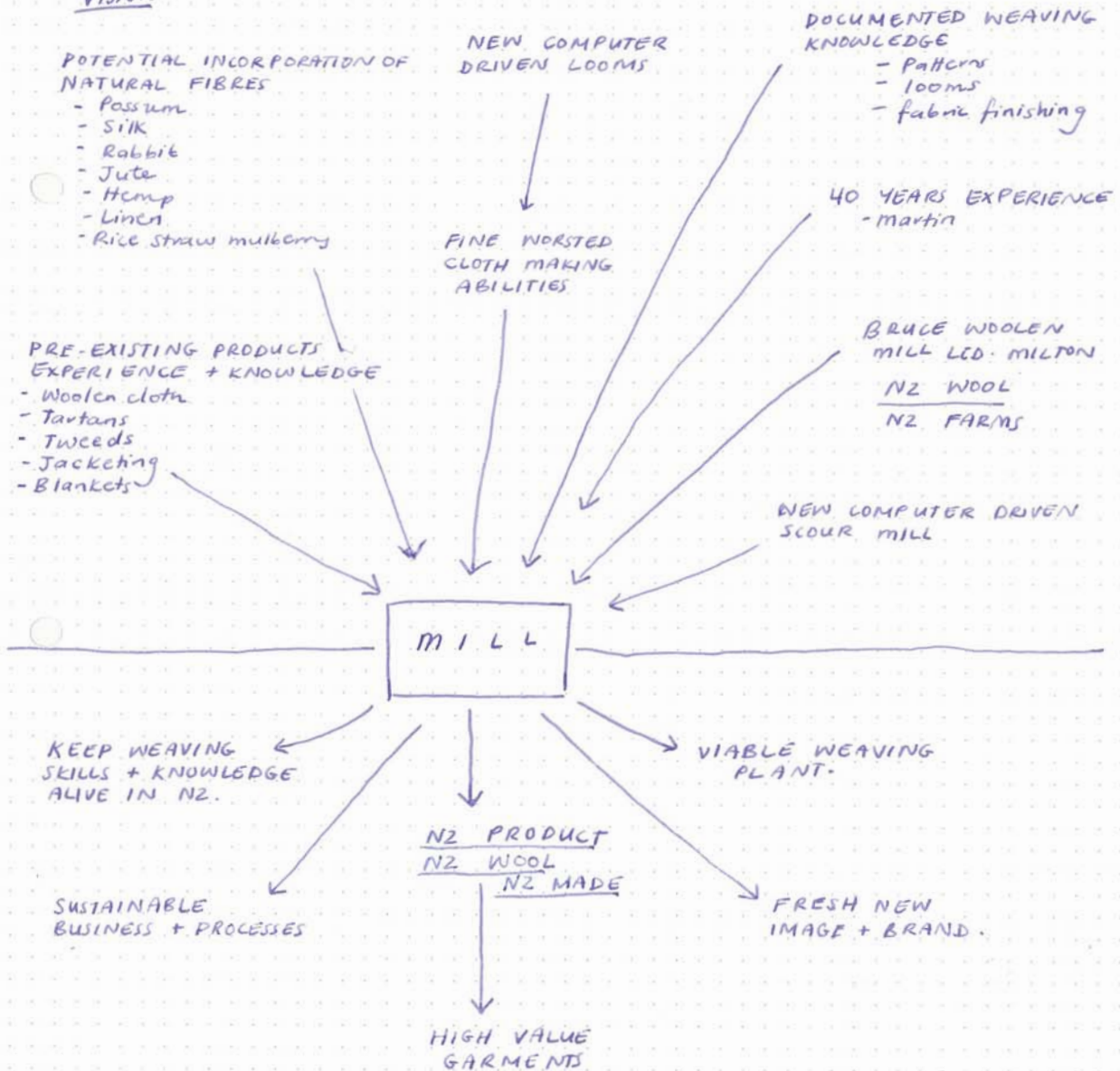


Figure 115. Initial brainstorm to identify inputs and outputs of the project.

CURRENTLY

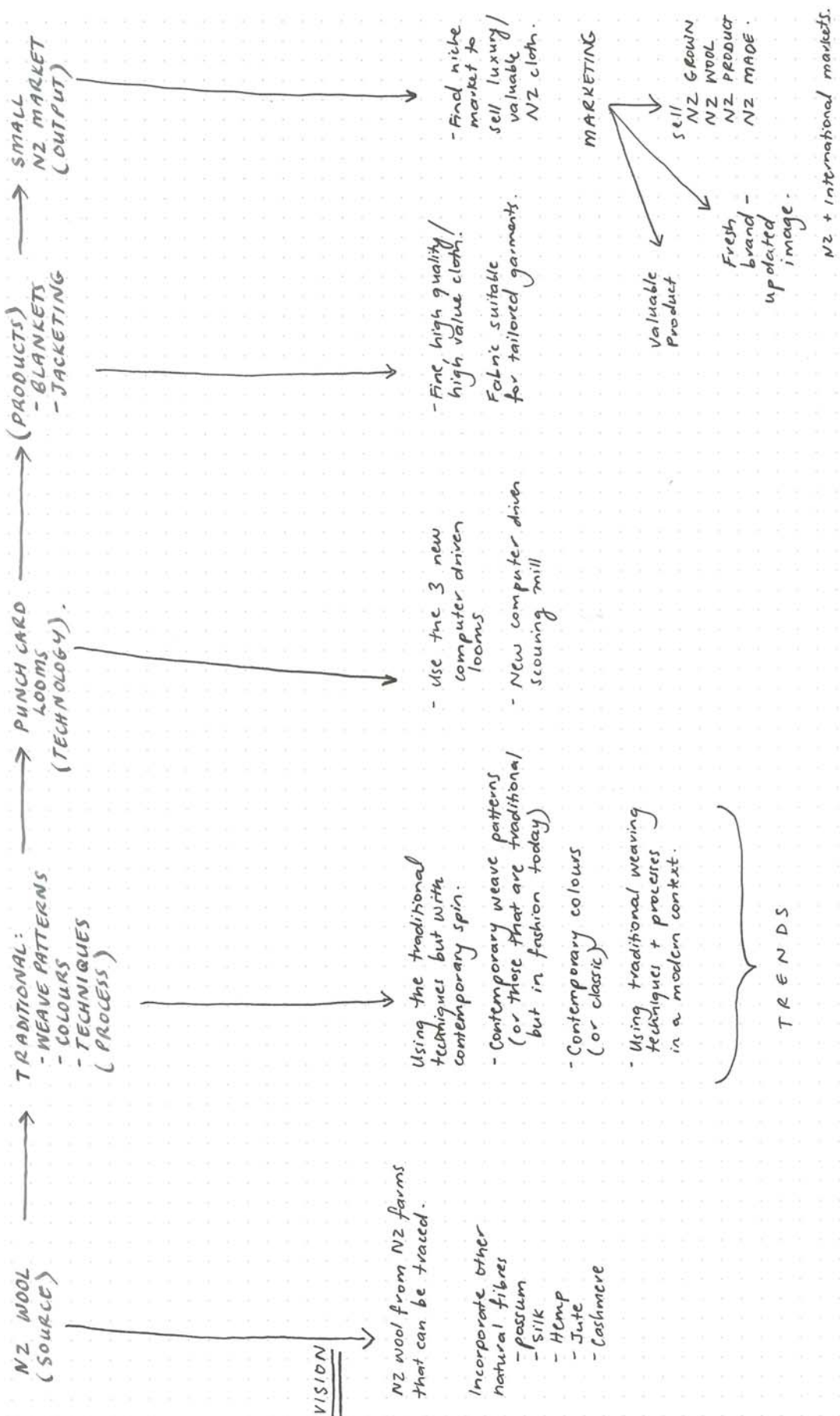


Figure 116. Flowchart of value from raw wool to manufactured product for market.

ORIGINALITY DECLARATION

Written assignment originality declaration

Student ID: 09079708
Surname: Webster
First Name: Hannah
Paper Number: 197.800
Paper Title: Master of Design
Assignment Title: The revitalisation of a weaving mill.

Declaration

I declare that this is an original assignment and is entirely my own work.

Where I have made use of the ideas of other writers, I have acknowledged (referenced) the sources in every instance.

Where I have made use any diagrams or visuals, I have acknowledged (referenced) the sources in every instance.

This assignment has been prepared exclusively for this paper and has not been and will not be submitted as assessed work in any other academic courses.

I am aware of the penalties for plagiarism as laid down by Massey University.

Hannah Webster

Student signature

23.02.15

Date