

Nelson  
**Textiles  
and Design**

Preliminary and HSC second edition

Lynda Peters • Christine Castle



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**Textiles  
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Preliminary and HSC second edition

Christine Latta • Lynda Peters

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Christine Castle  
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# Introduction

*Nelson Textiles and Design: Preliminary and HSC 2nd edition* presents the syllabus content in a contemporary and creative manner. Each chapter has many photos and images to allow you to gain a visual understanding of the content. There are also links to the Teacher Resource Book, which complements the textbook by providing blackline masters (BLMs) for the key content and access to a range of digital resources.

The textbook covers content from the three areas of study:

- ☺ Design
- ☺ Properties and Performance of Textiles
- ☺ Australian Textile, Clothing, Footwear and Allied Industries.

The textbook content is complemented with a variety of student activities, including:

- ☺ fibre, yarn and fabric case studies, updated for the second edition
- ☺ digital resources, including web research, weblinks and computer-aided design
- ☺ designer case studies
- ☺ manufacturing techniques
- ☺ Preliminary project ideas
- ☺ textile experiments
- ☺ glossary of terms
- ☺ list of textile suppliers.

Chapter 24 contains student examples of high-quality Major Textiles Projects, including the supporting documentation and hints on how to develop a successful Major Textiles Project.

Refer to the Board of Studies website for the Textiles and Design Course Objectives, Outcomes and Content: [www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au).



0.1 What will you learn in Stage 6 Textiles and Design?

0.2 Why did you decide to study Textiles and Design?



## About this book

Throughout the textbook you will find icons that relate to activities you can complete or links to resources.



Weblinks to useful websites and sometimes to a short video attached to an activity in the textbook.

**NelsonNet**

The NelsonNet website offers additional material to give you a greater understanding of the content.



These icons point to activities best completed in your creative journal.



These are teacher Resource Book worksheets. Your teacher can supply you with a copy of the relevant worksheets for this section.

NelsonNet is your protected portal to the digital resources that accompany this textbook. Separate websites are provided for students and teachers, with teachers able to access both student and teacher material.

Materials on the student website are grouped under the heading 'Chapter resources' and include direct links to websites and short video clips, activity sheets, templates, grids and pattern pieces, case studies, answers to activities in the textbook, interactive puzzles and additional material.

The teacher website includes PDFs of the textbook chapters and a resource finder for resources on the student website.

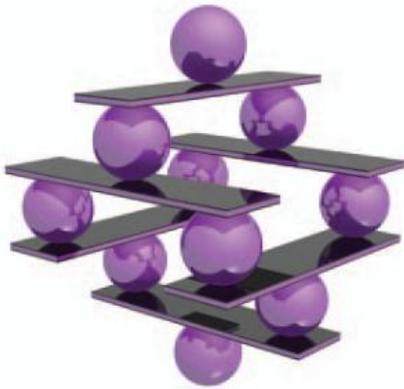
Visit [www.nelsonnet.com.au](http://www.nelsonnet.com.au) to find out more, to register or to log in if you are already registered.

## Why study Textiles and Design for the HSC?

Senior school can be a challenging time for you as a student. You have to organise your time to ensure you have an equal focus on all your subjects, as well as a balance between school, home, work, sporting and social commitments.

Textiles and Design gives you the opportunity to develop your creativity and inspire your artistic passion. You will have time to design and create products from the five focus areas – apparel, costume, textile arts, furnishings and non-apparel. You may see Textiles and Design as a 'break' from the rigours of subjects that are perhaps more theory-driven, as a large percentage of the content involves practical applications. Technology is also an essential component of the course as there are many opportunities to use your ICT skills to create supporting documentation, storyboards and for computer-aided designing.

Photos from Shutterstock.com



To achieve your best in the HSC you must be able to balance your commitments.



Use your netbook to research a concept, create a storyboard or complete the documentation for a textile project.

## Where can Textiles and Design take you?

Many students choose to study Textiles and Design because it provides an opportunity to create a folio to showcase their creativity if they decide to study textiles at a tertiary level. Many design courses at TAFE and university accept students after viewing a folio during an interview.

Shutterstock.com



Use your artistic skills when you leave school to develop a career as a fashion illustrator.

Studying Textiles and Design can lead to many different study and career paths:

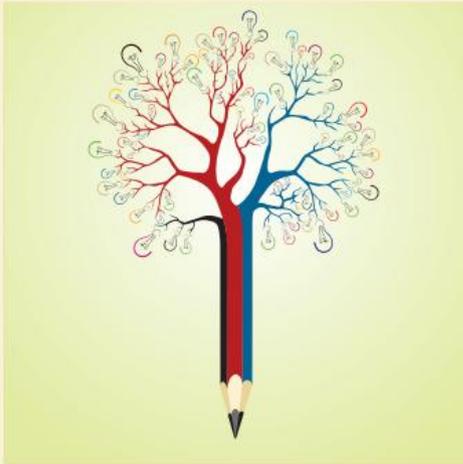
- ☺ fashion designer
- ☺ interior designer
- ☺ costume designer
- ☺ technology teacher
- ☺ retail buyer
- ☺ journalist
- ☺ fashion illustrator
- ☺ milliner
- ☺ textile technician
- ☺ textile mechanic
- ☺ industrial textiles fabricator.

Even if you decide not to develop a career in design, the study of Textiles and Design will provide skills for leisure activities that can be used throughout your life.

# Preparing for your study of Textiles and Design

Preparing to study Textiles and Design is no different from studying other subjects for the Higher School Certificate (HSC). You need a strong understanding of the syllabus requirements and good organisational skills to ensure you manage your time effectively. Most students will use an A4 folder to organise their class notes. With the introduction of laptops and netbooks into senior classrooms, some students may use programs like OneNote as an electronic exercise book.

The supporting documentation of your textile projects is completed in an A4 or A3 folder. It is important to present your Preliminary supporting documentations in a similar-sized folder as you intend to present your final supporting documentation for the HSC. This will give you the opportunity to explore presentation techniques and maximise the layout of the content.

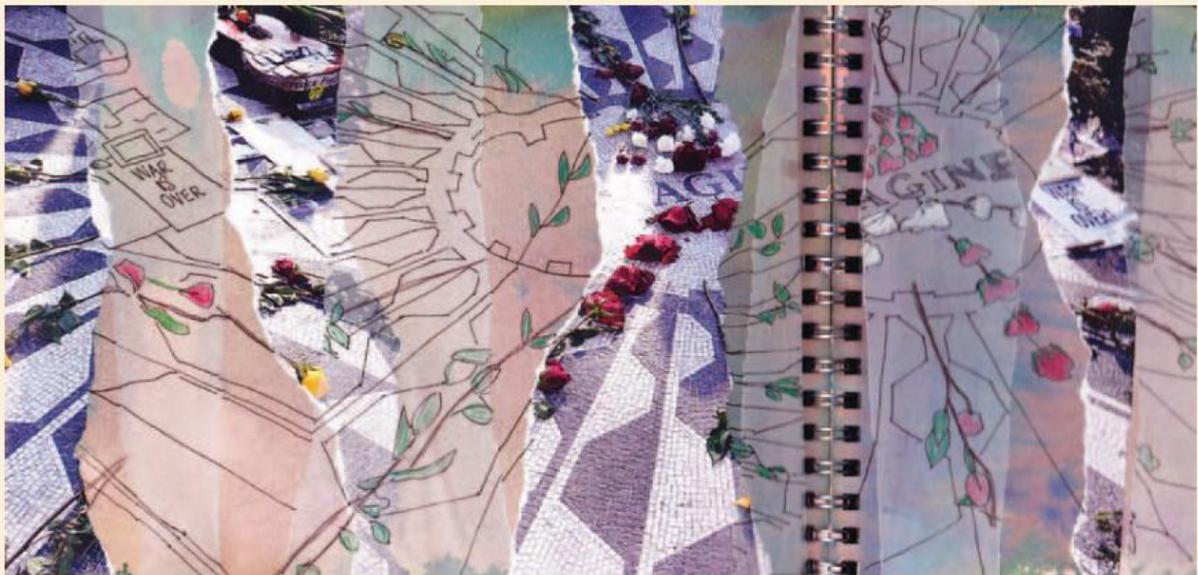


Creativity enhances your self-esteem and sense of satisfaction.

## Creative journal



Many students benefit from the use of a creative journal in Year 11. The creative journal can be a sketchbook or loose-leaf folder. The activities completed in the creative journal can be a source of inspiration for the HSC Major Textile Project. Throughout the textbook you will find creative journal icons indicating creative activities that can be completed in the journal.



Creative journal page inspired by John Lennon Memorial, Central Park, New York, by Lynda Peters

## Activity

## Creative journal cover

Create a cover for your creative journal that reflects your personality. Use only textile materials to create the cover. Make sure you include your name either in your cover design or just inside the front cover.

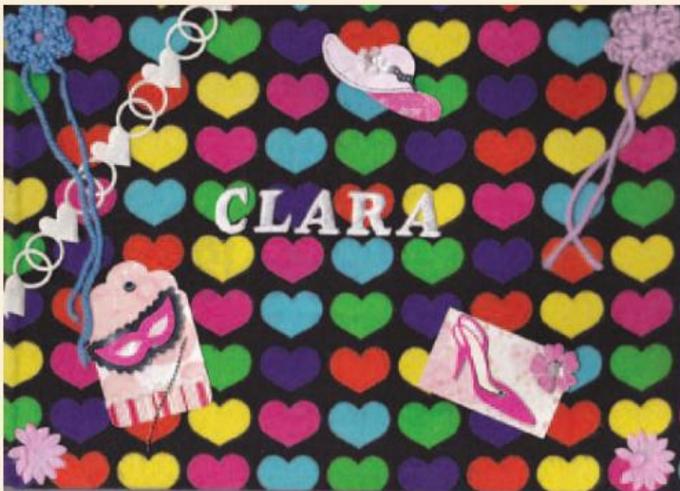
Image courtesy of Rhiannon Alcorn



Image courtesy of Tiffany Ramsay



Image courtesy of Clara Cynthia



Creative journal covers

# Course structure

## Preliminary course (120 indicative hours)

### Design **40%**

- ☉ Elements and principles of design
- ☉ Types of design
- ☉ Communication techniques
- ☉ Manufacturing methods
- ☉ Preliminary Textile Project 1 focuses on the generation and communication of ideas, design modification, manipulative skills, evaluation of ideas and the project, and management of time and resources.

### Properties and Performance of Textiles **50%**

- ☉ Fabric, yarn and fibre structure
- ☉ Types, classification and identification of fabrics, yarns and fibres
- ☉ Fabric, yarn and fibre properties
- ☉ Preliminary Textile Project 2 focuses on an analysis of fabric, yarn and fibre properties; experimental procedures; product design; fabric choice; manipulative and management skills; communication methods; and the recording of information.

### Australian Textile, Clothing, Footwear and Allied Industries **10%**

- ☉ Industry overview – past, present, future
- ☉ Quality and value of textiles

## HSC course (120 indicative hours)

### Design **20%**

- ☉ Historical design development
- ☉ Fabric decoration
- ☉ Influence of culture on design
- ☉ Contemporary designers

### Properties and Performance of Textiles **20%**

- ☉ End-use applications
- ☉ Innovations and emerging textile technologies

### Australian Textile, Clothing, Footwear and Allied Industries **10%**

- ☉ Appropriate textile technology and environmental sustainability
- ☉ Current issues
- ☉ Marketplace

### Major Textiles Project **50%**

Students select one focus area for which they develop a project, which includes supporting documentation and textile item/s:

- ☉ apparel
- ☉ furnishings
- ☉ costume
- ☉ textile arts
- ☉ non-apparel.

Students will demonstrate the development of manipulative, graphical, communication, research, decision-making, management and manufacturing skills.

# Acknowledgements

Writing a book is like creating a Major Textile Project. Along the journey there is a huge commitment of time, energy and expertise to ensure success. Once finished the sense of personal achievement is immense. Before you start you need inspiration and a commitment to see the project through to the end. Throughout my childhood, my mother and father instilled in me the belief that anything was possible if you work hard to achieve it. Mum, I wish more than anything that you were still here to share in our lives.

As an HSC student you require a support network of family and friends to encourage you to achieve your personal best. My family, husband Graham and children Jeff, Jenny and Kate, were my support network when writing this book, allowing me to have the opportunity to spend many, many hours researching, writing, sourcing and creating resources. I hope as you use this textbook you will be inspired to develop a passion for textiles.

– Lynda Peters

I wish to acknowledge the love and support of my beautiful family. Your encouragement has been truly inspiring. To my mum and dad, my husband Brad, my daughters Kayla and Lani, it is because of your eternal belief that I could continue with this project, even when times were extremely hard. I wish to acknowledge the creative talents of my students, past and present, and thank them for sharing their amazing creations in this textbook.

To the many gifted and talented Australian designers that have contributed their work to this book, your inspiration and dedication continues to fuel passion for Textiles and Design students across Australia and feed the creative art soul. To all my colleagues at HSC marking, in particular Pam Hicks, Leslee Wheeler and Vicki Smith, who have over the years inspired and guided me. Last but not least to my creative partner Lynda Peters, who is one of the most dedicated professionals I have ever had the opportunity to work with. Thank you.

– Christine Castle

# Preliminary course

## Area of study: Design

The following chapters will develop your knowledge and understanding of all aspects of textile design. You will gain an understanding of the difference between functional and aesthetic design and how design applies to the five focus areas. Practical examples of textile skills and techniques will build your creative textile capability. To be a successful textile student you must have strong verbal and non-verbal communication techniques. These skills will enable you to share your design concepts with your target audience.



Refer to the Board of Studies website for the Course Objectives, Outcomes and Content:  
[www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au).

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# 1

# Elements and principles of design

## What is design?

The nature of design is diverse. **Design** can be defined as a process that uses a combination of aesthetic and functional components to create solutions for an identified need. A sketch or plan for work so a project can be developed is also known as a design. Elements and principles are arranged to create different forms of art and different types of design. These elements and principles are applied to creating design work in all fields of textiles and design, including apparel, furnishings, costume, textile arts and non-apparel focus areas.



- 1.1 Focus area collage
- 1.2 Lines in textile collage

Focus areas				
Apparel	Furnishings	Costume	Textile arts	Non-apparel
				
Textile item that can be worn, is functional and can be easily cared for.	Textile items for the interior of the home, work, boats or caravans – cushions, bed linen, table cloth, curtains.	Clothing related to a particular culture, historical period or occasion; e.g. dance, fancy dress costume.	Textile item that is highly decorative and aesthetic is more important than function – wall hanging, wearable art.	Textiles that are functional – tents, sleeping bags, toys, umbrella.

Photos from Shutterstock.com

The elements and principles of design can also be used to analyse or evaluate design work. They are used as a guide to make judgements on visual appeal. Later in this chapter you will study the elements and principles of design in detail.

## Types of design

Design is usually a balance of aesthetic and functional components. Rarely does a design exist that is purely a source of one of these components. Successful design balances the right amount of aesthetic value with functional requirements. For example, a functional 'invisible' zipper used in the construction of a formal dress is usually also chosen for aesthetic reasons – to conceal the appearance of unsightly zipper teeth. It would also be chosen in a colour to best match the fabric. Functional and aesthetic design can have the same value. For example, in pattern-making, the construction techniques and pattern shapes chosen are both functional and aesthetic.

## Functional design

**Functional design** relates to the specific end-use or purpose of an item. Functional design judgements relate to the way in which the item performs its required task. The value of functional design often determines the success of a textile product in the marketplace.

Examples of functional design used in textile items include:

- pattern-making
- construction techniques, such as seams in patchwork and garment assembly
- closures, such as zippers and other fastenings.

## Aesthetic design

**Aesthetic design** relates to the visual appeal of an item. It often incorporates a surface decoration or design that enhances the appearance of the textile item. The design can be simple or complex. Judgements that are made by individuals in regard to aesthetic design value are often a reflection of personal taste. Aesthetic design judgements can be based on the senses, emotions or intellectual opinions, and can be affected by desire, culture, preferences, education, history, values, beliefs, fads and fashions.

Aesthetic design can be successful for different reasons. It may follow closely the design protocols in harmony with the elements and principles, or it may be in complete discord. Good aesthetic design is usually interesting and stimulating at the same time.

Examples of aesthetic design used in textile items include:

- patchwork
- dyeing
- printing
- embroidery
- beading.



An Indian sari is a highly aesthetic item of apparel due to the use of embroidery and beading to embellish the fabric. The sari is a draped garment and has no functional seams or closures in the design.

## Factors determining appropriate design

In contemporary society we are becoming increasingly aware of the need for all design fields to be appropriate to the end-use application. It is imperative that designers consider environmental sustainability and manufacturing techniques when designing textile items. Appropriate (or responsible) design practices consider the balance of function and aesthetics, as well as the safety of the item.



A hiking pack is a textile item that has been designed to be highly functional.



1.3 Functional and aesthetic design



## Environmental sustainability

**Environmental sustainability** aims to preserve biodiversity and natural ecosystems over an indefinite period of time. When designing a product, the designer must consider the needs of humanity in relation to a cleaner and greener world. This must be accomplished through responsible design practices. Safe and responsible practice must be used in selecting, procuring and processing the required design. The protection and preservation of resources, the energy required to process the product and the final disposal of both the textile item and the residual waste created during manufacturing all need to be carefully considered.

## Manufacturing techniques

If you supply or make textile items you have an obligation to ensure that you only market safe products. Designers must ensure their products are constructed using the correct manufacturing techniques to meet relevant safety standards, and provide clear instructions for proper use and warnings against possible misuse. If mandatory standards are not complied with in textile design, action can be taken against the designer under the *Competition and Consumer Act 2010* (Cwlth).

The Australian Competition and Consumer Commission (ACCC) enforces the mandatory recall of products that do not meet manufacturing standards under the *Competition and Consumer Act 2010*. Fair trading offices also play an important role in product safety within their own states.

Designers need to consider appropriate design aspects in relation to Standards Australia, which is recognised by the federal government as Australia's peak standards body. It develops Australian Standards® of public benefit and national interest and supports excellence in design and innovation through the Australian Design Awards.

## Economics

A designer must consider all aspects of **economics**, including the costs of all materials, designing and manufacturing. Careful consideration of economics will minimise the wastage of money and materials on unnecessary production output. This will keep the product competitive in the marketplace.

It is a designer's choice to select resources in designing a product. Resources include time, money, skills, materials, production, equipment and facilities needed to complete the item. Ultimately, the money spent on resources will affect the final price-point of the item in the marketplace.

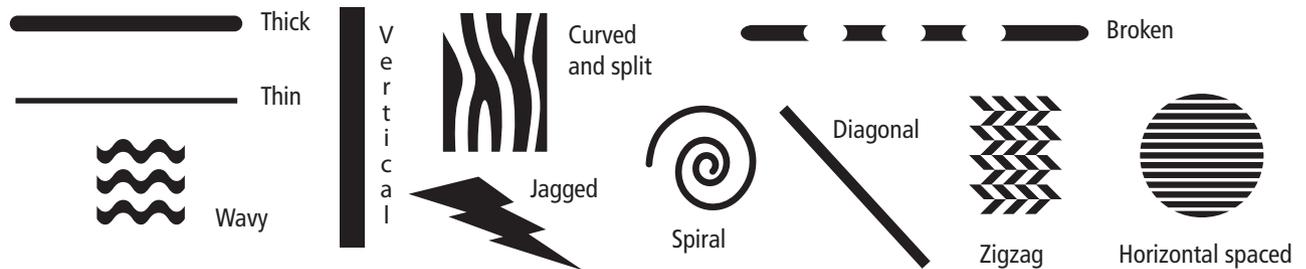
## Decorative techniques

The type of **decorative techniques** chosen to enhance a design should be appropriate to the end purpose. Decorative design should add to the aesthetic appearance and not detract from or interfere with the functional aspects of the design. Often designs are created with a clear aesthetic expectation. For example, the appropriate decorative technique for a baby's grow suit may be a printed or embroidered logo or picture. This method of decoration suits the functional and aesthetic requirements of the design, being both a safe and stable decorative design technique.

# Elements of design

## Line and direction

**Lines** are usually significantly longer than they are wide. Line defines the **direction** of a design. The human eye will be led around a design determined by the type of line used and the direction of the line produced in the design. Line can divide a space or outline an object. Line can express emotion and movement and can communicate a feeling. Examples of different types of design lines include horizontal, vertical, diagonal, zigzag, thick, thin, straight, curved, wavy, spiralled, split or broken lines.



Design lines

## Using line in apparel

The use of line in apparel can create optical illusions. Vertical lines create an illusion of height and make us look slimmer because they lead the eye up and down. Horizontal lines create width and emphasise shortness because of their side-to-side movement. A very curved line makes the figure look rounder and fuller than a slightly curved line. Two lines angling together create strong directional effects. A narrow angle draws the eye down into the narrow point, whereas a wider angle draws the eye out and emphasises width.



Horizontal lines create width and emphasise shortness.



Curved lines make the figure look fuller.

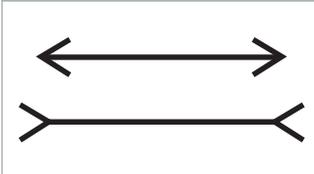
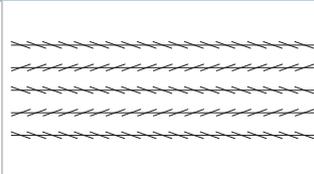
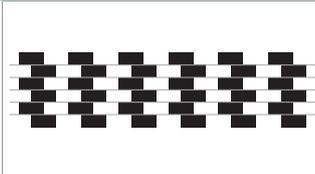
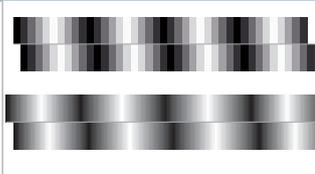


Corset boning creates diagonal lines that give interest to the garment.



Tartan fabric creates conflict and contrast in the design.

Photos from Shutterstock.com

Line optical illusions			
			
The two horizontal bars are the same length, but the lower one appears longer than the upper one.	The horizontal lines appear to tilt to the right and the left alternately. This illusion is caused by acute-angle expansion.	The lines are horizontal but appear to tilt from the top to the bottom.	The lines are horizontal but appear to tilt down to the left.

Line can be incorporated into a textile item using a functional design feature or an aesthetic design feature.

- Seams may be a functional design feature to create lines on a textile item, such as a yoke seam with top stitching in a contrast thread.
- Fabrics may have a printed design of lines or a woven design of lines, such as tartan.
- Frills and ruffles can create undulating lines on a garment.
- Pleats create zigzag lines.
- Free-motion embroidery may be an aesthetic design feature, such as on a wall hanging to create spiral lines.

### Textile techniques to create line



- 1.5 Line design inspiration – the built environment
- 1.6 Decorative machine stitching
- 1.7 Twin needling



Horizontal rows of decorative machine stitching

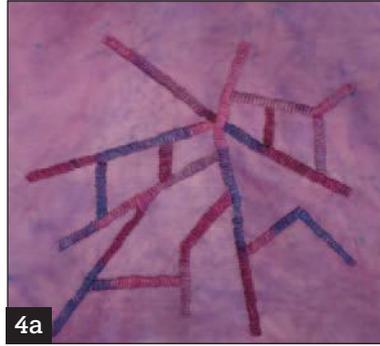


Curved lines of twin needling

## Method

- 1 Select two layers of calico: one solid coloured fabric such as poplin, and one sheer fabric such as organza.
- 2 Using a dressmaker's pencil or fabric pen, transfer the design to the right side of the coloured fabric.
- 3 Create a fabric sandwich with the calico layers first, and then place the solid fabric with transferred design and the sheer fabric on top of both.
- 4 Using no. 8 pearl variegated embroidery thread, hand stitch the following three samples.
  - a Use straight stitch to fill the road lines.
  - b Use straight stitch to fill the area between the road lines.
  - c Use back stitch to outline the roads.

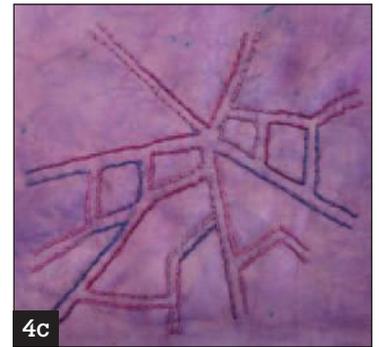
Refer to Chapter 16 for detailed instructions on hand stitching.



4a



4b



4c



1.8 Road map line activity

**Nuno felting** involves attaching a sheer fabric to wool tops or batts. The name is derived from the Japanese word *nuno*, meaning 'cloth'. Open, sheer, natural fibre fabrics can be used for nuno felting. The following sample is created using wool batts as the backing instead of wool tops. Wool batts are a prefelt or needle felt. When using wool batts there is no need for tiling wool tops, which is the case for traditional felting.

## Method

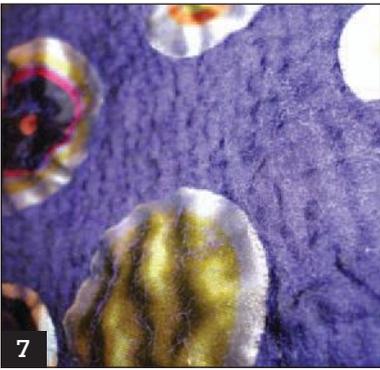
- 1 Lay a towel on a flat surface.
- 2 Place a sheet of bubble wrap on top of the towel. Make sure the bubble wrap is at least 5 cm larger than your project.
- 3 Cut the wool batt to the required size (such as 30 cm x 30 cm) and lay on top of the bubble wrap.
- 4 Lay the sheer fabric on top.
- 5 Prepare a soap solution: half a cup of Lux flakes dissolved in 2 cups of hot water, and then add water to make up 2 L – a milk bottle is a useful container.
- 6 Pour a small amount of the soap mixture into the middle of the sheer fabric and gently rub the wool fabric pad until the wool fibres are wet.



Nuno felting requirements



Sheer fabric lying on a wool batt



7 Wool fibres visible through sheer fabric



8 Nuno felted pieces ready for felt weaving



10 Vertical nuno felt strips



11 Woven nuno strips ready for felting



Converging lines – nuno woven bag

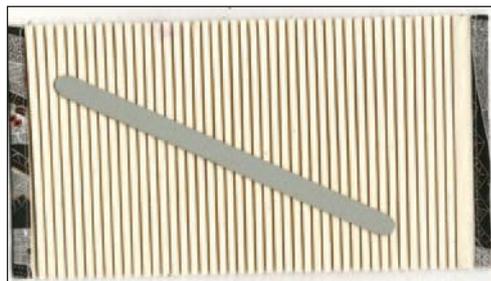
- 7 Cover the wool fabric pad with netting and roll using a dowel until the wool fibres start to attach to the sheer fabric.
- 8 Repeat steps 1–7 with a number of different sheer fabrics so that you have different-coloured nuno felting for weaving.
- 9 Cut the nuno felt into strips of varying widths.
- 10 Lay the vertical nuno felt strips to create the desired size.
- 11 Weave the horizontal nuno felt strips between the vertical strips.
- 12 Lay the netting over the nuno felt. Pour a little soap mixture onto the netting and lightly rub over the felting until the web is wet through.
- 13 Continue rolling until the wool fibres are visible through the fabric and the strips are felted together.
- 14 Rinse the nuno felt in cold water. A dash of vinegar in the final rinse clears away any residual soap.

## Skill development

1.3

## Pleating

Many fabrics are suitable for **pleating**, but the best results are achieved using lightweight thermoplastic fabrics such as polyester satin. A cloth pleater is suitable to pleat small lengths of fabric.

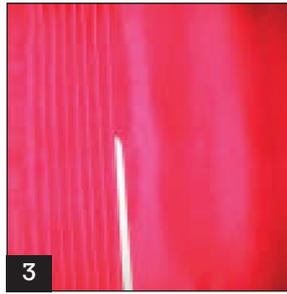


Cloth pleater

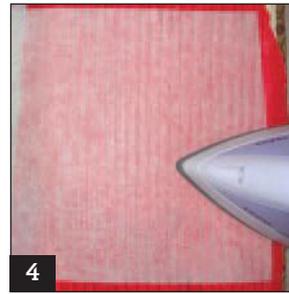
### Method

- 1 Cut the fabric to be pleated the same width as the cloth pleater, but at least twice the length. Press the fabric to remove any creases.
- 2 Position the cloth pleater on the ironing board with the fold of the pleater facing away from you. Place the right side of the fabric on top of the cloth pleater.

- 3 Tuck the fabric behind each pleat with the metal bar. Hold the pleat up with your finger and tuck the fabric to the back of the pleater. Use the bar to ensure the fabric is in place. Repeat until the desired length has been pleated.



Placing fabric in pleater

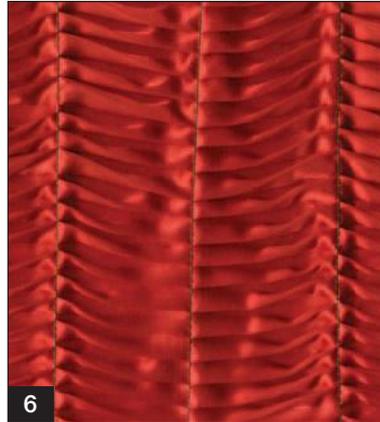


Ironing pleated fabric



Releasing pleated fabric

- 4 Spray the fabric with iron-on starch and iron with a pressing cloth. Or, place fusible interfacing (fusible side down) over the pleated fabric and fuse it to lock the pleats in place. Allow the fabric to cool.
- 5 Gently roll back the pleated fabric to release it from the cloth pleater.
- 6 Embellish the pleated fabric with straight stitch (SW0/SL3), stitching the pleats in one direction and then in the opposite direction for the next row. Or, embellish the pleated fabric with decorative machine stitching.



Zigzag lines produced by pleating; materials: satin, machine thread



Embellished pleats using decorative machine stitching; materials: satin, metallic machine embroidery thread

## Skill development 1.4 Free-motion stitching

**Free-motion stitching** is an effective method to incorporate line into textile projects as the stitching can be in any direction: forward or back, left or right. Any sewing machine can be used for free-motion stitching by lowering the drop feed and using a darning foot. With practice, any design can be stitched.

### Method

- 1 Select a suitable fabric. If using a lightweight fabric, stabilise the fabric with tear-away stabiliser or place the fabric in a hoop. Pellon can be used to stabilise fabrics and create a quilted effect.
- 2 Set the machine to free-motion stitching. (See Chapter 16 for detailed information on free-motion machine embroidery.)
- 3 Stitch in a curved motion, moving forward and back over the fabric.



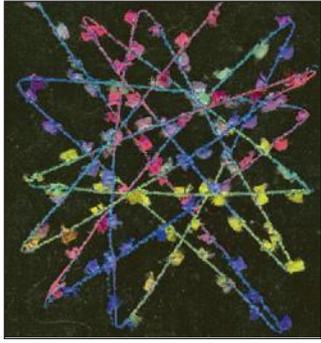
Stippling using gold metallic thread on satin



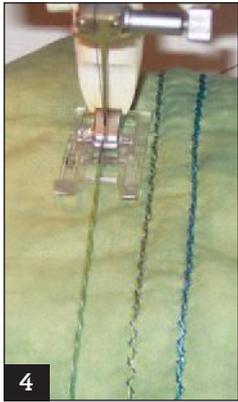
Stippling used to attach a fabric photo frame



Free-motion stitching used to embellish photo transfer images

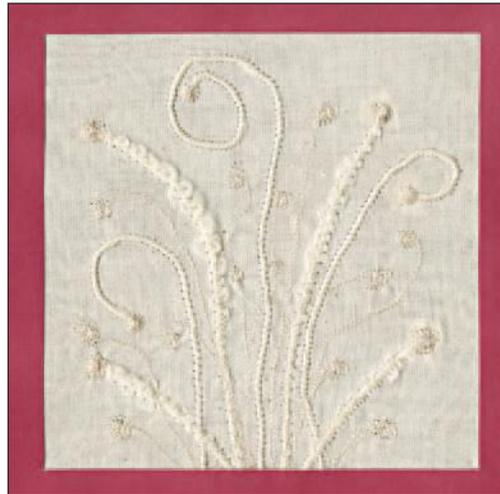


Converging lines of couching;  
materials: stretch suede  
backing, eyelash yarn



**Couching** is the process of attaching decorative yarns or cords to a fabric. A small zigzag stitch is used to attach the yarns. Changing both the thread type and the stitch width and length can achieve different effects.

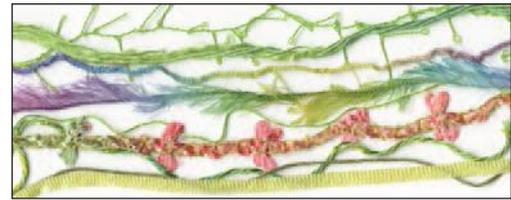
Machine threads suitable for couching are invisible thread, rayon embroidery thread, polyester machine thread and metallic thread.



Curved lines created by couching and freehand embroidery;  
materials: calico backing fabric, cream woollen yarn, slub yarn and  
rayon embroidery thread; couching stitch: zigzag SW3.5/SL2

### Method

- 1 Select the backing fabric. If the fabric is lightweight, stabilise it with tear-away stabiliser.
- 2 Cut the yarn or cord to the desired length plus 10 cm.
- 3 Use a stitch width just wider than the couching yarn or cord. Adjust the stitch length for the desired coverage over the yarn or cord.
- 4 Holding the cord or yarn both in front and behind the foot, zigzag over the yarn or cord.



Yarns suitable for couching



Textured twisted cords



Fabric box with twisted cord closure

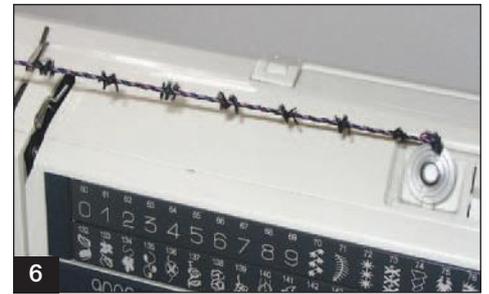
Fabric box by Lynda Peters

### Method – twisted cords

- 1 Select 2–4 yarns of various textures and thicknesses.
- 2 Cut to the desired length plus 10 cm.
- 3 Insert the yarns through the hole in the presser foot with 10 cm excess behind the foot. Use the same thread in the bobbin as the top thread.
- 4 Holding the yarns both in front and behind the presser foot, twist together and zigzag over the yarn. The stitch width will depend on the thickness of the yarns selected.

## Method – bobbin cords

- 1 Select 2–4 yarns of various textures and thicknesses.
- 2 Cut the yarns three times the finished length of the cord.
- 3 Thread the yarns through the hole in an empty bobbin and tie securely.
- 4 Place the bobbin on the bobbin winder.
- 5 Hold the end of the cords taut at a 45-degree angle and start the bobbin winder.
- 6 Stop winding when the yarns have twisted together.
- 7 Hold the middle of the twisted cord and bring the end of the cord to the bobbin. Release the middle and the cord will wrap around itself. Tie a knot at the end to secure.



Textured bobbin cords

NelsonNet

Mini scarf  
TEXD11AS010001

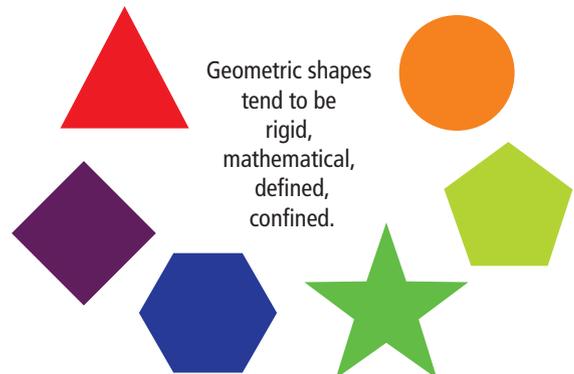
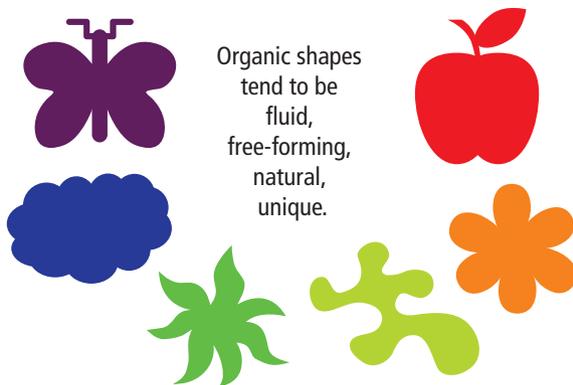


1.9 Line technique reflection  
scaffold

## Shape and size

**Shape** is a closed line. There are two main types of recognisable shapes: organic (such as free-formed natural shapes) and geometric (such as squares, circles and triangles).

When lines connect to form a shape with no depth, the shape is two-dimensional or flat. When depth is applied to a shape it becomes three-dimensional. Three-dimensional shapes are known as form. To demonstrate the difference, a square is a shape and a cube is a form.



## The use of shape in apparel

Shape can be used in apparel to create optical illusions in just the same way as line. Designs that create vertical shapes or spaces make the wearer look slimmer. Horizontal shapes divide the body, making it appear shorter and wider. Large, bold prints make the wearer look larger.

The use of shape in a textile item can be a focal point as the eye is drawn to the shape. Irregular shapes are more interesting to the eye than symmetrical shapes. Spaces between shapes add interest to the design. Little space between shapes results in a busy design and the design may become too congested. Too much space and the shapes are lost in the background.



Photos from Shutterstock.com

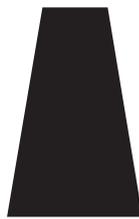


Bold design with little space between shapes creates a busy design.

Structural design features are used to create shape in a design.

Silhouette refers to the style of a garment. Seven basic fashion silhouettes or shapes have regularly appeared throughout history. These silhouettes can be altered by changing design features, such as the position of the waistline, sleeve styles, the amount of fullness in the skirt and variations in length.

### The seven basic fashion silhouettes



A-line



Hour-glass



Tube



Wedge



Square



Bell



Bustle

Shape can be incorporated into a textile item using a functional design feature or an aesthetic design feature. Examples include:

- stiffening a fabric or padding a design, such as using shoulder pads to change the shape of a jacket
- gathering a fabric to add fullness to the design and enlarge the shape
- cutting the fabric on the bias to change the shape of the garment, causing the fabric to hang differently
- using fabrics printed with designs containing shapes to change the look and focal point of the design.



1.11 Texture in textiles collage  
1.12 Shape design inspiration – the natural environment



Shape is incorporated in the design through the use of flowers to embellish the skirt.



Ruffles and frills add shape to a design.

Photos from Shutterstock.com

### NelsonNet

Felt and organza leaves  
TEXD11AS010002  
Tulle and organza flowers  
TEXD11AS010003  
Romeo motif  
TEXD11AS010004

## Textile techniques to create shape

Skill development

1.7

Hand stitching – leaf

### Method

- 1 Select a leaf to use as a template.
- 2 Select a fabric for your design. The fabric in the sample is batik with an organza layer on top. The organza is optional.
- 3 Using a dressmaker's pencil or fabric pen, trace around the design.
- 4 Using no. 8 pearl embroidery thread or stranded cotton, back stitch the outline of the leaf and then create the veins.





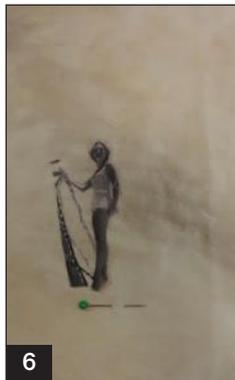
1.13 Shape – found objects  
1.14 Creating shape in Photoshop



1



2



6



7



8

## Method

- 1 Print an image onto cotton digital imaging fabric.
- 2 Create and cut out a paper template inspired by your digital image.
- 3 Select the fabrics for your design. Start with either Pellon or two layers of calico to create a backing, and then use a solid fabric like poplin. This sample uses hand-dyed silk. The next layer is organza or a sheer fabric, with either cotton or silk muslin for the top layer.
- 4 Using a dressmaker's pencil or fabric pen, trace the template onto the silk or poplin layer.
- 5 Using stranded thread and running stitch, create design lines that relate to the digital image. On this sample, lines were created across the waistline of the swimsuit.
- 6 Attach the digital image to the backing fabric using hand stitches. These stitches should become a feature of the design.
- 7 Hand stitch the muslin into place following the template. Use back stitch so that there is a solid line to cut back on.
- 8 Use embroidery scissors to cut away the muslin close to the back stitch. Be careful not to cut the underneath layers.
- 9 Embellish the design with contrast stitching and buttons.

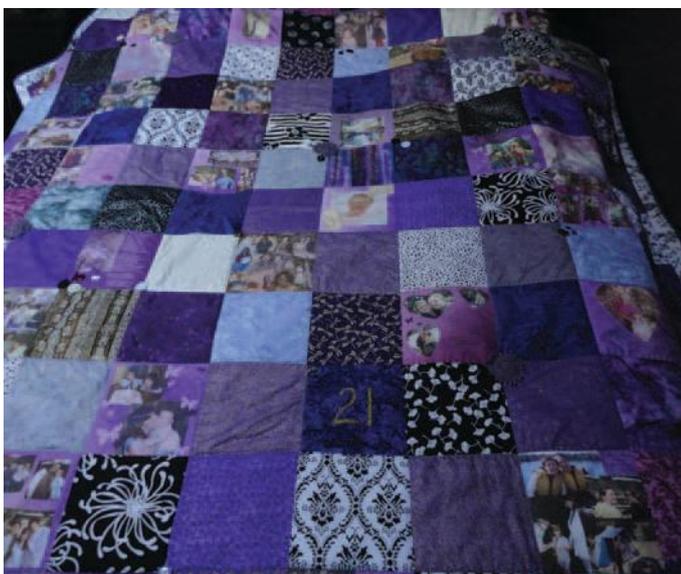


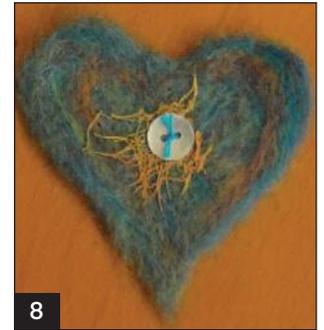
Photo quilt made by Jennifer Peters as 21st birthday present



9

### Method

- 1 Draw a shape for the motif onto water-soluble Vilene using a fabric pen.
- 2 Lay the Vilene on the needle-felting mat.
- 3 Use small pieces of wool tops to create the motif.
- 4 Hold the Vilene in place and punch up and down with the needle-felting tool. Do not punch too vigorously as the needles may break. Start around the outline of the motif first and then move towards the centre.
- 5 Add more wool tops until the desired thickness is achieved.
- 6 Attach a small square of muslin to embellish the motif.
- 7 Trim the Vilene close to the motif and wash in warm water to remove the Vilene.
- 8 Finish the motif with a hand-stitched button. The motif is now ready to embellish a textile item. Alternatively, needle felting can be done straight onto a textile project.



The needle-felting tool is available in different sizes; the one pictured has three barbed needles.

**Kunin felt** is made from acrylic and polyester. Using a soldering iron or creative textile tool to melt sections of the material can create a decorative effect. A creative textile tool has interchangeable heads used to create different effects, such as melting and embossing.

### Method

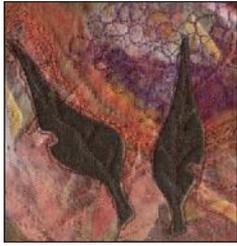
- 1 Cut the felt to the required size.
- 2 Use metallic embroidery thread and free-motion stitching to create a circular pattern on the felt.
- 3 Burn away sections of the felt using a soldering iron or creative textile tool to create a lace-like pattern.



*Note:* When burning or melting fabrics, always work in a well-ventilated area. Make sure you cover the work area with a metal tray to prevent burn marks.



1.15 Shape technique  
reflection scaffold



Felt leaves in fabric sandwich

- 1 Cut the backing fabric. Black organza was used for this sample.
- 2 Lay a variety of small fabric pieces, yarns and wool tops onto the backing fabric to create a thin layer.
- 3 Cut two black felt leaves and place onto the prepared background.
- 4 Cover with tulle.
- 5 Add detail to the design using free-motion stitching.

## Texture

**Texture** refers to the surface characteristics of a design. It has two main recognisable types: visual and tactile.

- Visual texture is where the design has the illusion of texture, such as a printed snakeskin pattern.
- Tactile texture is where the surface characteristics can physically be felt, such as the feel of a natural snakeskin handbag or shoes. Tactile texture is often referred to as the 'hand' of the fabric.

Texture adds interest, dimension and variety to a design. Types of textures include rough, smooth, shiny, bumpy, fuzzy, prickly, suede and matt.

## The use of texture in apparel

Texture can be used in apparel to create optical illusions in just the same way as line and shape. Bulky textures make the figure appear larger but can also disguise body shape. Smooth, shiny textures like satin make the body appear larger. Dull, matte textures tend to be slimming.

Texture is often incorporated into a textile item by using an aesthetic design feature.

- Thick pile fur or fluffy surfaces add bulk to a textile design.
- Large textures added to a garment may overpower the item and change the proportions.
- Trimming, such as braids and laces, add textural embellishment to a design.
- Fabric finishes, such as napping, flocking or embossing, can add texture to a design.
- Surface decoration, including beading and embroidery, can help achieve texture.



- 1.16 Creating texture using solvy  
1.17 Creating texture by fabric scrunching

Photos from Shutterstock.com



Bulky textures make the figure appear larger.



Shiny textures like satin make the figure appear larger.



Large textures change the proportion of a garment, causing unequal balance.



Heavily textured fabrics add bulk to the figure.

## Textile techniques to create texture

Skill development

1.12

Making your own fabric: desert inspiration

### Method

- 1 Select an image that inspires you. Consider how you can create a textural design from the image.
- 2 Collect textile materials suitable for a sand dune collage.
- 3 Cut a backing fabric to the desired size.
- 4 Layer textile materials to create the desired effect. Couch into place.

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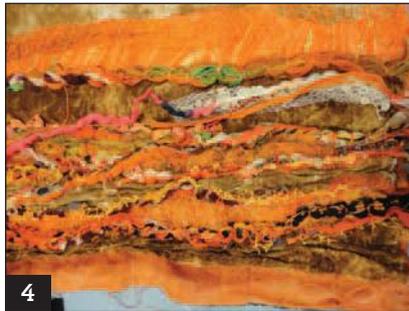
Make your own fabric  
TEXD11AS010006



Design inspiration: sand dunes



Photos from Jan Scudamore



Wall hanging inspired by sand dunes using a reverse-appliqué technique. Fabric layers were cut away to reveal different fabrics underneath.



Collage inspired by sand dunes. Textile materials include open zippers.

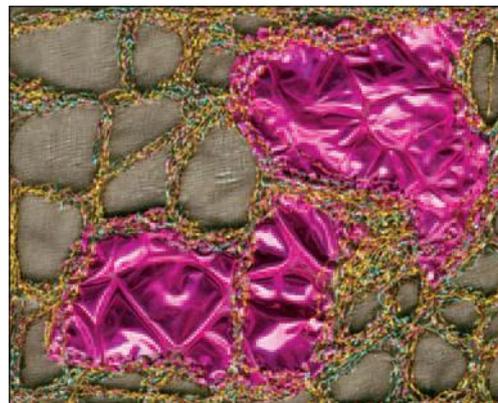
Skill development

1.13

Foil motifs

### Method

- 1 Heat-distort foil using an iron or heat gun. If using an iron, cover the foil with baking paper. Foil chocolate wrappers work well and will distort quickly.
- 2 Create an interesting shape with the distorted foil and lay onto the black organza.
- 3 Use free-motion stitching to attach the foil to the organza.



Foil motif



1.18 Texture technique reflection scaffold



Undulating texture is created by the heat-distorting technique.

### Method

- 1 Select and cut fabric to the desired size. Fabrics most suitable for this technique are 100% polyester or 100% nylon due to their thermoplastic nature. Plain weave polyester fabrics, satin, chiffon and organza were used in this sample.
- 2 Use elastic bands, sewing threads or yarns to create a design using an assortment of tied marbles, buttons and beads. Any items made from glass, plastic beads or wooden beads are suitable for shape distortions.
- 3 Steam the fabric in a colander for 20 minutes to heat-set the tied designs.
- 4 Remove marbles, buttons and beads to reveal the heat-distorted surface.



Felt bobbles



Underside of distorted felt



Felt flowers

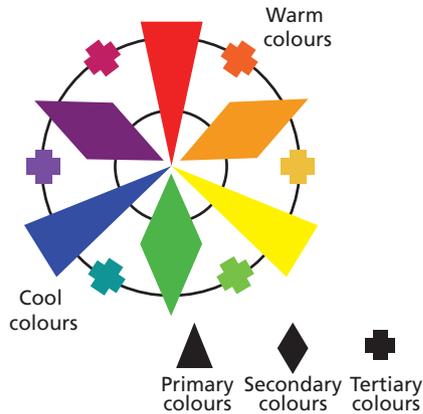
### Method

- 1 Lay a towel and some bubble wrap on a flat surface.
- 2 Place two contrasting layers of wool batts on the bubble wrap. Wet them with soap solution.
- 3 Cover with netting and roll (see Skill development 1.2, page 8) until the layers have started to felt together.
- 4 Place the marble under the wool batt and tightly wrap a rubber band around it. Repeat this process until all the marbles have been secured in the wool batt.
- 5 Half fill a large saucepan with water. Place the wool batt into the saucepan and agitate as the water boils for approximately 10 minutes.
- 6 Use metal tongs to remove the wool batt and dry on a towel. Allow the wool batt to dry completely before removing the rubber bands.
- 7 If desired, slit the bobbles to create a flower-like appearance.

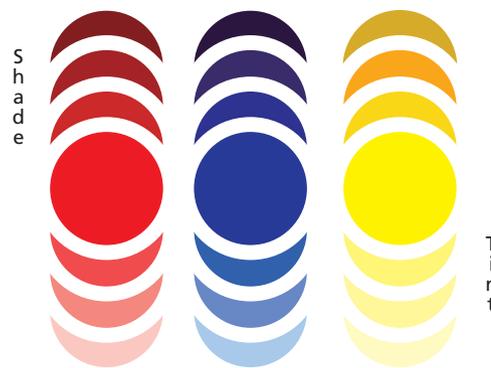
## Colour and value

**Colour** is one of the most important elements of design. Colours appear when light waves are reflected and absorbed by objects. Levels of colour are described using the terms *hue*, *value* and *intensity*.

**Hue** refers to the name of the colour. Primary hues are red, blue and yellow. These three colours are mixed to create secondary colours. Secondary hues are purple, green and orange. The mixing of a primary hue with a secondary hue forms a tertiary colour. On the colour wheel, warm colourways are characterised by reds, oranges and yellows and cool colourways are characterised by blues, greens and purples.



The colour wheel



Value showing shades and tints



1.19 Colour wheel  
1.20 Colour schemes

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Colour wheel  
TEXD11AS010007  
Colour wheel template  
TEXD11AS010008

**Value** is the lightness or darkness of a colour. Value can add depth and volume to a design. A colour that has black added to it is known as a shade and has a darker value; for example, burgundy is a shade of red. A colour that has white added to it is known as a tint and has a lighter value; for example, pink is a tint of red.

Monochromatic colour schemes use shades and tints of one colour. The colours go well together, creating a soothing effect.

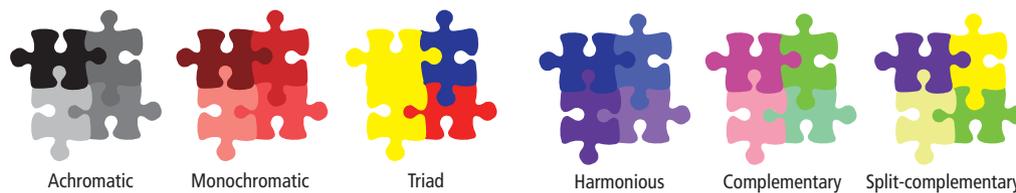
Analogous or harmonious colour schemes contain colours adjacent to one another on the colour wheel. The resulting colour scheme is richer than a monochromatic scheme but still lacks contrast.

Complementary colour schemes are made from colours opposite one another on the colour wheel. They consist of one warm colour and one cool colour; for example, red and blue. The resulting design is bright, with strong contrast.

Split-complementary colour schemes consist of two colours adjacent on the colour wheel and one opposite. These designs have high contrast but are more harmonious than complementary schemes.

Triad colour schemes contain three colours that are evenly spaced on the colour wheel: yellow, blue and red or green, orange and purple. The resulting design has strong visual contrast and is vibrant.

Achromatic colour schemes only use black, white and grey tones.



Colour schemes

Colours are often used to intensify mood (such as red for passion or anger) or to convey messages of association (such as white for purity and green for envy). There is a deep psychology associated with the use of colour. Colour preferences reflect our personal tastes and personalities and have significance to each individual in design. Colour is often associated with gender, age, social status, history, religious or spiritual events, marriages, funeral customs, cultures and subcultures.



- 1.21 Psychology of colour collage
- 1.22 Colour design inspiration – still-life collage
- 1.23 Colour technique reflection scaffold

Red is the symbol of fire, danger, power, passion, love, courage and warmth.

Blue creates images of the sea and sky. It symbolises coolness, freshness and first position.

Yellow is the symbol of safety, summer, happiness and warmth. It makes us feel better.

Green is the symbol of life. It is associated with nature and the environment.

Purple is the colour of royalty, wealth, power and luxury.

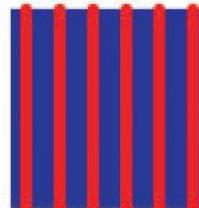
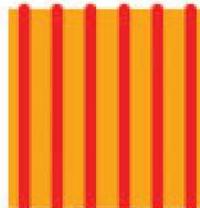
Orange is the symbol of autumn, earth, warmth, dirt and dust.

### The use of colour in apparel

Colour can also create optical illusions. Colours appear different depending on the background and lighting used. Dark colours such as black and navy blue make the figure appear smaller. Bright colours such as orange and lime make the figure appear larger. Areas of white bring colours together, whereas black divides an area.



Warm, bright colours seem heavier or denser than cool colours.



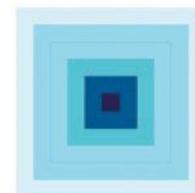
The same red is used in both images but appears different because of the background colour.



Bright colours make the figure appear larger.



Areas of white and black divide the design and draw the eye to the focal point.

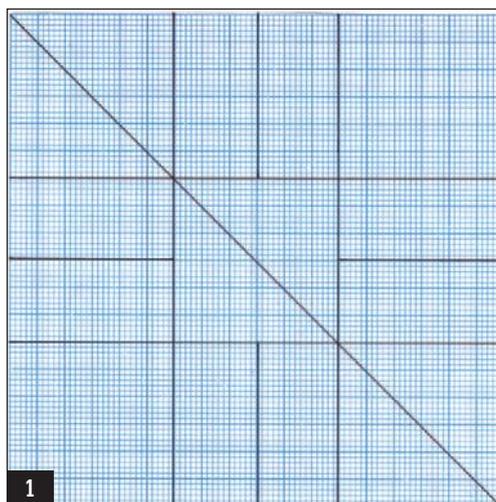


Advancing and receding gradients change the balance of colour within a design. This effect leads the eye to the more dominant colour or the colour with the highest value.

## Textile techniques to create colour

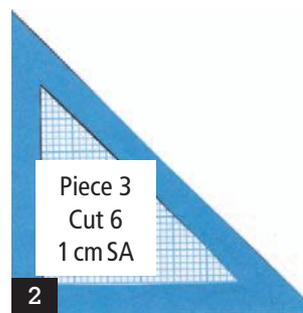
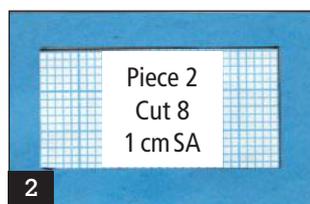
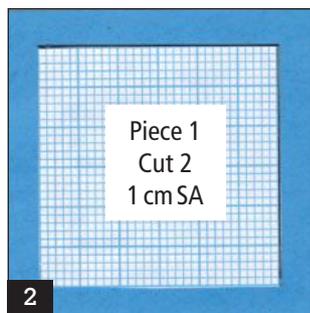
### Method

- 1 Create a pattern for the patchwork shapes. Graph paper is easy to use and creates accurate shapes.
- 2 Add a 1 cm seam allowance to all edges.
- 3 Use a rotary cutter and cutting board to cut out the shapes in woven fabric.
- 4 Plan your design so that the pieces are joined in strips.
- 5 Use a straight stitch (SL2.5) to join the pieces together.
- 6 Press all seam allowances open.
- 7 Join the strips together to create the patchwork square.



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Patchwork  
 TEXD11AS010009  
 Patchwork pattern piece 1  
 TEXD11TM010010  
 Patchwork pattern piece 2  
 TEXD11TM010011  
 Patchwork pattern piece 3  
 TEXD11TM010012  
 Patchwork pattern piece 4  
 TEXD11TM010013



Bottom panel



Centre panel



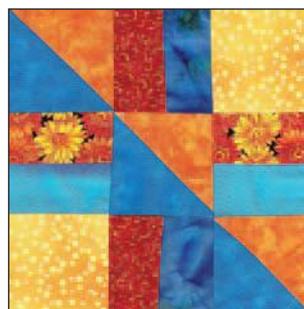
Top panel



Patchwork monochromatic colour scheme – created from one hue, with the addition of black, white, grey or other colours.



Patchwork achromatic colour scheme – uses only black, white and grey tones.



Patchwork complementary colour scheme – uses colours opposite one another on the colour wheel.



Patchwork triad colour scheme

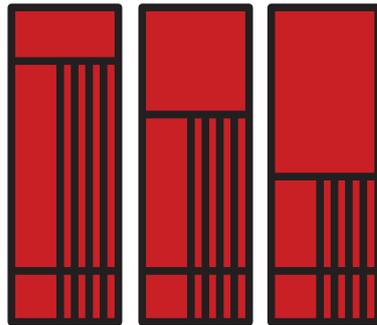
# Principles of design

## Proportion

**Proportion** refers to the relationship between two parts of a design, or between one part of a design and the entire design piece. Proportion can be a comparison of sizes, shapes or amounts of specified design elements. Distances, segments or parts can determine proportion. An example of this can be drawn from apparel manufacture, where every seam, yoke, collar, design line, dart, pleat, tuck or hemline alters the proportion of the garment. Also consider the relationship of measurements on a wall hanging or rug for your bedroom floor.

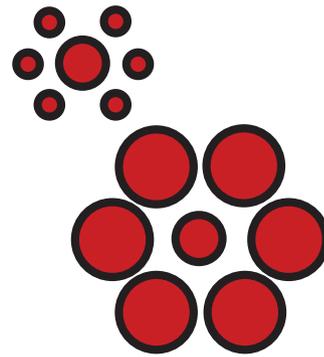
Symmetry has quite an effect on the proportion of design. The design may be more aesthetically pleasing if it is balanced, or more interesting if it is unbalanced. Proportion is a very important principle when drawing fashion figures.

Proportion of line



Changing the proportion of line and space alters the design features. In this example the longer the line, the thinner and longer the image appears.

Proportion of design features



Changing the proportion of design features changes the dominance of image elements. In this example the red circle in the centre of each design is exactly the same size. The centre appears larger in the top design due to the proportion of the outside circles.



A high waist and longer skirt make the figure look taller and slimmer.



Even proportions emphasize squareness and make the figure look shorter.

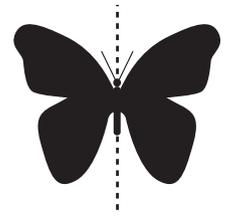
## Balance

**Balance** gives design stability and strength. It refers to the visual weight of shape, texture, colour, line and space. There are three types of balance: symmetrical, asymmetrical and radial.

Symmetrical balance is where the elements used are the same or similar on either side of an axis. That is, the weight is distributed evenly.

Asymmetrical balance is where the elements used on either side of an axis are not distributed evenly.

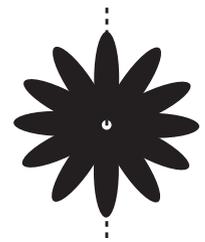
Radial balance is where a design originates from a central point and all elements radiate out evenly from that point.



Symmetrical balance



Asymmetrical balance



Radial balance



Photos from Shutterstock.com

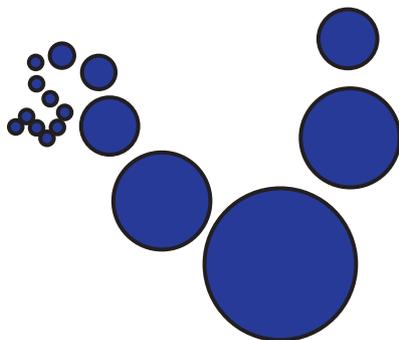
Design is symmetrical with formal balance.



Design is asymmetrical with informal balance.

## Rhythm

**Rhythm** is the repetition of various elements in a design to create a feeling of organised movement. These elements could include colour, shape, texture and line. Rhythm creates visual stimulation by prompting the viewer's eye to move around the design work. It also creates a mood or feeling within the design.



Rhythm

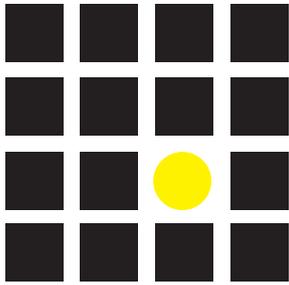


Graduated rhythm follows a regular pattern, which decreases down the garment.



Photos from Shutterstock.com

Random rhythm has different design features.



Emphasis

## Emphasis

**Emphasis** is the focal point. This is the part of the design that captures the viewer's attention. It will be an area on the design or within the design structure that stands out from the rest of the design.

Emphasis can be achieved in a variety of ways. The elements of design can be manipulated to create interesting focal points. Contrasting colours can be used, a shape can be made larger or smaller, backgrounds may be changed, or unusual or unexpected shapes, textures or lines can be incorporated.



Photos from Shutterstock.com

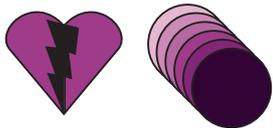
Emphasis created using surface decoration



Emphasis created using line



Emphasis created using shape and space



Contrast and harmony

## Contrast and harmony

**Contrast** is an unexpected change in the visual elements of a design. It can be created through colour, shape, line or texture. Colour can be altered through hue, value and saturation. Light and dark contrast creates depth of design. Shapes can change from smooth to jagged or sharp. Texture can change from rough to smooth. Line can change from thick to thin, or straight to curved.

**Harmony** combines colour, shape, line and texture. The similarities of the design or repeated design features are consistent and blend together to create an aesthetic design.



Photos from Shutterstock.com

Contrast created by the use of different fabrics and different-sized ruffles



Harmony created through the use of similar fabrics and the repetition of design features

## Unity

**Unity** is a composition that has a completeness of design. All the visual elements of the design unify the overall work. Harmony is created when the design looks like it belongs together and is unified.

## Evaluating designs

Evaluating your own designs and those of others can improve your knowledge and understanding about the process and composition of design. Each person will appreciate a design in their own way. A great deal of design evaluation comes down to a judgement made on a very subjective level and involves individual taste. To create guidelines for critical analysis of design work, technical observations are made.

Technical observations of design work include:

- functional and aesthetic features
- strengths and weaknesses
- elements and principles.

The success of a design can be analysed systematically using the features listed above. This will be discussed further in Chapter 24.



1.24 Analyse and evaluate textile items from the five focus areas

## Using elements and principles to analyse design

The elements and principles of design are the building blocks used to create design work. The elements are the key components of the design, whereas the principles can be thought of as the tools applied to create innovative and unique designs. The success of the final design relies on the unity of the functional and aesthetic aspects, the strengths and weaknesses, and the elements and principles.

The elements and principles are relatively objective components that can be used to analyse a design. Analysing a design involves 'pulling apart' each component or design feature, and examining and commenting on how, where, when and why each will be used. An example of how to analyse elements and principles of design is demonstrated in the provided on page 26.

## Analysis of elements and principles of design

### Focus area: textile arts

The information on page 26 is an excerpt from supporting documentation demonstrating an analysis of the elements and principles of design for a textile art wall hanging.

## Textile arts – Kathryn Peters

The function of the project is to be aesthetically pleasing. Therefore the aesthetic elements of the design are its strengths. However they can also be a weakness as the highly decorative surface is difficult to clean.

Wall hanging by Kathryn Peters



Major Textiles Project

The loops attached along the top of the wall hanging create shape. This is a strength as it allows the project to be hung straight and the loops, being visible, add to the overall design.

The seams used throughout the wall hanging create horizontal and vertical lines.

The use of black bordering fabric cut with a straight edge creates a thick line around the wall hanging design, which also creates contrast to the vibrant colours of the African design.

The distinct range of colours in the sunset creates both harmony and contrast within the project as the colours together are harmonious, but they also contrast with the dark trees and the glistening setting sun.

The use of the three wild cats creates repetition, as do the trees and bushes. The design is relatively evenly proportioned, which emphasises the realistic African design.

The use of fringing is an example of repetition in the project, as well as aiding in the proportion and rhythm.

A large variety of tactile and visual textures have been incorporated to create dimension and interest within the wall hanging. From the smooth and shiny hand of the silk in the fabric layering in the sky, through to the soft and smooth dyed cotton fabrics and felt, to the rougher Romeo trees and surface embellishment such as beading. The tactile and visual textures are a strength of the project.

Free-hand machine embroidery is used many times in the wall hanging to add texture, shape and colour. The use of rayon thread to complete this presents a lustrous and smooth texture; it also increases the vibrancy of the colours. The general repetitive stitching to fill in an area also creates a tactile texture.

The use of surface embellishments such as beading add texture and dimension to the project.

The innovative technique of digital imaging was used in the project to create the intricate detail of the animals. The printed pictures, with added detail of free-motion machine embroidery using rayon threads, created a contrast against the smooth texture of the silk images. Also, a contrast in texture was achieved, which helped to emphasise the natural shapes of the images.

The inclusion of different yarns throughout the project creates a variety of textures and effects. The couching of yarns in the grass creates shape and the inclusion of yarns and ribbons in the cording adds another dimension to the project.

The repetition of metallic threads/yarns incorporated into the sun, tree, bushes and lions' mane help to add contrast and colour to the design as this use of colour shows the reality of the sun coming through from behind.

Through the use of a variety of materials, innovative/creative techniques, and colour schemes symbolic of the African landscape represented in the design, unity is achieved within the wall hanging. The addition of the black bordering fabric creates a final design similar to that of a picture in a frame, which embodies the principles of harmony, unity and proportion.

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Define the term *design*.
- 2 Compare and contrast aesthetic and functional design.
- 3 Why is environmental sustainability an important factor for a fashion designer to consider when creating a new collection?
- 4 Identify the elements and principles of design.
- 5 Reflect on your creative textile experiences in this unit. Which techniques did you think were the most effective? Why? In the future, how could you use these techniques in textile projects?

## Websites

- ☺ Society for Responsible Design ([www.srd.org.au](http://www.srd.org.au)): An incorporated, independent, not-for-profit, volunteer-run organisation that aims to provide some of the answers in relation to environmental sustainability design.
- ☺ Fibre Fusion ([www.fibrefusion.com.au](http://www.fibrefusion.com.au)): Produces and sells supplies for felting, spinning, paper making and other textile pursuits, including wool batts.
- ☺ Silksational ([www.silksational.com.au](http://www.silksational.com.au)): Supplier of silk and textile art products, including wool batts.
- ☺ The Thread Studio ([www.thethreadstudio.com](http://www.thethreadstudio.com)): Supplier of textile products, including kunin felt, flimies (wool batts), Romeo and creative textile tool.
- ☺ Punch with Judy ([www.punchwithjudy.com.au](http://www.punchwithjudy.com.au)): Online supplier of textile products, including cloth pleater and needle-felting equipment.



1.25 Design palm cards

NelsonNet

Design crossword  
TEXD11IN010014  
Design word search  
TEXD11IN010015



# 2

## Communication techniques

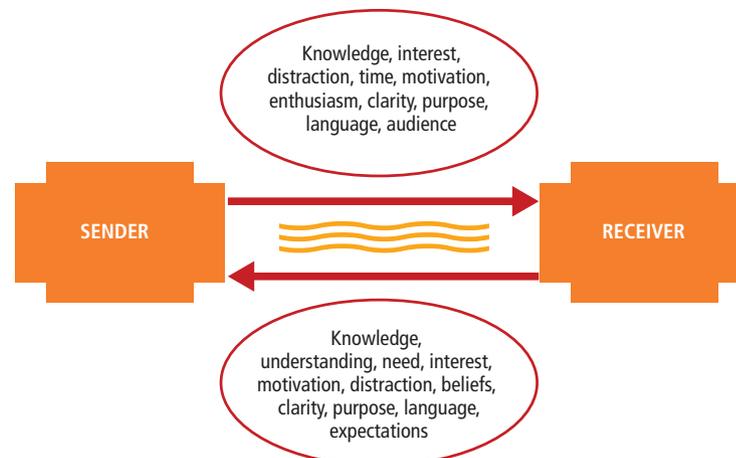
### Communication

**Communication** is one of the most important skills you can develop. It is often defined in simple terms as the transmission of information between a sender and a receiver using any of the five senses. Communication takes place in verbal and non-verbal forms, and often the two forms are mixed together to create the most efficient communication. For communication to be truly effective, it is essential that both the sender and receiver share a common meaning of the message that has been passed between them.

### Methods of communication for designers

Designers need to acquire effective communication skills to be successful. This does not mean that they need to be an expert in all fields of communication. It is possible, for example, for a designer to be successful even if they are not able to illustrate – they may have exceptional skills in written or verbal communication instead. Designers can also employ people with expert knowledge in any of the required design fields. For example, a designer without illustrative skills could employ another person to do that aspect of the design work.

Designers can share the meaning of their sources of inspiration, design ideas or visions in a variety of ways, including verbal and non-verbal communication methods or combinations of the two. The methods of communication all interact to provide the client, manufacturer or customer with a superior understanding of what the finished design will look like. The communication techniques will vary from one designer to another as all designers have their own preferred methods when communicating their design ideas. These methods will often be based on personal preference or specific talent. The designer may also be required to follow strict protocols for communication based on how a client or manufacturer expects the designer to present their work. These protocols are known as industry standards.



This communication model demonstrates factors affecting effective communication between a sender and receiver.

# Verbal communication

**Verbal communication** is that which is spoken. Successful verbal communication can depend both on the speaker's tone and delivery and on how the speaker integrates non-verbal elements into the communication. Verbal communication methods and environments can include:

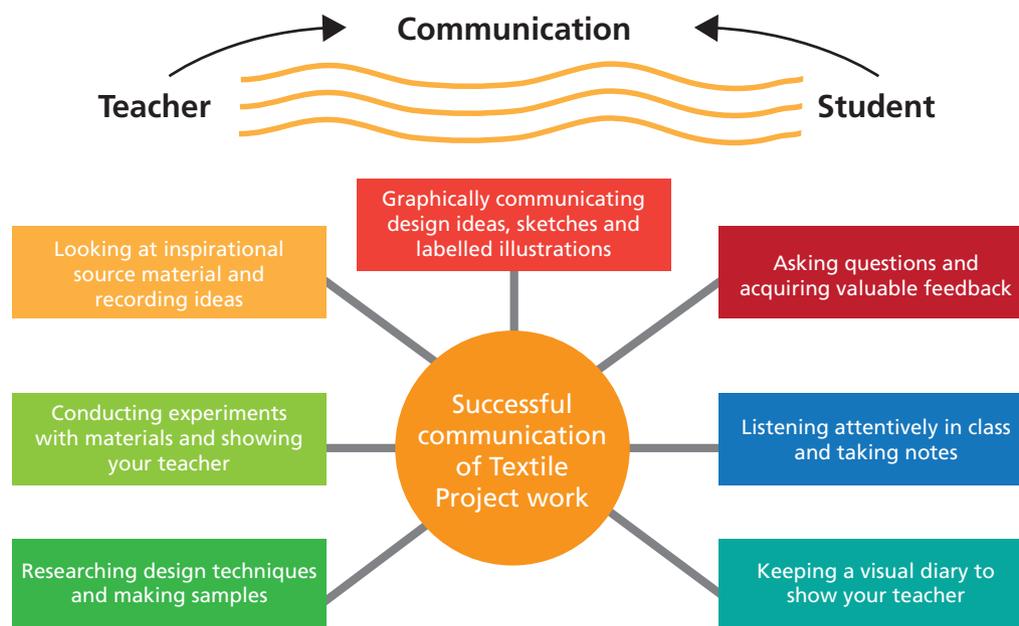
- personal meetings or conferences
- phone calls, including teleconference calls
- web conferencing.

The criteria for effective verbal communication include audience, purpose, context and language. When you are speaking to a friend or a teacher, you are communicating more than just words.

A student will often use written and graphic visual aids in a Textiles and Design presentation to assist in the understanding of design and design concepts, the purpose of the Australian Textile, Clothing Footwear and Allied Industries (ATCF AI) and the understanding of properties and performance of fibres, yarns and fabrics.



2.1 Planning scaffold for oral presentation



This communication model demonstrates effective communication between a teacher and a student in relation to Textiles Project work.

The following tips are for communicating via spoken word. The factors discussed in the table are interrelated and work together to form successful verbal communication.

Oral presentation	
Audience	Consider your audience. What do they expect from your presentation? What will interest, inform and hold their attention? Will they understand what you are trying to convey? Your presentation will be more effective if you maintain eye contact, use a clear speaking voice and choose words that are appropriate for your audience.
Purpose	What is the main intention of your presentation? Do you want to inspire, inform, educate, persuade, argue, demonstrate or achieve something else? Consider the tone of language that would best fit your purpose and use it to make your presentation dynamic. Know the key elements of what you want your audience to understand. Remember: you are the messenger, so it is up to you to deliver the message.

Oral presentation (continued)	
Context	<p>Consider the context of your presentation. The context is aligned to the purpose but is closely related to the direct outcome of your presentation. This means getting to the point, knowing exactly what you need to achieve, and delivering the message appropriately and in a timely manner.</p> <p>The presentation should not be read. It should be presented to your audience based on knowledge that you have acquired through research and preparation, and should demonstrate a clear understanding of the topic. If you understand the information, you will have a better chance of putting it in context for your audience.</p> <p>For a Textiles and Design presentation, you will need to be aware of what the teacher is assessing and make sure you are addressing the context in which the assessment has been set.</p>
Language	<p>The language you use should be appropriate. The way you speak to your family, friends, classmates and teachers is often different. Success in oral presentation delivery is often part of an assessment task for Textiles and Design, so choosing the most appropriate language for your audience will ensure that your delivery is more successful.</p> <p>Be confident – use a clear speaking voice that is well paced and energetic.</p>

## Non-verbal communication

**Non-verbal communication** is that which is unspoken. It can include written words, graphic or symbolic representation, body language and gestures. Examples of non-verbal communication methods include:

- samples or prototypes
- graphics, including computer-aided design
- newsletters, magazines or various print media
- show cards
- websites
- photographs
- sketches, such as freehand illustrations
- emails and faxes
- blogs
- PowerPoint presentations
- folios.

Two common types of non-verbal communication used by designers are written and graphic communication.

## Written communication

The criteria for effective **written communication** include appropriate text type and font, use of space, audience, purpose and context. In most applications of written communication the use of text type and font is a very expressive form of communication. A designer is able to choose from a variety of font and text types and each font design exhibits style. The style chosen can dramatically affect the finished design. As with all forms of communication, many factors must be considered: the use of positive and negative space, the purpose of the writing, the context in which it will be presented and the intended audience.

### Text type and font

A **text type** usually refers to the typefaces used for the main text of written material.

A **font** can be defined as a complete set of characters in a particular size and style of type.

There are literally thousands of font types, and many more are designed every day. Computer software programs usually come with a set of standard fonts, and numerous websites offer free fonts or designer fonts for purchase.

Font type Times new Roman Aa Bb Cc Dd Ee Ff	Font type Arial Aa Bb Cc Dd Ee Ff	Font type Chiller Aa Bb Cc Dd Ee Ff	Font type <b>Ravie</b> Aa Bb Cc Dd Ee Ff
Font type <b>Baby Kuffy</b> Aa Bb Cc Dd Ee Ff	Font type <i>Lucinda calligraphy</i> Aa Bb Cc Dd Ee Ff	Font type <b>Froster</b> Aa Bb Cc Dd Ee Ff	Font type CASTELLAR AA BB CC DD EE FF
Font type <i>Riba super</i> Aa Bb Cc Dd Ee Ff	Font type <b>Broadway</b> Aa Bb Cc Dd Ee Ff	Font type <b>ehick</b> aa bb cc dd ee ff	Font type <b>croobie</b> Aa Bb Cc Dd Ee Ff
Font type <i>Harlow Solid Italic</i> Aa Bb Cc Dd Ee Ff	Font type <i>Gigi</i> Aa Bb Cc Dd Ee Ff	Font type <b>Jokerman</b> Aa Bb Cc Dd Ee Ff	Font type <b>Wide Latin</b> Aa Bb Cc Dd Ee Ff

This selection of fonts, chosen from Microsoft Word, illustrates some of the differences in font style. The text type is 12 point and no other features such as bold or italics have been added.

When you write information for your supporting documentation, you can select different fonts to suit the nature of your textile project. It is imperative that you choose a text type no smaller than 12 point, otherwise it is too difficult to read. The Board of Studies suggests students use a legible font for supporting documentation as this assists the clarity of written presentation and communication of work.



2.2 Written communication:  
text types  
2.3 Written communication:  
use of space

## Use of space

The way you use space when you design your written page is very important. Headings of different sizes, space between lines, and paragraphs to separate new ideas or themes are all important factors that lead to a successful design layout.

White space is also known as negative space. Without an adequate amount of negative space, text would become unreadable, graphics would lose their prominence, and there would be no sense of balance between the design elements on a page. Negative space describes open space that exists between all design elements, including shape, colour, texture and line. It is found between letters, words, headings and



paragraphs of text. It exists between all of the elements of the page and is important for providing interaction between textual, visual and graphic design objects.

The balance of text to negative space ratio affects all the design elements on a page layout. This example is a production drawing.

## Audience

The font type used in written communication should be selected based on the intended audience. The dynamics of font can be very effective and can add meaning to the overall concept of the design work, so you will want to select a font that is appropriate for the reader.

## Purpose

The primary purpose of written communication is to inform. Whether the information is educational, inspirational, meant as advertising or demonstrates understanding or knowledge of a topic in assignment work, it is all about getting your message across. There is no use creating the work if it is not easy to read or has slabs of text without space, headings or graphics that will interest the reader. Designers need to get their message across in a vibrant way. This ensures that the purpose of their work is worth the effort.

Textiles and Design students need to develop skills in communicating ideas in a variety of written methods for appropriate applications. This can be done through handwritten and computer-based technologies. The purpose of student work in Textiles and Design is to demonstrate to the teacher the understanding and application of sound written communication. The teacher can provide initial feedback, and then examiners will assess written communication in both the written paper and supporting documentation.

## Context

It is important to keep your writing in the context of the Board of Studies requirements for project work. The supporting documentation that you produce in class must be related to your design concepts and must answer the questions that have been set for you. Designers in industry also have specific contexts within which they have to work, often defined by their clients.

## Graphic communication

**Graphic communication** is any form of visual artistic representation. Freehand sketching, rendering, illustration, drawing symbols or shapes, or taking photographs can create graphics. Graphics can also be created via appropriate computer graphic software programs by using photographs that can be stored, manipulated and retrieved.

A powerful skill a designer can develop is the use of graphic communication in design. This can be in the form of object drawing (including views from different perspectives), two- and three-dimensional drawing, rendered illustrations, industry production drawings and pictorial representations. Graphic communication allows almost instant understanding of a design concept. One old saying often quoted says, 'A picture paints a thousand words.' A designer can represent ideas quickly in sketch form to convey ideas or design concepts. Graphic designs can be shown to a client or kept in a book, such as a journal of inspirational ideas, which may be revisited later on in the design process.

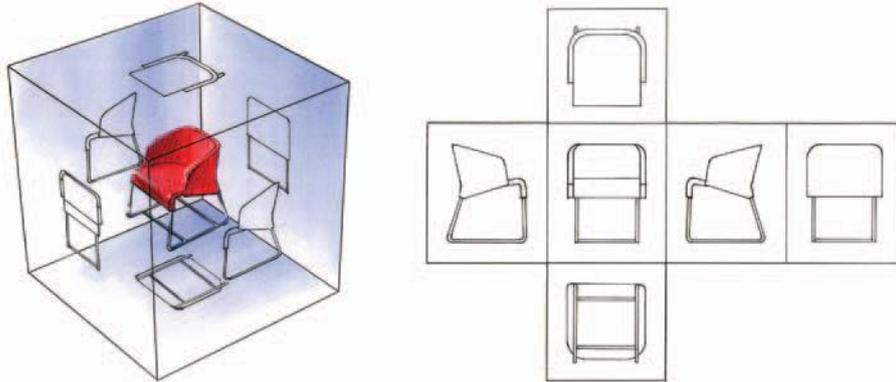
If designs are to be realised from initial idea sketches or rendered illustrations to functional and aesthetically pleasing designs, a designer must create industry production drawings. This type of graphic communication demonstrates industry standards necessary for manufacturing the item. On these production drawings, correct dimensions and proportions provide accurate details of pattern pieces.



Design inspiration created using a harmonious colour scheme based on a peacock theme

## Orthogonal 2-D object drawing

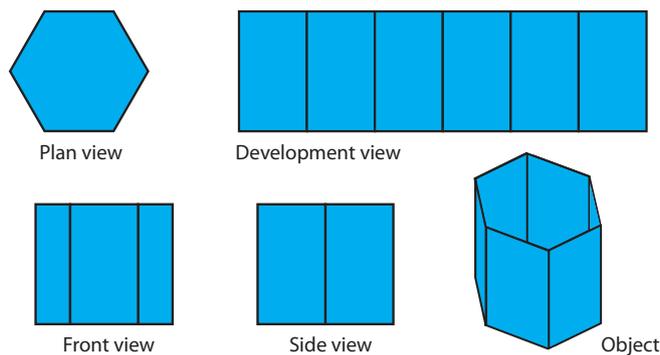
**Orthogonal (or two-dimensional) drawings** are sometimes known as working drawings or multi-view drawings. They demonstrate section specifics and assembly features. Orthogonal drawings give different views of an object. These types of drawings are used mostly when communicating information graphically to industry where the drawing needs to be analysed. The information analysed from the drawing enables the industry worker to develop the design ready for manufacture.



Visualisation

Every orthogonal drawing must be drawn in proportion to the original three-dimensional object. The scale must be applied consistently throughout the drawing and indicated on the page. The first numeral in the scale ratio indicates a measurement on the drawing, while the second numeral indicates the equivalent measurement on the actual object. For example, a scale of 1:5 indicates that one unit of measurement on the drawing represents five units on the actual object.

These drawings have scale, proportion and dimension included. Orthogonal drawings can show plans, elevations, developments, sections, cross-sections or specific structure plans.



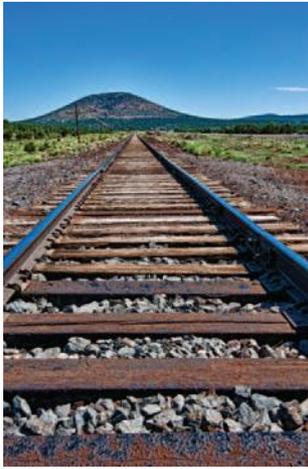
Orthogonal drawings are two-dimensional and show a variety of object views. They are usually drawn to scale or have dimensions added so that design profiles are conveyed to the industry.

## Pictorial 3-D object drawing

**Pictorial (or three-dimensional) drawing** is where an object is drawn onto a flat surface with the main aim of demonstrating a certain element of realism, no matter what the style. There are several ways a graphic design can be created via pictorial representation. Pictorial drawing includes perspective drawing, planometric and isometric styles.



- 2.4 Step-by-step guide to one-point perspective
- 2.5 Step-by-step guide to two-point perspectives
- 2.6 Step-by-step guide to orthogonal drawing



Perspective phenomenon – the long, straight railway seems to narrow as it heads towards the horizon, but the tracks are parallel.

### Perspective drawing

Perspective drawing creates the illusion of a three-dimensional object on a two-dimensional surface. When we see an object, our brain tells us that the object gets smaller as it recedes into space. We know for a fact this isn't true, but it is what the eye sees.

The most common methods of perspective drawing are one-point perspective (see page 39) and two-point perspective. Three-point perspective is sometimes used in illustrations where a dramatic and exaggerated representation is required.

Perspective drawing can be completed freehand or by using technical drawing equipment or CAD systems.



The sides of the building recede to separate vanishing points.

### Fashion drawing

**Fashion drawing** is a stylised type of pictorial drawing. The fashion figure is usually elongated to reflect a tall, thin base model. Fashion drawing is an art form that is revered around the world. There is no specific technique required; each designer uses their own artistic manner to create distinctive fashion illustrations that are representative of their design style. Fashion drawing is a unique quality of drawing that fascinates and captures the imagination of the audience. There is no right or wrong way to draw; like all skills, it is one that is developed over time and refined with practice.



Fashion drawing created using felt-tip pens



Fashion drawing rendered with water-colour paints

While there are no rules for fashion drawing, there are some basic tips that may help you get started with your illustrations.

- You do not need to be an expert. Anyone can begin to draw and the more you practise, the better you become.

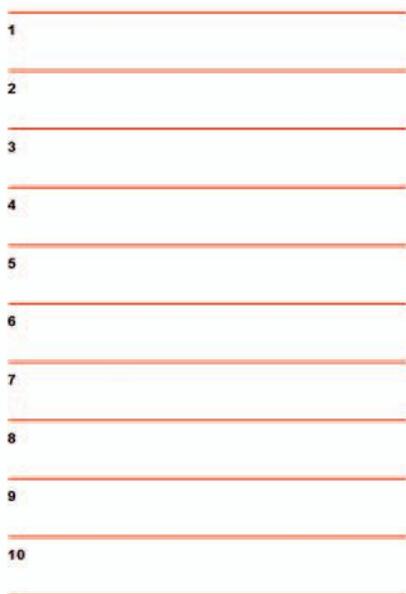
- Develop confidence as you practise your skills.
- Decide on a style that will capture the mood of your design.
- Think creatively and design for maximum audience impact.
- Try different styles of illustrations and ways of rendering your designs.
- Label the features your designs provide.
- Innovation is great but remember to balance aesthetics with functionality for a sound design concept.
- Use the elements and principles of design as a basis for reviewing your work.
- Educate yourself and be aware of fabric properties and performance. The fabric choice will affect the drape, look, feel and handle of your garments. Fabric choice will also dictate the selection of finishing and construction choices in your designs.
- Always present your work to your best ability.
- Sign and date your original work.
- Be proud of your designs.



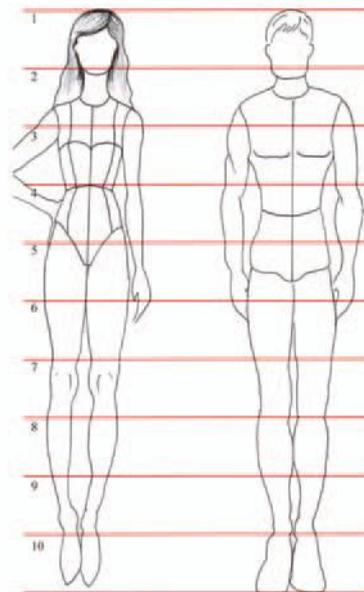
- 2.7 Fashion drawing
- 2.8 Female figure templates
- 2.9 Male figure templates
- 2.10 Children and teenage figure templates
- 2.11 Using fashion figure templates
- 2.12 Ten-head female model proportions

### Figure sketching

Drawing style is personal. There are different ways of approaching fashion drawing and designers develop their own unique style over time. Fashion figure sketching can range between eight to ten heads in height. The figure-sketching model used in this chapter is based on models that are both nine and ten heads high. This means you basically start by drawing a head shape and then make marks to create a set of gridlines. You can create a blackline master from these gridlines to use as a basis for figure sketching over and over again.



A set of gridlines used in figure sketching



Basic figure line drawings of a female and male using gridlines

NelsonNet

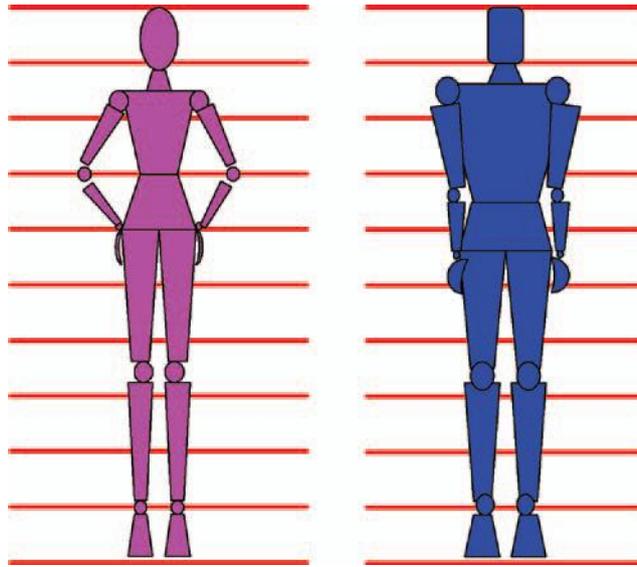
Gridline master template  
 TEXD11TM020017  
 Male and female grid  
 templates  
 TEXD11TM020018

### Computer-aided design

Various computer technologies can be used to create fashion illustrations.

Hardware such as graphic tablets, a stylus, a mouse, scanners and USB ports are great for starting input for design work.

Software such as Adobe Illustrator, Photoshop and InDesign are industry-standard programs that help you create and edit your work. Programs such as Microsoft Word, PowerPoint and Paint can also be used to create illustrative designs.



Fashion model trapezoids can be used under a sheet of sketch paper to give you a sense of proportion when you first start drawing. These can be used to make basic figure line drawings. As you practise and improve your illustrating skills, you will be able to move the figures and change poses.

Fashion model trapezoids for women and men created using Microsoft Word auto shapes, formatted with colour fill



2.13 Thumbnail figure templates

### Thumb sketches

Many designers start to record their design ideas using a series of small sketches called thumb sketches. These are an important part of the design process and can be used to evaluate designs before selecting the most appropriate for the specific end-use.

### Drawing human features

When you begin to draw it is a good idea to practise shapes and different views of a diverse range of features. There is no right or wrong way to represent features on an illustration. Here are some basic illustration techniques that may help you begin the fashion drawing process.

#### Eyes

Eyes are one of the most beautiful features of the human body. The colours of eyes are diverse and in fashion sketching you can exaggerate features such as eyelashes, size and colour of pupils.

#### Ears

A simple silhouette can represent ears or they can be much more detailed. They can also be hidden by hair. Ears become important features when your illustration includes accessories such as earrings or sunglasses.



Eyes

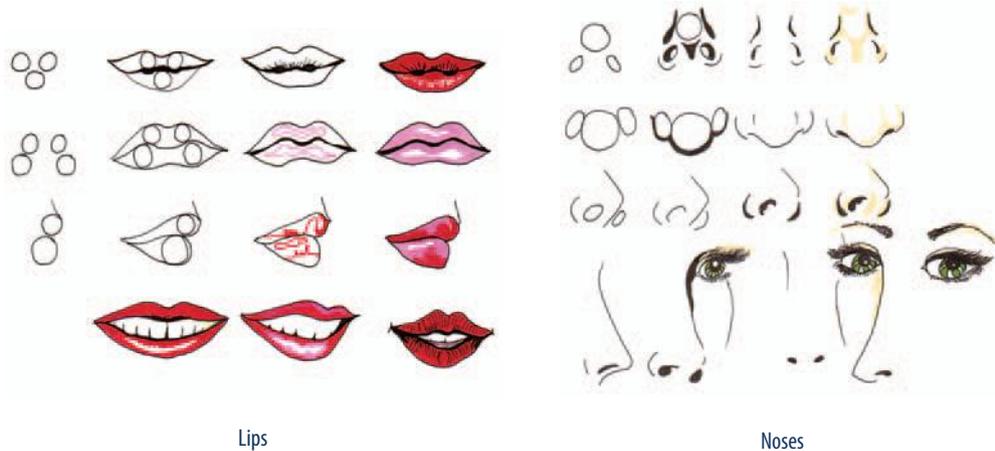
Ears

## Lips

Lips can be represented by simple line drawings, or they can be filled out for a pout or smile as seen in typical fashion illustrations. It is a good idea to add shine to lips on female fashion illustrations, which can be done by simply leaving a white space to suggest reflected light.

## Noses

Noses are quite complex. A fashion illustration usually simplifies the nose to a series of simple lines to indicate nostrils, the bridge and the tip. Noses will change the appearance of your drawing. Try out different shapes and angles.



Lips

Noses

## Faces

Some fashion illustrators prefer not to draw faces. This is quite acceptable, but it is best not to draw headless models. Figure sketching always looks more professional when it includes even the simplest elements or features of a human face. This may be represented pictorially as hair swept across the face, headdresses or hats.

## Hair

Hair can add value and interest to your illustration. Different hairstyles will help demonstrate the fashion style and the design of the clothes you want to present. Once you have decided on a hairstyle, you can add highlights and texture through rendering.



Faces

Hair

NelsonNet

Face grid template  
TEXD11TM020020



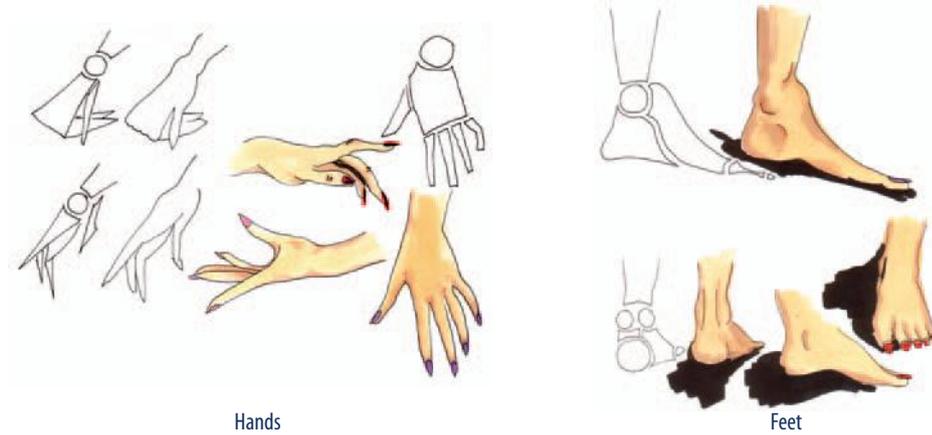
2.14 Drawing a face master grid  
2.15 Digitally rendering a face

## Hands

Hands are deceptively large. As a general rule it is better to draw your hands too big than too small. An open hand almost covers a face, which is useful to remember when illustrating to help with proportion. When drawing hands, taper the fingertips and soften the lines so that they do not appear as an outline.

## Feet

Feet are also very large, and are actually the same size as your head. The feet balance a whole image, so it is important to use the correct size to ground the image. Practise drawing feet and shoes to improve your skills.



## Creating fashion illustrations from photography

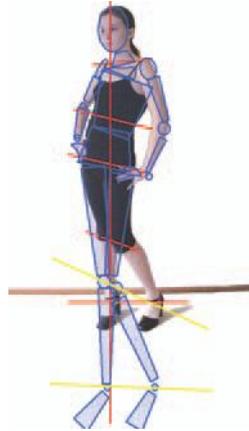
You can create your own fashion illustrations based on photographs you have taken or from magazines. When you use a photograph, it contains realistic proportions that need to be changed to fashion-illustration proportions. To do this you need to extend the leg length in both the thigh and calf regions. The model shown below has been extended to nine heads in height. If you want to extend your model to be ten heads high, add either one more head length to the thigh area or half a head length to the thigh area and half to the neck area. You can play around with proportions; for example, moving the shoulder widths further apart, lengthening the neck and thinning down the waist gives a taller, more willowy appearance.



2.16 Fashion templates from photo inspiration



The model in this photograph has been asked to pose in a fashion stance.



Once you have your photographic image, mark in balance lines (red) and extended balance lines (yellow), and draw trapezoid shapes over the top of the photograph.



Use a light box or a window to transfer your shapes onto a new piece of paper to use as a template.

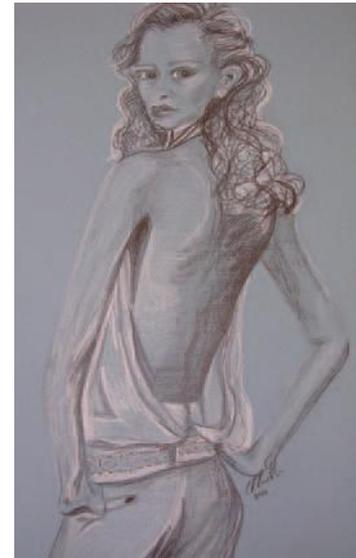


Use your own template to create a unique fashion illustration.

# Rendering

**Rendering** in Textiles and Design is the art of interpreting fabrics and textures in an illustration. It converts the design into another form of communication from the designer to the intended audience. Depth is created by using line, colour, value, texture, form and shape. Rendering adds value to the illustration by putting it into a more realistic perspective. Fashion and textile illustrators can take their skills beyond simply outlining and filling in colour blocks by learning how to draw without lines. In the real world, very few objects have actual lines defining their shape. Fabrics and textiles have contrasting values that identify the object's parts according to the play of light on the surface of the design.

Rendering for a fashion illustration is limited only by your own creativity. It is a good idea to select your rendering technique to reflect the style of the design and the type of fabric you want to portray. You do not have to rely on just one method of rendering your design work. Mixed media is a term used when designers use a variety of colouration or texture types to represent their work. Rendering for fashion illustration is only limited by your own creative boundaries. A surprising number of conventional and unconventional materials can be used to create your design illusions. For example, nail polish helps achieve a patent leather look, and glitter helps add texture to the representation of lamé fabrics.



Mixed-media rendering using value scales of black and white pencil on Canson card, embellished with silver glitter paint details



Some rendering materials for graphic illustration



Rendered one-point perspective drawing of a lounge room

Rendering materials for graphic illustration include:

- lead pencils
- Aquarell or water-sketch pencils
- water colours
- oil colours
- pastel
- gouache
- acrylic paints
- resists, such as wax crayons
- fabrics
- magazine cutouts or collages
- stickers, wrapping papers, tissue papers
- fibre-tip pens, such as Tria Letraset or Pantone markers
- objects such as feathers, beads, leaves or dried flowers
- special paints, such as pearlescent and glitter
- computer gradients, textures and filters.



2.17 Step-by-step guide to drawing an interior room

## Sample rendering techniques



2.18 Rendering  
2.19 Creating a rendering folio

Rendering sample	Technique
	<p>Use a white wax crayon to draw swirls all over a piece of paper. Paint gouache or water colour over the top. The wax creates a resist that forms a lacy pattern.</p>
	<p>Scrunch up white tissue paper and attach to your work with glue. Allow the paper to dry and then paint or draw your lines on top of the image. This creates great folds for skirts and dresses.</p>
	<p>Use coloured card with a texture already imprinted on it. Use only black and white pencils to render your image.</p>
	<p>Decorate your design using swirls of acrylic pearlescent paint and black Artline defining pen 0.4. Also embellish with flower shape sequins.</p>
	<p>Draw your design using pastel pencils. Use your finger to smudge and mute the tones to create depth.</p>
	<p>Rip, tear, shred, scrunch or fold wrapping paper to render your illustration. Use old pieces of jewellery, buttons, shells, feathers or objects you have found to also add interest.</p>

# Industry production drawing specifications

**Industry production drawing** requires correct dimensions and proportions, and accurate details on drawings and pattern pieces. Industry production drawings are technical trade sketches that effectively communicate all the necessary requirements for a manufacturer, pattern maker and machinist to produce a garment or textile item. This type of graphic illustration does not require artistic style or rendering.

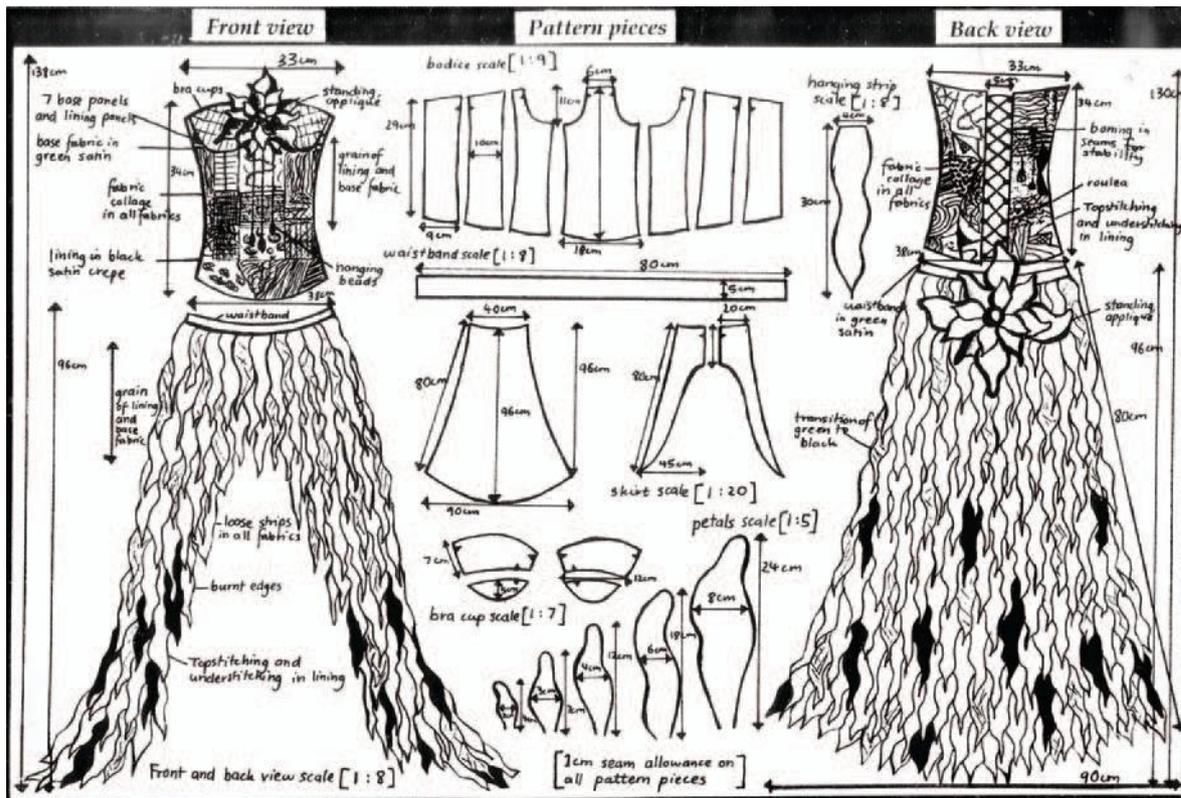
The main function of the graphic is to communicate information that will enable a manufacturer to transform it into a product. Production drawings are sometimes called production flats as they are a two-dimensional flat drawing of the front, back and design feature views. They are usually used with a manufacturing specification sheet and a fashion illustration. Using a combination of written, verbal, non-verbal and graphic communication techniques will ensure a manufacturer understands the design.

Industry production drawing specifications must be completed to scale and proportion, and include:

- an accurate, detailed description of the item
- production sketches of a professional standard that clearly reflect the item
- front, back and featured views, such as the structure of a crinoline underskirt or embroidered motif
- pattern shapes with appropriate markings
- construction details such as grain line and placement lines for seams, hems, closures, pleats and folds
- design details such as trims, pockets, buttons and topstitching
- fully dimensioned drawings that communicate appropriate measurements, number of seams, and sizes of items such as cuffs, collars, hanging dimensions and hems.



2.20 Production drawing

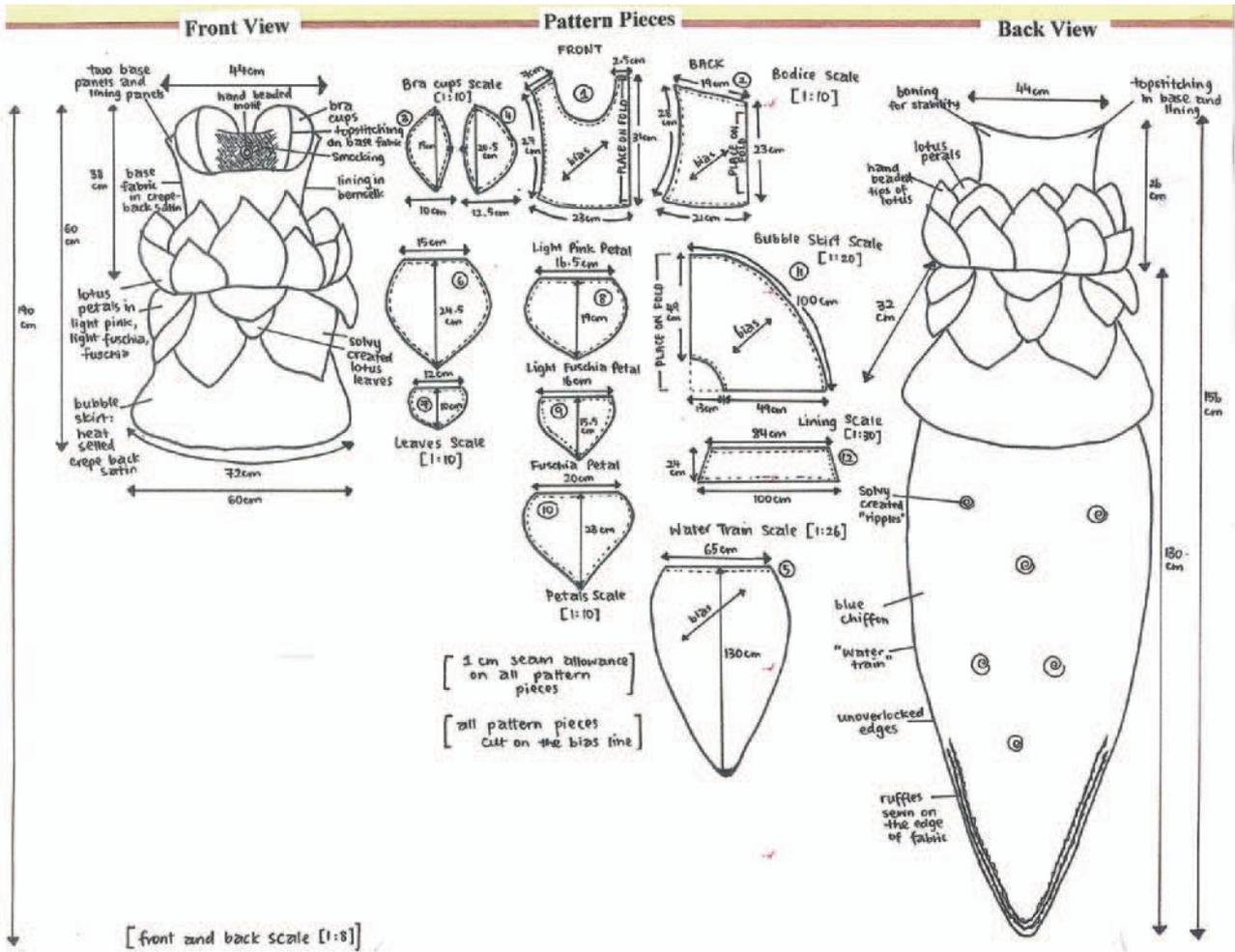


Original production drawing by Emma Burns



Emma Burns – Textile Arts Major Textile Project

Drawing by Emma Burns



Drawing by Karen Fu

Original production drawing by Karen Fu



Karen Fu – Textile Arts Major Textile Project

## Graphic design presentation layout

Written and graphic communication techniques combine to present a graphic design presentation layout. This process is essential in communicating the dynamics of design to an audience. It is important to consider that you will not always be available in person to explain your work. For the HSC Major Textiles Project, you will need to develop competent communication skills to be effective in the graphic design presentation layout of your work and to communicate your design ideas to an examiner. The communication skills you develop during Preliminary Textiles and Design will help you achieve this.

Following are guidelines for layout ideas and supporting documentation in Textiles and Design.

- Work on standard-sized paper: A4 or A3.
- Choose one mode of orientation: portrait or landscape.
- Use a clear and legible font.
- Create clear headings appropriate to your teacher's marking guidelines or the required headings directed from the Board of Studies to guide the reader through your work.

- Consider the style and size of images and use only those that are visually linked to your design concepts.
- Consider all the elements and principles of design when laying out your pages.
- Aim to achieve a mixture of written text and visual images in your communication.
- Include appropriate computer skills, such as word processing, to make your presentation more professional.
- Secure all images and written text to the page.
- Ensure no part of your graphic design presentation layout requires a reader to fold out or turn over an overlay.

## Communication-based technologies

Computer-aided design (CAD) is used extensively in the design industry. CAD is any system that uses software that enables a user to modify, communicate, create, store and retrieve illustrative material, patterns, graphics, scans, swatches or artwork. Such software can be used to assist in drawing designs.

There are many advantages that make CAD such a great tool for design:

- CAD allows a faster design response to consumer and product market demand.
- Designs can be rendered with texture, pattern and colour explicit to the clients' needs.
- Finished designs can be easily manipulated to be draped onto three-dimensional models of furnishings, apparel, textile art, non-apparel and costume designs. These images can then be changed quickly to accommodate design colour schemes or different versions of the same idea.
- Professional and sophisticated modelling of designs can be electronically transferred quickly to clients via email systems.
- Digital designs can be directly printed onto fabrics via direct digital printing.
- Fabric patterns, weaves, knits, textures and prints can be designed and chosen on a computer screen. The information can then be sent directly to printing, weaving and knitting machines ready for manufacture.



Ease of changing colour and pattern design in CAD

- Designer-drawn fabrics can be chosen from a screen and printed directly, saving time and money in traditional production runs with minimum orders.
- Pattern-making programs can alter and modify basic pattern pieces.
- Input data into a pattern-making program can be altered via sophisticated grading systems and printed out directly onto paper at the work site or used directly by computer-linked machinery.
- Pattern data drawn and scanned directly via CAD can work out the most economical way to arrange and cut patterns for fabric layout, minimising wastage.
- Computer-aided embroidery can be created by scanning original drawings, saving the data into a laptop and then linking the laptop to a sewing machine.
- Drawings can be quickly scanned into a computer. A wide range of colour choices, fabric designs, fashion silhouettes and garment details can be easily changed to suit design requirements without having to take the time and cost to manufacture sample garments.
- A graphic tablet and stylus can be used to freehand sketch and store the information in a computer for a variety of uses.

## Activity

2.1

## Digital fabric printing



Visit [www.bravoprint.com.au](http://www.bravoprint.com.au), [www.digitalfabricprint.com.au](http://www.digitalfabricprint.com.au) and [www.imagescience.com.au](http://www.imagescience.com.au). Explore the possibilities of digital fabric printing for the Australian textile industry.

- 1 Briefly describe the process of digital fabric printing.
- 2 Identify suitable end-uses for digital fabric printing.



Examples of digital fabric printing

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Define the term *communication*. Why are highly developed communication skills important as a student of Textiles and Design?
- 2 Identify the required communication skills needed to be a successful designer.
- 3 Create a five-point checklist for positive verbal communication.
- 4 Explain the difference between two-dimensional and three-dimensional drawings.
- 5 Create a five-point checklist for effective design presentation layout.
- 6 Describe how communication-based technologies can be used in the textile industry.



2.21 Communication palm cards

## Websites

- ☺ StartingAClothingLine.com ([www.startingaclothingline.com](http://www.startingaclothingline.com)): An informative website about breaking into the fashion industry, with a section about learning to use CAD programs for designing fashion.
- ☺ Designers Nexus ([www.designersnexus.com](http://www.designersnexus.com)): The 'sketches' section of this website offers ideas and help for fashion design, rendering illustrations and production flats.
- ☺ Fashion Era ([www.fashion-era.com](http://www.fashion-era.com)): This website, especially the 'Fashion tutorials' section, includes fashion illustration tips and style silhouettes for a variety of fashion eras.



# 3

## Manufacturing methods

To succeed in Textiles and Design you must have a strong understanding of the equipment available and the expertise to use the equipment to complete appropriate functional and aesthetic techniques. Equipment includes major items like the sewing machine, overlocker and embellishing machine, as well as small equipment like irons, scissors, tape measures, marking tools, pins and needles. As equipment is available in many different brands, types and sizes, it is important to have the knowledge and understanding of the most appropriate equipment for the specific end-use.

### The sewing machine

There are many different brands of sewing machines, but they all have the same parts and are threaded in a similar way.

You must be able to identify the parts of the sewing machine and know how to thread the sewing machine correctly as you cannot assume the machine is set to the correct stitch setting for your sewing. Every time you sit down at the sewing machine, check that the following parts of the machine are set correctly: thread tension, stitch selector, stitch width dial, stitch length dial, needle position and feed dog control.



3.1 Parts of the sewing machine



Bernina Activa 230 sewing machine

NelsonNet

Threading the sewing machine

TEXD11AS030021

### Threading the sewing machine

Sewing machines are all threaded in a similar way, but you will need to refer to the specific manual for your machine to ensure you are threading it correctly.

# Machine needles

Many different sewing machine needles are available. Each needle has been designed for a specific fabric type and thread type. The selection of a machine needle depends on:

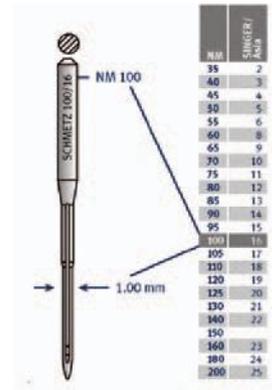
- fabric type and weight
- thread type
- stitch type.

Today there are mainly two size designations in use for sewing machine needles:

- International metric size designation: This 'number metric' (NM) indicates the diameter of the needle blade in hundredths of a millimetre measured above the scarf or the short groove.
- Singer size designation: This designation is still in use today, especially in the United States.

In the metric system of needle numbering, the smaller the number, the finer the fabric:

- Size 70 is suitable for lightweight fabrics like organza, lining and chiffon.
- Size 80 is suitable for medium-weight fabrics like microfibre, drill, double knit and satin.
- Sizes 90 and 100 are suitable for heavyweight fabrics like denim, lycra, wool suiting, fleecy, upholstery and vinyl.



Universal needles are suitable for most fabrics, especially wovens. They have a slightly rounded point.



Stretch needles have a medium ballpoint, special eye and scarf area to prevent skip stitches, especially in highly elastic materials. They are suitable for all knit fabrics.



Microtex needles have a very slim, acute point for easier piercing of very fine or densely woven fabrics. They are suitable for precise stitching of edges, and also for silk, microfibre fabrics, coated materials, foils and artificial leather.



Topstitch needles are sharp needles with a long eye (2 mm in all sizes). They are used for topstitching and decorative stitching with multiple threads.



Jeans needles have a medium ballpoint that penetrates thick and solid fabrics without damaging the material. They are suitable for denim, heavyweight fabrics or multiple layers of fabrics.



Metallic or metalfil needles have a universal point, a large elongated eye and a large groove to allow fragile metallic and synthetic filament threads to flow smoothly.



Embroidery spring needles have a spring around the needle, which assumes the function of the presser foot. They are used for embroidering in a frame without a presser foot, for individual patterns, free-motion stitching and better visibility during embroidery.



Hemstitch needles have a 'wing' on each side of the needle blade that pushes the fabric aside. They are used for decorative seams and hemstitching in loosely woven fabrics.



Twin needles are two needles on a single shaft that produce two rows of stitches. The needles come with universal, stretch, embroidery, denim or metallic points and are used for pintucks, and single and multi-coloured decorative seams and hems.

Images from Schmetz

# Manufacturing methods



3.2 Seams  
3.3 Manufacturing technique scaffold

It is essential to consider many factors when selecting a suitable production technique for use in the construction of a textile item. First, consider the fabric you are using. Is it woven, knit or non-woven? Is it light, medium or heavyweight? The fabric type will determine whether a technique is suitable, and also the type and size of machine needle to use. Next, consider the end-use of the textile item and how it will be cared for.

## Seams

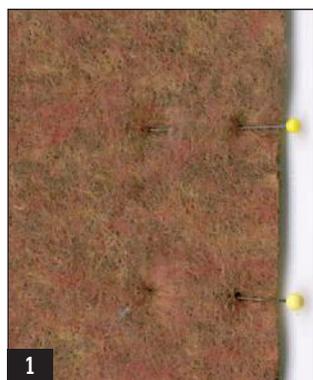
A **seam** is the basic structural element of all textile items.

### Skill development 3.1

### Seam



Seam – 100% acrylic felt, medium-weight fabric. This fabric is a non-woven and will not fray; therefore, it does not require neatening.



### Method

- 1 Pin the two right sides of the fabric together. Place the pins perpendicular to the seam line so that it is easier to remove the pins as you stitch the seam. It is important not to stitch over the pins as you may break a machine needle.
- 2 Use the needle plate as a guide to ensure your stitching is straight. The standard seam allowance on a commercial pattern is 1.5 cm, so you need to find this marking on the needle plate and line up the edge of the fabric on this groove in the needle plate.
- 3 Always reverse for 1 cm at the start and end of your seam to secure it. Use the stitch width 0 and stitch length 2.5 (SL0/SL2.5).

### Skill development 3.2

### Overlock seam



Four-thread overlock seam – 65% polyester, 35% cotton fleecy, medium-weight pile knit fabric. Overlocking is suitable for knit fabrics as overlock stitch has give in it and stretches with the fabric.



### Method

- 1 Overlocking has an advantage over a sewing machine as it trims the fabric, stitches and neatens the seam in the one action.

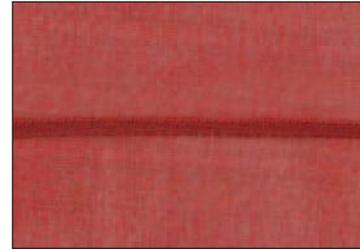
A French seam is suitable for sheer fabrics as all the raw edges of the seam allowance are enclosed within the completed seam.

### Method

- 1 Place the wrong sides of the fabric together and stitch 1 cm from the edge.
- 2 Trim the seam allowance to 3 mm.
- 3 Place the right sides of the fabric together, with the first stitching line exactly on the fold. Press. Stitch 5 mm from the fold. Press the seam to one side.



3.4 French seam  
3.5 Flat-felled seam

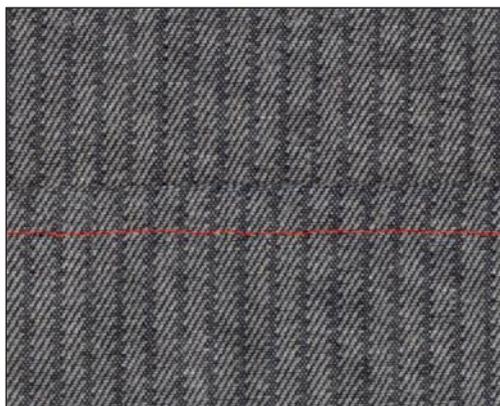
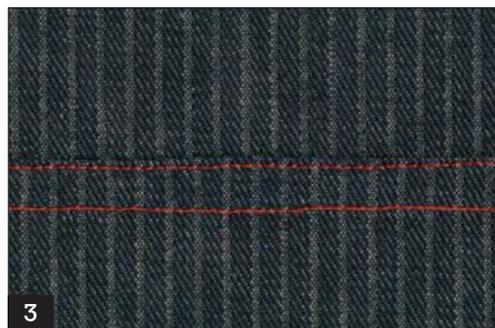


French seam – 100% silk organza, lightweight plain weave

This is a strong seam and is often used on jeans, sportswear and children's clothing. It is a decorative seam as the stitching is visible on the right side.

### Method

- 1 Place the wrong sides of the fabric together and stitch 1.5 cm from the edge. Trim one side of the seam allowance to 3 mm.
- 2 Press under 4 mm on the untrimmed seam allowance.
- 3 Press the seam allowances flat and stitch close to the folded edge of the seam allowance.



Wrong side of a flat-felled seam – 100% cotton denim, medium-weight twill weave

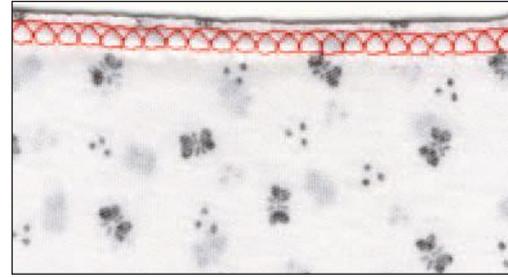


3.6 Stretch stitch seam  
3.7 Pin-stitched seam finish

Knit fabrics require a seam stitch that will give as much as stretch in the fabric, otherwise the stitching will snap when the garment is worn.

### Method

- 1 Sewing machines have a variety of stretch stitches that are suitable for knit fabrics.



Stretch stitch seam – 65% polyester, 35% cotton interlock, lightweight double knit

## Seam finishes

A **seam finish** is used to make a seam neater or to stop the raw edges of the seam allowance from fraying. These techniques are not essential but will give your textile item a more professional look.

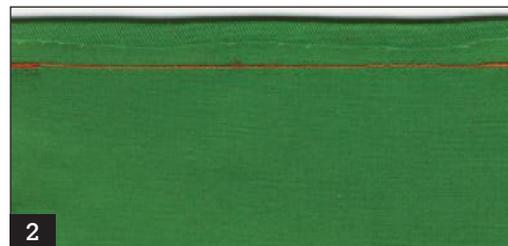
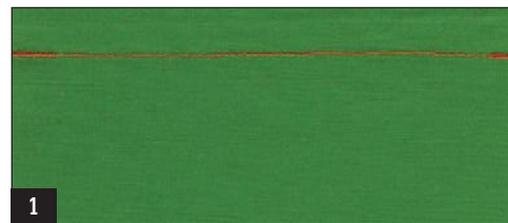
This seam finish is suitable for light- to medium-weight fabrics. It is a very neat finish as no raw edges are visible.

### Method

- 1 Place the right sides together and stitch 1.5 cm from the edge.
- 2 Press the seam allowance under 3 mm to the wrong side.
- 3 Stitch close to the folded edge of the seam allowance.



Pin-stitched seam – 100% cotton homespun fabric, medium-weight plain weave



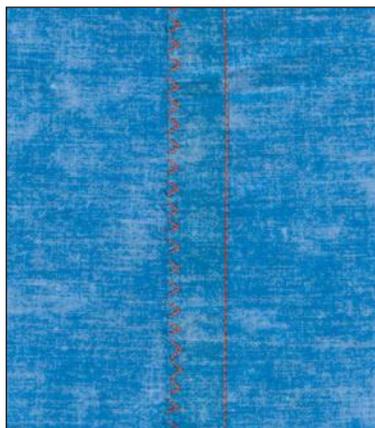
### Skill development 3.7

### Zigzag seam finish

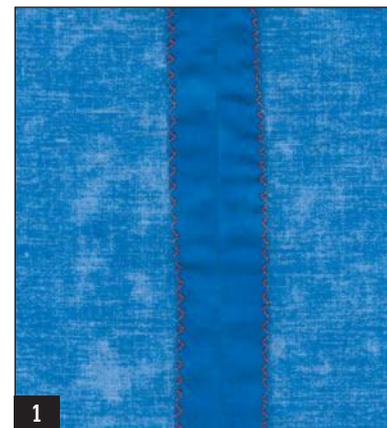
This finish is suitable for woven fabrics. If using on a knit fabric, care must be taken not to stretch the fabric; otherwise, the edge of the seam allowance will stretch out of shape.

#### Method

- 1 Place the right sides together and stitch 1.5 cm from the edge. You can either zigzag the seam allowances open or closed.
- 2 Open seam with zigzag neatening – stitch close to the edge of the seam allowance using SW3/SL2.



Closed zigzag seam – 100% cotton patchwork fabric, lightweight plain weave



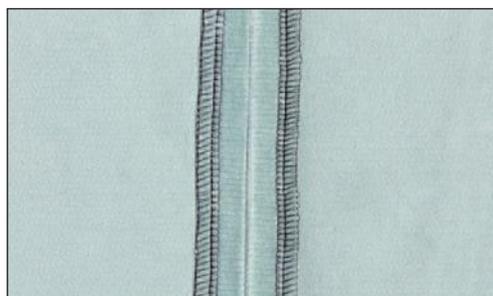
### Skill development 3.8

### Overlock seam finish

Overlock seam finish is suitable for all fabric types – woven, knit and non-woven.

#### Method

- 1 Place the right sides together and stitch 1.5 cm from the edge. Press the seam open.
- 2 Overlock to neaten each edge of the seam allowance.



Overlock seam finish – 100% linen, medium-weight cotton corduroy



3.8 Zigzag seam finish  
3.9 Overlock seam finish

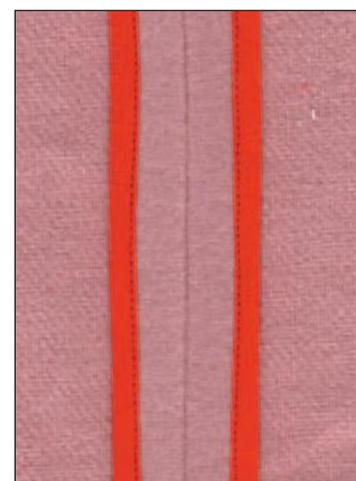
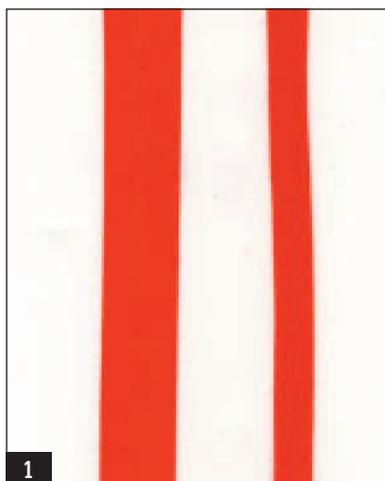
### Skill development 3.9

### Bias-bound seam finish

Bias-bound seam finish is suitable for unlined garments, especially linen and woollens where fraying is likely to occur.

#### Method

- 1 Place the right sides together and stitch 1.5 cm from the edge. Press seam allowances open. Use 12 mm bias binding cut to the required seam length and press in half.
- 2 Slip the raw edges of the seam allowance between the folded bias binding, and stitch through all the thicknesses of the fabric close to the folded edge of the bias binding. Make sure you catch both sides of the bias binding in the stitching.



Bias-bound seam – 100% wool suiting, heavyweight twill weave

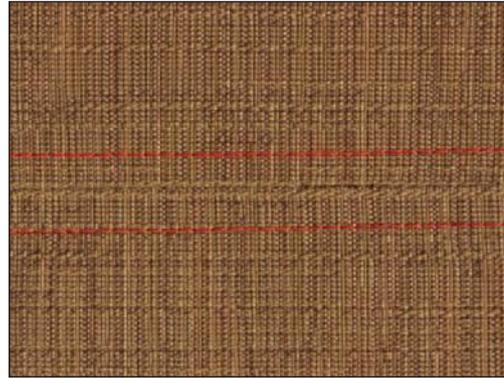


- 3.10 Topstitching collage
- 3.11 Fashion collage
- 3.12 Removing bulk from seams

Topstitching is a row of stitching completed on the right side of the textile item. Usually the seam allowance is caught in the topstitching. Topstitching emphasises the design features and is often completed in a contrast colour thread.

### Method

- 1 Use a longer stitch length, either 3 or 3.5. A topstitch thread can be used, which is thicker than a normal machine thread.



Topstitched seam – 50% polyester, 30% cotton and 20% rayon, medium-weight plain weave

## Removing bulk from seams

To ensure your textile project looks professional, you must press each stage of construction after completion and remove bulk from seams. **Trimming, grading, clipping** and **notching** can achieve this. The method selected depends on the fabric used and the seam shape. A pair of sharp embroidery scissors is essential.

Trimming seams can be used to remove bulk in areas like the armhole.

### Method

- 1 Cut away approximately 50% of the seam allowance.



Trimmed seam – 96% cotton, 4% spandex, medium-weight stretch woven denim

This technique can be used when attaching facings to necklines or armholes, or when using heavyweight fabrics.

### Method

- 1 To grade a seam with a bulky ridge, trim the seam allowances to different widths to allow the seam to lie flat instead of creating a bulky ridge.



Grading seams – 100% wool hound's-tooth suiting, heavyweight twill weave

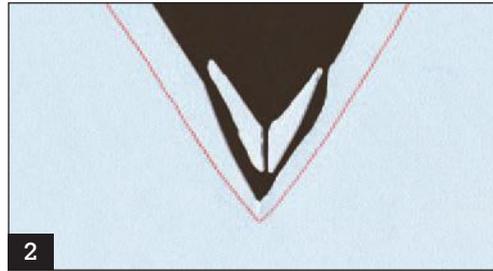
### Skill development 3.13

### Clipping seams

Removing bulk from a V-neck is essential if the neckline is to sit flat.

#### Method

- 1 Use embroidery scissors to clip close to the point of the V-neck.
- 2 Remove the bulk of the seam allowance from the centre of the V-neck.
- 3 Fold the facing over to the wrong side and press.



Clipped seam – 95% cotton, 5% elastane stretch woven, medium-weight twill weave

### Skill development 3.14

### Notching seams

Removing bulk from a curved seam is essential if the princess seam, neckline or armhole is to sit flat.

#### Method

- 1 Use embroidery scissors to cut wedges out of the seam allowance to allow the fabric to sit flat.



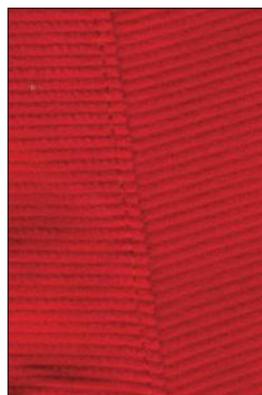
### Skill development 3.15

### Understitching

Understitching is used to stop lining or facing from rolling to the right side.

#### Method

- 1 Complete a row of understitching to hold the seam allowance to a facing or a lining. Understitching is not visible on the right side of the fabric.



Facing with notching, understitching and overlock facing finish – 100% cotton corduroy, medium-weight pile weave



Corner seam – 100% cotton pique, medium-weight dobby weave

### Method

- 1 Place the right sides together and stitch to the corner using a 1.5 cm seam allowance. It is important to leave the needle in the fabric before raising the presser foot and turning the corner.
- 2 Use a pair of embroidery scissors to remove the bulk from the corner.
- 3 Carefully turn the fabric to the right side, pushing out the corner to create an accurate shape. Press.

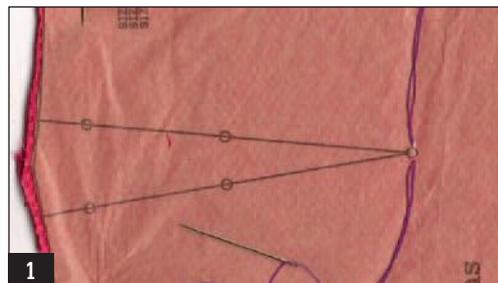
## Creating shape in a garment

Removing fullness from a garment and adding shape can be achieved in a variety of ways.

- **Darts** are used to shape the fabric to fit the body and may be found at the bust, waistline and hips. Darts are formed from triangular shapes on the pattern piece that taper to a point. It is important to stitch darts accurately so that the garment fits correctly.
- **Tucks** are stitched folds of varying widths, which normally have a space between them. Pintucks are very narrow tucks. Tucks are usually created for decorative purposes, although they also remove fullness in a garment.
- **Pleats** are folds in the fabric. They can be partially stitched or held in place by a waistband. The most common types of pleats are inverted, box and knife pleats.
- **Gathering** is the process of drawing up a fabric by using rows of stitches. It is most suitable for soft, lightweight fabrics.
- **Shirring** is similar to gathering except an elastic bobbin thread is used. The fabric will gather up as it is stitched and the gathering will have stretch due to the elastic bobbin thread.



3.13 Transferring pattern markings

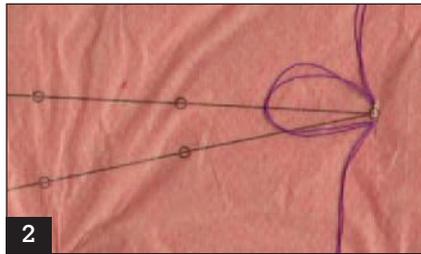


### Method

There are a variety of ways to transfer pattern markings to your fabric, including dressmaker's chalk, fabric pens and tailor's tacks.

- 1 Using a double strand of thread, make a small running stitch across the pattern marking for the dart. Leave a 5 cm tail.

- Take another stitch at the same place and leave a 3 to 5 cm loop. Cut the thread, leaving a tail of at least 5 cm in length.
- When all the tailor's tacks are complete, carefully remove the pattern piece. Gently separate the fabric layers and cut the threads.

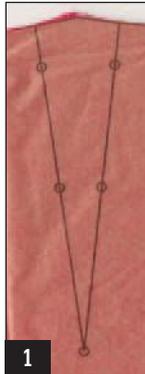


### Skill development 3.18

### Darts

#### Method

- Transfer the dart pattern markings to the fabric using tailor's tacks, a fabric pen or dressmaker's chalk.
- On the wrong side of the fabric, pin the dart into place, matching the pattern marking.
- Stitch the dart in place, making sure you finish right at the point. Secure.
- If it is a vertical dart, press to the centre back or centre front. Press horizontal darts downwards.



Dart – 100% cotton pique, medium-weight woven fabric

### Skill development 3.19

### Tucks

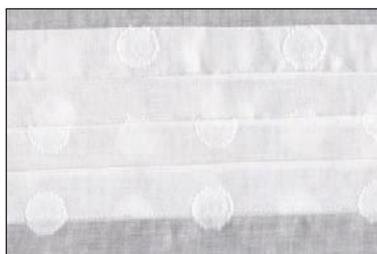
Standard tucks are equally spaced apart. Tucks with no space between them are called blind tucks. A twin needle can create pintucks, and tightening the bobbin tension will create a more raised effect.

#### Method

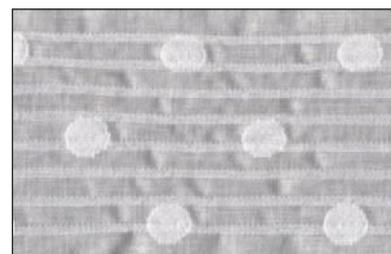
- Transfer the tuck pattern markings to the fabric using tailor's tacks, a fabric pen or dressmaker's chalk.
- On the right side of the fabric, pin the tuck into place, matching the pattern marking.
- Stitch the tucks into place. Press.



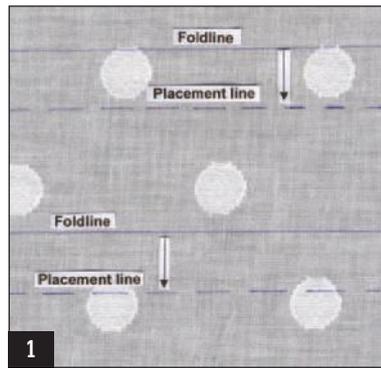
Spaced tucks – all material 100% cotton, lightweight dobby weave



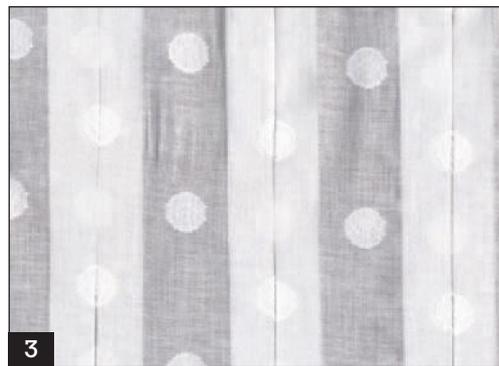
Blind tucks



Pintucks (created using a 4 mm twin needle)



Knife pleats – all material 100% cotton, lightweight dobby weave

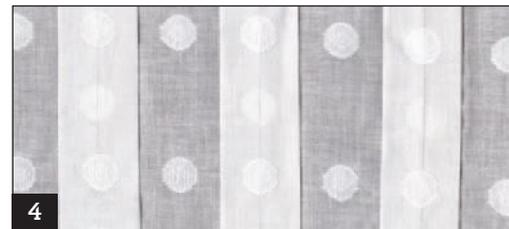


Inverted pleats

## Method

Pleats are usually stay stitched or topstitched into place, unlike tucks that are stitched for their entire length.

- 1 Fold and press the fabric along a fold line, and then align the fold to another line called the placement line. Repeat to create the pleats and then topstitch into place.
- 2 Knife pleats have one fold line and one placement line. All the folds face the same direction. As knife pleats are only held in place with stitching or a waistband, the pleats will flare out at the hemline.
- 3 Inverted pleats have two fold lines and a common placement line. The two folds of each pleat face towards each other and meet in the centre. The back folds of an inverted pleat face away from each other.
- 4 Box pleats have two fold lines and two placement lines. The two folds of each pleat face away from each other. The back folds in a box pleat are facing each other and usually meet.



Box pleats

## Method

- 1 Stitch two parallel rows of straight stitch (SL4), one on either side of the seam allowance. Do not reverse, and leave the threads with about 6 cm tails.
- 2 Find the centre point of the gathering and the fabric backing. Match these points and the edge of the fabric and pin into place.



- 3 Using the top threads only, pull up the gathering thread from each side until the gathered fabric is the same size as the fabric backing.
- 4 Change back to a smaller stitch length (SL2.5) and straight stitch through the middle of the two rows of gathering.
- 5 Hold the ends of the gathering thread and pull the thread out.
- 6 Overlock to neaten the seam edges.
- 7 Lay the seam allowances away from the gathering and topstitch into place using straight stitch (SL3).



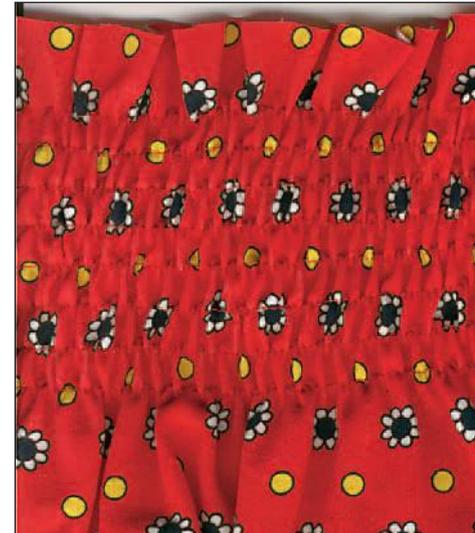
Gathers – 100% nylon tricot, lightweight warp knit

### Skill development 3.22

### Shirring

#### Method

- 1 Wind the elastic cord onto an empty bobbin, making sure not to stretch it. You will need to either loosen the tension on the bobbin case so that the elastic thread can run freely, or bypass the tension in the bobbin area.
- 2 Cut the fabric to be shirred approximately three to four times the finished width.
- 3 Straight stitch (SL3) parallel rows. The fabric will gather as you are stitching.



Shirring – 100% cotton printed jersey, lightweight single weft knit

# Opening and closure treatments

Openings are an essential part of textile items if they are to be functional. Where there is an opening there will normally be a closure treatment. Closures include zippers, buttons and buttonholes, hooks and eyes, snap fasteners and Velcro.

## Zippers

**Zippers** are made of nylon or metal teeth that are attached to fabric tapes. They come in different weights and sizes, so it is important to select the right type and method of application for your textile item.

There are three main types of zippers: conventional, open-ended and invisible.

Conventional and invisible zippers are closed at one end and are used in dresses, skirts, pants and tops. Open-ended zippers are open at both ends and are suitable for jackets and corsets.

NelsonNet

Lapped zipper activity

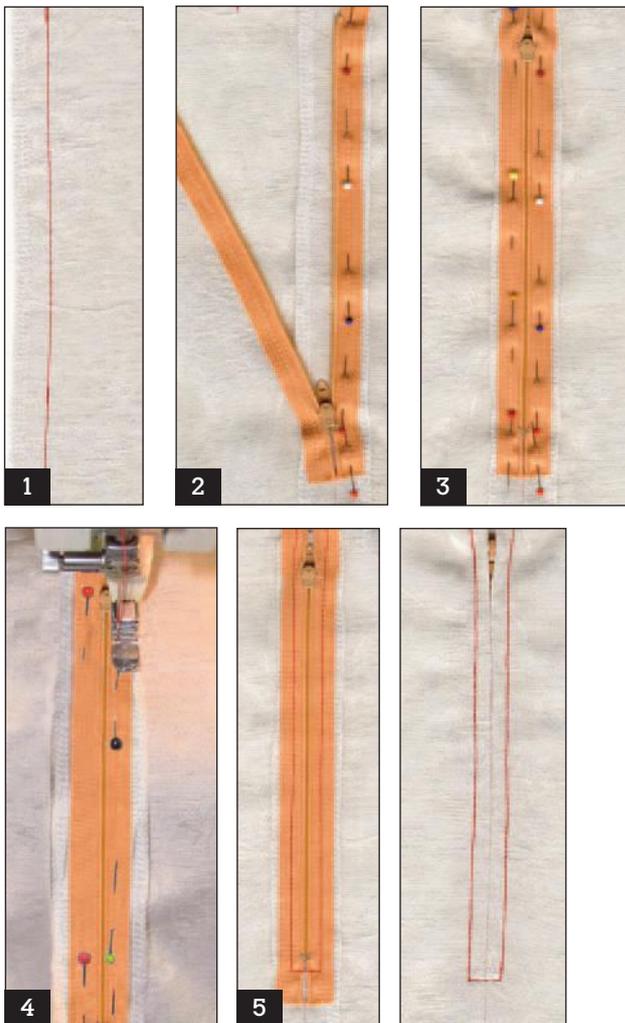
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Open-ended zipper activity

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### Skill development 3.23

### Centre zipper



Centre zipper – 95% polyester, 5% elastane, medium-weight stretch woven

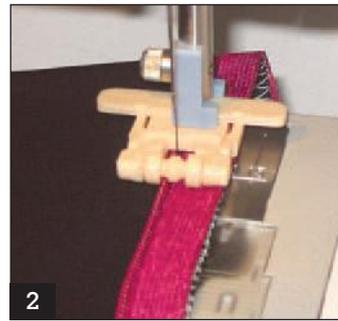
### Method

- 1 Pin the right sides of the fabric pieces together. Use dressmaker's chalk to mark the length of the zipper onto the fabric. Stitch to the mark using straight stitch SL4. Change to SL2.5 and reverse for 1 cm, and then continue stitching to the end of the seam. Reverse to secure the seam. Neaten the seam edges.
- 2 Press the seam open. Open the zipper and lay it on top of the seam allowance. Pin down the left-hand side through all layers, making sure the teeth of the zipper are in line with the seam.
- 3 Do the zipper up and pin the right-hand side in place.
- 4 Change the presser foot to a zipper foot and move the needle position to the right.
- 5 Stitch down the length of the zipper using a straight stitch (SL3). When you reach the bar of the zipper, use the hand wheel to create two more stitches. If you are not below the bar when you stitch across the base of the zipper, you will break the needle. Leave the needle in the fabric and turn. Stitch across the width of the zipper and then turn and stitch up the right-hand side. Do not reverse as it will be visible on the right side of the garment. Tie a knot with the threads to secure the stitching.
- 6 Use a stitch unpicker to carefully remove the stitching to release the zipper.

### Method

Invisible zippers are inserted before the seam is stitched, so you will need to neaten the edge of the seam before you apply the zipper. The sample has been overlocked.

- 1 Open the zipper and place it face down on the right side of the fabric. Pin in place.
- 2 Using an invisible zipper foot, stitch down the length of the zipper. You will notice the zipper teeth will uncoil as the invisible zipper foot moves down the zipper. It is important to stitch very close to the teeth; otherwise the zipper application will not be invisible.
- 3 Pin the other side of the invisible zipper in place and stitch.
- 4 Close the zipper. Using a normal zipper foot, stitch a seam from the base of the zipper to the end of the fabric. Make sure you do not stitch through the zipper tape.



Invisible zipper – 100% polyester, imitation suede, medium-weight woven fabric



3.14 Invisible zipper

Sometimes it is difficult to purchase a zipper that is the correct length; therefore, it may need to be shortened.

### Method

- 1 Set the sewing machine to zigzag. Use the widest stitch width and a length of only 0.5. Stitch a new bar at the desired length.
- 2 Cut off the excess zipper 2 cm below the new bar.



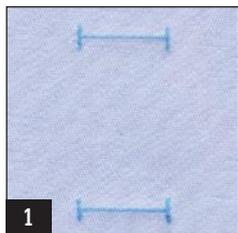
## Buttons and buttonholes

There are two main types of buttonholes used on textile items. Bound buttonholes have a fabric binding and are suitable for tailored jackets and coats. They are not suitable for sheer or delicate fabrics. Buttonholes created on the sewing machine consist of two parallel rows of satin stitch. The ends are enclosed with a bar tack.

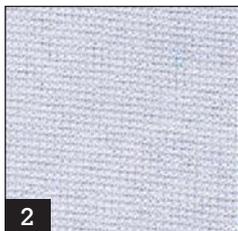
Many new sewing machines have an automatic buttonhole feature, where you only have to select the buttonhole length and the machine programs the rest. The length of a buttonhole is determined by the size and thickness of the button. A buttonhole is usually about 2 mm larger than the button. It is important to stabilise the fabric with interfacing before working a buttonhole.

### Skill development 3.26

### Machine buttonhole



1



2



4



Bar tack buttonhole – 100% silk, medium-weight plain weave

There are different types of buttonholes for different fabric weights. Bar tack buttonholes are suitable for most fabric weights.

#### Method

- 1 Transfer the buttonhole placement from the pattern piece.
- 2 Use interfacing to stabilise the fabric.
- 3 Read the sewing machine manual and set the machine as required.
- 4 Use a stitch unpicker to slit the buttonhole. Place a pin through the side of the bar tack to ensure you do not cut through the end of the buttonhole.

### Skill development 3.27

### Attaching buttons



3.15 Buttons and buttonholes



Button positions should be marked after the buttonholes are made. Use a single strand of thread as a double thread tends to knot. It is important to select the right size and style of button for the end-use. Do not select a button that is too large or heavy for the fabric weight.

#### Method

- 1 Secure the thread in the fabric by either a knot or a double stitch.
- 2 Take about four small stitches through the fabric and shank (or buttonholes) to make it secure.
- 3 Finish the thread with a double stitch in the fabric behind the button.

### Skill development 3.28

### Covered buttons



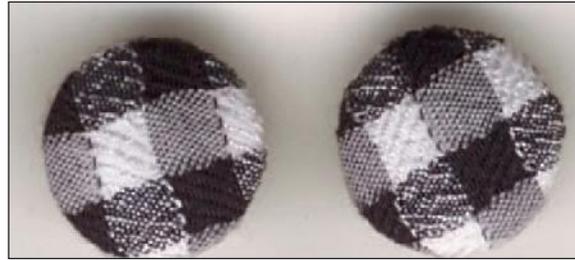
Covered buttons can be made to match the fabric of the textile item. You can purchase a kit from your fabric store to make covered buttons. There are two parts to a covered button: the button and the backing ring.

#### Method

- 1 Use the template in the kit to cut out a circle of fabric for your button covering. Use a small running stitch to create a gathering stitch around the fabric circle.

Covered button kit

- 2 Place the button over the fabric circle and draw up the gathering thread so that the fabric fits tightly over the button.
- 3 Place the backing ring over the shank and press down firmly.



Covered button  
– 100% polyester  
check, lightweight  
weave



## Snap fasteners

Snap fasteners come in different sizes suitable for different weight fabrics, although they are not as secure as hooks and eyes.

## Hooks and eyes

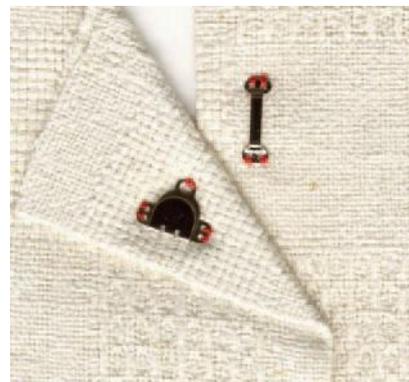
Hooks and eyes (or bars) are small fasteners that are usually used at a single point on a garment, like the neckline or on a waistband, and are often attached using a blanket stitch or whip stitch. See Chapter 16 for information about the blanket stitch technique.



Snap fastener attached using  
whip stitch over each hole –  
100% linen, medium-weight  
weave



Hook and eye attached using blanket stitch – 100% linen,  
medium-weight weave



Hook and bar attached using whip stitch over each  
hole (suitable for skirts and pants) – 100% linen,  
medium-weight weave

## Velcro

Velcro is an example of a tape fastener. It consists of two different tapes: one a looped nap and the other a hooked nap. The hooks lock onto the loops when the two are pressed together. Velcro is attached using straight stitch (SL2.5). It is suitable for sportswear, rainwear, upholstery and camping gear.



Velcro – 100% furnishing  
fabric, heavyweight basket-  
weave

# Hems

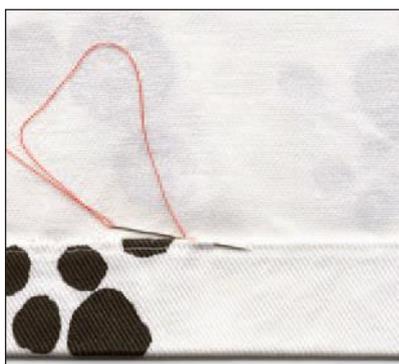
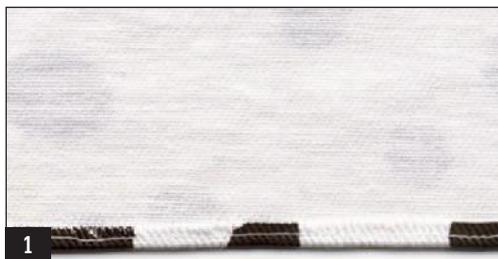
A **hem** is a finish used on the bottom edge of a textile item. The type of hem selected depends on the style of the textile item and the fabric type. Whatever the choice, the item should hang evenly and the hem should not be bulky. Most hems are invisible from the right side, but some hems can be decorative.

## Skill development 3.29

## Slip-stitched hem



3.16 Slip-stitched hem  
3.17 Narrow hem



Slip-stitched hem – 100% cotton, medium-weight twill weave

Before stitching a hem you need to neaten the hem edge. This can be done by pin-stitching, zigzag stitching or overlocking.

### Method

- 1 Pin-stitch to neaten the hem edge.
- 2 Press over the hem allowance and pin in place.
- 3 With a single strand of thread in the needle, secure the thread at the beginning of the hem. Bring the needle out through the fold of the hem. Catch a few threads in the fabric and then pass the needle back through the fold of the hem for 3 mm. Continue until you have completed the hem. Press.

## Skill development 3.30

## Narrow hem



Narrow hem – 100% polyester, medium-weight satin weave

A narrow machine hem is suitable for circular or full skirts, shirts and garment linings.

### Method

- 1 Press the hem allowance over 3 mm.
- 2 Press over again 5 mm. Pin in place.
- 3 Using a straight stitch (SL3), stitch around the hem close to the folded edge of the hem. Do not reverse. Bring the threads through to the wrong side and tie together close to the fabric.

### Skill development 3.31

### Topstitched hem

This hem finish is suitable for knit fabrics as twin needling has give and will stretch with the fabric.

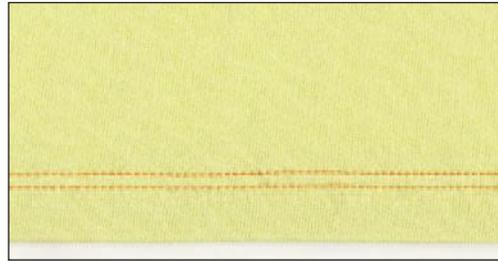
#### Method

- 1 Overlock to neaten the hem edge.
- 2 Press the hem allowance over and pin.
- 3 Using a twin needle, stitch on the right side of the fabric close to the hem edge.

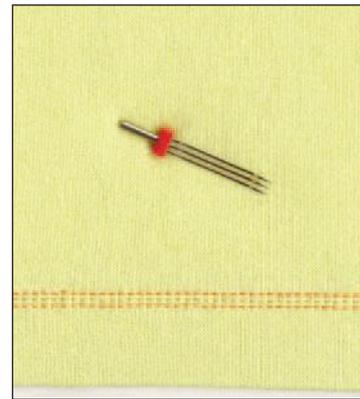
In a good blind hem the stitches are invisible.



3.18 Topstitched hem  
3.19 Blind hem



Twin needle topstitch hem – 65% polyester, 35% cotton fleecy, heavyweight single knit



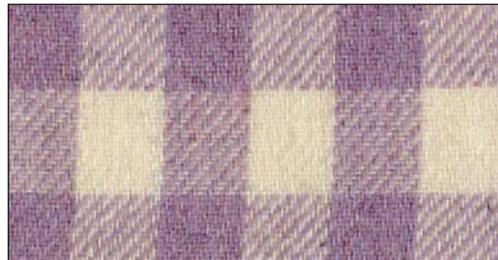
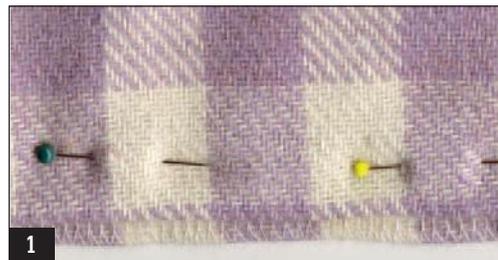
Triple needle topstitch hem – 65% polyester, 35% cotton fleecy, heavyweight single knit

### Skill development 3.32

### Blind hem

#### Method

- 1 Overlock to neaten the hem edge. Press over. Lay the hem allowance face down, and fold the garment back to reveal the hem edge.
- 2 Check your sewing machine manual for the machine settings and the correct presser foot to use for a blind hem. Stitch, catching only the garment in the zigzag stitch.



Blind hem – 100% wool suiting, medium-weight twill weave



### Skill development 3.33

### Overlock rolled hem

A rolled hem can be completed on either the sewing machine or the overlocker. It is suitable for sheer fabrics.

#### Method

- 1 Sewing machine: Use a rolled hem foot. This rolls the hem edge over.
- 2 Overlocker: A two- or three-thread rolled hem can be created. Check your manual for stitch settings.



Overlock rolled hem – 100% silk organza, lightweight plain weave

NelsonNet

Lettuce edging activity  
TEXD11AS030024  
Shell edging activity  
TEXD11AS030025

# Iron on, fusible and soluble materials

## Interlining

**Interlining** is a textile material that is placed between the outer fabric or face of the garment and the lining. Although it covers the whole garment and creates the framework of the garment, it is not visible. Often it is basted (hand stitched) to the outer fabric and the two layers are then treated as one. Interlinings change the handle of the garment. They may be used to give a flimsy fabric extra body, make a pale fabric denser or opaque, or provide extra insulation in a winter jacket. Textile materials used as interlinings include silk organza and Pellon.



Silk organza can be used as interlining.



Winter jacket with interlining to add bulk and insulation

Photos from Shutterstock.com

## Interfacing

**Interfacing** is used to support, shape and stabilise areas, edges and details of textile items. It may be woven, knit or non-woven, fusible or stitch-in, black or white. It also comes in different weights: light, medium or heavy. The type of interfacing selected depends on the fabric type and the amount of support and body required.

Interfacing is used in collars, waistbands, cuffs and facings. Shapewell is a firm, sew-in interfacing that is used in evening, bridal wear and corsetry. Vilene is the brand name for many interfacings. There are many different types of Vilene, so it is important that the most appropriate be selected for the specific end-use.



Calico with woven fusible interfacing



Calico with stretch fusing



Calico with non-woven fusible interfacing

## Stabiliser

**Stabiliser** is used to support and stabilise fabric during decorative sewing processes, including appliqué, machine embroidery and free-motion stitching. There are four basic types of stabilisers: cut-away, tear-away, heat-away and wash-away. The name relates to the way the stabiliser is removed after the decorative textile process is completed. Usually the stabiliser is positioned on the wrong side of the fabric under the design area; however, in the case of pile fabrics like velvet, it is used on the right side.

Stabilisers can also be used as a way of transferring a pattern. The design can be drawn onto the stabiliser with a fabric pen and attached to the right side of the fabric. The design is embroidered and then the stabiliser with the pattern is washed away.

Stabilisers are available in different weights, as well as in infusible, non-fusible and adhesive-backed forms.



Stabiliser used in hooped machine embroidery

Fusible web requires a hot iron to melt, so testing the iron temperature on the fabric it will be used on is important. You do not want to melt your appliqué or backing fabric in the process. You may need to cover your work with a pressing cloth to prevent the fabrics being damaged. Fusible web stabilises the area where it is applied, which can be a disadvantage. If you are using fusible web on a knit fabric, the garment will have little or no stretch where the fusible web has been applied and may no longer fit.

Hemming tape is a type of fusible web and is a quick way of taking up a hem, although it will separate when washed unless stitched into place.

Vliesofix is a common brand name for fusible web.

## Wadding and Pellon

**Wadding** and **Pellon** are used as a fabric layer to add bulk to a textile item. They are usually placed between two layers of fabric to create a layer of insulation. Wadding is thicker than Pellon, although they are both available in different weights and widths.



Wadding is used as insulation in a quilt.

## Fusible web

**Fusible web** is a non-woven, synthetic material that melts when heated. When placed between two fabrics and ironed, the fusible web melts and fuses the two fabrics together. It is used in appliqué to attach the design to the background fabric. Fusible web is available by the metre in different weights and widths.



Fusible web used to attach velvet flowers before blanket stitch is completed

Wadding is usually sew-in and can be made from a variety of fibre types, including cotton, polyester, wool and bamboo. In the United States, wadding is known as batting. Pellon is fusible and is made from polyester. When wadding or Pellon is used in a quilt, free-motion stitching can be used to create stitched designs with added dimension.



Water-soluble films can be used to create lace.



3.20 Iron on, fusible and soluble materials  
3.21 Body measurements

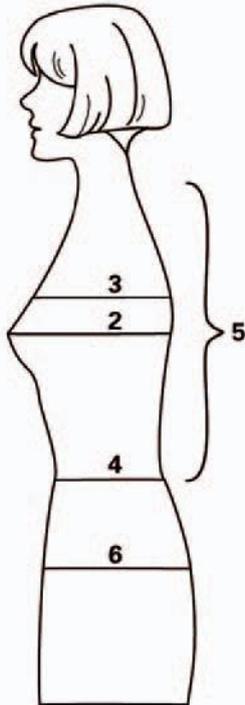
## Water-soluble films

There are a number of water-soluble films available that can be used for making your own fabric creations, including lace.

- Romeo is strong and thick, which allows it to be used with or without a hoop, and only one layer is required.
- Guliette is medium-weight film with excellent strength, but it must be used in a hoop.
- Solvy is a lightweight film that must be used in a hoop.
- Vilene 541, or Solusheet, is a water-soluble fabric made from PVA. It has good strength and can be used for machine embroidery and hand stitching. Unlike Romeo, Guliette and solvy, Vilene 541 will not become sticky and dissolve in hot weather.

## Interpreting, using and modifying commercial patterns

Commercial sewing patterns are available for males and females in all age groups in a wide range of apparel designs. They are also available for furnishing, costumes and non-apparel items. To decide which apparel or costume pattern to purchase, you must take your body measurements. This task is easier and more accurate if you have someone to help you.



### How to measure:

Measure over the undergarments you normally wear. Hold the tape measure comfortably snug, but not tight.

- 1 Height:** Standing against a flat wall without shoes, from floor to top of your head
- 2 Bust:** Around the fullest part of the bust and straight across the back
- 3 High bust:** Directly under the arms, straight across the back and above the bust
- 4 Waist:** Tie a narrow elastic around waist and let it settle naturally at your waistline. Measure over the elastic. Keep the elastic in place for the next measurement
- 5 Back waist length:** From the most prominent bone at the base of neck to the natural waistline
- 6 Hip:** Around body at fullest part, usually 18–23 cm below waist

Image courtesy of Simplicity Pattern Co., Inc.

Once you have taken your body measurements, you can compare them with the size range charts below to determine which pattern size suits your figure type.

### Junior

Sizes	3/4	5/6	7/8	9/10	11/12	13/14	15/16	17/18	19/20	21/22	23/24	
Bust	71	73.5	77.5	81.5	85	89	92.5	98	103	108	113	cm
Waist	56	58.5	61	63.5	66	68.5	71	75	78.5	85	90	"
Hip - 7" below waist	78.5	81.5	85	89	92.5	96.5	100.5	106	111	116	121	"
Back waist length	34.5	35.5	37	38	39	40	41	42	42.5	43	43.5	"

Misses'/Miss Petite – for well-proportioned, developed figures.

Misses' about 164cm to 168cm without shoes. Miss Petite under 163cm without shoes.

Sizes	4	6	8	10	12	14	16	18	20	22	24	26	
Sizes-European	30	32	34	36	38	40	42	44	46	48	50	52	
Bust	75	78	80	83	87	92	97	102	107	112	117	122	cm
Waist	56	58	61	64	67	71	76	81	87	94	99	106	"
Hip - 9" below waist	80	83	85	88	92	97	102	107	112	117	122	127	"
Back waist length	38.5	39.5	40	40.5	41.5	42	42.5	43	44	44	44.5	44.5	"
Petite-back waist length	36	37	37.5	38	38.5	39.5	40	40.5	41.5	41.5	42	42	"

Boys and teen boys – for growing boys and young men who have not reached full adult stature.

Sizes	7	8	10	12	14	16	18	20	
Chest	66	69	71	76	81	85	89	93	cm
Waist	58	61	64	66	69	71	74	75	"
Hip	69	71	75	79	83	87	90	94	"
Neck band	30	31	32	33	34.5	35.5	37	38	"
Approx. height	122	127	137	147	155	163	168	173	"
Shirt sleeve	57	59	64	68	74	76	79	81	"

Men – for men of average build; about 178cm without shoes.

Sizes	32	34	36	38	40	42	44	46	48	50	52	
Sizes-Eur/Fr	42	44	46	48	50	52	54	56	58	60	62	
Chest	82	87	92	97	102	107	112	117	122	127	132	cm
Waist	66	71	76	81	87	92	99	107	112	117	122	"
Hip	84	89	94	99	104	109	114	119	124	130	135	"
Neck band	34.5	35.5	37	38	39.5	40.5	42	43	44.5	45.5	47	"
Shirt sleeve	78.5	81	81	84	84	87	87	89	89	91.5	91.5	"

Image courtesy of Simplicity Pattern Co., Inc.

A commercial pattern consists of the pattern envelope, guide sheet and tissue paper pattern pieces. Most patterns today are multi-sized, so you will have three or four sizes in the same pattern envelope.



Pattern and Images used with permission of Simplicity Pattern Co.

Front of pattern envelope



3.22 Parts of a commercial pattern

The front of the pattern envelope indicates:

- brand name
- pattern number
- sizes in pattern
- photo or drawing of the textile item
- view numbers or letters.

The back of the pattern envelope indicates:

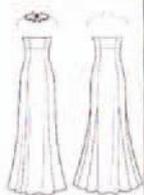
- suitable fabrics
- notions required
- size chart
- quantity of fabric required
- finished garment measurements
- back view of garment.

The guide sheet provides the following information:

- front and back view of garment
- image of pattern pieces
- pattern symbols or markings
- pattern pieces required for each view
- suggested cutting layouts.

# 2212

## 23 PIECES



### MISSES' DRESS IN TWO LENGTHS WITH BODICE VARIATIONS

**Fabrics:** Laundered Cottons, Batiks, Lightweight Denim, Pique, Poplin, Seersucker, Saten, Challis, Crepe Back Satin, Laundered Silks-Rayons, Satin, Shantung, Flouces B also in Voile, Organdy, Organza. Belt in Synthetic Leather, Synthetic Suede. Extra fabric needed to match plaids, stripes or one-way design fabrics.

**Notions:** Thread, one 16" invisible zipper. **Bodice B:** Two 3/4" shank buttons. **Belt:** One 23" buckle. Look for Simplicity notions and Wrights® Trims.

#### BODY MEASUREMENTS (For Sizing Help Visit [www.simplicity.com](http://www.simplicity.com))

Bust	29 1/2	30 1/2	31 1/2	32 1/2	34	36	38	40	42	44	in
Waist	22	23	24	25	26 1/2	28	30	32	34	"	
Hip-9" below waist	31 1/2	32 1/2	33 1/2	34 1/2	36	38	40	42	44	"	
Back-neck to waist	15 1/2	15 1/2	15 1/2	16	16 1/2	16 1/2	17	17 1/2	"		
Pattern Size	4	6	8	10	12	14	16	18	20		
Sizes-European	30	32	34	36	38	40	42	44	46		

Welcome to inspired by Project Runway™. With this pattern you can feel like you are in a design studio. Each "design element" has a separate yardage so that you can rise to the challenge and make it work!

<b>Bodice A</b>	45***	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	Yd
60***	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	"
Lining 1/2 yd. of 45**; Interfacing 1/2 yd. of 20" to 25" lightweight fusible											
Boning 1 1/2 yd. of 3/4" wide featherweight											

<b>Bodice B</b>	45" or 60"	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	Yd
Lining 1/2 yd. of 45**; Interfacing 1 1/2 yd. of 20" to 25" lightweight fusible											
Boning 1 1/2 yd. of 3/4" wide featherweight											
Neck Flouces 1/2 yd. of 45" or 60"											

<b>Long Skirt</b>	45***	3/4	3/4	3/4	3/4	3/4	4 1/4	4 1/4	4 1/4	4 1/4	Yd
60***	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	"
Godet 1 1/2 yd. of 45" or 60"											

<b>Short Skirt</b>	45***	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	Yd
60***	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	"
Godet 1/2 yd. of 45" or 60"											
Belt 3/4 yd. of 60"											

#### FINISHED GARMENT MEASUREMENTS (Includes Design and Wearing Ease)

All Dresses Bust	30 1/2	31 1/2	32 1/2	33 1/2	35	37	39	41	43	in
Finished back length from base of neck:										
Long Dress	56 1/2	56 1/2	56 1/2	57	57 1/2	57 1/2	57 1/2	58	58 1/2	in
Short Dress	37 1/2	37 1/2	37 1/2	38	38 1/2	38 1/2	38 1/2	39	39 1/2	"

\*without nap \*\*with nap \*\*\*with or without nap

### JEUNE FEMME: ROBE EN DEUX LONGUEURS AVEC CHOIX DE CORSAGE

**Tissus:** Cotons prélavés, Batiks, Denim Léger, Pique, Popeline fine, Seersucker, Satinette, Crêpe de Satin, Soies/Rayons prélavées, Satin, Shantung, Volants B en Voile, Organdi, Organza aussi. Ceinture en Cuir ou Suintine Synthétique. Prévoyez davantage de tissu pour raccorder les écossons, les rayures ou les motifs unidirectionnels.

**Mercerie:** Fil, une glissière invisible de 40cm. **Corsage B:** Deux boutons à tige de 1cm.

**Ceinture:** une bout de 6.3cm. Demandez la mercerie Simplicity et les garnitures de Wrights® Trims.

#### MESURES NORMALISEES

Poitrine	75	78	80	83	87	92	97	102	107	cm
Taille	56	58	61	64	67	71	76	81	87	"
Hanches (23cm au-dessous de la taille)	80	83	85	88	92	97	102	107	112	cm
Dos (encolure à taille)	38.5	39.5	40	40.5	41.5	42	42.5	43	44	cm
Tailles	4	6	8	10	12	14	16	18	20	
Tailles-Françaises	32	34	36	38	40	42	44	46	48	

Bienvenue à notre série inspirée de Project Runway™. Grâce à ce patron vous aurez l'impression d'être dans un studio de styliste. Chaque "élément de couture" comporte des métrages séparés vous permettant de créer un modèle sensationnel!

<b>Corsage A</b>	115cm**	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	m
150cm**	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.40	"
Doublure 0.70m de 115cm*; Entoilage 0.80m de 51cm à 64cm, léger, thermocollant											
Baleine 1.70m de 6mm de large, très légère.											

<b>Corsage B</b>	115cm ou 150cm**	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	m
Doublure 0.80m de 115cm*; Entoilage 1.00m de 51cm à 64cm léger, thermocollant											
Baleine 1.10m de 6mm de large, très légère											
Volants d'encolure 0.60m de 115cm ou 150cm**											

<b>Jupe longue</b>	115cm**	2.90	2.90	3.00	3.00	3.10	3.80	3.80	3.80	3.80	m
150cm**	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.60	2.60	2.60	"
Godet 1.60m de 115cm ou 150cm**											

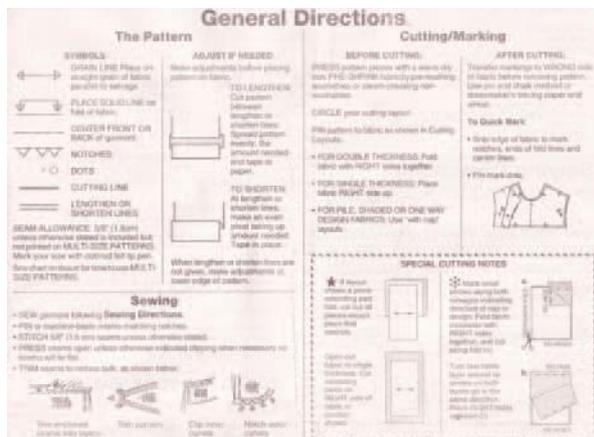
<b>Jupe courte</b>	115cm**	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	m
150cm**	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	"
Godet 0.50m de 115cm ou 150cm**											
Ceinture 0.60m de 150cm**											

#### MESURES DES VÊTEMENTS FINIS

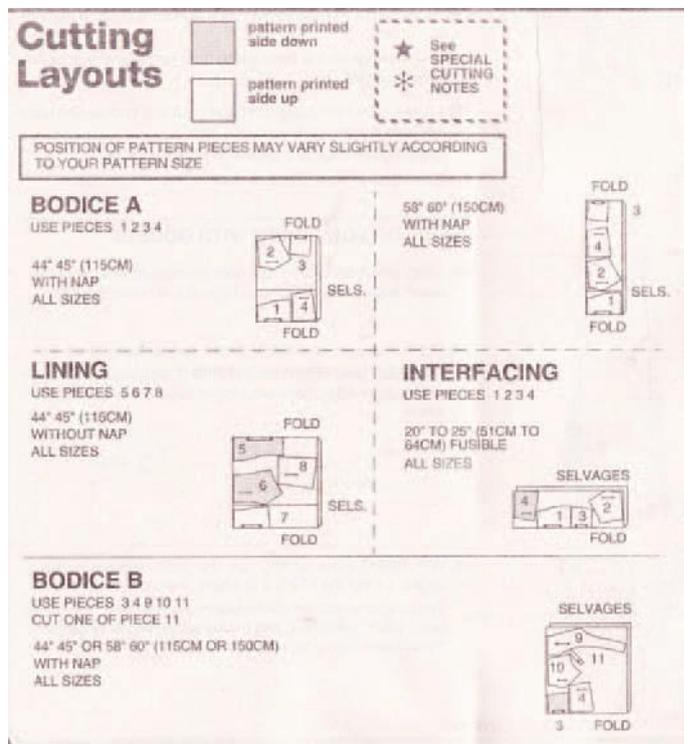
Toutes les Robes Poitrine	77.5	80	82.5	85	89	94	99	104	110	cm
Longueur finie du dos depuis la base du cou:										
Robe longue	143	144	145	145	145	146	147	148	148	cm
Robe courte	94.5	95	96	96.5	97	98	98.5	99	100	"

\*WITH NAP \*\*WITH NO NAP \*\*\*WITH OR WITHOUT NAP

Back of envelope



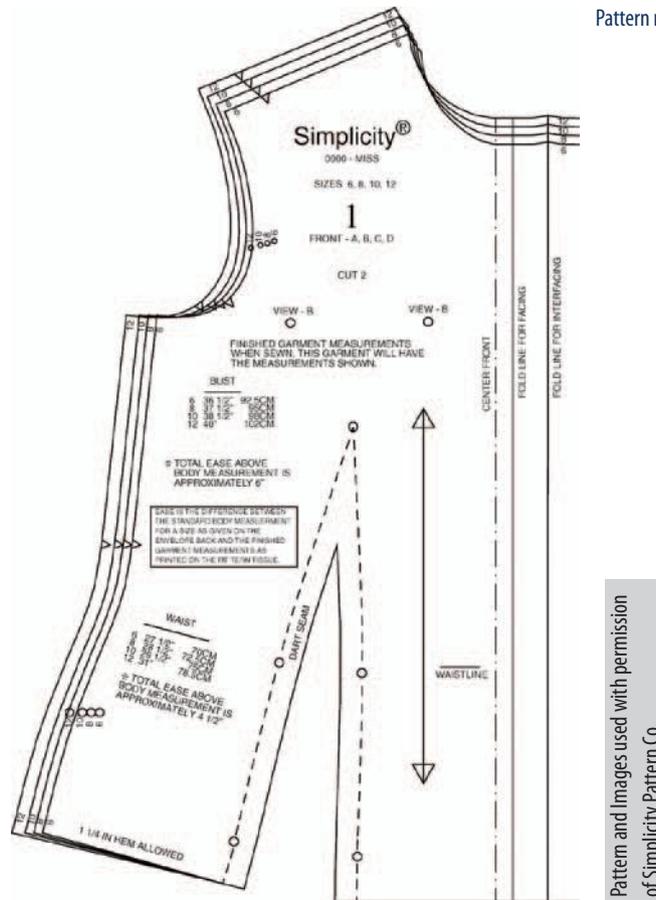
Guide sheet



To be used for individual private home use only and not for commercial or manufacturing purposes.

Pattern and Images used with permission of Simplicity Pattern Co.

Pattern and Images used with permission of Simplicity Pattern Co.



Pattern and images used with permission of Simplicity Pattern Co.

## Pattern markings

It is essential to gain an understanding of pattern markings if you are to use commercial patterns successfully.

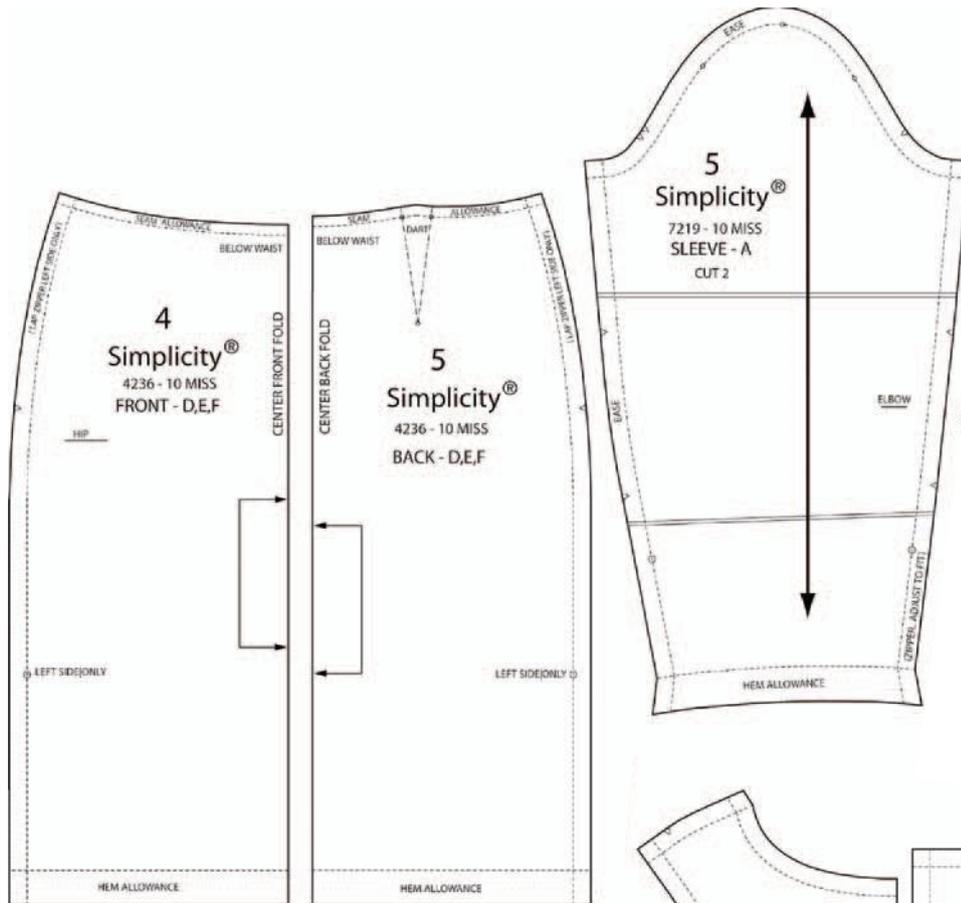
- Grainline: represented by a line with an arrow at either end. When you lay the pattern piece on the fabric, the grainline should be parallel to the selvedge. A grainline can also be represented by a place on the fold line. This means the fabric is folded along the straight grain and the pattern piece is placed on the fold. When you have this pattern marking, there is no seam line down the centre of the garment.
- Cutting line: may be represented by a bold line. Most patterns are multi-sized, and a different type of line for each size represents the cutting line. It is important to cut out your pattern accurately if the garment is to fit correctly.
- Seamline: usually represented by a broken line. The seam allowance on a commercial pattern is 1.5 cm, so the seam line will appear 1.5 cm from the cutting line.
- Notches: diamond-shaped symbols used for accurate joining of pieces. It is important to cut out around the notches. A notch on one pattern piece will match with a notch on another pattern piece.
- Circles, squares and triangles: additional construction markings to help line up pattern pieces, identify the start or end of stitching, or indicate the pocket and fastening positions.
- Darts: usually represented by a broken line. The dart on the Simplicity pattern shown has circles that must match to ensure the right dart shape is achieved.
- Centre front and back: always clearly labelled on the pattern.
- Hem allowance: listed on the pattern.

Actual garment measurements can be found on the pattern pieces. If you compare these with your own body measurements, you will gain an understanding of the sizing of the garment. Sometimes it is difficult to judge the amount of fullness in a pattern from the illustration on the pattern envelope.

## Pattern modifications

Commercial patterns are designed for figure types. Most people find their measurements are not a perfect match for a particular figure type. When making a top or shirt, the bust or chest measurement is the most important. When making pants or a skirt, the hip measurement is the most important. Often you need to make pattern modifications to ensure the garment fits perfectly or has the design features required.

To learn the techniques of pattern modification, it is more manageable to use quarter-scale (as shown below) rather than full-scale patterns.



Basic block patterns

Pattern and Images used with permission of Simplicity Pattern Co.

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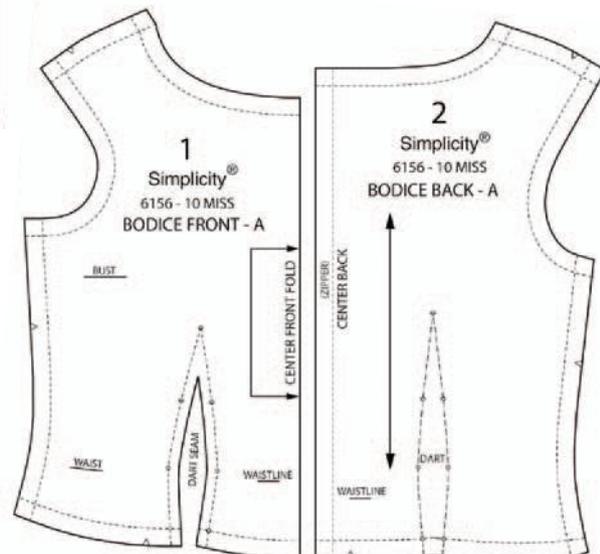
Quarter-scale patterns for pattern modification  
[TEXD11TM030027](#)



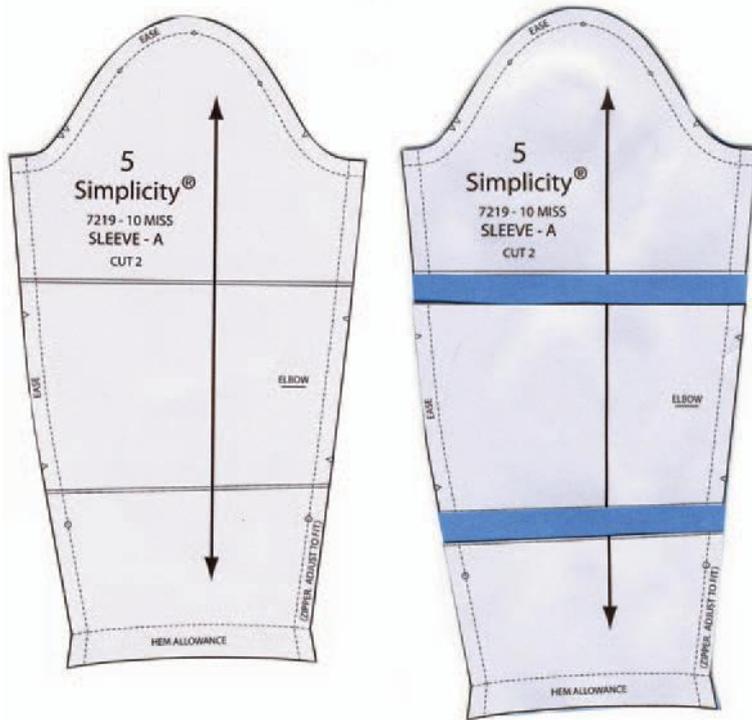
3.23 Pattern markings  
 3.24 Pattern modifications  
 3.25 Creating patterns without using a block pattern

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Shortening a pattern  
[TEXD11AS030026](#)  
 Lengthening a pattern  
[TEXD11AS030027](#)  
 Adding flare  
[TEXD11AS030028](#)



One of the advantages of creating your own clothes is that you can make them fit perfectly. Some people are short-waisted, so shop-bought clothes do not sit on their waist. Other people are petite, so clothing is too long for them.



### Method

- 1 Use the lengthen and shorten line marked on the pattern piece. It is important not to just cut from the bottom of the pattern piece as you will alter the fit of the garment.
- 2 Fold up half of the required shortening. Use tape to secure the pattern piece. Remember: if you are shortening a bodice or skirt, whatever you do to the front pattern piece you must do exactly the same to the back. Otherwise the garment will not fit together correctly.
- 3 Reshape the seam edge if required.

If you are tall, long-waisted or have long arms your clothing may be too short for you.



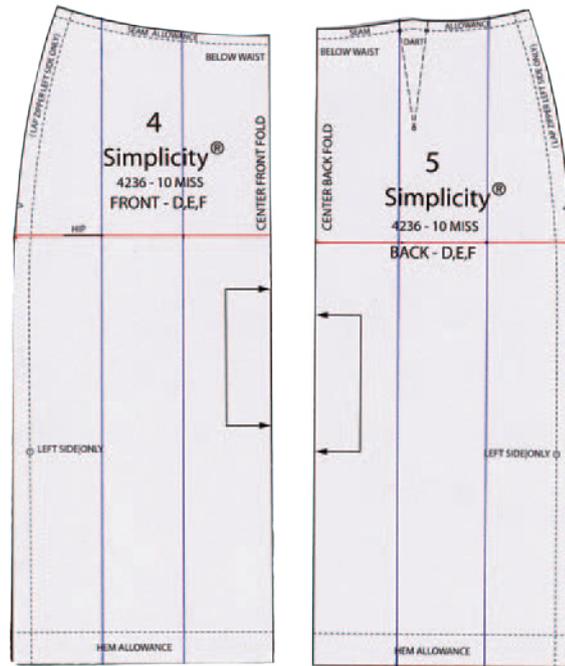
### Method

- 1 Cut across the lengthen and shorten line.
- 2 Spread the pattern to the required length. Glue your spread pattern piece to tissue paper, making sure the distance between the pattern pieces is equal. Also make sure your grainline is in a straight line.
- 3 Cut around your pattern piece, reshaping the seam line.

This quarter skirt pattern is for a straight skirt. For a flared skirt, you need to modify the pattern by slitting the pattern and spreading the required amount of fullness.

### Method

- 1 Draw a line across the pattern at the hip line. Divide this line evenly into three.
- 2 Draw two lines from the waistline to the hemline to evenly divide the skirt pattern into three.
- 3 Cut from the hemline but leave the pieces attached at the waistline. Spread the required amount of fullness, ensuring the grainline remains straight.
- 4 Reshape the hemline.



## Review questions

Use the information in this chapter to answer the following questions.

- 1 Identify the machine needle type you would use for the following end-uses and explain why this needle type is the most appropriate.
  - a Pintucks
  - b Stitching denim
  - c Free-motion stitching
  - d Microfibre fabrics
  - e Metallic machine embroidery threads
  - f Knit fabrics
- 2 Outline the method for a suitable seam and seam finish for the following end-uses.
  - a Woollen tailored jacket
  - b Sheer fabric
  - c Knit fabric
  - d Jeans
- 3 Explain how you would complete the following techniques.
  - a Grade a seam
  - b Understitching
- 4 Compare and contrast the following: darts, tucks and pleats.
- 5 Explain the difference between interlining and interfacing.
- 6 Explain the difference between wadding and Pellon.

## Websites

- ☺ Bernina Australia ([www.bernina.com.au](http://www.bernina.com.au)): The Australian website for Bernina, where you can find detailed information about sewing machines, inspiration and a range of textile projects.
- ☺ Schmetz ([www.schmetz.com/en](http://www.schmetz.com/en)): Detailed information regarding Schmetz sewing machine needles.
- ☺ Vlieseline ([www.vlieseline.com](http://www.vlieseline.com)): This website has detailed information and product videos that demonstrate how to use the different interfacings and stabilisers.
- ☺ Pellon Projects ([www.pellonideas.com](http://www.pellonideas.com)): Detailed information regarding Pellon products and some free projects available for download.
- ☺ Vilene ([www.vilene.com](http://www.vilene.com)): A German website (in both German and English) with detailed information regarding Vilene products.
- ☺ Sulky ([www.sulky.com](http://www.sulky.com)): Information about stabilisers and machine threads.
- ☺ The Thread Studio ([www.thethreadstudio.com](http://www.thethreadstudio.com)): Has information regarding vanishing products, such as Romeo, and is an online supplier of these products.
- ☺ Simplicity Creative Group ([www.simplicity.com](http://www.simplicity.com)): An online shop for commercial patterns.



3.28 Manufacturing methods  
palm cards

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Manufacturing methods  
crossword  
TEXD11IN030031



# Preliminary course

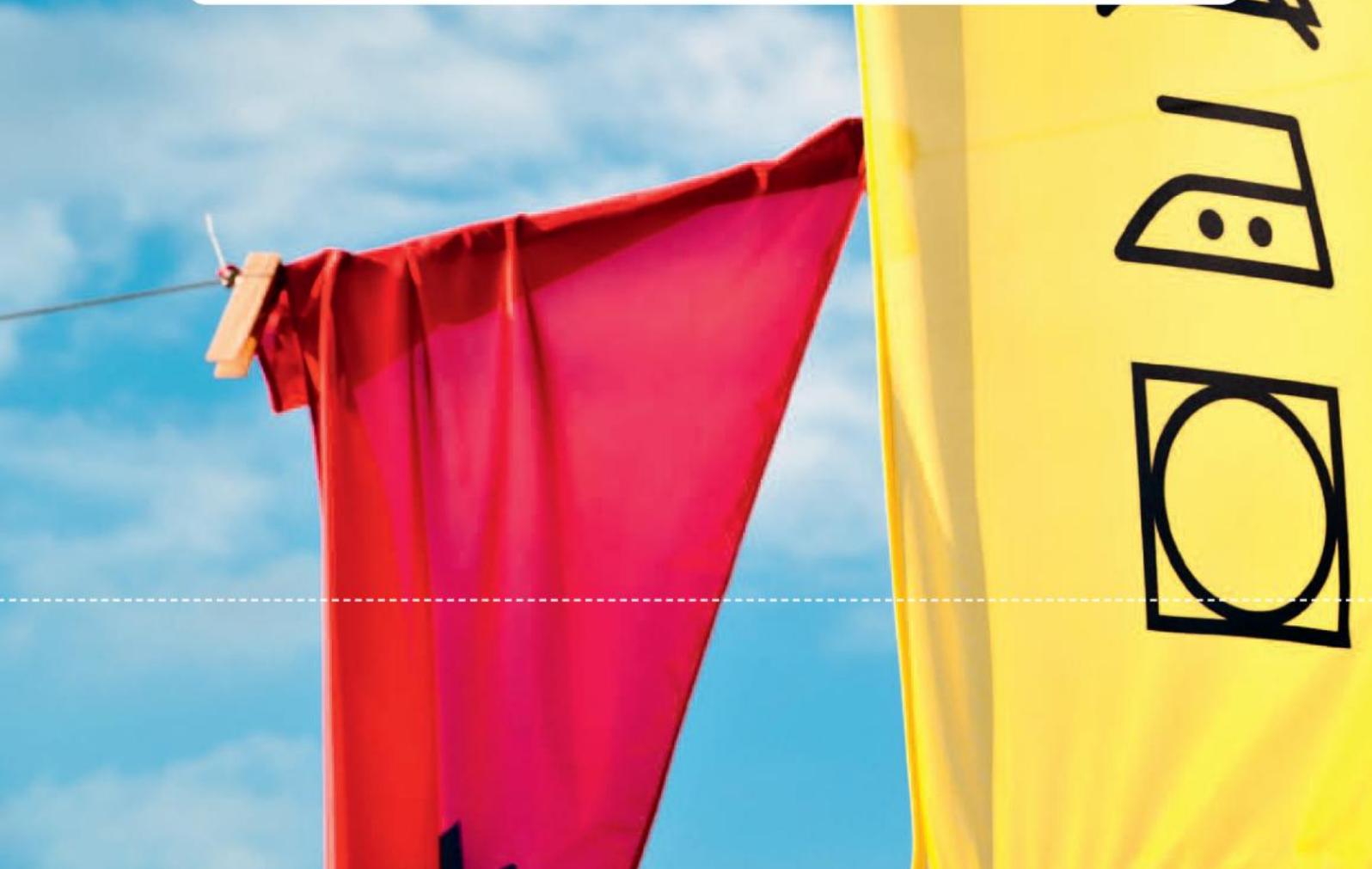
## Area of study: Properties and Performance of Textiles

The following chapters will extend your knowledge of fibres, yarns and fabrics. An understanding of fibre properties will allow you to select the most appropriate textile product for a specific end-use.



Refer to the Board of Studies website for the Course Objectives, Outcomes and Content: [www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au).

<b>Chapter 4</b>	Fibre structure and properties	76
<b>Chapter 5</b>	Fibre types and classification	82
<b>Chapter 6</b>	Yarn structures and characteristics	103
<b>Chapter 7</b>	Woven fabric types and classification	118
<b>Chapter 8</b>	Knitted fabric types and classification	129
<b>Chapter 9</b>	Non-woven fabric types and classification	138
<b>Chapter 10</b>	Fabric testing	151
<b>Chapter 11</b>	Preliminary Textile Project	167



# 4

## Fibre structure and properties

### What are fibres?

A **fibre** is a fine, thread-like substance with a length at least 100 times greater than the width. Fibres are the raw materials used to make yarns and fabrics. They contribute to the aesthetics, durability, comfort and care of fabrics. They determine to a large extent the end-use of a fabric and influence the cost of fabrics.

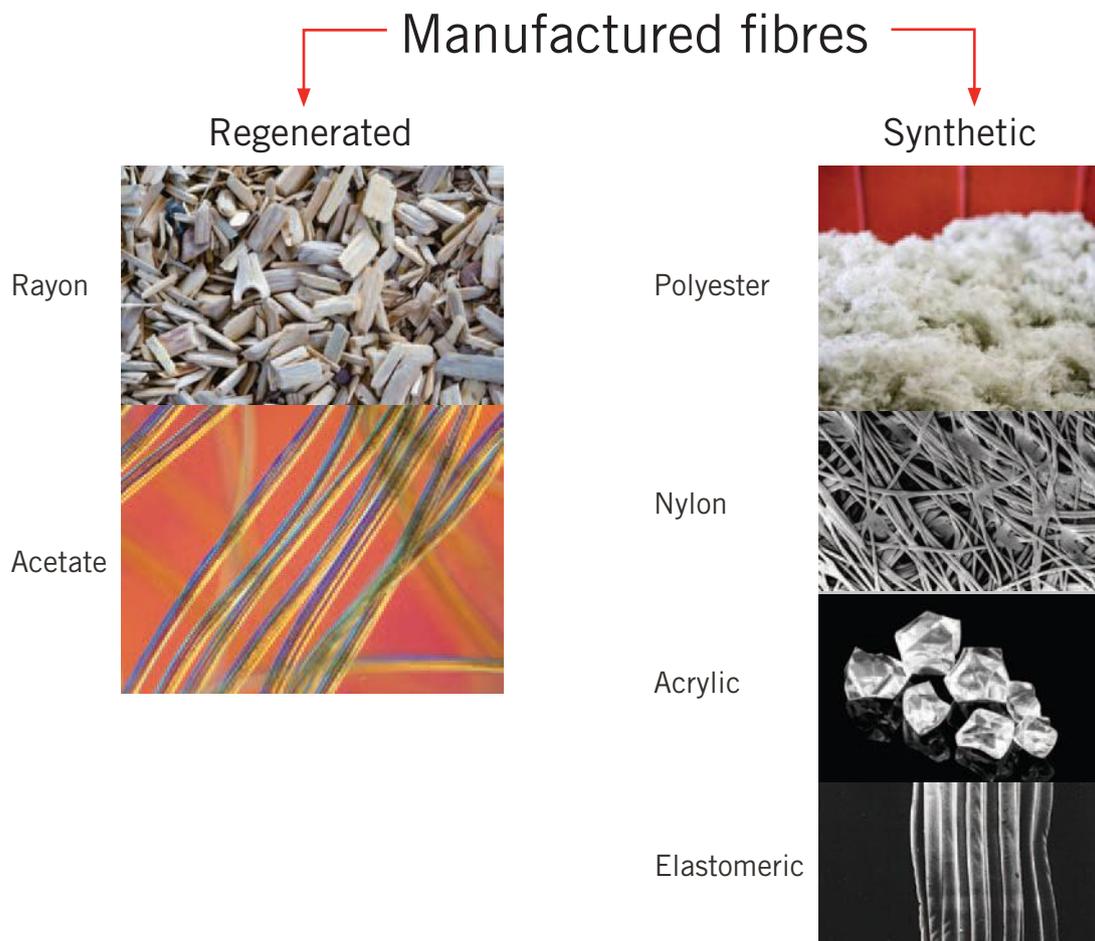
Short fibres are known as staple fibres. These usually range from 15 mm to 1500 mm in length. Long or continuous fibres are known as filament fibres.

### Classification of fibres

Textile fibres are classified according to their origin.



4.1 Fibre chart



# Natural fibres

Animal

Inorganic

Vegetable

Sheep



Alpaca



Camel



Goat



Rabbit



Silk



Spider silk



Metallic



Fibre optics



Asbestos



Fibreglass



Linen



Hemp



Rubber



Coir



Sisal



Cotton



Photos from Shutterstock.com

Cotton, wool, rayon, polyester, nylon and elastomeric are the fibres you will study in depth for the HSC.

# Fibre properties

All fibres have different properties, or qualities. Properties determine the end-use of the fibre.

## Aesthetics

- Lustre – gloss, sheen, sparkle or shine of a fabric caused by light reflecting from the surface
- Drape – how a fabric hangs or falls

## Durability

- Abrasion resistance – ability to withstand rubbing or wear and tear
- Strength – ability to resist breaking

## Comfort

- Absorbency – ability to absorb moisture
- Elasticity – ability to return to original shape after being stretched or compressed
- Thermal properties – ability to withstand and transfer heat
- Dimensional stability – inability to shrink or stretch

## Care

- Effect of chemicals – ability to withstand acids, alkalis and solvents
- Sun resistance – ability to withstand deterioration when exposed to sunlight
- Colour fastness – ability to withstand colour change after exposure to heat or water
- Shrink resistance – inability to contract



4.2 Fibre properties

## Extend your knowledge 4.1 Properties of textile items

Identify the desirable fibre properties for the textile items in the following table. The first example has been completed for you. Select two other end-uses and identify the fibre properties required for each.

End-use					
	Jeans	School backpack	Sofa and cushions	Patchwork quilt	Clown costume
Properties required	<ul style="list-style-type: none"> <li>• Abrasion resistance</li> <li>• Strength</li> <li>• Dimensional stability</li> </ul>				

Photos from Shutterstock.com

# Fibre structure

Fibre properties are determined by the external structure, chemical composition and internal (or molecular) structure of the fibre.

## External structure

External structure refers to the fibre morphology:

- length – short fibres are known as **staple fibres**; long or continuous fibres are known as filament fibres
- diameter, size or **denier**
- cross-sectional shape
- surface characteristics, such as crimp.

Chapter 5 looks in greater detail at the fibre morphology of cotton, wool, rayon, polyester, nylon and elastomeric.

## Chemical composition

Chemical composition refers to what fibres are made from. For example, cotton is made from cellulose and wool is made from protein.

## Internal structure

A monomer is the basic unit of a fibre. Polymerisation is the process of joining monomers to form a chain or polymer. The length of the polymers varies between fibres.

All fibres contain crystalline and amorphous regions, which are related to the arrangement of the polymers. The amount of crystalline and amorphous regions varies between fibres and determines some of the fibre properties, including durability, comfort, appearance and care.

## Amorphous structure

Amorphous regions occur when the polymers are in a random arrangement and there are large distances between them, resulting in few binding forces and a weak fibre.

Fibres with a high percentage of amorphous regions include wool and rayon. The properties of these fibres are generally:

- poor strength
- low durability
- good absorbency
- can be easily dyed
- more elasticity
- good abrasion resistance.



## Crystalline structure

Crystalline regions occur when the polymers are packed closely together and in a parallel arrangement, allowing many binding forces and resulting in a stronger fibre.

A fibre with a high percentage of crystalline regions is nylon. Its properties are generally:

- strength
- high durability
- low absorbency
- not easily dyed
- less elasticity
- poor abrasion resistance.



### Activity

4.2

### Forensic science

Fibre analysis is an important forensic technique. At crime scenes, textile fibres can be transferred through physical contact between the victim and suspect, attached to broken glass or fly screens if there has been a break in; and in road accidents, textile fibres and pieces of clothing may adhere to the car.

Forensic scientists conduct a range of tests on a sample to determine the fibre type and to identify if the textile item belongs to the suspect or the victim. Chapter 10 gives detailed instructions on a range of fibre tests, including microscopic and burning tests.

This simple experiment demonstrates the possibilities of textile forensic science to solve crimes and can be carried out in the classroom.

In pairs, collect your textile fibres and swap your samples with your partner. Do not tell your partner the textile source of your fibres.



Shutterstock.com

#### Aim

To determine the fibre content of a range of textile items and, where possible, identify the product source of the fibres.

#### Equipment

Clear sticky tape, microscope, microscope slides, cover slips, plain paper (white and black), tweezers, water dropper, textile fibres, water.

#### Method

- 1 Use sticky tape to pick up fibres from your clothing or textile furnishing items.
- 2 Place the tape onto a piece of white or black paper, depending on the fibre colour.
- 3 Examine the fibres under a microscope to determine the fibre type. Refer to pages 154–5 for microscopic fibre images.

- 4 For higher magnification analysis, place the fibres on a microscope slide, cover with a drop of water and place a cover slip over the fibres. Examine the fibre under a microscope with magnifications of 100x and 400x.

## Results

- 1 Name the fibre type.
- 2 Describe the microscopic appearance of the fibre.
- 3 Draw a sketch of the microscopic appearance.

## Conclusion

- 1 Is the fibre classified as a regenerated, synthetic, animal, inorganic or vegetable fibre?
- 2 Is the fibre a staple or a filament?
- 3 Does the fibre have a high lustre?
- 4 Is the fibre strong or weak?
- 5 Does the fibre have crimp?
- 6 Does the fibre have a high percentage of amorphous or crystalline regions?
- 7 Identify the textile product from which the fibres have been collected.

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Define the following terms.

<b>a</b> Fibre	<b>f</b> Polymerisation
<b>b</b> Lustre	<b>g</b> Filament
<b>c</b> Amorphous	<b>h</b> Crystalline
<b>d</b> Staple	<b>i</b> Elasticity
<b>e</b> Drape	<b>j</b> Monomer
- 2 Name two examples of a natural fibre.
- 3 Explain the term *regenerated fibre* and identify one example.
- 4 Name three examples of a synthetic fibre.

## Websites

- ☺ Nu Mei ([www.numei.com](http://www.numei.com)): This online yarn store contains a resource centre that provides excellent information about the different types of fibres.
- ☺ GCSE Bitesize Textiles ([www.bbc.co.uk/schools/](http://www.bbc.co.uk/schools/)): The GCSE Bitesize section of the BBC website contains a summary of fibre types and sources. To navigate to this, click on 'GCSE' under the 'Bitesize' heading in the middle of the page. Then for the subject area, click on first 'Design and Technology' and then 'Textiles'.
- ☺ Cotton Australia ([www.cottonaustralia.com.au](http://www.cottonaustralia.com.au)): An Australian website providing up-to-date information on the Australian cotton industry and resources for secondary students.



4.3 Fibre crossword  
4.4 Fibre properties palm cards

NelsonNet

Fibre properties crossword  
TEXD11IN040033  
Fibre properties word search  
TEXD11IN040035



# 5

## Fibre types and classification

### Cotton

#### What is cotton?

**Cotton** has been used for over 7000 years and during that time, no other fibre has come close to matching its natural properties. Cotton is a cellulosic fibre produced by the cotton plant, which is a member of the *Hibiscus* family.



Cotton  
([www.qwiki.com/embed/Cotton](http://www.qwiki.com/embed/Cotton))



5.1 Growing cotton

Shutterstock.com



Green and white cotton bolls



White cotton boll ready for harvesting

Shutterstock.com



Apparel items featuring cotton fabrics

The word *cotton* is derived from *quten* (or *kuten*), an Arabic word used to describe any fine textiles. Cotton comprises about one-third of the world's fibre market. More than 95% of cotton grown in Australia each year is exported, mainly to Asian spinning mills. It is then imported back to Australia as yarns, fabrics and textile products. Cotton is one of Australia's highest rural export earners.

Cotton is known for its durability, appearance and natural comfort. Specific end-uses include:

- apparel, such as jeans, T-shirts and underwear
- home furnishings, such as sheets and towels
- non-apparel, such as medical supplies and tents.

Cotton can also be blended with other fibres, including lycra, polyester and wool.

### Cotton morphology

#### Physical characteristics

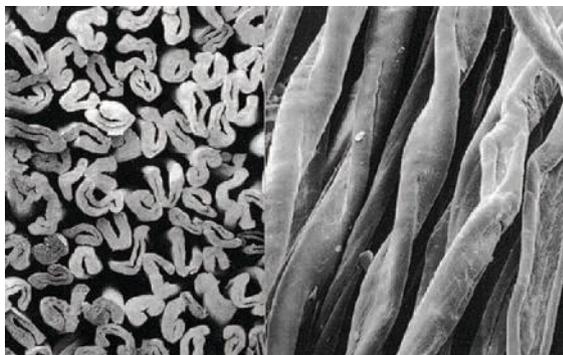
Cotton fibres are:

- obtained from the cotton plant
- natural staple fibres measuring 10–65 mm in length
- made of cellulose
- thin and tubular
- usually white to beige in colour, although the use of naturally coloured cotton is becoming more popular due to the environmental issues of dyeing.

## Microscopic appearance

The longitudinal microscopic appearance shows that cotton fibres have irregular ribbon-like twists called convolutions. These twists are the result of the central canal, or lumen, which collapses as the fibre matures. These convolutions allow cotton fibres to be spun easily.

The cross-sectional appearance shows cotton fibres are kidney-shaped. The cuticle is a wax-like film that coats the fibre. Nutrients are transported through the lumen as the fibre is developing. Between the lumen and the cuticle are layers of cellulose called fibrils. The fibrils are arranged in a spiral direction. Cotton is primarily a crystalline fibre.



Cross-sectional and longitudinal microscopic view of cotton

## Burning test

Fibre	Cotton	
On approach to flame	Doesn't shrink away	
Inside flame	Burns quickly with yellow flame	
After removal from flame	Continues to burn; afterglow	
Ash or residue	Light grey ash	
Smell	Similar odour to burning paper	

## Properties of cotton

Fibre properties		Properties of cotton
Aesthetic	Lustre	<ul style="list-style-type: none"> <li>Fibres are not naturally lustrous</li> <li>Fibres can be treated with a finish called mercerisation, which results in a low lustre</li> </ul>
	Drape	<ul style="list-style-type: none"> <li>Poor, but can be improved depending on fabric construction</li> </ul>
Durability	Abrasion resistance	<ul style="list-style-type: none"> <li>Moderate to good depending on the fabric structure</li> <li>Denim made using a twill weave has high abrasion resistance</li> </ul>
	Strength	<ul style="list-style-type: none"> <li>Relatively strong due to the intricate fibre structure and highly crystalline regions (70%)</li> <li>Becomes stronger when wet</li> </ul>
Comfort	Absorbency	<ul style="list-style-type: none"> <li>Highly absorbent, holding up to 27 times its own weight in water</li> <li>Very comfortable to wear in hot weather as it quickly absorbs perspiration</li> </ul>
	Elasticity	<ul style="list-style-type: none"> <li>Relatively inelastic because of the high percentage of crystalline regions</li> </ul>
	Thermal properties	<ul style="list-style-type: none"> <li>A cool fibre as it is a good conductor of heat</li> <li>Breathes easily due to fibre structure, making it more comfortable to wear than manufactured fibres</li> <li>Does not irritate the skin or cause allergies as it is a smooth fibre</li> <li>Can be ironed with a hot iron</li> <li>Ignites and burns quickly as it is made from cellulose</li> </ul>
	Dimensional stability	<ul style="list-style-type: none"> <li>Garments retain their shape due to the inelasticity of the fibre</li> <li>If a garment stretches out of shape it will not return to its original size</li> </ul>
Care	Effect of chemicals	<ul style="list-style-type: none"> <li>Broken down by strong acids</li> <li>Minimal harm by acids in food if they are removed quickly after coming into contact</li> <li>Resistant to alkalis, therefore can be cleaned using strong detergents and bleach</li> <li>Not harmed by organic solvents, therefore can be dry-cleaned</li> </ul>
	Sun resistance	<ul style="list-style-type: none"> <li>Not easily damaged by sunlight, therefore often used to manufacture curtains, tents and tarpaulins</li> <li>Ultraviolet rays of sunlight affect the strength of cotton after a prolonged length of time, changing the colour to yellow</li> </ul>
	Colour fastness	<ul style="list-style-type: none"> <li>Hydrophilic, so it is easily dyed</li> <li>If a cotton garment fades it is due to the dyestuff used, not the properties of cotton</li> </ul>
	Shrink resistance	<ul style="list-style-type: none"> <li>Tends to shrink when dried after washing, which is due to fabric construction rather than fibre properties</li> <li>Pre-shrinkage finishes can overcome shrinking issues</li> </ul>

### Extend your knowledge 5.1



Visit the Cotton Australia website ([www.cottonaustralia.com.au](http://www.cottonaustralia.com.au)) and answer the following questions.

- 1 Where is the bulk of Australian-grown cotton exported?
- 2 How much does the Australian cotton industry generate in export revenue per year?
- 3 Briefly explain the term *best management practices*.
- 4 Identify how biotechnology has improved Australian cotton over the last 10 years.

# Wool

## What is wool?

**Wool** is one of the oldest textile fibres known and possesses distinct properties. It is nature's technical textile fibre; science has not been able to produce another fibre containing all the natural properties of wool.

The uniqueness of wool lies in the structure of its fibres, which absorb moisture, insulate against heat and cold, resist flame and maintain their resilience. Wool is versatile, and its end-uses include luxurious designer apparel, high-performance sportswear and superior furnishings. It is used in emerging biomedical technology applications and is the desired medium for many textile fibre artists.

Wool is a natural bicomponent fibre (with a core and sheath); however, wool's properties and performance can also be enhanced through fibre blends such as denim wool, and treated with finishes to improve existing qualities, such as machine washability.

Australian wool is recognised for its high quality and is sought after by international markets. Wool is taken from the fleece of domesticated sheep but can also come from other animals, such as alpaca, Angora and Kashmir goats (cashmere), camel, llama and vicuna.



Wool video  
([www.qwiki.com/embed/Wool](http://www.qwiki.com/embed/Wool))



5.3 Wool collage  
5.4 Wool pair-and-share activity



Australian Merino sheep



Fleece

Photo courtesy of CSIRO Textile and Fibre Technology

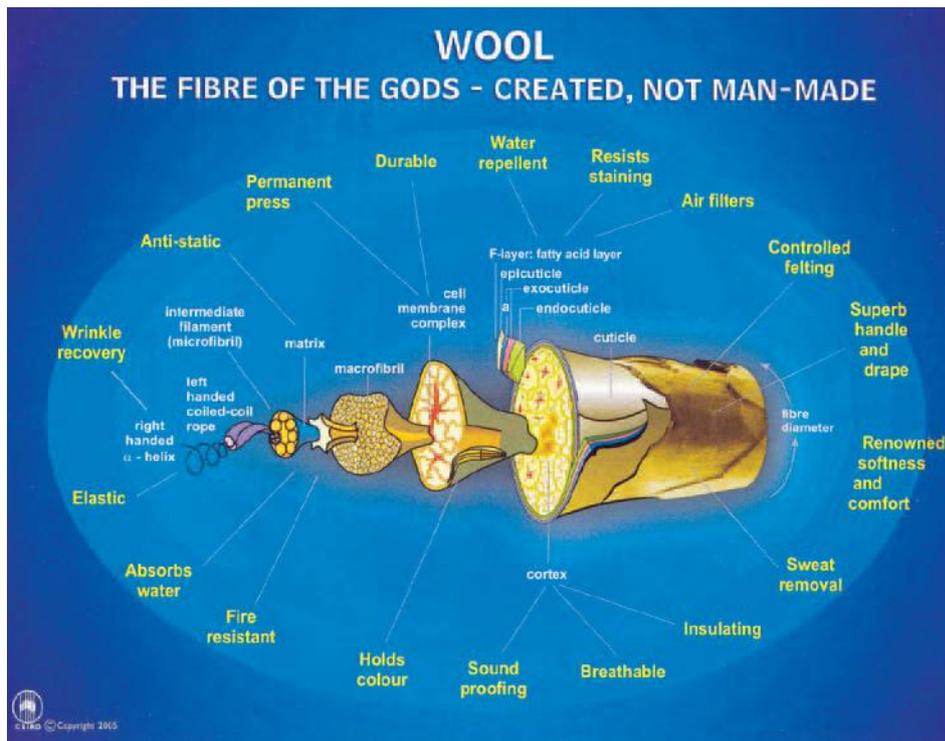


Image courtesy of CSIRO Textile and Fibre Technology

# Wool morphology

## Physical characteristics

Wool fibres are:

- obtained from the fleece of domesticated sheep
- natural staple fibres
- made of multi-cellular protein
- matt in appearance
- crimped or wavy (the more crimps per centimetre, the finer the wool)
- coloured off-white to light cream, or come in a full range of blacks and browns.

## Microscopic appearance



Wool longitudinal view, three scanning electron micrograph photographs

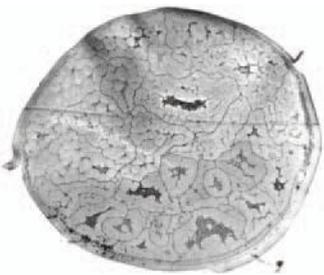
The longitudinal microscopic appearance shows that wool fibres have overlapping surface cells called scales. These scales overlap towards the tip of the fibre, giving wool a type of serrated surface. It is this scale structure that gives wool its felting capabilities, and is known as the directional friction effect.

Cross-sectional images usually show wool fibres as oval in appearance. The outside epithelial cells are known as the cuticle. The cuticle

surrounds the cortex of the wool, which contains between 20 and 50 cortical cells depending on the diameter of the wool fibre. Wool is primarily an amorphous fibre.

## Burning test

Fibre	Wool	
On approach to flame	Shrinks away from flame	
Inside flame	Smoulders and burns slowly	
After removal from flame	Tends to self-extinguish	
Ash or residue	Crushable black ash	
Smell	Similar odour to burning hair	



Wool cross-sectional view, scanning electron micrograph photography

Images courtesy of CSIRO Textile and Fibre Technology

## Properties of wool

Fibre properties		Properties of wool
Aesthetic	Lustre	<ul style="list-style-type: none"> <li>• Not typically lustrous and generally have a matte appearance</li> <li>• Often blended with other fibres, such as silk, to increase lustre</li> </ul>
	Drape	<ul style="list-style-type: none"> <li>• Exceptional, making it perfect for all types of apparel and furnishings</li> <li>• Lustre, drape and hand can all be modified through the choice of yarn structure, fabric structure and finishing techniques</li> <li>• Highly versatile – consumers can buy anything from a luxurious gossamer-weight voile evening dress to a heavy-duty resilient hard-wearing carpet made from wool</li> </ul>
Durability	Abrasion resistance	<ul style="list-style-type: none"> <li>• Moderate, due to the fibre scale construction and excellent elasticity</li> </ul>
	Strength	<ul style="list-style-type: none"> <li>• Weak, due to the fibre's highly amorphous structure</li> <li>• The coarser the wool diameter, the stronger the wool fibre, which is why coarser fibres are often used in the manufacture of carpets</li> </ul>
Comfort	Absorbency	<ul style="list-style-type: none"> <li>• Extremely absorbent due to the fibre's amorphous regions, therefore comfortable in most conditions</li> <li>• Soft and comfortable – the prickle associated with wool is reduced as the diameter of the fibre becomes smaller</li> </ul>
	Elasticity	<ul style="list-style-type: none"> <li>• Excellent elastic recovery</li> </ul>
	Thermal properties	<ul style="list-style-type: none"> <li>• Poor conductor of heat, so is known as a warm fibre</li> <li>• Excellent insulation properties</li> <li>• Can be shaped by heat and moisture, although wool is affected by high temperatures and will scorch easily, so a low iron temperature must be used</li> <li>• Has a self-extinguishing property and does not burn, which makes it perfect for flame-resistant cloth used in firefighters' suits, theatrical curtains and home furnishings</li> </ul>
	Dimensional stability	<ul style="list-style-type: none"> <li>• Poor dimensional stability</li> </ul>
Care	Effect of chemicals	<ul style="list-style-type: none"> <li>• Does not soil readily</li> <li>• Resistant to acids but is weakened by alkalis and damaged by chlorine bleach</li> </ul>
	Sun resistance	<ul style="list-style-type: none"> <li>• Sunlight yellows wool over time and weakens the fibre</li> </ul>
	Colour fastness	<ul style="list-style-type: none"> <li>• Excellent – wool is dyed readily due to its highly amorphous structure</li> </ul>
	Shrink resistance	<ul style="list-style-type: none"> <li>• Poor shrink resistance – if wool fibres are combined with water, heat, soap and agitation they will mat together to form a web of non-woven fabric known as felt</li> <li>• Weaker when it is wet, therefore care must be taken when laundering</li> <li>• Dry-cleaning or hand-washing in cold to warm water using a specially designed wool detergent is recommended, and should always be dried in the shade</li> </ul>



5.5 Compare and contrast the properties of natural fibres

# Rayon

## What is rayon?

**Rayon** was the first artificial fibre to be created, developed by Count Hilaire de Chardonnet in France in 1889. *Rayon* is derived from a French word meaning 'rays of light'.

Rayon is not a synthetic fibre as it is made from wood pulp, which is cellulosic in nature. The cellulose is chemically modified to create a fibre. Although rayon was originally called 'artificial silk' due to its lustre and soft handle, its cellulosic composition means many of its properties are more similar to cotton and flax. Rayon is classified as a **regenerated fibre**.

The 1920s were the boom years for the rayon industry, with consumers selecting rayon's silk-like properties without the expense of silk. By the end of the 1920s in the United States, rayon was six times more popular than silk for apparel items.

Rayon is made through a process called wet spinning. A liquid substance of cellulose is passed through a spinneret, which is a small nozzle with up to 20 000 holes. A filament of rayon is extruded from each hole in the spinneret, and each filament then passes into a chemical bath where it solidifies. The filament fibres can be cut into short, staple lengths and spun together to form yarn.

Rayon has many end-uses, including apparel and home furnishings. Rayon's excellent absorbency and its ability to biodegrade has led to its use as the predominant fibre in the non-woven industry. It is used for industrial wipes, nappies and surgical products such as bandages.

## Rayon morphology

### Physical characteristics

Rayon fibres are:

- made from cotton linters or the pulp of trees, such as spruce, hemlock or pine
- produced by an extrusion process, which is modelled on the natural process used by silkworms to transform the cellulose of mulberry leaves into silk
- manufactured to possess a range of fibre properties to meet specific end-uses.



Rayon embroidery thread

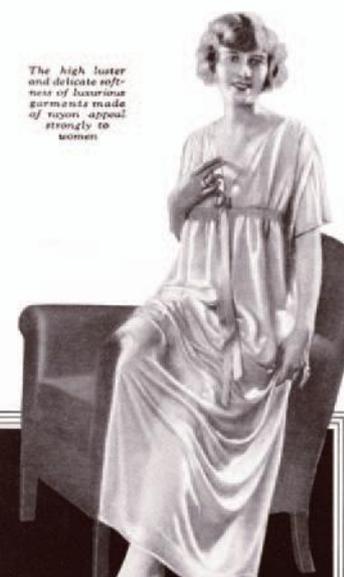


5.6 Rayon  
([www.qwiki.com/embed/Rayon](http://www.qwiki.com/embed/Rayon))



Rayon video

Photo courtesy of DuPont

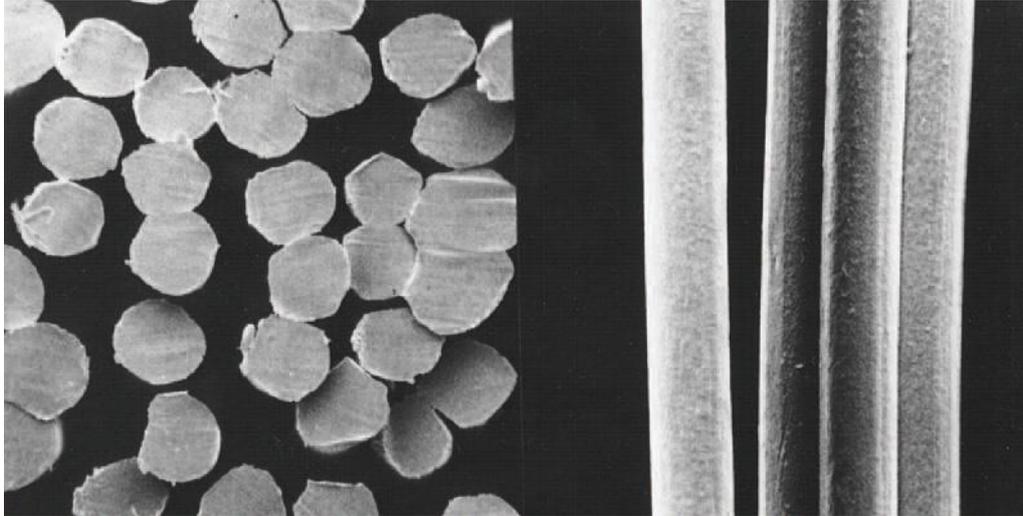


Vintage DuPont – the high lustre and delicate softness of luxurious garments made of rayon appeal strongly to women.

## Microscopic appearance

The longitudinal microscopic appearance of rayon is characterised by lengthwise lines called striations.

The cross-sectional appearance of rayon depends on the spinneret used. Traditionally, it is an irregular circle with serrated edges, although it can also appear round, irregular, T-shaped, E-shaped or U-shaped.



Images courtesy of Shirley Technologies LTD. Part of the British Textile Technology group of companies

Cross-sectional and longitudinal microscopic view

## Burning test

Fibre	Rayon	
On approach to flame	Doesn't shrink away	
Inside flame	Burns quickly with yellow flame	
After removal from flame	Continues to burn; afterglow	
Ash or residue	Light grey ash	
Smell	Similar odour to burning paper	

## Properties of rayon

Fibre properties		Properties of rayon
Aesthetic	Lustre	<ul style="list-style-type: none"> <li>• A lustrous fibre – often used for formal wear</li> <li>• May be treated with a delustering finish to reduce the lustre of the fabric</li> </ul>
	Drape	<ul style="list-style-type: none"> <li>• Good drapeability</li> </ul>
Durability	Abrasion resistance	<ul style="list-style-type: none"> <li>• Fair; resists pill formation</li> </ul>
	Strength	<ul style="list-style-type: none"> <li>• Low to medium strength but the strength reduces by 40–70% when wet, causing it to stretch easily</li> <li>• Take care when washing rayon garments as they may stretch out of shape</li> </ul>
Comfort	Absorbency	<ul style="list-style-type: none"> <li>• Highly absorbent as it is an amorphous fibre</li> <li>• Absorbs dye easily</li> </ul>
	Elasticity	<ul style="list-style-type: none"> <li>• Poor elasticity due to large percentage of amorphous regions</li> </ul>
	Thermal properties	<ul style="list-style-type: none"> <li>• Good conductor of heat, and therefore is a cool fibre suitable for summer clothing</li> <li>• Highly flammable due to its cellulosic nature</li> </ul>
	Dimensional stability	<ul style="list-style-type: none"> <li>• Poor dimensional stability – evident in hemlines on rayon garments, which will often drop out of shape</li> </ul>
Care	Effect of chemicals	<ul style="list-style-type: none"> <li>• Damaged by acids</li> <li>• Strong alkalis may disintegrate rayon, so a mild soap and lukewarm water are recommended for washing</li> <li>• Attacked by bleaches but only at high concentrations</li> </ul>
	Sun resistance	<ul style="list-style-type: none"> <li>• Sun resistant</li> </ul>
	Colour fastness	<ul style="list-style-type: none"> <li>• Colour fastness is dependent on the dyestuff used to dye the fibre or fabric</li> </ul>
	Shrink resistance	<ul style="list-style-type: none"> <li>• Will shrink more than cotton fabrics</li> </ul>

## Polyester

### What is polyester?

**Polyester** polymers were discovered as part of Wallace H. Carothers' research work in the 1930s for the US company DuPont, although the initial work on polyesters was discontinued in favour of nylon. The first fibre produced from polyester was known as Terylene. In 1946, DuPont purchased the exclusive right to produce polyester in the United States.

Polyester fibre was given the name Dacron (pronounced *Day-kron*) and was first produced commercially in 1951. Polyester was once considered a magic fibre as it was capable of being washed, scrunched and worn without a wrinkle in sight. Historically, it is remembered for its bright knit fabrics of the late 1960s and early 1970s, and for its uncomfortable feel.

In contemporary society, polyester has evolved with the technological age and has been reinvented, displaying diverse end-uses in apparel, non-apparel, furnishings, textile arts and costumes. Polyester is a universal blender, contributing its outstanding properties to many other fibres without detracting from the properties of the fibre it is blended with.



Polyester video  
([www.qwiki.com/embed/Polyester](http://www.qwiki.com/embed/Polyester))



Apparel made from polyester fabric

## Polyester morphology

### Physical characteristics

Polyester fibres:

- are made from a chemical reaction between dicarboxylic acid and dihydric alcohol
- are melt-spun, with their shape formed by the shape of the hole in the spinneret
- are filaments that can be high or regular tenacity, delustered, bright, white or dyed
- can have a variety of cross-sectional shapes, including round, trilobal, pentalobal, oval and hollow
- are made from polymer chips, which are mostly white in their natural state and therefore do not normally have to be bleached
- are crystalline in structure, which gives strength and resilience to the fibre
- can be used as a drawn filament, and can be textured and/or cut into staples and spun
- are available in deniers from less than 1.0 to 10, and microfibres that range from as small as 0.3 to 0.9.



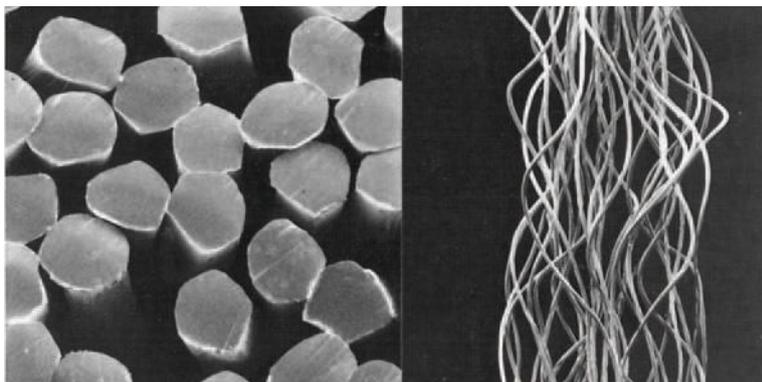
5.7 Polyester

### Microscopic appearance

The longitudinal microscopic appearance of regular polyester shows a smooth, rod-like appearance.

The cross-sectional appearance shows that regular polyester fibres are round in shape. Polyester is primarily a crystalline fibre.

Technological advances have made it possible to engineer polyester fibres; therefore, the microscopic appearance can be quite different and affect the end-use of the fibre.



Images courtesy of Shirley Technologies LTD. Part of the British Textile Technology group of companies

Cross-sectional and longitudinal microscopic view of polyester

## Burning test

Fibre	Polyester	
On approach to flame	Fuses and shrinks away from flame	
Inside flame	Burns slowly with some melting and a black thick smoke is apparent	
After removal from flame	Usually self-extinguishing	
Ash or residue	Hard, black bead	
Smell	Sweet smell	

## Properties of polyester

Fibre properties		Properties of polyester
Aesthetic	Lustre	<ul style="list-style-type: none"> <li>Variable, depending on the cross-sectional shape and the additives to the fibre, such as delustering agents</li> </ul>
	Drape	<ul style="list-style-type: none"> <li>Good, but can depend on the yarn and fabric construction – for example, microfibre has exceptional drape</li> </ul>
Durability	Abrasion resistance	<ul style="list-style-type: none"> <li>Excellent</li> </ul>
	Strength	<ul style="list-style-type: none"> <li>Relatively strong due to highly oriented fibre structure and highly crystalline regions</li> <li>Wet strength is comparable to its dry strength</li> </ul>
Comfort	Absorbency	<ul style="list-style-type: none"> <li>Poor absorbency, which lowers the comfort of the fibre as the moisture does not escape</li> <li>Often blended with cotton to improve its absorbency</li> </ul>
	Elasticity	<ul style="list-style-type: none"> <li>Relatively elastic because of the high percentage of crystalline regions</li> </ul>
	Thermal properties	<ul style="list-style-type: none"> <li>Moderate thermal properties – not as warm as wool in cold weather; however, blending it with wool and using fibre modifications can change the performance and end-use for cooler weather</li> <li>Poor conductor of heat but feels cool against the skin</li> <li>An excellent insulator, therefore used in fibrefill quilts, pillows and linings of padded clothing, such as parkas</li> </ul>
	Dimensional stability	<ul style="list-style-type: none"> <li>Excellent dimensional stability – can be heat-set into shape and retain its size</li> <li>Can be permanently heat-set, pleated or moulded into interesting shapes</li> </ul>

Fibre properties		Properties of polyester
Care	Effect of chemicals	<ul style="list-style-type: none"> <li>Resistant to acids and alkalis, therefore strong detergents and bleach can be used</li> <li>Can be dry-cleaned as organic solvents do not cause harm</li> </ul>
	Sun resistance	<ul style="list-style-type: none"> <li>Resistant to sunlight – often used to manufacture sheer curtains</li> </ul>
	Colour fastness	<ul style="list-style-type: none"> <li>Hydrophobic, so it is best dyed at the fibre stage</li> </ul>
	Shrink resistance	<ul style="list-style-type: none"> <li>Low shrinkage due to its hydrophobic and crystalline properties</li> </ul>

## Nylon

### What is nylon?

**Nylon** was the first manufactured synthetic fibre, created by Dr Wallace H. Carothers while working for the DuPont Company in the United States. Charles Stine, a vice-president of DuPont, announced the invention of nylon to a large group of women's club members gathered at the site of the 1939 New York World's Fair.

The very first nylon product was a toothbrush with nylon bristles, although nylon's first real success came in 1940 with its use in women's stockings. They were a big hit, but became hard to obtain due to World War II as nylon was needed to make war materials, such as parachutes and ropes.

### Nylon morphology

#### Physical characteristics

Nylon fibres:

- are polyamides made by various substances such as hexamethylenediamine and adipic acid
- are melt-spun, with their shape formed by the shape of the hole in the spinneret
- are filaments that can be high or regular tenacity, delustered, bright or dyed
- can have a variety of cross-sectional shapes, including round, trilobal and square fibres with voided cavities
- are polymer chips that are mostly grey, green or off-white in their natural state
- are crystalline in structure, which gives strength and resilience to the fibre
- can be used as a drawn filament, and can be textured and/or cut into staples and spun
- are available in a wide range of deniers.



Hot-air balloons made from nylon fabric



Nylon video  
([www.qwiki.com/embed/Nylon](http://www.qwiki.com/embed/Nylon))

Image courtesy of DuPont



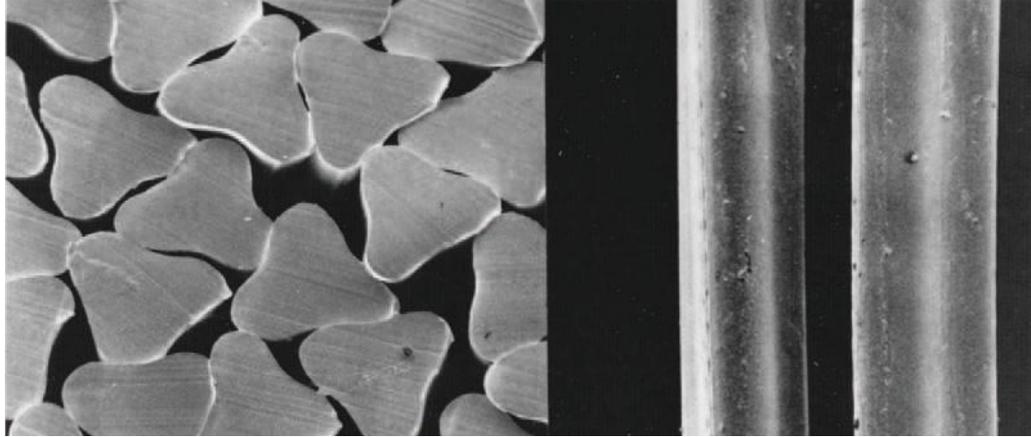
Actress Maria Wilson, perched atop a crane, watched as a 2 tonne, 10 metre cast of her leg was unveiled in Los Angeles in 1940, to promote the sale of nylon stockings.

## Microscopic appearance

The longitudinal microscopic appearance of regular nylon shows a smooth, rod-like appearance.

The cross-sectional appearance shows that regular nylon fibres are a round shape. Nylon is primarily a crystalline fibre.

Technological advances have made it possible to engineer nylon fibres; therefore, the microscopic appearance can be quite different and can affect the end-use of the fibre.



Images courtesy of Shirley Technologies Ltd. Part of the British Textile Technology Group of companies

Cross-sectional and longitudinal microscopic view of nylon

## Burning test



5.8 Nylon

Fibre	Nylon	
On approach to flame	Fuses and shrinks away from flame	
Inside flame	Burns slowly with some melting	
After removal from flame	Usually self-extinguishing	
Ash or residue	Hard grey or tan bead	
Smell	Smells like celery	

## Properties of nylon

Fibre properties		Properties of nylon
Aesthetic	Lustre	<ul style="list-style-type: none"> <li>Variable, depending on the cross-sectional shape and the additives to the fibre, such as delustering agents</li> </ul>
	Drape	<ul style="list-style-type: none"> <li>Good, but can depend on the yarn and fabric construction</li> <li>High drape in sheer apparel formal wear</li> <li>Medium drape in stiff nylon taffeta apparel formal wear</li> <li>Stiff industrial-use webbing for non-apparel car seatbelts or luggage manufacture</li> </ul>
Durability	Abrasion resistance	<ul style="list-style-type: none"> <li>Excellent abrasion resistance</li> </ul>
	Strength	<ul style="list-style-type: none"> <li>Relatively strong due to highly oriented fibre structure and highly crystalline regions</li> </ul>
Comfort	Absorbency	<ul style="list-style-type: none"> <li>Low absorbency, which lowers the comfort of the fibre as the moisture does not escape</li> <li>Low absorbency is beneficial for other end-use applications, such as wind- and water-resistant jackets, tents and umbrellas</li> </ul>
	Elasticity	<ul style="list-style-type: none"> <li>Relatively elastic due to the high percentage of crystalline regions</li> </ul>
	Thermal properties	<ul style="list-style-type: none"> <li>Moderate thermal properties</li> <li>Low heat resistance – heat causes the nylon polymer bonds to break down</li> <li>Has thermoplasticity – if nylon is heated and then cooled under controlled conditions, the textile material can be permanently heat-set</li> </ul>
	Dimensional stability	<ul style="list-style-type: none"> <li>Excellent dimensional stability – can be heat-set into shape and retain its size</li> <li>Can be permanently heat-set, pleated or moulded into interesting shapes</li> </ul>
Care	Effect of chemicals	<ul style="list-style-type: none"> <li>Not resistant to acids – tends to yellow or discolour</li> <li>Fairly resistant to alkalis, but tends to yellow with repeated exposure</li> <li>Can be dry-cleaned as organic solvents do not cause harm</li> </ul>
	Sun resistance	<ul style="list-style-type: none"> <li>Fairly resistant to sunlight but prolonged exposure to sunlight will cause yellowing over time</li> </ul>
	Colour fastness	<ul style="list-style-type: none"> <li>Hydrophobic, so it is best dyed at the fibre stage</li> </ul>
	Shrink resistance	<ul style="list-style-type: none"> <li>Low shrinkage due to its hydrophobic and crystalline properties</li> </ul>

## Elastomeric

### What is elastomeric?

**Elastomeric** is a natural or synthetic polymer that can be used in fibre, yarn or fabric manufacture. Rubber is an example of a natural elastomer. In 1959, chemist Joseph Shivers created synthetic elastomeric for the Du Pont Company. Synthetic elastomeric is known by a number of different names, including spandex, elastane or lycra. Spandex is an anagram of the word *expands*.

The specific end-use of a textile item governs the choice of elastomer and ultimately the blend mixture or combination. Elastomeric is always blended with other fibres for apparel. In woven garments, it is usually covered with a non-elastic fibre such as cotton, wool, silk or flax. In knitted fabrics, it may be used bare or covered.



Shutterstock.com

Lycra swatches – fibre elastomeric blended with nylon

Elastomeric fibres are made up of many polymer strands that are composed of long, amorphous sections and short, rigid sections. The amorphous sections have a random molecular structure, making the fibre soft. The rigid sections bond with one other and give the fibre structure.

When the fibre is stretched, the bonds between the rigid sections are broken and the amorphous sections lengthen. This makes the amorphous sections longer, increasing the fibre length. When the fibre is stretched to its maximum length, the rigid sections bond with one other. The amorphous segments remain in a stretched state. This makes the fibre stiffer and stronger. After the force is removed, the amorphous segments recoil and the fibre returns to its original size.

## Elastomeric morphology

### Physical characteristics

Elastomeric fibres:

- are made from the polymer called polyurethane
- can stretch and be returned to their original size and shape
- are produced by solution dry spinning
- are extruded into a fibre as a monofilament
- are available in a wide range of deniers from 10 to 2500.

### Microscopic appearance

The longitudinal microscopic appearance of elastomeric shows a flat, broad appearance with some lengthwise striations.

The cross-sectional appearance shows that regular elastomeric fibres are shaped like dog bones.

Elastomeric is primarily an amorphous fibre.



5.9 Elastomeric  
5.10 Compare and contrast the properties of manufactured fibres

Image courtesy of Shirley Technologies Ltd. Part of the British Textile Technology Group of companies



Cross-sectional and longitudinal microscopic view of elastomeric

## Burning test

Fibre	Elastomeric	
On approach to flame	Fuses, but does not shrink away from the flame	
Inside flame	Burns with melting	
After removal from flame	Continues to burn with melting	
Ash or residue	Soft, fluffy black ash	
Smell	Chemical smell	

## Properties of elastomeric

Fibre properties		Properties of elastomeric
Aesthetic	Lustre	<ul style="list-style-type: none"> <li>• Variable, depending on the fibre it is blended with</li> <li>• High lustre in fabric with nylon and elastomeric blend</li> <li>• Matt in fabric with cotton and elastomeric blend</li> </ul>
	Drape	<ul style="list-style-type: none"> <li>• Variable, depending on the fibre it is blended with</li> <li>• Nylon lycra has good drape and is often used for dance costumes</li> </ul>
Durability	Abrasion resistance	<ul style="list-style-type: none"> <li>• Excellent abrasion resistance</li> </ul>
	Strength	<ul style="list-style-type: none"> <li>• Very strong</li> </ul>

Fibre properties		Properties of elastomeric
Comfort	Absorbency	<ul style="list-style-type: none"> <li>Poor absorbency, resulting in a fabric that feels clammy in hot weather</li> </ul>
	Elasticity	<ul style="list-style-type: none"> <li>Can be stretched up to 500% without breaking and will return to its original shape – an outstanding property</li> </ul>
	Thermal properties	<ul style="list-style-type: none"> <li>Poor conductor of heat</li> </ul>
	Dimensional stability	<ul style="list-style-type: none"> <li>Excellent dimensional stability – it can be stretched repeatedly and will return to its original size</li> </ul>
Care	Effect of chemicals	<ul style="list-style-type: none"> <li>Resistant to acids but damaged by continued exposure to alkalis</li> <li>Fabrics containing elastomeric should not be bleached</li> </ul>
	Sun resistance	<ul style="list-style-type: none"> <li>Can be damaged by continued exposure to sunlight</li> </ul>
	Colour fastness	<ul style="list-style-type: none"> <li>Will vary – depends on the percentage of each fibre in the blend</li> </ul>
	Shrink resistance	<ul style="list-style-type: none"> <li>Will vary – depends on the percentage of each fibre in the blend</li> </ul>

## Fibre blends

### What is a blend?

A **blend** is a combination of two or more generically different fibre types in any fibrous assembly, such as a sliver, yarn or fabric. Blends can be made up of fibres that are opposing in composition, length, colour and diameter.

### Why are blends created?

A blend is created specifically to meet an end-use application. It must offer a superior end-use quality compared with its single fibre, yarn or fabric counterpart. This is necessary to ensure the newly formed blend is able to compete successfully within the textile marketplace.

Blending can create:

- fibres, yarns or fabrics with more beneficial performance characteristics – for example, wool or cotton blended with nylon or polyester will retain its natural appearance but improve its durability and abrasion resistance
- an improvement in fabric quality, therefore meeting specific end-use requirements, such as performance, comfort or ease of care that would not otherwise be available in the single fibre, yarn or fabric
- a better texture, hand or appearance, such as the addition of colour or lustre or the production of a fancy effect yarn, which adds value to the aesthetics of a yarn or fabric
- a reduction in costs – for example, high-end luxurious silk filaments can be blended with merino wool fibres to produce a more lustrous yarn and a fabric that doesn't cost as much as silk and doesn't have the appearance of wool
- increased profitability through the control of fibre costs, and the control of supply and efficiency in the manufacturing process.

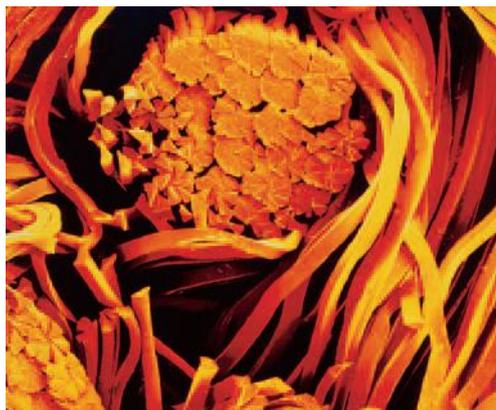
## Types of blends

### Intimate blends

An intimate blend is when two or more different fibre types are combined to form a uniform mixture before the single yarn is spun. They cannot be separated as they are mixed together throughout the entire yarn. This means both fibres are visible when you look under a microscope. Cotton/polyester is a very common intimate blend.



Coloured scanning electron micrograph of polyester and cotton fibres in woven fabric (a shirt). The cotton, a natural fibre, is coloured green, and the polyester, a synthetic fibre, is coloured orange.



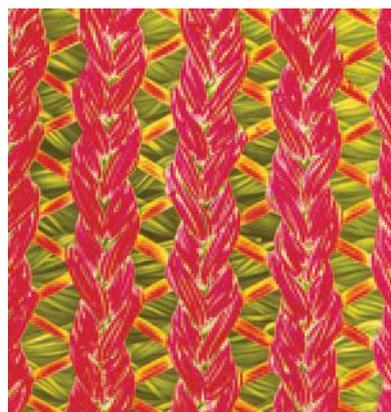
Coloured scanning electron micrograph of a synthetic microfibre cloth used to clean spectacle lenses. The wedge-shaped fibres are so thin that they scoop up the fine layer of oil and dirt that accumulates on glasses lenses, unlike other fabrics that merely spread the oil around.

### Mixture blends

A mixture blend uses a combination of yarns. One type of fibre may be used in the warp and another used in the weft. A mixture blend also occurs when two different yarns are knitted together.

### Combination blends

In a combination blend, ply yarns are used. This means at least one component of the ply yarn is different from the other components of the yarn. For example, a core-sheath yarn of elastane and nylon blended together forms yarns and fabrics with greater elastic performance properties.



False-colour scanning electron micrograph of a fabric constructed from nylon and lycra, showing the lycra sandwiched between the two layers of nylon.



Coloured scanning electron micrograph of the fibres in a bra. These are mainly nylon and polyester.



Coloured scanning electron micrograph of a cotton and polyurethane mixture of fibres woven to form part of a women's underwear item



## Successful blends

Successful blends are those that consumers find have the best end-use qualities to address the demands of aesthetics, durability, comfort, appearance and care. The most common blends include cotton/polyester and nylon/elastomeric.

## Disadvantages of blends

The disadvantages of blends are related to the different chemical properties of the fibres in the blends, which means their reaction with certain chemicals can be very different. For example, cotton is resistant to alkali but wool is not. This is particularly important in bleaching. Another example is the difference in dye uptake between different fibre types, such as cotton and polyester, although manufacturers can also exploit this disadvantage.

## Cotton/polyester blend

A cotton/polyester blend is made by combining strands of synthetic polyester fibre with natural cotton. The typical mix is 65% polyester and 35% cotton.

Cotton/polyester is often used for uniforms, bed sheets and home furnishings because it is easy to care for, does not shrink and is virtually wrinkle-free.

## Properties of cotton/polyester blends

Fibre properties		Properties of cotton/polyester
Aesthetic	Lustre	• Will vary – depends on the percentage of each fibre in the blend, and whether the blended polyester has been delustered
	Drape	• Will vary – depends on the percentage of each fibre in the blend, and the yarn and fabric manufacturing techniques
Durability	Abrasion resistance	• Increased abrasion resistance compared with its all-cotton equivalent
	Strength	• Superior strength compared with its all-cotton equivalent
	Absorbency	• Much more comfortable alternative to its all-polyester equivalent as the absorbency is increased
Comfort	Elasticity	• Increased significantly compared with its all-cotton equivalent
	Thermal properties	• Heat resistance is increased significantly compared with its all-polyester equivalent • Thermal retention is increased compared with its all-cotton equivalent
	Dimensional stability	• Increased significantly compared with its all-cotton equivalent
Care	Effect of chemicals	• Will vary – depends on the percentage of each fibre in the blend
	Sun resistance	• Generally increased, but will vary depending on the percentage of each fibre in the blend
	Colour fastness	• Will vary – depends on the percentage of each fibre in the blend, and the yarn and fabric manufacturing techniques
	Shrink resistance	• Generally improved compared with its all-cotton equivalent, but will vary depending on the percentage of each fibre in the blend

# Nylon/elastomeric blends

## Properties of nylon/elastomeric blends

Blending nylon and elastomeric fibres provides outstanding wrinkle resistance and excellent recovery due to the exceptional elasticity of the elastomeric fibre. The blending of these two fibres helps fabric retain its shape and improves its ability to return to its original shape after being stretched.

The type of stretch recovery required for a specific end-use yarn or fabric varies. Nylon/elastomeric blends are used in various apparel items, including sportswear, hosiery, furnishings and swimwear. Power-stretch fabrics are created for medical and surgical support textile applications. Examples of this technology include pressure suits for burn victims and surgical stockings to improve circulation in lower limbs (also used in long-distance air travel to help prevent deep vein thrombosis). Power-stretch fabrics using nylon/elastomeric blends are also a focus of swimsuit technology.

Fibre properties		Properties of nylon/elastomeric
Aesthetic	Lustre	<ul style="list-style-type: none"> <li>High lustre due to the nylon component – makes an ideal fabric for costumes</li> </ul>
	Drape	<ul style="list-style-type: none"> <li>Good drape</li> </ul>
Durability	Abrasion resistance	<ul style="list-style-type: none"> <li>Good abrasion resistance due to nylon component</li> </ul>
	Strength	<ul style="list-style-type: none"> <li>Excellent strength</li> </ul>
	Absorbency	<ul style="list-style-type: none"> <li>Low absorbency</li> </ul>
Comfort	Elasticity	<ul style="list-style-type: none"> <li>Excellent – able to stretch to several times its size and return to its original shape</li> </ul>
	Thermal properties	<ul style="list-style-type: none"> <li>Moderate thermal properties</li> </ul>
	Dimensional stability	<ul style="list-style-type: none"> <li>Excellent dimensional stability</li> </ul>
Care	Effect of chemicals	<ul style="list-style-type: none"> <li>Good resistance to acids and alkalis, but poor resistance to bleach</li> <li>Can be treated to make the fabric resistant to chlorine</li> </ul>
	Sun resistance	<ul style="list-style-type: none"> <li>Good resistance to sunlight, although can be damaged by continued exposure to sunlight</li> </ul>
	Colour fastness	<ul style="list-style-type: none"> <li>Will vary – depends on the percentage of each fibre in the blend</li> </ul>
	Shrink resistance	<ul style="list-style-type: none"> <li>Will vary – depends on the percentage of each fibre in the blend</li> </ul>



Coloured scanning electron micrograph of a fabric constructed from nylon and lycra. The material seen here is from a pair of cycling shorts.



5.12 Fibre audit

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Describe the microscopic appearance of cotton, wool and polyester fibres.
- 2 Outline the properties that make each of the following fibres suitable for the specific end-use.

Fibre	End-use
Cotton	Bath towels
Wool	Men's suits
Rayon	Cleaning cloths
Polyester	Evening dresses
Nylon	Tents
Cotton/polyester	School uniforms
Nylon/elastomeric	Leotards

- 3 Identify the following statements as true or false.
  - a Nylon smells like celery when burnt.
  - b Wool self-extinguishes after it is removed from a flame.
  - c Cotton will not burn when placed near a flame.
  - d Polyester has a sour smell when burnt.
  - e Rayon has similar burning properties to cotton.
  - f Polyester produces a hard, black bead when burnt.
  - g Nylon produces a crushable black ash when burnt.
  - h Cotton produces a hard, grey bead when burnt.
  - i Wool has a similar odour to burning hair when burnt.
  - j Rayon produces a light-grey ash when burnt.

## Websites

- ☺ Cotton Australia ([www.cottonaustralia.com.au](http://www.cottonaustralia.com.au)): An Australian website providing up-to-date information on the Australian cotton industry and resources for secondary students.
- ☺ Australian Wool Innovation ([www.wool.com](http://www.wool.com)): An Australian wool website providing information on all aspects of the Australian wool industry.
- ☺ *Beyond the bale* (<http://digital.wool.com.au>): A digital magazine about innovations in the Australian wool industry.
- ☺ INVISTA ([www.invista.com](http://www.invista.com)): An international website providing information on nylon, spandex (elastomeric) and polyester.



5.13 Fibre classification palm cards

NelsonNet

Fibres mind map  
TEXD11AD050036



# Yarn structures and characteristics

## What are yarns?

**Yarns** are the basic thread components of all fabric construction, excluding non-wovens; non-wovens are created directly from fibres. Yarns have a continuous length but a small cross-section, and are usually held together by twisting or spinning. Fabric texture and appearance are determined by the yarns used to construct it. Yarns also have a significant impact on the fabric performance characteristics.



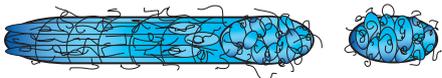
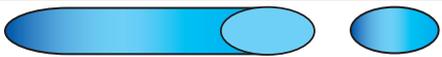
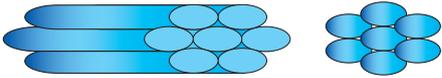
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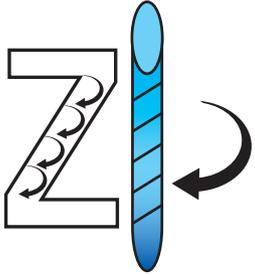
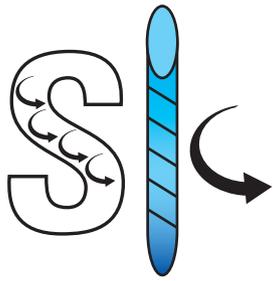
Woollen yarns spun using wooden spindles



Yarn video  
([www.qwiki.com/embed/Yarn](http://www.qwiki.com/embed/Yarn))

## Types of yarns

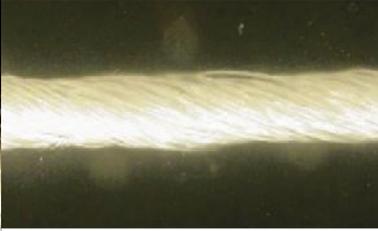
Yarn type	Definition	Characteristics	End-use
 Staple spun yarn	Made from staple fibres (cotton or wool) or manufactured fibres cut into short lengths	<ul style="list-style-type: none"> <li>• Uneven, weak yarn with poor lustre and durability</li> <li>• Good elasticity, resiliency and absorbency</li> </ul>	<ul style="list-style-type: none"> <li>• Apparel</li> <li>• Furnishings</li> </ul>
 Monofilament yarn	Made from one filament of a manufactured fibre (rayon, polyester or nylon)	<ul style="list-style-type: none"> <li>• Fine, strong yarn with good lustre and durability</li> <li>• Inelastic, poor resiliency and absorbency</li> </ul>	<ul style="list-style-type: none"> <li>• Hosiery</li> <li>• Invisible sewing thread</li> </ul>
 Multifilament yarn	Made from two or more filaments of a manufactured fibre (rayon, polyester or nylon)	<ul style="list-style-type: none"> <li>• Even, strong yarn with good lustre and durability</li> <li>• Medium elasticity and resiliency, and slightly absorbent</li> </ul>	<ul style="list-style-type: none"> <li>• Eveningwear</li> <li>• Lingerie</li> </ul>



S- and Z-twists

## Yarn twist

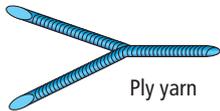
Twisting or spinning fibres holds them together to form a yarn. The twist is the most important factor in determining the properties of a yarn. Without twist, yarns have little strength. Twist can be inserted in a clockwise (S-twist) or anticlockwise (Z-twist) direction. Light is reflected from S-twist and Z-twist yarns in opposite directions. If you alternate groups of S-twist and Z-twist yarns, you can create lustrous stripes in the fabric.

Property	Low-twist yarn	High-twist yarn
		
Aesthetic	<ul style="list-style-type: none"> <li>• Soft</li> <li>• Hairy</li> <li>• Low lustre</li> <li>• Poor resiliency</li> </ul>	<ul style="list-style-type: none"> <li>• Firm</li> <li>• Smooth</li> <li>• Good lustre</li> <li>• Good resiliency</li> </ul>
Durability/strength	<ul style="list-style-type: none"> <li>• Weak</li> <li>• Poor abrasion resistance</li> </ul>	<ul style="list-style-type: none"> <li>• Strong</li> <li>• Good abrasion resistance</li> </ul>
Comfort	<ul style="list-style-type: none"> <li>• Good insulation</li> <li>• Good absorbency</li> <li>• Poor elasticity</li> </ul>	<ul style="list-style-type: none"> <li>• Poor insulation</li> <li>• Poor absorbency</li> <li>• Good elasticity</li> </ul>
Care	<ul style="list-style-type: none"> <li>• Slow drying</li> </ul>	<ul style="list-style-type: none"> <li>• Quick drying</li> </ul>
End-uses	<ul style="list-style-type: none"> <li>• Knitting yarn, weft yarns, soft furnishings, curtaining</li> </ul>	<ul style="list-style-type: none"> <li>• Warp yarns, work wear, sewing yarns</li> </ul>

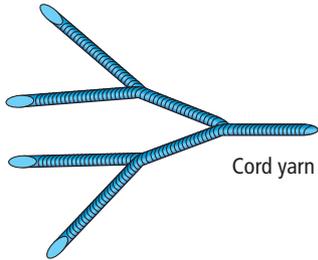
Images courtesy of Textile Fabric Consultants, Inc.



Single yarn



Ply yarn



Cord yarn

- Single or simple yarn has the same fibre composition throughout the length of the yarn and can be a single, ply or cord yarn. A single yarn is produced during the first stage of the spinning process.
- Ply yarn is formed by twisting two or more simple yarns together. A ply yarn is generally thicker than a single yarn, with improved strength and quality.
- Cord yarn is created by twisting ply yarns together. Cords are very strong and used for embroidery thread, piping and decorative cords.

## Types of spinning

Two different methods of spinning are used to create yarns.

- Staple spinning turns short fibres (cotton and wool) into yarn. Short fibres are combed or carded, and then drawn out to produce a long yarn.
- Extrusion spinning creates yarns by passing a fibre-forming substance through a spinneret. The substance then solidifies to form a filament. Rayon, polyester and nylon are created by extrusion spinning.

# Staple spinning

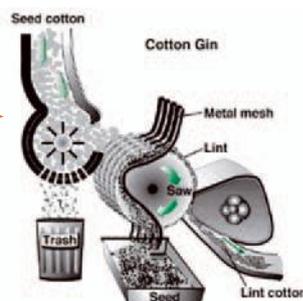
## Processing of carded and combed yarns



1 Mature cotton bolls are ready for harvesting.



2 A mechanical harvester picks the cotton bolls.



3 Ginning separates the cotton fibres from the cottonseed, removes any foreign matter such as leaves from the lint, and combs the fibres.



4 Cotton classing sorts the fibres according to length, strength and fineness.



5 Ginned cotton is packed into bales ready for further processing. Most Australian cotton is exported to Asian spinning mills.



6 Carding aligns the fibres and condenses the fibres into a sliver. Short fibres are removed during carding.



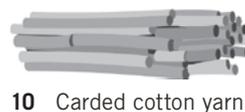
7 Combing removes short fibres and other impurities from carded cotton. Combed yarn is superior to carded yarns as it is stronger, more uniform and less hairy.



8 Drawing is where the fibres are blended and straightened. This improves the uniformity of the sliver.



9 Spinning adds twist, creating a single-spun yarn. Staple yarns are produced by ring spinning, rotor spinning or air-jet spinning.



10 Carded cotton yarn



11 Combed cotton yarn

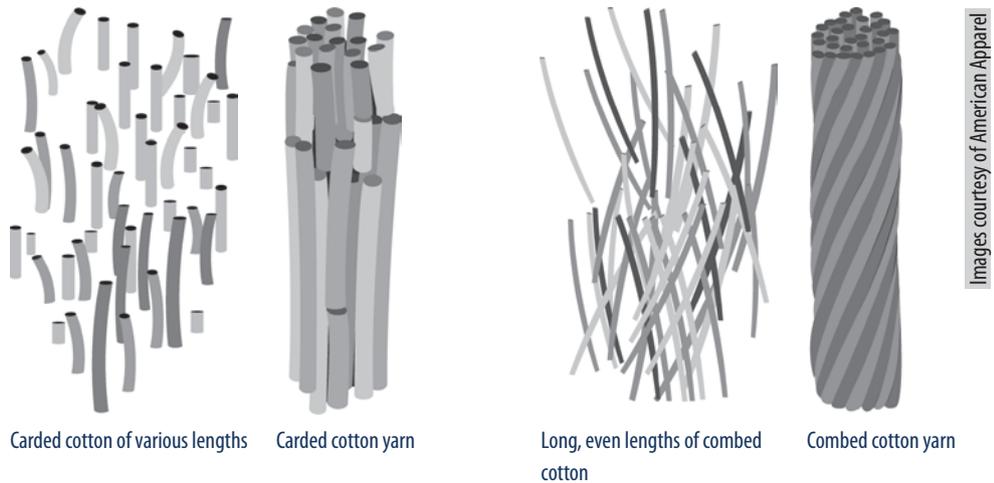
Images 1, 2, 4–9 courtesy of Cotton Australia; image 3 courtesy of Beda Richlin/Swificil AG Textile Services; images 10 and 11 courtesy of American Apparel

## What is carded cotton yarn?

**Carded cotton yarn** consists of fibres in various lengths, resulting in a more uneven yarn.

## What is combed cotton yarn?

**Combed cotton yarn** consists of fibres of long, even lengths. Combed ring-spun cotton is noticeably softer and higher in quality than carded cotton.



Property	Carded cotton yarn	Combed cotton yarn
Aesthetic	<ul style="list-style-type: none"> <li>• Low to medium twist</li> <li>• Uneven thickness of yarn</li> <li>• Uneven surface</li> <li>• Thicker yarn</li> <li>• Poor resiliency</li> </ul>	<ul style="list-style-type: none"> <li>• Medium to high twist</li> <li>• Even thickness of yarn</li> <li>• Smooth surface</li> <li>• Finer yarn</li> <li>• Poor resiliency</li> </ul>
Durability/strength	<ul style="list-style-type: none"> <li>• Strong</li> <li>• More durable</li> </ul>	<ul style="list-style-type: none"> <li>• Improved yarn strength</li> <li>• Durable</li> </ul>
Comfort	<ul style="list-style-type: none"> <li>• Soft</li> </ul>	<ul style="list-style-type: none"> <li>• Soft</li> </ul>
Care	<ul style="list-style-type: none"> <li>• Absorbent</li> <li>• Slow drying</li> </ul>	<ul style="list-style-type: none"> <li>• Absorbent</li> <li>• Quick drying</li> </ul>
End-uses	<ul style="list-style-type: none"> <li>• Drill, jeans, gabardine, denim, sheeting, towelling, cotton poplin</li> </ul>	<ul style="list-style-type: none"> <li>• Cotton sewing thread, knitted cotton underwear, batiste, cotton lawn, voile, shirting, percale</li> </ul>

### Extend your knowledge 6.1



How It's Made: cotton yarn  
([www.youtube.com/watch?v=kH\\_b3Heo48L](http://www.youtube.com/watch?v=kH_b3Heo48L))

Watch the video clip about how cotton yarn is made and answer the following questions.

- When was the first spinning wheel developed?
- Explain the following steps in the processing of cotton.
 

<ol style="list-style-type: none"> <li>a Carding</li> <li>b Coiling</li> <li>c Drawing</li> <li>d Roving</li> </ol>	<ol style="list-style-type: none"> <li>e Winding</li> <li>f Quality control</li> <li>g Air-jet spinning</li> </ol>
---	--
- Describe the qualities of the spun cotton yarn.
- How long does it take to spin a cotton yarn?

## Processing of woollen and worsted yarns



**1** Wool on a sheep's back is shorn once a year. The shorn wool is known as 'greasy wool clip'.



**2** Shearing in Australia takes place in early spring.



**3** Classing ensures that the wool fibres are of similar length and fineness.



**4** Wool is baled and transported to auction.

Photos courtesy of CSIRO



**7** Wool is then scoured or washed.



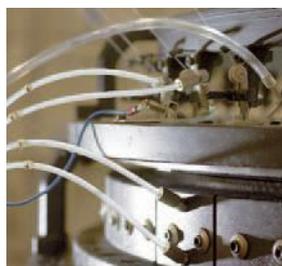
**6** Sorting takes place; the wool is divided into lots that are similar in length and fineness.



**5** Wool is auctioned.



**8** Wool contaminated with burrs and seeds is carbonised using an acid solution.



**9** Wool is dried on a conveyor belt using hot air.



**10** Carding uses wire rollers to tease wool staples apart. The fibres form a carded web, which is then brought together to form a sliver. The short fibres are known as noils; these are removed.



**14** Spinning inserts a twist.



**13** The drawing out of the tops or rovings reduces the thickness of the yarn.



**12** Long wool fibres are combed and laid parallel.



**11** Noils are condensed and separated into rovings.



**15** Worsteds yarns are formed from long, smooth, combed fibres.



**16** Woollen yarns are formed from condensed, shorter noils.



## What is a woollen yarn?

A **woollen yarn** is characterised by short staple wool fibres that are not always uniform in length. The fibres in the yarn are less parallel, softer and looser than worsted yarn.

## What is a worsted yarn?

A **worsted yarn** is characterised by longer fibres. When spun, the fibres are more uniform in length, smoother and are more compact than woollen yarn.

Property	Woollen yarns	Worsted yarns
Aesthetic	<ul style="list-style-type: none"> <li>Fuzzy, dull and matt in appearance</li> <li>Excellent drape</li> <li>Less wrinkle resistance</li> </ul>	<ul style="list-style-type: none"> <li>Smooth and fine in appearance; can give off a low sheen</li> <li>Moderate drape</li> <li>More wrinkle resistance</li> </ul>
Durability/strength	<ul style="list-style-type: none"> <li>Weak, less durable</li> <li>Softer handle</li> <li>Thicker</li> <li>More resilient</li> </ul>	<ul style="list-style-type: none"> <li>Moderate weakness, more durable than woollen yarns</li> <li>Harder handle</li> <li>Finer</li> <li>Less resilient</li> </ul>
Comfort	<ul style="list-style-type: none"> <li>Heavier in weight</li> <li>Warmer handle due to fuzzy protruding ends</li> <li>Slower drying</li> <li>More absorbent</li> </ul>	<ul style="list-style-type: none"> <li>Lighter in weight</li> <li>Cooler handle due to finer, smoother texture</li> <li>Quicker drying</li> <li>Less absorbent</li> </ul>
Care	<ul style="list-style-type: none"> <li>Tendency to felt</li> <li>Slow drying</li> </ul>	<ul style="list-style-type: none"> <li>Less tendency to felt</li> <li>Quick drying</li> </ul>
End-uses	<ul style="list-style-type: none"> <li>Coarse wool carpet, knitting wool</li> </ul>	<ul style="list-style-type: none"> <li>Fine wool suiting</li> </ul>

### Extend your knowledge 6.2



How It's Made: wool yarn  
([www.youtube.com/watch?v=vuEYsmzophTA](http://www.youtube.com/watch?v=vuEYsmzophTA))

Watch the video clip about how wool yarn is made and answer the following questions.

- 1 Explain what happened at the following times in relation to the wool industry: 10 000 BC, 4000 BC, 50 AD, 1797.
- 2 Identify the properties of woollen fabrics.
- 3 Identify the end-uses of wool yarn.
- 4 How is wool graded?
- 5 Outline the process of spinning wool fibres into yarn.
- 6 Outline how wool fibres are blended with other fibres.

# Jenny McWhinney Designs

## Designer profile

Jenny McWhinney has always had a passion for creating beautiful things, whether it be drawing, painting, stitching or sewing. As a self-taught artist, Jenny learnt the basic methods of her craft through her father, who was an avid painter and embroiderer. After entering the Royal Adelaide Show textiles exhibition in 1998, Jenny's unique style of 'thread painting' was shown to the public for the first time, and ultimately published in *Inspirations*, Australia's most successful embroidery magazine.

Since her first article in 1999 in *Inspirations*, Jenny has now had more than 50 of her stitched creations featured in various textile publications. Jenny regularly teaches her craft at needlework conventions, both nationally and internationally, with her main goal being to inspire others to embrace their own creativity.

Working from her studio in the seaside suburb of Seacliff in South Australia, Jenny now runs her own business. She teaches her art to clients and runs an online web boutique selling kits, patterns and various needlework notions.

## Design inspiration

Jenny McWhinney's textile practice is predominantly influenced by the natural world, with a particular focus on creating artistic reflections of various animals in their natural habitats. These embroidered thread paintings capture not only a physical likeness, but also the essence of each creature's spirit and personality.

Jenny believes that her expressive and uninhibited style of thread painting is the perfect medium to capture the many textures seen in nature – from a camel's coarse fur to a kookaburra's delicate feathers, thread can perfectly emulate any effect.

Jenny's body of work is extremely diverse. She loves bold and ambitious animal designs, such as the striking *Samburu Africa* project featuring a regal lion in the grasslands. She also enjoys illustrative caricatures with a more simplistic appeal, such as *Cupcake the Clown*, which are inspired by the life, colour and innocence of childhood.



Jenny McWhinney painting a design before creating it in stitch



*Samburu Africa* project lion



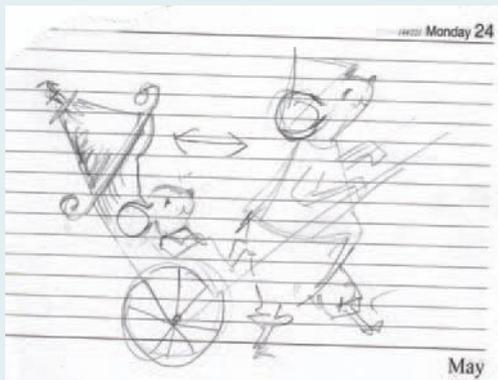
*Cupcake the Clown*



## Design process

Jenny McWhinney's project *Shanghai Taxi* features a pair of her much loved mice. This creation was stitched in stranded cottons on a beautiful Osnaberg fabric while Jenny was on holiday in China. The following outlines her design process for this project.

- 1 Jenny made a visual summary of her inspiration with a simple sketch. This sketch was only the loose portrayal of the subject matter. Some elements changed as the design process continued.
- 2 A more detailed drawing was made. Shading was added, and particular attention was given to adding character to the facial expressions of the mice. The overall size of the finished project was decided at this point.
- 3 Using a water-soluble transfer material (solvly), the basics of the design were traced out and affixed to the fabric support.
- 4 The finished design was stitched in DMC stranded cottons, varying from one to two strands.



## Selecting yarns



*Possum & Gum Flowers*

When selecting the appropriate thread for her designs, Jenny takes into account several different factors. As much of her work is intended for reproduction and commercial purposes, the ply of the thread or yarn must complement the size of the design. For example, a large project such as *Possum & Gum Flowers* has been stitched in wools, making it less time-consuming to complete. A smaller, more intricate design is best worked in stranded cottons or silks as it leaves room for fine details and gradual reduction in ply.

Subject matter is also a key consideration. Stranded cottons may be used for the silky feathers of a bird, whereas a contrast of mohair and crewel wool may be used for a heavily textured nest.

Finally, Jenny considers the durability of the finished item. A toddler's knee rug or library bag must be easily washable; therefore, generic threads are used to avoid the dye colours running and staining. If the piece is to be framed for a picture, boutique or home-dyed threads may be readily implemented. Jenny stitched the *Resting Camels* bolster cushion in DMC yarns as this brand of thread is washable.

## Thread painting with cotton

Although stranded cotton yarn is available in a wide variety of variegated shades, major manufacturers also produce a vast array of threads in flat dyed colours. This is optimum for thread painting as it allows you to create your own shading by blending the colours as you stitch, resulting in an embroidered piece that shows depth and realism. Most cotton threads are made up of six strands. Splitting the strands and varying the number used, and therefore the thickness of the stitches, can achieve different effects. For pieces that are particularly delicate in appearance, stranded cottons are perfect for fine lines and intricate stitches.



*Resting Camels bolster cushion*



*Stitching details of Resting Camels*

Cotton threads have a high sheen appearance as they are mercerised, and stranded cotton threads have a smooth texture when stitched. These properties can be utilised effectively in many designs to complement the texture of the subject matter. For example, Jenny would use stranded cotton rather than wool to achieve the smooth and glossy appearance of a creature's glossy eyeball or the wet scales of a fish.

## Thread painting with wool

Woollen yarn comes in many different forms, ranging in ply and density. Thread painting with wools such as crewel, tapestry and mohair all give a unique appearance. Using wools in textile crafts gives a beautiful textural appearance and a softly yielding effect. Woollen yarns are particularly useful in Jenny's practice as they are easily adaptable to many consistencies observed in nature. From a lion's coarse mane to a panda's fuzzy coat, there is sure to be a particular wool that can act as a perfect reproduction.

Woollen yarn is a particularly good option for novice stitchers as it is extremely forgiving. Any errors are easily hidden when stitching with a heavier ply thread. Stranded cottons can be more challenging to work with due to their delicacy and fineness; however, as wool is of a denser ply and composition, even large projects can be completed much more quickly. For these reasons, working with woollen yarn can prove much more financially viable for students, beginners and hobbyists.

### Extend your knowledge 6.3

Read the case study on Jenny McWhinney and visit her website ([www.jennymcwhinneydesigns.bigcartel.com](http://www.jennymcwhinneydesigns.bigcartel.com)) to complete the following tasks.



- 1 Describe the technique of thread painting.
- 2 Identify sources of inspiration for Jenny McWhinney's designs.
- 3 Describe the design process that Jenny follows to create a thread painting.
- 4 Compare and contrast the properties of cotton and woollen yarns when used for thread painting.
- 5 Select your favourite Jenny McWhinney design. Justify your selection in terms of the elements of design.
- 6 Using the hand embroidery techniques explained in Chapter 16, experiment with cotton and woollen yarns to discover the effects you can create. Complete a PMI chart (plus/minus/interesting) to compare and contrast the properties of the yarns and share your findings with the class.



NORO yarns  
(www.noroyarns.com)



NelsonNet

Lifestyle interiors case study  
TEXD11CS060037

Visit the NORO yarns website and complete the following tasks.

- 1 Are NORO yarns produced for a mass market or a niche market?
- 2 Identify the practices that NORO has implemented at all stages of production to ensure their yarns are environmentally friendly.
- 3 Select two industrial yarns produced by NORO yarns and write a brief description for each.
- 4 Many companies manufacture garments using NORO yarns. Visit the reference link on the NORO website to gain an understanding of the diversity and uniqueness of their yarns. Select your favourite garment and share your reasons for selecting it with the class.
- 5 In your creative journal, design your own knitted garment using NORO yarn. Render the design using shading similar to the NORO yarn.

## Extrusion spinning

### Processing of smooth filament yarns

#### Wet spinning

Wet spinning is used for fibre-forming substances that have been dissolved in a solvent. The spinnerets are submerged in a chemical bath and as the filaments emerge, they precipitate from a solution and solidify. Because the solution is extruded directly into the precipitating liquid, this process for making fibres is called 'wet spinning'. This process is used to produce rayon.

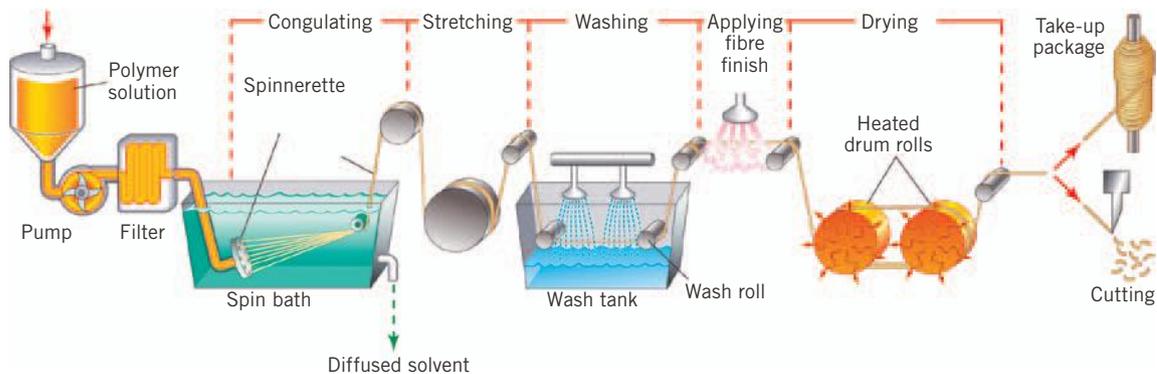


Image courtesy of Encyclopedia Britannica

#### Wet spinning

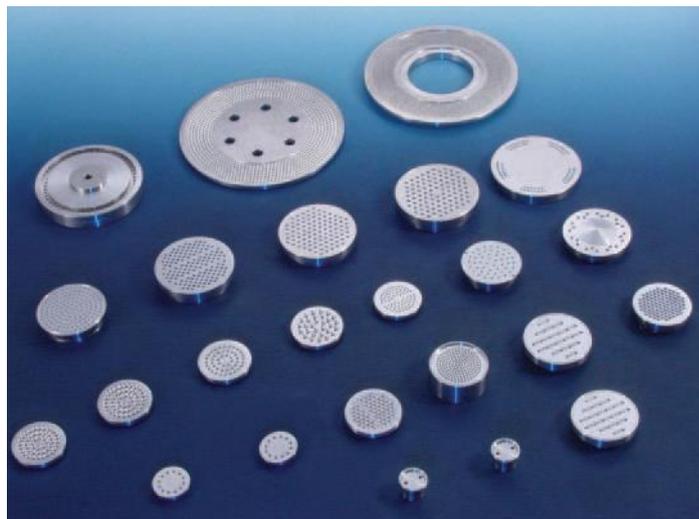
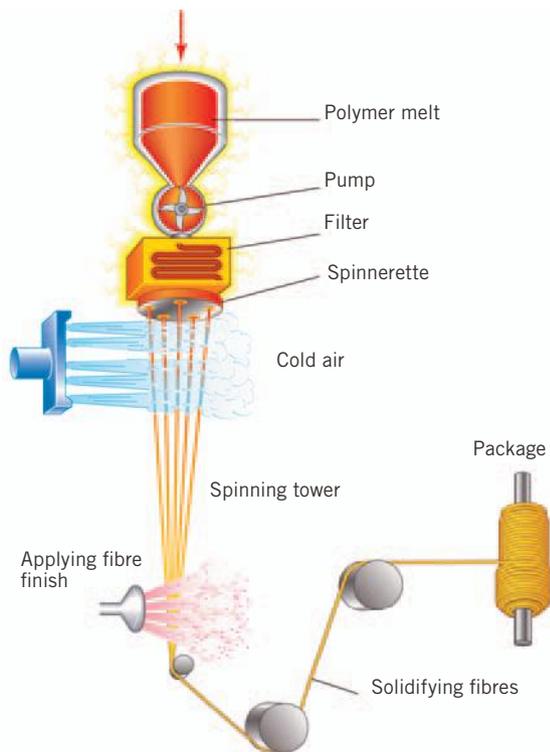
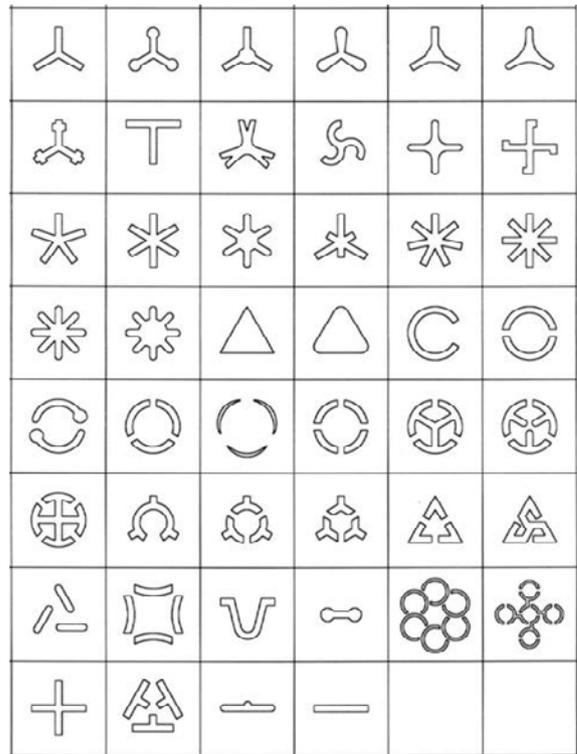


Photo courtesy of Sossna

Spinneret nozzles for round or shaped spinning



Melt spinning



Examples of profiled holes in spinnerets

### Melt spinning

In melt spinning, the fibre-forming substance is melted for extrusion through the spinneret and then directly solidified by cooling. Nylon and polyester are produced in this manner. Melt-spun fibres can be extruded from the spinneret in different cross-sectional shapes:

- Trilobal-shaped fibres reflect more light and give an attractive sparkle to textiles.
- Pentagonal-shaped and hollow fibres, when used in carpet, show less soil and dirt.
- Octagonal-shaped fibres offer glitter-free effects.
- Hollow fibres trap air, creating insulation, and provide loft characteristics comparable to down.

### Extend your knowledge 6.5

Watch the video clip about how recycled polyester yarn is made and outline the process of recycling plastic bags into polyester fibre.



How It's Made: recycled polyester yarn  
([www.youtube.com/watch?v=ofUlwK4sZDs](http://www.youtube.com/watch?v=ofUlwK4sZDs))

## Comparison of monofilament and multifilament yarns

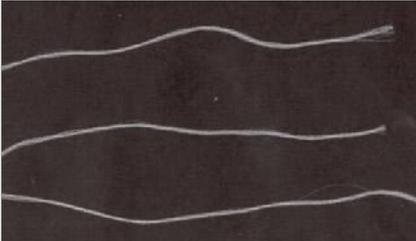
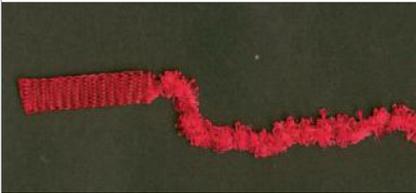
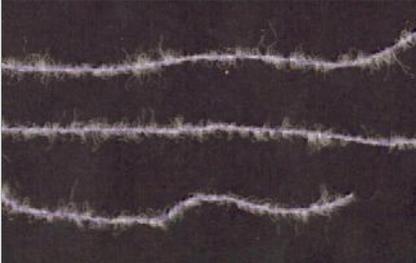
Property	Monofilament yarns	Multifilament yarns
Aesthetic	<ul style="list-style-type: none"> <li>• Fine</li> <li>• Very even</li> <li>• Smooth</li> <li>• High degree of lustre</li> <li>• Good resiliency</li> </ul>	<ul style="list-style-type: none"> <li>• Fine to medium</li> <li>• Even</li> <li>• Smooth</li> <li>• High degree of lustre</li> <li>• Good resiliency</li> </ul>
Durability/strength	<ul style="list-style-type: none"> <li>• Strong</li> <li>• Durable</li> </ul>	<ul style="list-style-type: none"> <li>• Strong</li> <li>• Durable</li> </ul>
Comfort	<ul style="list-style-type: none"> <li>• Inelastic</li> <li>• Poor insulator</li> <li>• Low absorbency</li> </ul>	<ul style="list-style-type: none"> <li>• Slightly elastic</li> <li>• Poor insulator</li> <li>• Low absorbency</li> </ul>
Care	<ul style="list-style-type: none"> <li>• Quick drying</li> </ul>	<ul style="list-style-type: none"> <li>• Quick drying</li> </ul>
End-uses	<ul style="list-style-type: none"> <li>• Hosiery</li> <li>• Invisible sewing thread</li> </ul>	<ul style="list-style-type: none"> <li>• Evening wear</li> <li>• Lingerie</li> </ul>



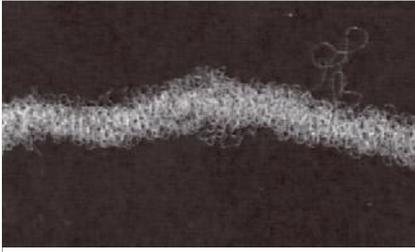
Inserting false twist into yarns  
 (www.youtube.com/watch?v=SKfa\_drPTFI)

## Textured filament yarns

**Textured filament yarns** are made from synthetic filaments that have been modified to add texture, bulk and elasticity to yarns.

Textured filament yarn type	Production	Properties	End-uses
 False twist	A rotating spindle inserts twist into the yarn. When heat is applied it sets the twist. It is then untwisted in the opposite direction to form a tangled yarn.	<ul style="list-style-type: none"> <li>• Bulky</li> <li>• High degree of stretch</li> </ul>	<ul style="list-style-type: none"> <li>• Ski pants</li> <li>• Leotards</li> <li>• Hosiery</li> <li>• Sportswear</li> <li>• Socks</li> <li>• Gloves</li> <li>• Swimwear</li> </ul>
 Knit deknit	A small knitting machine produces a tube of knitted filament, which is heat-set. The yarn is then unravelled. The result is a crinkled, boucle-style yarn.	<ul style="list-style-type: none"> <li>• High degree of elasticity</li> <li>• High degree of lustre</li> </ul>	<ul style="list-style-type: none"> <li>• Pantyhose</li> <li>• Sweaters</li> <li>• Knitted dresses</li> <li>• Tops</li> </ul>
 Air jet	This method needs no heat, so it can be used for non-thermoplastic filaments. The filaments are passed through a chamber with a jet of air blowing through the yarn. As some filaments are blown out of the bundle and looped, the yarn becomes tighter, causing loops to remain as a texture on the surface.	<ul style="list-style-type: none"> <li>• Little or no stretch</li> </ul>	<ul style="list-style-type: none"> <li>• Jackets</li> <li>• Dresses</li> <li>• Shirts</li> <li>• Blouses</li> <li>• Underwear</li> <li>• Napery</li> <li>• Linen</li> <li>• Furnishings</li> </ul>

Photos courtesy of Technology Educators Association

Textured filament yarn type	Production	Properties	End-uses
 Gear crimping	<p>A uniformly wavy crimp is set into filaments by passing them between the intermeshing teeth of heated gear wheels. The crimps are angular due to the shape of the gears, unlike the curves in wool. The crimp is permanent due to the use of thermoplastic yarns.</p>	<ul style="list-style-type: none"> <li>• Lustrous</li> <li>• Little or no stretch</li> <li>• Bulky yarn</li> </ul>	<ul style="list-style-type: none"> <li>• Tricot for lingerie</li> <li>• Dress materials</li> <li>• Overcoats</li> <li>• Suiting</li> </ul>
 Stuffer box	<p>A parallel set of filaments are pushed upwards through crimped rollers and stuffed into a heated container, which sets them in a random zigzag shape.</p>	<ul style="list-style-type: none"> <li>• Bulky yarn</li> <li>• Limited elasticity</li> <li>• Soft</li> </ul>	<ul style="list-style-type: none"> <li>• Knitted outerwear</li> <li>• Gloves</li> <li>• Swimwear</li> <li>• Sports shirts</li> <li>• Upholstery</li> <li>• Carpet</li> <li>• Underwear</li> </ul>

## Novelty yarns

Novelty yarns are used for decoration and to increase the aesthetic properties of the fabric and textile product. They can be made from both staple and filament fibres. Either altering the amount of twist or twisting yarns of different thickness together can achieve different decorative effects. Novelty yarns are expensive to produce and the process does not necessarily improve the durability and strength of the yarn. Novelty yarns are an essential part of the apparel industry and are currently in great demand by knitters and weavers.

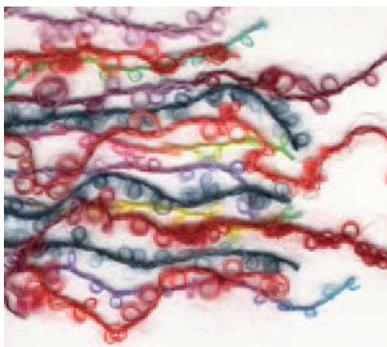
**Boucle yarns** are created by combining different plied yarns. One yarn usually has less twist than the other, causing it to loop. Often different coloured yarns are combined to create a colourful effect.

**Slub yarns** can be made from single or ply yarns. The slub effect is created by altering the degree of twist along the length of the yarn. In areas of low twist, a thick area of soft yarn is created, which is called a slub. Slub yarns are weak due to the varying degree of twist along their length.

**Core-spun yarns** have a centre (or core) of one fibre composition, around which another fibre is spun or wrapped. Core-spun yarns may be made with an elastomer core, such as spandex, which is covered by another yarn to produce a stretch yarn.



BLM 6.2 Different types of yarns



Boucle yarns



Slub yarns



Core-spun yarns

# Yarn properties and their effect on fabric

All fabrics, except non-wovens, are made from yarns. Yarn properties affect fabric performance, and it is these properties such as fibre composition, level of twist, thickness, elasticity and lustre that make yarns suitable for different end-uses. Designers take these properties into account when selecting particular yarns to meet specific end-uses. The following are some different types of fabrics made from yarns with various properties.



BLM 6.3 Yarns for different end-uses

- Stretch woven satin is made from a core-spun yarn with a fibre composition of 98% cotton and 2% elastomeric. It has the appearance and feel of cotton, with the added comfort or stretch of spandex. End-uses for this fabric include jeans and sportswear.
- Tweed suiting is made from a slub yarn with a fibre composition of 100% wool. Woven fabric is characterised by slubs on the surface in different colours. It is a strong, hardwearing fabric. End-uses include tailored jackets and skirts.



Stretch woven satin

Courtesy of Textile Fabric Consultants, Inc.  
Swatch 44; [www.textilefabric.com](http://www.textilefabric.com)



Tweed suiting

Shutterstock.com

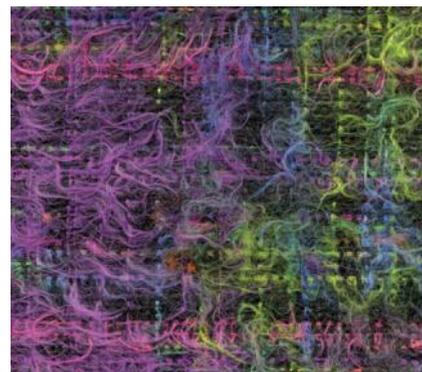
- Polyester crepe is made from a high-twist yarn with a fibre composition of 100% polyester. The high-twist yarns are woven on a loom to create a fabric. When the tension is released, the yarns create an uneven, pebbly surface in the fabric.
- Mohair rug is composed of wool and mohair fibres. The fabric is characterised by woven wool fabric with a pile of mohair yarns. The yarns are different weights, colours and textures, which creates an interesting end product.

Note that all fabric swatches shown here have been magnified to show the weave structure.



Polyester crepe

Courtesy of Textile Fabric Consultants, Inc.  
Swatch 62; [www.textilefabric.com](http://www.textilefabric.com)



Mohair rug

Shutterstock.com

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Define the term *yarn*.
- 2 Provide the definition, characteristics and possible end-uses for the following yarn types.
  - a Staple spun
  - b Monofilament
  - c Multifilament
- 3 Why is twist an important feature of spun yarns?
- 4 Compare and contrast low-twist and high-twist yarns.
- 5 Explain the difference between single yarn, ply yarn and cord yarn.
- 6 Briefly outline the processing of cotton fibres into yarns.
- 7 Compare and contrast carded cotton yarns and combed cotton yarns.
- 8 Briefly outline the processing of woollen fibres into yarns.
- 9 Compare and contrast woollen and worsted yarns.
- 10 What spinning method is used to produce rayon?
- 11 Name two fibres produced by melt spinning.
- 12 List the properties and end-uses for the following yarn types.
  - a False twist
  - b Knit deknit
  - c Air jet
  - d Gear crimping
  - e Stuffer box



BLM 6.4 Yarn structures palm cards



## Websites



- ☺ Nundle Woollen Mill ([www.nundle.info](http://www.nundle.info)): The website of a working woollen mill in New South Wales, Australia.
- ☺ Eiasku Noro Yarns ([www.noroyarns.com](http://www.noroyarns.com)): A Japanese company that produces industrial yarns and knitting yarns.
- ☺ Jenny McWhinney ([www.jennymcwhinneydesigns.bigcartel.com](http://www.jennymcwhinneydesigns.bigcartel.com)): Jenny McWhinney's online store selling her needlework designs.
- ☺ Australian Country Spinners ([www.auspinners.com.au](http://www.auspinners.com.au)): Australian textile company producing high-quality pure wool, wool-blend and synthetic yarns.
- ☺ Patons ([www.patonsyarns.com](http://www.patonsyarns.com)): This website provides knitters and crocheters with high-quality yarns and creative patterns.
- ☺ DMC Creative World ([www.dmc-usa.com](http://www.dmc-usa.com)): In addition to providing hand embroidery threads, this website offers a learning centre that outlines various techniques used in cross-stitch, crochet and fashion embroidery.
- ☺ Madeira ([www.madeirausa.com](http://www.madeirausa.com)): This website sells Madeira machine embroidery threads and other embroidery supplies.

## 7

# Woven fabric types and classification

## Fabric structure

In contemporary society, weaving is the most popular method of fabric construction. Woven fabric is produced on a loom. Hand-operated looms are used to create fabric for niche markets, whereas computerised looms create fabric on a large scale at high speed for mass markets.



Hand-operated loom



Computerised Jacquard loom

### Extend your knowledge 7.1



How fabric is made  
([www.youtube.com/watch?v=YYWlevX7Kw0](http://www.youtube.com/watch?v=YYWlevX7Kw0))

Watch the video clip about how fabric is made and answer the following questions.

- 1 Which yarns are attached to the loom first?
- 2 How are these yarns treated to strengthen them for the weaving process, and how is this treatment removed before dyeing?
- 3 How is the weft yarn inserted?
- 4 Outline the processes that occur after weaving.

To create a woven fabric, two or more sets of yarns are interlaced at right angles. The **warp** yarns run the length of the fabric and the **weft** yarns run across the width of the fabric. Weft yarns are also called filling yarns as they fill the spaces between the warp yarns. Warp yarns are stronger than weft yarns because they are wound onto the loom first and have tension applied to ensure a uniform fabric is produced.

The design of a fabric and the resulting properties depend on the order in which the warp and weft yarns are interlaced. As the warp and weft yarns cross over each other, one yarn is on top and visible and the other is underneath and hidden. When the weft yarns cross over more than one warp yarn at a time, floats are formed and the fabric becomes weaker as there is less interlacing. Fabrics with yarns packed tightly together

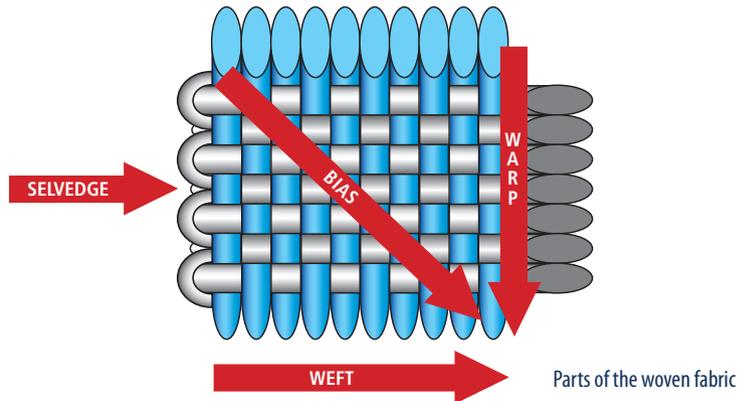
are stiffer and more durable. If there is a lot of space between the warp and weft yarns, the fabric is softer and more pliable.

The **selvedge** is the reinforced edge of the fabric that does not fray. Warp yarns run parallel to the selvedge. The selvedge is usually a tighter weave or contains stronger warp yarns than the rest of the fabric.

The **grain** of the fabric is the direction in which the yarns run. The lengthwise grain is parallel to the selvedge. Woven fabrics have little stretch except across the bias, which is the diagonal direction across the grain.

The properties of woven fabrics are determined by the:

- type and quality of the fibre used
- type, strength and degree of twist of the yarn used
- type of weave used in fabric construction.



iStockphoto



Shedding



Weaving shed video  
[www.qwiki.com/embed/Shed\\_\(weaving\)](http://www.qwiki.com/embed/Shed_(weaving))  
 Weaving shuttle video  
[www.qwiki.com/embed/Shuttle\\_\(weaving\)](http://www.qwiki.com/embed/Shuttle_(weaving))  
 Weaving reed video  
[www.qwiki.com/embed/Reed\\_\(weaving\)](http://www.qwiki.com/embed/Reed_(weaving))  
 Plain weave video  
[www.qwiki.com/embed/Plain\\_weave](http://www.qwiki.com/embed/Plain_weave)

## The weaving process

There are four steps in the weaving process. After the warp yarns are first attached to the loom, these steps are completed in sequence and constantly repeated to form a fabric.

- 1 **Shedding:** Raising some of the warp yarns using the heddles on the loom. The space between the raised and lowered warp threads is called the shed.
- 2 **Picking:** Inserting the weft yarns through the shed using a shuttle. The raised warp yarns are then lowered by the heddle and the previously lowered warp yarns are raised. This allows the weft yarns to become interlaced, forming a woven fabric.
- 3 **Beating up:** Pushing the weft yarns firmly together using the reed.
- 4 **Taking up and letting off:** To allow a length of fabric to be formed, the woven fabric must be wound onto the cloth beam and the warp yarns must be gradually released from the warp beam.

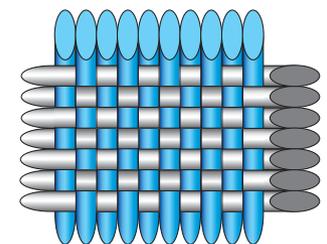
## Weave types

There are several different types of weave used to create woven fabrics.

### Plain weave

#### Woven structure

Plain weave is the simplest type of weave and the least expensive to produce. Weft yarns pass over one warp yarn and then under one warp yarn; they alternate on the next row. Plain weaves can be made from any type of yarn, including high-twist yarns, novelty yarns and yarns of different fibre composition and weight. Plain weave fabrics have no right or wrong side. They have an even, flat texture and are often used for printing. Plain weave fabrics have poor resiliency and are less absorbent than other weaves.



Plain weave

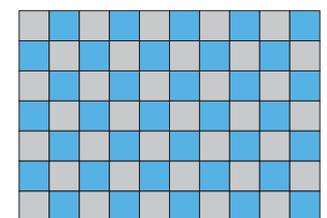
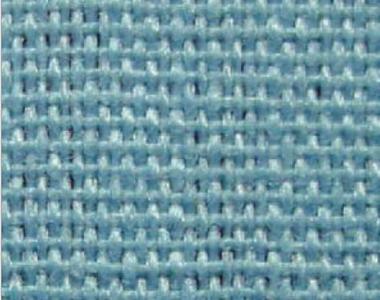
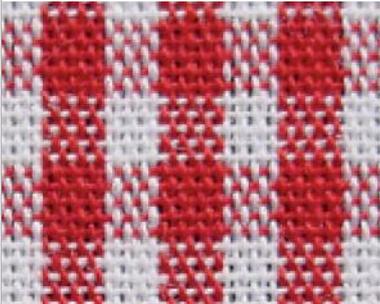
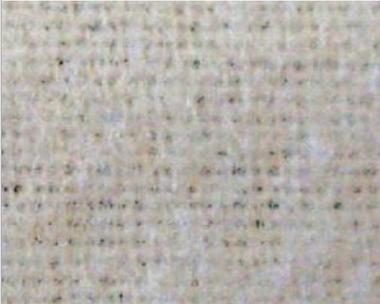


Diagram of plain weave



## Plain weave fabrics

Plain weave fabrics include calico, batiste, poplin, broadcloth, organza, hessian, gingham, flannel, Bemsilk lining, flannelette, lawn, muslin, silk dupion, sinamay and voile.

Fabric name	Woven structure	Properties	End-uses
Poplin 	<ul style="list-style-type: none"> <li>65% polyester/35% cotton</li> <li>Plain weave that is piece dyed</li> </ul>	<ul style="list-style-type: none"> <li>Smooth, crisp handle with poor drape</li> <li>Good durability</li> </ul>	<ul style="list-style-type: none"> <li>Shirting</li> <li>Summer dresses</li> <li>Children's clothing</li> </ul>
Organza 	<ul style="list-style-type: none"> <li>100% silk</li> <li>Plain weave constructed from highly twisted filament yarns</li> <li>Fabric has been piece dyed</li> </ul>	<ul style="list-style-type: none"> <li>Sheer fabric with crisp, smooth handle</li> <li>Medium to good drape</li> <li>Durable, comfortable to wear and easy to press</li> <li>Little elasticity</li> </ul>	<ul style="list-style-type: none"> <li>Bridal and formal wear</li> <li>Millinery</li> <li>Curtains</li> </ul>
Gingham 	<ul style="list-style-type: none"> <li>55% polyester/45% cotton</li> <li>Plain weave constructed from dyed yarns</li> <li>Checked pattern created by using white and red yarns</li> </ul>	<ul style="list-style-type: none"> <li>Good strength and durability</li> <li>Easy care</li> <li>Low resiliency</li> <li>Low lustre</li> </ul>	<ul style="list-style-type: none"> <li>Blouses, shirts, dresses</li> <li>Curtains</li> <li>Base fabric for cross stitch</li> </ul>
Flannel 	<ul style="list-style-type: none"> <li>100% cotton</li> <li>Balanced plain weave with napped finish</li> </ul>	<ul style="list-style-type: none"> <li>Soft</li> <li>Good thermal properties</li> </ul>	<ul style="list-style-type: none"> <li>Suiting</li> <li>Children's clothing</li> <li>Blankets</li> <li>Pyjamas</li> <li>Bedding</li> </ul>

*Note:* Throughout this chapter images of fabrics have been magnified to show the yarn structure.



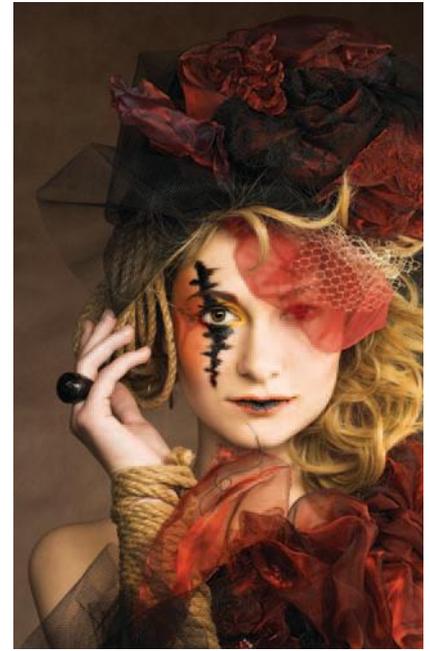
Flannel video  
([www.qwiki.com/embed/Flannel](http://www.qwiki.com/embed/Flannel))



Headdress made from organza, netting and peacock feathers



Headdress made from different-coloured organza



Headdress made from organza, netting and rope

Photos from Shutterstock.com

Create a headdress using woven fabrics from either the fabric bin in the classroom, home or your local opportunity shop. Attach your headdress to a hair comb or Alice band so that it can be worn. Embellish your creation with scraps of knitted fabrics, ribbons, braids, feathers, buttons or beads.

The purpose of this activity is to explore the properties of woven fabrics through folding, scrunching, pleating, weaving, gathering, plaiting and creasing. Properties include:

- lustre
- drape
- strength
- dimensional stability
- elasticity.

Collect fabric swatches and experiment with each to see what happens when it is scrunches, folded, gathered and so on. When you are pleased with the result, secure the fabric in place with small hand stitches or machine stitching. Make sure you explore a variety of techniques before deciding on the final look of your headdress.

Document this activity in your creative journal.

- 1 Take a photo of your headdress and place it in your creative journal.
- 2 Write a brief description of your final product.
- 3 Record the method used to create the headdress.
- 4 Include swatches of all textile materials used.
- 5 For each textile swatch, identify:
  - a fibre composition
  - b yarn structure
  - c fabric type (if relevant).
- 6 For each fabric used, describe the properties relevant to the fabric structure.
- 7 Personal reflection: What did you enjoy most about this project? If you did this again, what changes would you make?



NelsonNet

Card weaving  
TEXD11AS070038

## Twill weave

### Woven structure

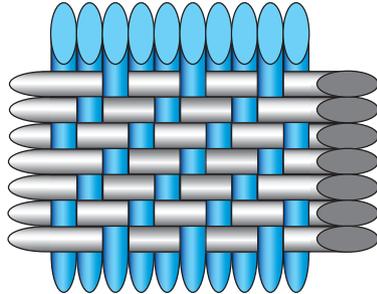
Twill weave has warp and weft yarns that interlace to form diagonal lines in the fabric. Weft yarns pass over two or more warp yarns and then under one. Twill weaves are heavier in weight than plain weaves. They are the most durable type of weave and are often used for work clothes. Twill weaves have a right and wrong side.



7.3 Twill weave



Twill weave video  
([www.qwiki.com/embed/Twill](http://www.qwiki.com/embed/Twill))  
Gabardine video  
([www.qwiki.com/embed/Gabarine](http://www.qwiki.com/embed/Gabarine))  
Denim video  
([www.qwiki.com/embed/Denim](http://www.qwiki.com/embed/Denim))



Twill weave

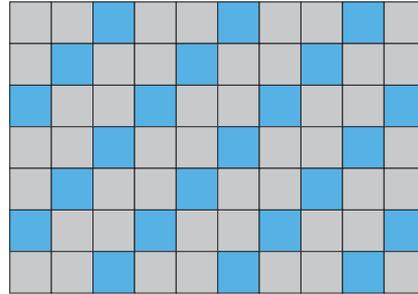


Diagram of twill weave

### Twill weave fabrics

Twill weave fabrics include gabardine, denim, drill, houndstooth and wool suiting.

Fabric name	Woven structure	Properties	End-uses
Gabardine 	<ul style="list-style-type: none"> <li>• 100% cotton</li> <li>• Warp-faced twill weave (has mainly warp yarns on right side of fabric) that is piece dyed</li> <li>• Distinguished by its diagonal line and durability</li> </ul>	<ul style="list-style-type: none"> <li>• Good durability</li> <li>• Smooth, hard handle</li> <li>• Low to medium drape</li> </ul>	<ul style="list-style-type: none"> <li>• Uniforms</li> <li>• Suits</li> <li>• Sportswear</li> </ul>
Denim 	<ul style="list-style-type: none"> <li>• 100% cotton</li> <li>• Warp-faced twill weave using dyed yarns – coloured (indigo blue) warp yarns and white weft yarns</li> </ul>	<ul style="list-style-type: none"> <li>• Good durability and abrasion resistance</li> </ul>	<ul style="list-style-type: none"> <li>• Work clothes and jeans</li> <li>• Home furnishings</li> </ul>
Drill 	<ul style="list-style-type: none"> <li>• 100% cotton</li> <li>• Warp-faced twill weave, which is piece dyed</li> </ul>	<ul style="list-style-type: none"> <li>• Stiff, with low drape</li> <li>• Inelastic</li> <li>• Good durability and abrasion resistance</li> <li>• Good absorbency</li> </ul>	<ul style="list-style-type: none"> <li>• Work clothing</li> <li>• Industrial fabrics</li> </ul>

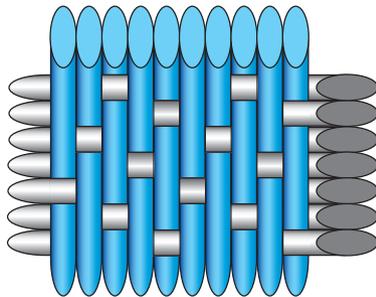
Images courtesy of Textile Fabric Consultants, Inc. Swatches 41, 40, 39; [www.textilefabric.com](http://www.textilefabric.com)

Fabric name	Woven structure	Properties	End-uses
Houndstooth 	<ul style="list-style-type: none"> <li>• 100% wool</li> <li>• Even-sided twill weave (same amount of warp and weft on both sides of fabric)</li> <li>• Fibres are dyed before spinning into yarns</li> <li>• Distinguished by a two-colour yarn pattern with a broken design resembling a four-pointed star</li> </ul>	<ul style="list-style-type: none"> <li>• Heavy handle with poor drape</li> <li>• Rough yet soft texture</li> </ul>	<ul style="list-style-type: none"> <li>• Suiting</li> <li>• Apparel</li> <li>• Upholstery</li> </ul>

## Satin weave

### Woven structure

Satin weave produces a lustrous surface because it is constructed using long warp floats over the weft yarns. The warp yarn goes over four weft yarns and under one. Satin weaves have a right and a wrong side, and more warp yarns than weft yarns on the right side. Filament yarns with low twist are often used for satin weave. Satin weave fabrics have poor strength due to the long floats that create minimal interlacing.



Satin weave

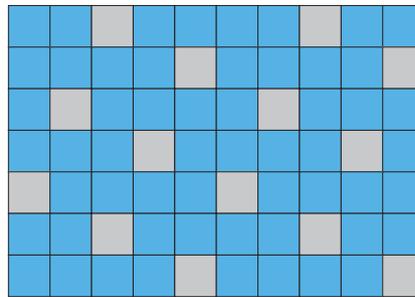


Diagram of satin weave



Houndstooth video  
[www.qwiki.com/embed/Houndstooth](http://www.qwiki.com/embed/Houndstooth)  
 Satin weave video  
[www.qwiki.com/embed/Satin\\_weave](http://www.qwiki.com/embed/Satin_weave)



7.4 Satin weave

### Satin weave fabrics

Satin weave fabrics include metallic satin, satin and crepe back satin.

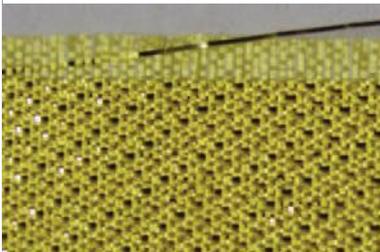
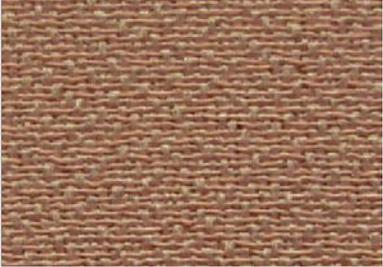
Fabric name	Woven structure	Properties	End-uses
Metallic satin 	<ul style="list-style-type: none"> <li>• 55% rayon/45% metallic</li> <li>• Warp-faced satin weave</li> <li>• Yarns are dyed before being woven</li> </ul>	<ul style="list-style-type: none"> <li>• High lustre</li> <li>• Poor abrasion resistance</li> <li>• Snagging may occur on surface</li> </ul>	<ul style="list-style-type: none"> <li>• Formal wear</li> </ul>
Satin 	<ul style="list-style-type: none"> <li>• 100% polyester</li> <li>• Warp-faced satin weave</li> <li>• Solution dyed</li> <li>• Characterised by warp floats over four weft yarns</li> </ul>	<ul style="list-style-type: none"> <li>• Good lustre</li> <li>• Excellent drape</li> <li>• Snagging may occur on surface</li> </ul>	<ul style="list-style-type: none"> <li>• Formal wear</li> </ul>

Photo courtesy of Textile Fabric Consultants

Shutterstock.com

<p>Crepeback satin</p> 	<ul style="list-style-type: none"> <li>• 60% acetate/40% rayon</li> <li>• Warp-faced satin weave, which is piece dyed</li> <li>• Low twist, lustrous warp yarns are combined with tightly twisted weft yarns</li> </ul>	<ul style="list-style-type: none"> <li>• Good drape</li> <li>• Soft hand with a lustrous appearance</li> </ul>	<ul style="list-style-type: none"> <li>• Lingerie</li> <li>• Sleepwear</li> <li>• Dresses and trims</li> </ul>
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### 7.5 Jacquard weave



Damask video  
([www.qwiki.com/embed/Damask](http://www.qwiki.com/embed/Damask))  
Jacquard loom video  
([www.qwiki.com/embed/Jacquard\\_loom](http://www.qwiki.com/embed/Jacquard_loom))

## Jacquard weave

### Woven structure

Jacquard is an intricate weave because individual warp yarns can be raised or lowered on the loom. Jacquard patterns may be combinations of plain, twill and satin weaves. Jacquard fabrics contain long floats as some of the pattern is created by a satin weave. Fabrics produced on jacquard looms are expensive due to their intricate designs.

### Jacquard weave fabrics

Jacquard weave fabrics include damask, brocade, tapestry and jacquard upholstery.

Fabric name	Woven structure	Properties	End-uses
<p>Damask</p> 	<ul style="list-style-type: none"> <li>• 100% cotton</li> <li>• Yarns have been dyed before weaving</li> <li>• Pattern is created by satin floats in the opposite direction of the satin weave background, producing a slight difference in lustre that makes the pattern stand out</li> <li>• Fabric is reversible</li> </ul>	<ul style="list-style-type: none"> <li>• Hardwearing</li> <li>• Soft to medium handle</li> <li>• Good absorbency</li> </ul>	<ul style="list-style-type: none"> <li>• Home furnishings, including tablecloths</li> </ul>
<p>Brocade</p> 	<ul style="list-style-type: none"> <li>• 58% cotton/42% acetate</li> <li>• Yarns have been dyed before weaving</li> <li>• Distinguished by a more elaborate pattern than damask</li> <li>• Design is created by twill or satin weaves</li> <li>• Background is typically plain, twill, ribbed or satin weave</li> <li>• Often a multi-coloured floral pattern</li> </ul>	<ul style="list-style-type: none"> <li>• Lustrous</li> <li>• Snags easily</li> <li>• Soft handle</li> <li>• Good drape</li> </ul>	<ul style="list-style-type: none"> <li>• Formal and evening wear</li> <li>• Upholstery</li> </ul>

Fabric name	Woven structure	Properties	End-uses
Tapestry 	<ul style="list-style-type: none"> <li>• 100% cotton</li> <li>• Yarns are dyed before weaving</li> <li>• Distinguished by its very intricate pattern, which imitates hand-woven tapestry</li> </ul>	<ul style="list-style-type: none"> <li>• Low to medium drape</li> <li>• Poor to medium lustre</li> <li>• Snags easily</li> </ul>	<ul style="list-style-type: none"> <li>• Upholstery</li> </ul>
Jacquard upholstery 	<ul style="list-style-type: none"> <li>• 100% cotton</li> <li>• Yarns are dyed before weaving</li> </ul>	<ul style="list-style-type: none"> <li>• Low to medium drape</li> <li>• Poor lustre</li> <li>• Snags easily</li> </ul>	<ul style="list-style-type: none"> <li>• Upholstery</li> </ul>

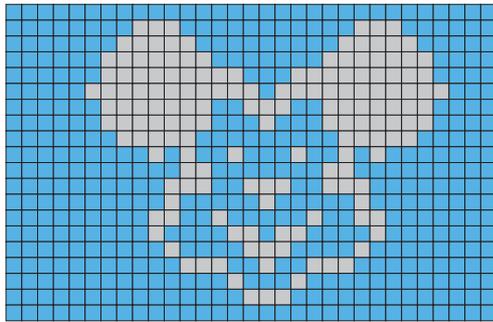


Diagram of jacquard weave



Tapestry video  
[www.qwiki.com/embed/Tapestry](http://www.qwiki.com/embed/Tapestry)  
 Velvet video  
[www.qwiki.com/embed/Velvet](http://www.qwiki.com/embed/Velvet)

## Pile weave

### Woven structure

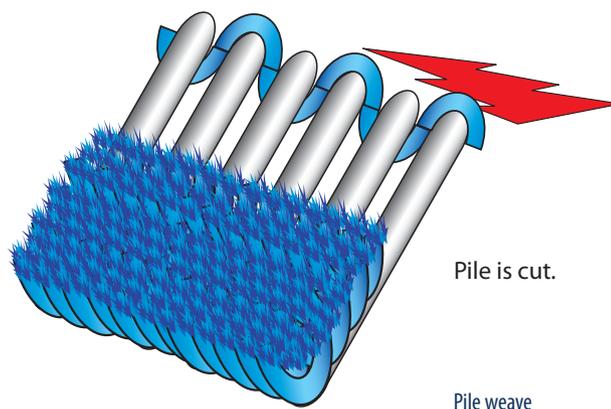
Pile weave is a decorative weave. It includes a plain or twill weave as a base and extra warp or weft yarns that project above the base weave. The extra warp and weft yarns may be cut or left looped. Pile weaves have a three-dimensional structure.

### Pile weave fabrics

Pile weave fabrics include crushed velvet, velveteen, velour, corduroy, terry towelling and chenille.

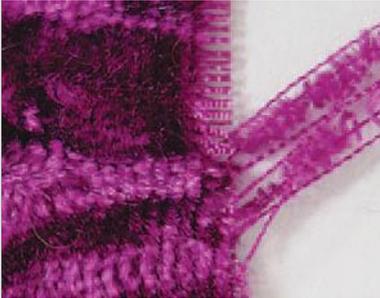
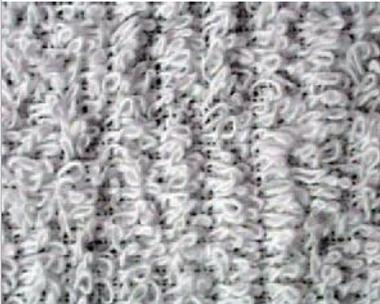


7.6 Pile weave



Pile is cut.

Pile weave

Fabric name	Woven structure	Properties	End-uses
Crushed velvet 	<ul style="list-style-type: none"> <li>• 68% acetate/32% rayon</li> <li>• Cut-warp pile weave that is piece dyed</li> <li>• Crushed surface is created by twisting the velvet when wet</li> <li>• Pile height is 3 mm or less</li> </ul>	<ul style="list-style-type: none"> <li>• Lustrous</li> <li>• Soft and warm</li> </ul>	<ul style="list-style-type: none"> <li>• Apparel</li> <li>• Home furnishings</li> </ul>
Velveteen 	<ul style="list-style-type: none"> <li>• 100% cotton</li> <li>• Cut-weft pile weave that is piece dyed</li> <li>• Pile height is 2 mm or less</li> <li>• Extra weft yarns form the pile</li> </ul>	<ul style="list-style-type: none"> <li>• Good absorbency</li> <li>• Lustrous</li> <li>• Poor resiliency</li> </ul>	<ul style="list-style-type: none"> <li>• Apparel</li> <li>• Home furnishings</li> </ul>
Velour 	<ul style="list-style-type: none"> <li>• 100% cotton</li> <li>• Cut-warp pile weave</li> <li>• Deeper pile than velvet or velveteen</li> </ul>	<ul style="list-style-type: none"> <li>• Lustrous</li> <li>• Good absorbency</li> </ul>	<ul style="list-style-type: none"> <li>• Apparel</li> <li>• Theatrical fabrics</li> </ul>
Terry towelling 	<ul style="list-style-type: none"> <li>• 100% cotton</li> <li>• Slack-tension pile weave with loop pile</li> <li>• Extra yarns that form the pile are in the warp direction</li> </ul>	<ul style="list-style-type: none"> <li>• High absorbency</li> <li>• Snags easily</li> <li>• Thick and soft</li> <li>• Low lustre</li> </ul>	<ul style="list-style-type: none"> <li>• Towels</li> <li>• Dressing gowns</li> </ul>

Images courtesy of Textile Fabric Consultants, Inc. Swatches 72, 71, 73; [www.textilefabric.com](http://www.textilefabric.com)



Terrycloth video  
([www.qwiki.com/embed/Terrycloth](http://www.qwiki.com/embed/Terrycloth))

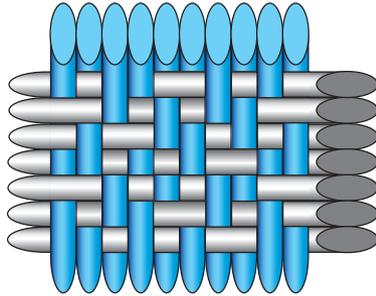
# Crepe weave

## Woven structure

Crepe weave is created by a random arrangement of floats that achieves an all-over pebble effect. Crepe weave can also be constructed using high-twist yarns. The fabric is woven under tension on the loom; therefore, when the tension is released, the fabric forms an uneven, pebbly texture.



- 7.7 Crepe weave
- 7.8 Woven fabrics – apparel focus area
- 7.9 Woven fabrics – furnishings focus area
- 7.10 Woven fabrics – costume focus area



Crepe weave

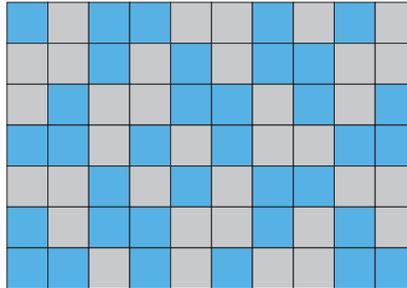
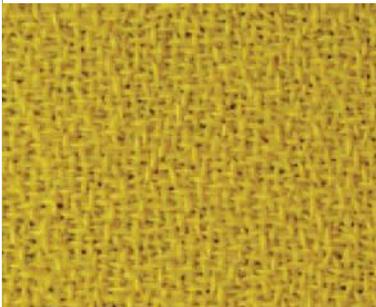


Diagram of crepe weave

## Crepe weave fabrics

Crepe weave fabrics include wool and upholstery varieties.

Fabric name	Woven structure	Properties	End-uses
Wool crepe 	<ul style="list-style-type: none"> <li>• 100% worsted wool</li> <li>• Crepe weave</li> <li>• Fibre dyed</li> <li>• Distinguished by a pebbly surface caused by random interlacing</li> </ul>	<ul style="list-style-type: none"> <li>• Medium drape</li> <li>• Low strength</li> <li>• Limited durability</li> <li>• Lightweight</li> </ul>	<ul style="list-style-type: none"> <li>• Apparel</li> <li>• Home furnishings</li> </ul>
Upholstery crepe 	<ul style="list-style-type: none"> <li>• 50% nylon/50% polyester</li> <li>• Crepe weave</li> <li>• Yarn dyed</li> <li>• Distinguished by a pebbly surface caused by random interlacings</li> </ul>	<ul style="list-style-type: none"> <li>• High lustre</li> <li>• Good strength</li> <li>• Good drape</li> </ul>	<ul style="list-style-type: none"> <li>• Draperies</li> </ul>

Images courtesy of Textile Fabric Consultants, Inc. Swatches 61, 63; www.textilefabric.com

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Name the most popular method of fabric construction in contemporary society.
- 2 Explain the following terms in relation to a woven fabric: selvedge, warp, weft, bias, lengthwise grain.
- 3 Briefly explain the process of weaving.
- 4 Identify a weave with a high lustre.
- 5 Identify a pile weave with high absorbency.
- 6 Identify the hardest-wearing weave.
- 7 Select six woven fabrics from the fabric bin in the classroom. Complete the following identification activity for each fabric and present your findings to the class.
  - a Name the fabric.
  - b Identify the fabric structure.
  - c Identify the yarn structure.
  - d Identify the fibre composition.
  - e Describe fabric properties affected by fabric structure.
  - f Name three end-uses for this fabric.

*Note:* You will require a pick glass (special magnifying glass) for this activity and may need to complete a burning test to identify the fibre composition.

## Websites

- ☉ Glenora Weaving & Wool ([www.glenoraweaving.com.au](http://www.glenoraweaving.com.au)): Supplier of an extensive range of fibres and yarns for spinning, felting and weaving, as well as equipment for spinning and weaving.
- ☉ Petlins ([www.petlins.com](http://www.petlins.com)): Supplier of spinning and weaving equipment, and also offers classes at their studio in Rhodes, Sydney.
- ☉ Hand Weavers and Spinners Guild of NSW ([www.nsweave.org.au](http://www.nsweave.org.au)): A guild to bring together people who practise hand weaving, spinning and associated crafts.
- ☉ Australian Weaving Mills (AWM) ([www.ausweave.com.au](http://www.ausweave.com.au)): AWM is a home textiles management company, and Australia's only towel manufacturer.
- ☉ Reverse Garbage ([www.reversegarbage.com.au](http://www.reversegarbage.com.au)): A Sydney-based non-profit organisation diverting waste from landfill for practical and creative reuse.



7.11 Woven fabrics palm cards



# Knitted fabric types and classification

## Fabric structure

In contemporary society, knitting is the second most popular method of fabric construction (the first is weaving). Knitted fabric is produced using needles, either by hand or on a knitting machine. Knitting machines are flatbed or circular in design. Knitted fabric can be made from any fibre type, whether it is natural or manufactured.

Knitted fabrics are made up of interlocking loops of yarns. A **course** is a horizontal row of loops and a **wale** is a vertical row of loops. All knit fabrics stretch due to their loop formation. The greater the number of wales in the fabric, the greater dimensional stability there will be in the width. The greater the number of courses in the fabric, the greater dimensional stability there will be in the length. Fabrics with a lower percentage of wales and courses in their construction have greater stretch and less dimensional stability. The design of the fabric and resulting properties depend on whether the fabric is knitted by the weft or warp method.



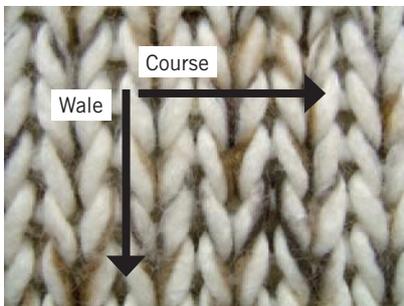
Knitting video  
([www.qwiki.com/embed/Knitting](http://www.qwiki.com/embed/Knitting))



Hand knitting



Circular knitting machine



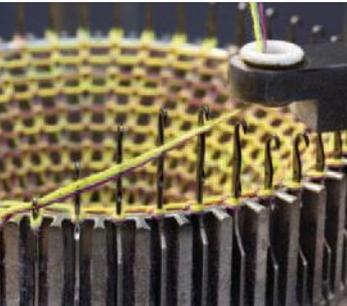
The horizontal row of loops is a course and the vertical row of loops is a wale.

Photos from Shutterstock.com



Weft knitting – knitting latch needle  
([www.youtube.com/watch?v=ykkP6\\_N\\_Oc4NR=1](http://www.youtube.com/watch?v=ykkP6_N_Oc4NR=1))

Shutterstock.com



Weft knitting constructed on a circular knitting machine



8.1 Weft knitting  
8.2 Single knit

NelsonNet

Knitted fabric types  
TEXD11AD080060

## Weft knitting

**Weft knitting** uses one length of yarn, and the loops are formed along the width of the fabric. Each row of loops interlocks with the row above and below, holding the fabric together. It is called weft knitting because the yarn goes across the width of the fabric (the same as weft yarns in woven fabric).

Weft knitting can be done commercially or at home, and produces either a flat or circular fabric or a fully fashioned garment.

The ability of weft knitting to produce fully fashioned garments is an advantage over weaving: it saves time and money as the construction stage is eliminated from the manufacturing process.

Weft knit fabrics have a right and a wrong side. When cut, they will unravel and curl at the edges and will also ladder. Weft knit fabrics are very stretchy and have less dimensional stability than warp knits.

## Warp knitting

**Warp knitting** uses one yarn per needle or wale, and the loops run the length of the fabric. Each row of loops interlocks with the adjacent row or wale. It is called warp knitting because the yarns run the length of the fabric (the same as warp yarns in woven fabric).

Warp knitting is done commercially and produces flat fabric (the same as woven fabric), circular fabric or fully fashioned garments such as hosiery.

Warp knit fabrics can be reversible as they are often the same on both sides. Although warp knit fabrics stretch, they are more stable than weft knits.

## Knit types

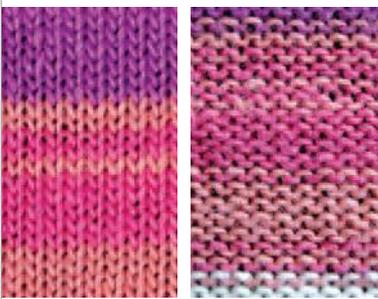
### Single knit

#### Knit structure

Single knit fabrics are constructed by weft knitting. The fabric has a definite right and wrong side. The right side (face of the fabric) is smooth and the wrong side is loopy. If knitted by hand, this fabric would be called stocking stitch. Single knit fabrics ladder vertically and will curl to the wrong side when cut. Using different-coloured or textured yarns can create single knit fabric variations. Single knit fabrics stretch more widthways than lengthways.

#### Single knit fabrics

Single knit fabrics include jersey knit, cotton lycra and hand knitting.

Fabric name	Knit structure	Properties	End-uses
<b>Jersey knit</b>  Face of jersey knit      Wrong side of jersey knit	<ul style="list-style-type: none"> <li>• 50% wool/50% acrylic</li> <li>• Single weft knit</li> <li>• Fibres have been dyed before spinning</li> <li>• Distinguished by knit stitches on the right side and purl stitches on the wrong side</li> </ul>	<ul style="list-style-type: none"> <li>• Good elasticity</li> <li>• Unravels</li> <li>• Easily distorted</li> <li>• Edges curl when cut</li> <li>• Low to medium drape</li> </ul>	<ul style="list-style-type: none"> <li>• T-shirts</li> <li>• Jumpers</li> <li>• Cardigans</li> </ul>

Photos courtesy of Textile Fabric Consultants, Inc.  
 Swatch 83: [www.textilefabric.com](http://www.textilefabric.com)

# Nikki Gabriel, knitwear and textile designer

## Designer profile

Nikki Gabriel studied textiles at RMIT (Royal Melbourne Institute of Technology). After graduating, she created a small handmade knitwear range. Sales grew quickly over a couple of seasons and Nikki's niche business was established. She now produces two collections a year and employs a number of hand and machine knitters. Collections include dresses, capes and vests. The garments appear to be quite simple, but the knitting process is very labour intensive as many of the garments are created by deconstructing conventional knitting stitches. The majority of the collections are sold in boutiques in Australia, Japan and New Zealand. Nikki has also collaborated with designers Akira Isogawa and Aurelio Costarella to produce knit collections.

## Design process

A curiosity with raw materials is the core of Nikki's creative process. She spends time experimenting with a variety of tools, including knitting machines, spinning wheels, crochet hooks and knitting needles to explore the possibilities of both tools and materials (fibres and yarns).



Nikki Gabriel

Nikki Gabriel knitting needles

Recently, Nikki has been experimenting with high-tech knitting machines to see how technology can advance traditional hand knitting. The Shima Seiki Wholegarment machine knits complete garments, eliminating the time-consuming cut-and-sew process of garment construction. Designers use computer-aided design to create a garment pattern, which is then saved and transferred to a knitting machine.

## Inspiration

Nikki is inspired by a number of different sources, including:

- Raw materials and fibres: Nikki visits farmers to view the flocks and gain inspiration for the next season's collection.
- Growing up in South Africa: Nikki developed the ability to observe the character and tactility of nature. Today, living in New Zealand, she takes frequent bushwalks in the Urewera National Park. Many of the sights in the bush are the source of inspiration for Nikki's garments, including the delicate wispy mosses that cascade off the branches.
- Indigenous craft: The basketry and textile artists of South Africa and tapa cloth makers of New Zealand inspire Nikki.



The Design Files:  
Nikki Gabriel  
(<http://thedesignfiles.net/2009/10/interview-nikki-gabriel>)  
Wholegarment machine  
(<http://vimeo.com/13971115>)



Nikki Gabriel

Nikki Gabriel cream knitted dress

'I want to keep what I do fairly experimental, so I do spend quite a bit of time before a collection exploring the value of the materials and trying to get something new and different out of it'.

**NIKKI GABRIEL**

Interview with Lynda Peters, 2011

Nikki Gabriel



Wispy moss found in the Urewera National Park, New Zealand

## Current collections

Nikki has extended her range to include bespoke yarn, hand knitting patterns and kits. To produce the bespoke yarns, Nikki collaborates with farming communities and spinning mills in Australia and New Zealand. The fibres are harvested, processed and spun for an environmentally sustainable product line. The wool has a hand-spun feel as it is processed in small batches rather than mass-produced, and is available in the natural colours of cream and fawn. The yarn is chunky, slubby and bumpy, giving it a light and fluffy feel that is rich in texture.

Nikki's current knitting patterns are called 'Construction'. The garments are designed to be made in stages by knitting shapes. Each shape is simple to knit. Like a building block system, you begin with a one-ball wool construction – the first block. Knitting another ball creates a garment. Adding another knitted shape with two balls of wool builds on the first garment. Construction patterns are a fusion of craft and design, involving the experience of making, creating and discovery.

Bespoke yarn



Construction No. 1



Construction No. 2

Nikki Gabriel

### Extend your knowledge 8.1



#### NelsonNet

Case study: the knitting revolution

TEXD11CS080039



Nikki Gabriel  
([www.nikkigabriel.com](http://www.nikkigabriel.com))  
Akira Isogawa  
([www.akira.com.au](http://www.akira.com.au))  
Aurelio Costarella  
([www.aureliocostarella.com](http://www.aureliocostarella.com))  
Sandra Backlund  
([www.sandrbacklund.com](http://www.sandrbacklund.com))  
Issey Miyake  
([www.isseymiyake.com](http://www.isseymiyake.com))

- 1 Define the following terms: niche, deconstruction, conventional, tactility, bespoke, sustainable, fusion.
- 2 Imagine you are completing work experience with Nikki Gabriel and have been given three balls of bespoke wool to design building block garments. In your creative journal, design a three-block knitted garment. Draw this garment flat and then show the final product rendered on a figure.
- 3 Explore the work of fashion designers who use knitting as a fabric structure in their collections. Select one garment, write a brief description of it and identify the fabric structure used. Give your reasons for selecting this particular garment.

## Double knit

### Knit structure

Double knit fabrics are constructed by weft knitting. They are made on knitting machines with two sets of needles. The fabric is the same on both sides, resembling the right side of a single knit. Double knits do not curl at the edges or ladder. As the surface of the fabric is smooth, it can be printed. Double knits are less elastic than single knits.



8.3 Double knit

### Double knit fabrics

Double knit fabrics include interlock and jacquard.

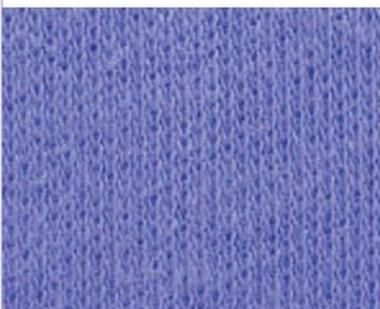
Fabric name	Knit structure	Properties	End-uses
Interlock 	<ul style="list-style-type: none"> <li>• 50% cotton/50% polyester</li> <li>• Double weft knit</li> <li>• The fabric has been piece dyed</li> <li>• Both sides of the fabric resemble the face of a jersey knit</li> </ul>	<ul style="list-style-type: none"> <li>• Resilient</li> <li>• Poor to good dimensional stability</li> <li>• Soft handle</li> <li>• Low elasticity</li> <li>• Absorbent</li> </ul>	<ul style="list-style-type: none"> <li>• Underwear</li> <li>• Dresses</li> <li>• Shirting</li> <li>• Sportswear</li> <li>• Children's wear</li> </ul>
Jacquard double knit 	<ul style="list-style-type: none"> <li>• 100% polyester</li> <li>• Double weft knit</li> <li>• Yarn is dyed before knitting</li> <li>• Distinguished by its limitless patterns made from different-coloured yarns</li> <li>• Often produced to resemble woven fabrics</li> </ul>	<ul style="list-style-type: none"> <li>• Good drape</li> <li>• Resilient</li> <li>• Good dimensional stability</li> <li>• Low elasticity</li> </ul>	<ul style="list-style-type: none"> <li>• Apparel</li> </ul>

Photo courtesy of Textile Fabric Consultants, Inc.

Shutterstock.com

## Pile knit

### Knit structure

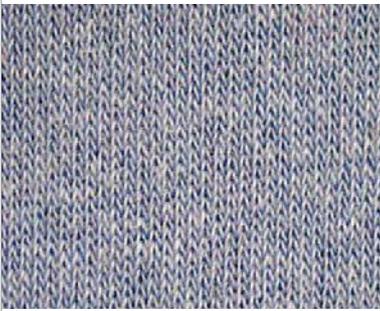
Pile knit fabrics are constructed by weft knitting. To create a terry knit fabric, two yarns are fed into the knitting machine. One yarn forms the base fabric and the other forms the pile. High-pile fabrics like fake fur are constructed by adding a sliver of staple fibre into the base cloth during the knitting process. The slivers are caught into the knit and held tightly in place. Fleece is constructed like a terry knit fabric but one side of the fabric is brushed or napped to form the fleece or pile.

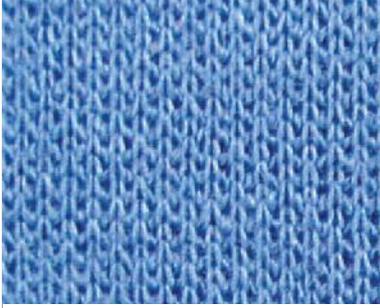


8.4 Pile knit

## Pile knit fabrics

Pile knit fabrics include terry cloth, fake fur and fleecy.

Fabric name	Knit structure	Properties	End-uses	
<p>Knitted terry cloth</p> 	<ul style="list-style-type: none"> <li>• 80% cotton/20% polyester</li> <li>• Pile knit, uncut, single weft knit</li> <li>• Fibre is dyed before spinning</li> <li>• Distinguished by loop pile in the warp direction</li> </ul>	<ul style="list-style-type: none"> <li>• Good absorbency</li> <li>• Stretch in both directions</li> <li>• Poor durability</li> <li>• Poor dimensional stability</li> <li>• Medium drape</li> </ul>	<ul style="list-style-type: none"> <li>• Beachwear</li> <li>• Towels</li> <li>• Dressing gowns</li> <li>• Baby towels</li> <li>• Car seat covers</li> </ul>	
<p>Face of terry cloth</p> 				<p>Wrong side of terry cloth</p>
<p>Fake fur</p> 				<ul style="list-style-type: none"> <li>• 85% recycled polyester/15% polyester</li> <li>• Pile knit, cut, single weft knit</li> <li>• Fibre is dyed before spinning</li> <li>• Distinguished by a heavy, high-density pile</li> </ul>
<p>Face of fake fur</p> 	<p>Wrong side of fake fur</p>			

Fabric name	Knit structure	Properties	End-uses
Fleecy 	<ul style="list-style-type: none"> <li>• 80% cotton/20% polyester</li> <li>• Pile knit, single weft knit</li> <li>• Piece dyed</li> <li>• Distinguished by napping on wrong side of fabric</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced elasticity due to pile yarn</li> <li>• Poor to good durability</li> <li>• May pill</li> </ul>	<ul style="list-style-type: none"> <li>• Sportswear</li> <li>• Toys</li> <li>• Children's wear</li> <li>• Dressing gowns</li> </ul>
Face of fleecy 			
Wrong side of fleecy 			

Photos courtesy of Textile Fabric Consultants, Inc. Swatches 71, 88, 80; www.textilefabric.com

## Extend your knowledge 8.2

Watch the video clip about how Polartec is made and answer the following questions.

- 1 What is Polartec made from?
- 2 Name the type of knitting machine that produces Polartec fabric.
- 3 Describe the surface characteristics of the fleecy fabric before the napping process occurs.
- 4 Explain the process of napping.
- 5 How is pilling prevented?
- 6 Polartec fabric undergoes a number of quality control performance tests. Outline two of these tests by explaining the process and why the test is carried out.
- 7 Visit the Polartec website ([www.polartec.com](http://www.polartec.com)) and research one innovation in knit fabric technology. Write a short report and share your findings with the class.



([www.polartec.com/video-gallery](http://www.polartec.com/video-gallery))

## Tricot

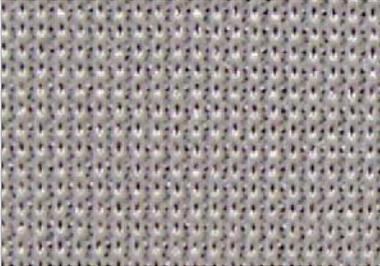
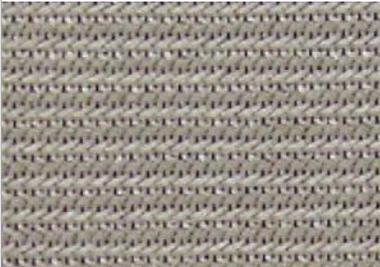
### Knit structure

Tricot fabrics are constructed by warp knitting. They are knitted on a flatbed knitting machine using two sets of warp threads that move from left to right with each new row. Tricot fabrics are usually made from filament yarns such as nylon or polyester.



8.5 Tricot knit

## Tricot fabrics

Fabric name	Knit structure	Properties	End-uses
<p>Tricot</p> 	<ul style="list-style-type: none"> <li>• 100% polyester</li> <li>• Warp knit</li> <li>• Piece dyed</li> <li>• Distinguished by tightly knitted filament yarns</li> </ul>	<ul style="list-style-type: none"> <li>• Good drape</li> <li>• Elastic</li> <li>• Edges do not unravel or curl</li> <li>• Good dimensional stability</li> <li>• Good resiliency</li> </ul>	<ul style="list-style-type: none"> <li>• Lingerie</li> <li>• Underwear</li> <li>• Sportswear</li> </ul>
<p>Face of tricot</p> 			
<p>Wrong side of tricot</p> 			

Photos courtesy of Textile Fabric Consultants, Inc. Swatch 87; www.textilefabric.com



8.6 Lace



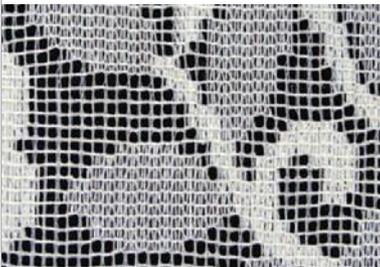
Differences in lace video  
([www.youtube.com/watch?v=H41gf7EuxE74](http://www.youtube.com/watch?v=H41gf7EuxE74))

## Lace knit

### Knit structure

Lace fabrics are constructed by warp knitting. They are knitted on a Raschel flatbed knitting machine using one bar of needles to create vertical rows of loops, with each row connected by a horizontal inlay thread. Elaborate patterns can be created on a Raschel knitting machine.

### Lace fabrics

Fabric name	Knit structure	Properties	End-uses
<p>Raschel knit lace</p> 	<ul style="list-style-type: none"> <li>• 100% polyester</li> <li>• Warp knit</li> <li>• Distinguished by the vertical pillars of loops</li> <li>• The pattern yarns are inlaid to form the design</li> </ul>	<ul style="list-style-type: none"> <li>• Poor dimensional stability</li> <li>• Highly decorative</li> <li>• Medium drape</li> </ul>	<ul style="list-style-type: none"> <li>• Apparel</li> <li>• Curtains</li> <li>• Lingerie</li> </ul>
<p>Knit lace</p> 			

Photos courtesy of Textile Fabric Consultants, Inc. Swatch 91; www.textilefabric.com

# Net

## Knit structure

Net is constructed on a Raschel knitting machine using spun or textured yarns.

## Net fabric

Tulle is an example of a net fabric.

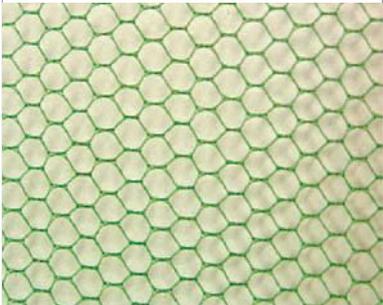
Fabric name	Knit structure	Properties	End-uses
Tulle 	<ul style="list-style-type: none"><li>• 100% nylon</li><li>• Warp knit</li><li>• Solution dyed</li><li>• Distinguished by the hexagonal shapes created in the fabric</li></ul>	<ul style="list-style-type: none"><li>• Poor dimensional stability</li><li>• Durable</li><li>• Sheer</li></ul>	<ul style="list-style-type: none"><li>• Veils</li><li>• Apparel overlays</li><li>• Support fabrics such as petticoats</li><li>• Ballet wear</li><li>• Fishnet stockings</li></ul>

Photo courtesy of Textile Fabric Consultants, Inc.,  
[www.textilefabric.com](http://www.textilefabric.com)

## Review questions

Use the information in this chapter to answer the following questions.

- 1 What is the difference between a wale and a course?
- 2 Why do knit fabrics stretch?
- 3 Compare and contrast weft and warp knitting.
- 4 Identify a knit fabric that will curl when cut.
- 5 Name a knit fabric that looks the same on the right and wrong side.
- 6 Explain how terry knit is manufactured.
- 7 Name two fabrics produced by warp knitting and two produced by weft knitting.



- 8.7 Net
- 8.8 Woven and knitted fabrics experiment
- 8.9 Knitted fabrics – apparel focus area
- 8.10 Knitted fabrics – non-apparel focus area
- 8.11 Knitted fabrics palm cards

## Websites

- ☺ Polartec ([www.polartec.com](http://www.polartec.com)): Producer of high-performance knit fleece fabrics for sportswear, active wear and furnishing applications.
- ☺ Nikki Gabriel ([www.nikkigabriel.com](http://www.nikkigabriel.com)): Knitwear and textile designer.
- ☺ Knitters' Guild NSW ([www.knittersguildnsw.org.au](http://www.knittersguildnsw.org.au)): A guild to promote and encourage the disciplines of hand knitting and crochet.
- ☺ Knitwit ([www.knitwit.com.au](http://www.knitwit.com.au)): Australian supplier of quality knit and stretch fabrics.
- ☺ Ecoyarns ([www.ecoyarns.com.au](http://www.ecoyarns.com.au)): Australian supplier of organic and eco-friendly yarns, fibres and fabrics.
- ☺ Tessuti ([www.tessuti-shop.com](http://www.tessuti-shop.com)): Online fabric shop that specialises in designer fabrics.
- ☺ Ravelry ([www.ravelry.com](http://www.ravelry.com)): An interactive online community of knitters, crocheters, designers, spinners, weavers and dyers.



# 9

## Non-woven fabric types and classification

### Fabric structure

In contemporary society, non-wovens are emerging as fabrics of the future. They have end-use versatility, a quick rate of production and relatively low manufacturing costs. Non-wovens are the only fabric structure that is made directly from fibres: they can be made from natural or manufactured fibres, but the most popular are polypropylene, polyester and rayon. The properties of non-wovens depend on their fibre composition. For example, non-wovens made from rayon have a soft handle and high absorbency, and are breathable and biodegradable.

Unlike woven or knitted fabrics, non-wovens have no grainline as the fibres are matted together. They will not fray or unravel. They are usually stiff with poor drape, are inelastic, but have good resiliency and dimensional stability.

Non-wovens may be classified as disposable or durable. Disposable non-wovens have a short usage period and include nappy fabrics, medical fabrics, wet wipes, facemasks and feminine hygiene products. Durable non-wovens have a longer lifespan and include filters, protective apparel, interlinings, geotextiles and agricultural and automotive fabrics.



#### 9.1 Non-woven fabrics



Disposable non-woven: nappies



Durable non-woven: geotextiles, such as drainage application during roadway construction

Photos from Shutterstock.com

There are three main steps in the production of non-woven fabrics.

- 1 Fibres are selected depending on the end-use of the product.
- 2 The fibres are laid out to form a web.
- 3 The web is bonded together, either by a mechanical or chemical process or by using heat.

There are three main types of non-woven fabrics: felts, webs and films.

## Extend your knowledge 9.1

Watch the video clip about non-woven fabrics and answer the following questions.

- 1 List the advantages of non-woven fabrics.
- 2 Non-woven fabrics are extremely versatile. Identify the end-uses of non-woven fabrics.
- 3 List the methods of manufacturing non-woven fabrics.
- 4 What are geotextiles and where are they used?
- 5 Why will non-woven fabrics become more important in the 21st century?



Industrial felt production video  
([www.inda.org/video/NonwovensVideo.html](http://www.inda.org/video/NonwovensVideo.html))

## Felts

### True felt

#### Non-woven structure

The crimp and scaly surface of wool fibres means they will **felt** together when agitated in the presence of heat and moisture. Wool felt can be ‘blocked’ to create shapes, including hats and shoes. The process of commercial felt making is similar to the method of hand felting. Fibres are laid out to form a web of even thickness. More webs are laid out on top until the desired weight or thickness is achieved. The web is then sprinkled with warm water and passed backwards and forwards between rollers that felt the web.



9.2 Compare industrial felting and traditional felt making  
9.3 Textile felt artists

## Extend your knowledge 9.2

Watch the video clip about industrial felt making and briefly outline the process. Include the following words in your information: heat, moisture, carding, motion, batts, pressure, layered, steam, compressed, entangled, wool, felted, rollers, trimmed, packaged.

### Felt fabric

There is only one type of true felt fabric.



Industrial felt making video  
([www.youtube.com/watch?v=4454e0oRTrM](http://www.youtube.com/watch?v=4454e0oRTrM))

Fabric name	Non-woven structure	Properties	End-uses
Felt 	<ul style="list-style-type: none"> <li>• Staple web – usually made from wool but can be combined with other animal fibres</li> <li>• Wool fibres, when agitated in the presence of heat and moisture, matt together</li> </ul>	<ul style="list-style-type: none"> <li>• Good insulator</li> <li>• Strong</li> <li>• Resilient</li> <li>• Inelastic</li> <li>• Stiff</li> <li>• Poor drape</li> <li>• Will shrink</li> </ul>	<ul style="list-style-type: none"> <li>• Coats</li> <li>• Furnishings</li> <li>• Billiard-table cloth</li> <li>• Acoustics</li> <li>• Shock absorption</li> <li>• Toys</li> </ul>

Photo courtesy of Textile Fabric Consultants, Inc. Swatch 99; [www.textilefabric.com](http://www.textilefabric.com)

NelsonNet

Felted bowls  
TEXD11AS090040

## Marjolein Dallinga – Bloomfelt

Bloomfelt is Marjolein Dallinga's textile design company. Bloomfelt produces unique felted fabrics for *Cirque du Soleil* costumes and also commissioned individual work.

Photo courtesy of Bloomfelt



Waves, made from wool felt

### Textile artist profile

The desire to create came at an early age for Marjolein, learning the basics of sewing, knitting, crocheting and weaving from her grandmother. As a young girl she loved to make things from fabrics, ribbons, threads or buttons. Marjolein trained in the field of graphic arts and painting in Holland but found it too restricting and started sewing pictures, patchwork, quilting and combining materials to make art books hand bound with textile materials. When Marjolein became a mother she started to explore toy making from natural fibres, including wool and cotton, and this is when she discovered felting. The technique of felting requires very little equipment but allows unlimited freedom in the creative process. It also has the possibility to create such varied results in the items produced. So now Marjolein paints with fibre.

Initially she created handbags, hats, shawls and mittens, which interested enough people for Marjolein to be asked to teach the art of felting. Through the contacts she made in her courses, she became involved in producing theatrical pieces when her work came to the notice of the *Cirque du Soleil*.

### Design inspiration

The natural world inspires Marjolein: its sounds, feel and touch, the textures and forms.

Her work comes from her thoughts and dreams. Marjolein often dreams of something deep and colourful, which moves and is very mysterious. There are many corners, strange places and holes. True creativity does not spring from momentary inspiration. It derives from much experimentation, many mistakes and doing things over and over again. It comes from dreaming, from the workings of the subconscious and then perhaps something will present itself.

For several years Marjolein has tried to shape, sculpt, fold and cut this warm and woolly material through the process of felting, during which it metamorphoses from an array of loose, colourful fibres to a strong, sturdy textile. 'Feel the fear but do it anyway' is an underlying emotional energy that urges her to create forms with wool. It is not a visual or intellectual motivation but more of a gut feeling. The sculptures resemble parts of the human anatomy. Some are skin-like and others are more internal, like a liver, kidney or spleen. Some express something as mysterious as the heart or the strange plasticity of the brain. They vary in form, size and colour. Some are empty; they have their secrets within their folds and craters, and their longings hidden in their colours and layers. These sculptures are soft and light, yet unbreakable. There's a need to get them out into the light. Maybe someone else is moved by them too.

Marjolein is inspired by the fibre wool and its properties, and its ability to be so versatile in terms of the colours it can be dyed and the shapes it can create. The main focus in felting for Marjolein is the colour, the texture and the organic, irregular shapes.

The work of other artists including Joseph Beuys, Anselm Kieffer, Louise Bourgeois and Kiki Smith inspires Marjolein, and she often refers to their work in her creative process.

## The creative process

When creating, Marjolein will make an extensive range of items: one item leading to the next and one expression leading to another. This process is called experimentation and gives her the opportunity to explore the fibre and the technique to allow the best possible item to be developed.

Through her work with *Cirque du Soleil*, Marjolein began to combine felt with other materials, developing wonderful and sometimes outrageous and unusual creations. She enjoys being immersed in the sea of creativity at the *Cirque du Soleil* design rooms and working with other designers, such as costume designer François Barbeau. Marjolein's painting background gives her a strong understanding of colour and the skill to combine colours to create warmth and contrast in her designs. Marjolein loves texture and the multi-dimensional effects that felt can create. Her felted projects are rarely one-dimensional, but include craters, spikes, ruffles, cords, holes and twists.

## The future

Marjolein's dream is for Bloomfelt to become a cooperative, where people can create, exhibit, teach and produce their own raw materials for the felting process, sheep for wool and nature for the dyes. She loves to teach and believes in sharing her expertise. Marjolein would like to build a Canadian Felt Association, such as they have in many countries. Lately, she has been working on items for several exhibitions, art salons and the famous World of Wearable Art show in New Zealand.



Craters, made from wool felt with organza



Spikes, made from hand-dyed merino wool felt



Spleen, made from hand-dyed wool felt and silk

Photos courtesy of Bloomfelt

### Extend your knowledge 9.3



- 1 Visit the Bloomfelt website ([www.bloomfelt.com](http://www.bloomfelt.com)) and explore the creativity of felting. Look through the gallery to gain an insight into the possibilities of felt making.
- 2 Visit the *Cirque du Soleil* website ([www.cirquedusoleil.com](http://www.cirquedusoleil.com)) to gain an understanding of the costuming of this company. Select one of the *Cirque du Soleil* shows as your inspiration.
- 3 In your creative journal, design a *Cirque du Soleil* costume incorporating multi-dimensional felting. Render your design and label the costume with your design inspiration and design features.

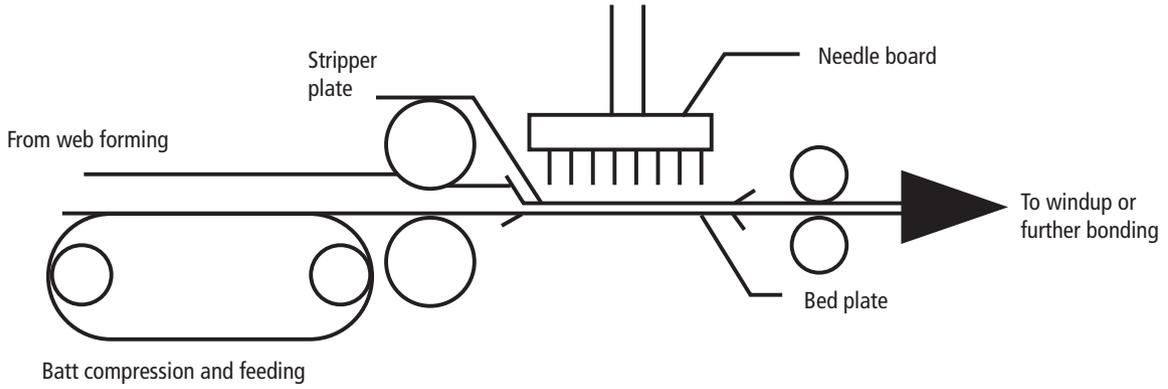




# Needle felt

## Non-woven structure

In needle felt, the web of fibres is laid out on paper or hessian. The bulky fibre web is repeatedly punched with hot barbed needles. These needles drag the fibres to the lower side of the web and through the backing of paper or hessian, which holds the fibres in place and creates a fabric.



Needle felting

## Needle felt fabric

Felt underlay is an example of needle felt fabric.

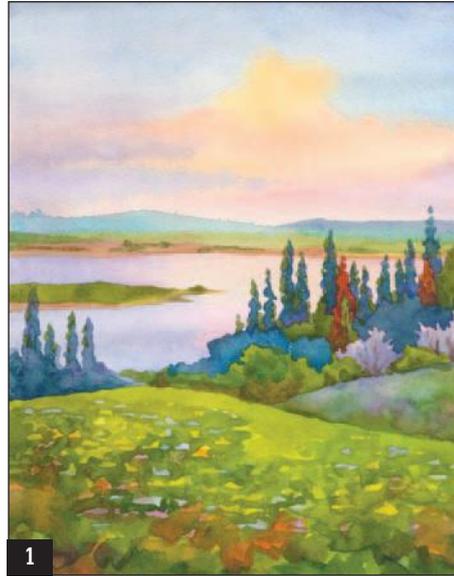
Fabric name	Non-woven structure	Properties	End-uses
Felt underlay  Side view	<ul style="list-style-type: none"> <li>• Acrylic/wool</li> <li>• Dry-laid mechanical bonding</li> <li>• Fibre dyed</li> <li>• Made from fibres entangled together by barbed needles</li> </ul>	<ul style="list-style-type: none"> <li>• Inelastic</li> <li>• Lightweight</li> <li>• Resilient</li> <li>• Hardwearing</li> </ul>	<ul style="list-style-type: none"> <li>• Carpet underlay</li> <li>• Wadding</li> <li>• Mattress covers</li> <li>• Floor coverings</li> </ul>

Photos courtesy of Textile Fabric Consultants, Inc.; [www.textilefabric.com](http://www.textilefabric.com)

The **embellishing machine** works in the same way as the process of commercial needle felting. An open weave or felt backing is used. Fibres, yarns and fabrics are placed on top of the fabric to create a design. A set of barbed needles stab or push the fibres through the backing. Suitable fabrics for this technique include open-weave fabrics and felts.

### Method

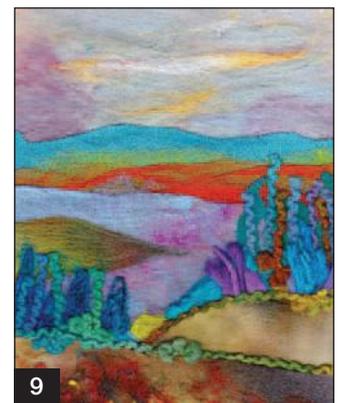
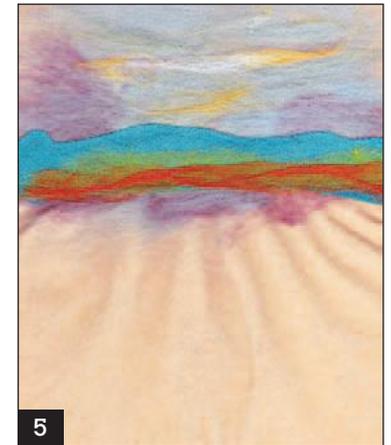
- 1 Select a suitable photo, painting or drawing of a landscape as a source of inspiration. You could use your creative journal and complete a line drawing of the image to help with proportions.
- 2 Start with a backing fabric (such as acrylic felt) 5 cm larger than the required finished design. You will work from the background to the foreground of the design, building up layers.
- 3 Create the colours of the sky by layering wool tops and hand-dyed mulberry silk onto the backing fabric.
- 4 Use the embellishing machine to needle felt in place.
- 5 Create the distance hills using aqua wool blanketing, and orange and green organza ribbon. Repeat step 4.
- 6 Create the water using blue acrylic felt and hand-dyed muslin. Repeat step 4.
- 7 Create the island using silk tops. Repeat step 4.
- 8 The trees are made from woollen yarns. Repeat step 4.
- 9 The hills are made from hand-dyed wool, and organza snippets are needle felted to give added colour.
- 10 Trim your design to the required size.



Water-colour landscape painting



Barbed needles on an embellishing machine with plastic safety cover

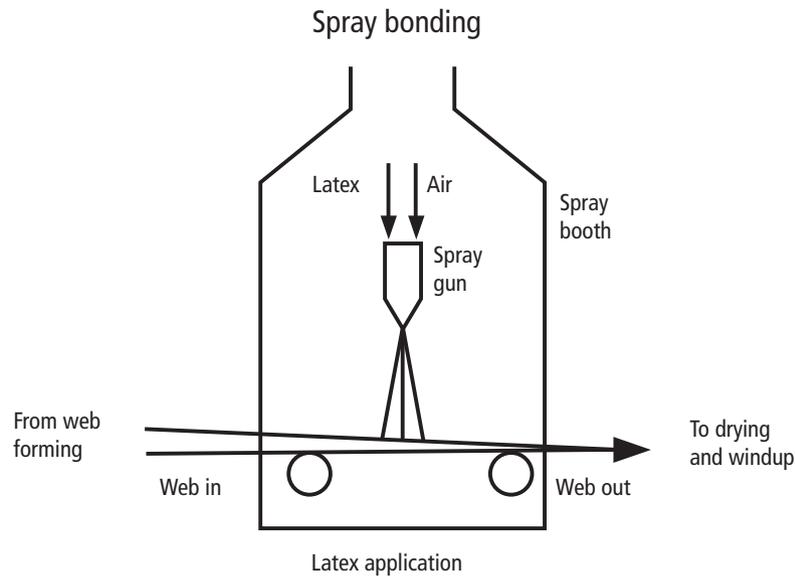


# Webs

## Chemically bonded

### Non-woven structure

Chemically bonded non-woven fabrics have staple fibres, usually cotton or rayon, laid out in a parallel, crossways or random formation to form a web. The web is held together with an adhesive or bonding agent by spraying or printing, then the fabric is dried. This method of fabric production is relatively simple and cheap.



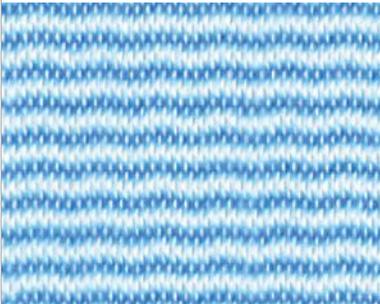
Spray bonding, used in making chemically bonded fabrics



9.5 Chemically bonded fabrics

## Chemically bonded fabrics

An example of a chemically bonded non-woven is Chux cloth.

Fabric name	Non-woven structure	Fabric properties	End-use applications
Chux 	<ul style="list-style-type: none"> <li>• 100% rayon</li> <li>• Staple web – greater amounts of adhesive make the fabric stronger, stiffer and less absorbent</li> <li>• Addition of holes increases absorbency</li> </ul>	<ul style="list-style-type: none"> <li>• Lightweight</li> </ul>	<ul style="list-style-type: none"> <li>• Wipe cloths</li> <li>• Nappy liners</li> <li>• Disposable underwear</li> <li>• Surgical dressings</li> <li>• Filters</li> <li>• Tablecloths</li> </ul>

# Thermo-bonded

## Non-woven structure

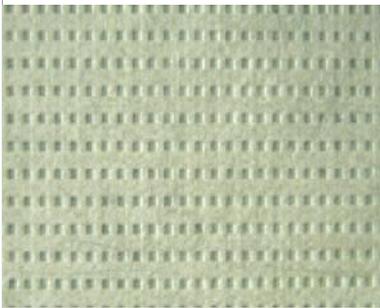
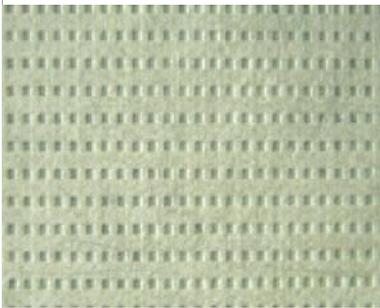
Thermo-bonded non-woven fabrics have synthetic fibres laid out in a parallel, crossways or random formation to form a web. The web is passed through heated rollers that cause the synthetic fibres to soften, melt and stick to one another.



9.6 Thermo-bonded fabrics

## Thermo-bonded fabrics

Thermo-bonded non-wovens include interfacing and Tyvek.

Fabric name	Non-woven structure	Properties	End-use
Interfacing 	<ul style="list-style-type: none"> <li>• 100% polyester</li> <li>• Spun-bonded fibre web</li> <li>• Heat-bonding</li> <li>• Solution dyed</li> </ul>	<ul style="list-style-type: none"> <li>• Quick and inexpensive to produce</li> <li>• Lightweight</li> <li>• Non-fraying</li> <li>• Smooth</li> <li>• Poor drape</li> </ul>	<ul style="list-style-type: none"> <li>• Supporting fabric for collars, cuffs and plackets</li> </ul>
Fusible interfacing 			
Magnified view of fusible interfacing 			
Tyvek 	<ul style="list-style-type: none"> <li>• 100% olefin</li> <li>• Heavyweight</li> <li>• Spun-bonded fibre web</li> <li>• Solution dyed</li> </ul>	<ul style="list-style-type: none"> <li>• Vapour permeable</li> <li>• Resistant to water, chemicals, punctures, tears and abrasion</li> <li>• Low-linting</li> </ul>	<ul style="list-style-type: none"> <li>• Protective apparel</li> <li>• Geotextiles</li> <li>• Medical packaging</li> <li>• Car covers</li> </ul>

Photos courtesy of Textile Fabric Consultants, Inc. Swatches 95, 96; www.textilefabric.com

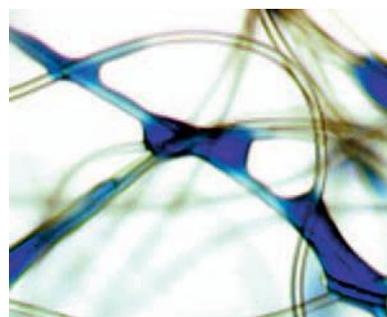


Image courtesy of Beda Richlin/  
Swicofil AG Textile Service

Fibres in thermo-bonding

# Tyvek

Case study information courtesy of DuPont

Tyvek is a durable, spun-bonded olefin sheet product. It is stronger than paper and more cost-effective and versatile than fabrics. Tyvek is an extremely versatile material, combining the best properties of paper, film and fabric.

Spun-bonded olefin is formed by a continuous process from very fine 0.5–10 micrometre fibres. (For the purposes of comparison, a human hair is about 75 micrometres in cross-section.) These non-directional fibres are first spun and then bonded together by heat and pressure, without binders.

Tyvek was discovered in 1955 by chance, and it took another 12 years of trialling before commercial production started. Originally it was produced for book covers, tags, labels and protective apparel.

## Properties

Tyvek has a unique combination of properties. It is:

- strong and rip resistant
- lightweight
- flexible
- smooth and bright white, making it an excellent printing surface
- low-linting
- opaque
- resistant to water, chemicals, abrasion and aging.

## End-uses of Tyvek

Tyvek is ideal for a broad range of applications in many industries. It can be used as:

- protective membranes in buildings to improve energy efficiency
- protective covers for consumer and industrial end-use applications – from furniture to vehicle covers
- envelopes that are strong and durable, to withstand rough conditions during the mail-delivery process
- banners that will not fade or rip in any weather condition
- ski tags that will last the most challenging downhill runs all day long
- labels for everything, from construction to horticulture
- medical fabrics
- protective apparel
- packaging.

Courtesy of DuPont



Microscopic appearance of Tyvek

Courtesy of DuPont



Protective apparel made from Tyvek

NelsonNet

Using Tyvek as a creative medium  
TEXD11AS090041



Banners made from Tyvek

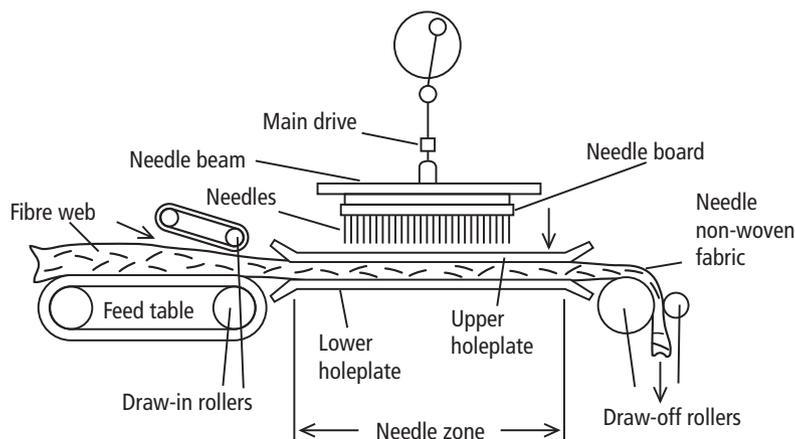
Courtesy of DuPont

## Mechanically bonded

### Non-woven structure

Mechanically bonded non-woven fabric consists of a synthetic web that is passed through a needle loom to entangle the fibres. The web is then put into hot water, which causes the fibres to shrink and tangle. This forms the fabric.

#### Fundamentals of needle bonding



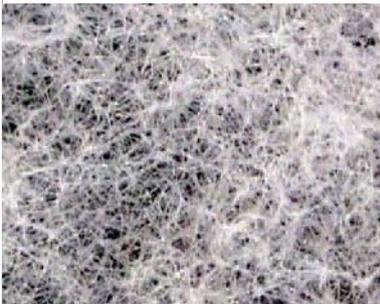
The synthetic web passes through the needle loom

### Mechanically bonded fabrics

Mechanically bonded non-wovens include needle-punched felt and looped needle-punched fabric.



9.7 Mechanically bonded fabrics

Fabric name	Non-woven structure	Properties	End-uses
 <p>Needle-punched felt</p>	<ul style="list-style-type: none"> <li>• 100% polyester</li> <li>• Dry-laid mechanical bonding</li> <li>• Solution dyed</li> <li>• Made from fibres entangled by barbed needles</li> </ul>	<ul style="list-style-type: none"> <li>• Strong</li> <li>• Good chemical resistance</li> <li>• Resilient</li> </ul>	<ul style="list-style-type: none"> <li>• Interlinings</li> </ul>
 <p>Looped needle-punched felt</p>	<ul style="list-style-type: none"> <li>• 100% acrylic</li> <li>• Dry-laid mechanical bonding</li> <li>• Fibre dyed</li> <li>• Characterised by looped fibres that have been needle-punched through the non-woven</li> </ul>	<ul style="list-style-type: none"> <li>• Strong</li> <li>• Good chemical resistance</li> <li>• Resilient</li> </ul>	<ul style="list-style-type: none"> <li>• Stuffed toys and crafts</li> </ul>

Photos courtesy of Textile Fabric Consultants, Inc. Swatch 94; [www.textilefabric.com](http://www.textilefabric.com)

## Spunlaced (or hydroentangled)

### Non-woven structure

The method of **spunlacing** involves bonding a web by interlocking and entangling the fibres using high-velocity streams of water. The web or fabric may have other bonding methods in addition to spunlacing.



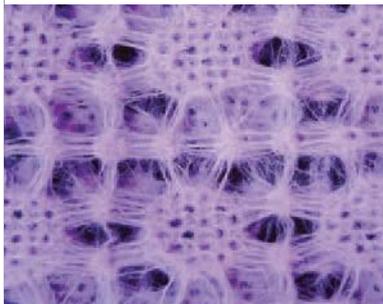
Photo courtesy of Sossna

Spinnerets for thermo-bonded and spun-bonded non-wovens, and water strips for spunlaced fabrics that can be manufactured up to 5.6 m in length.

### Spunlaced fabric



#### 9.8 Spunlaced fabrics

Fabric name	Non-woven structure	Properties	End-use
Spunlace curtain 	<ul style="list-style-type: none"> <li>• 100% polyester</li> <li>• Hydroentangled polyester web</li> <li>• Solution dyed</li> </ul>	<ul style="list-style-type: none"> <li>• More flexible and elastic than spun-bonded fabrics</li> </ul>	<ul style="list-style-type: none"> <li>• Curtains</li> </ul>

### Extend your knowledge 9.5



Hydrospace spunlace fabrics video  
([www.youtube.com/watch?v=ywRg0sSnTbA](http://www.youtube.com/watch?v=ywRg0sSnTbA))

Watch the video on hydrospace spunlace fabrics and then answer the questions that follow.

- 1 What properties make hydrospace fabrics unique?
- 2 Identify the types of hydrospace fabrics.
- 3 Why are the cavities so important in hydrospace fabrics?
- 4 Identify the end-uses of hydrospace fabrics.
- 5 Explain the process of hydroentangling.

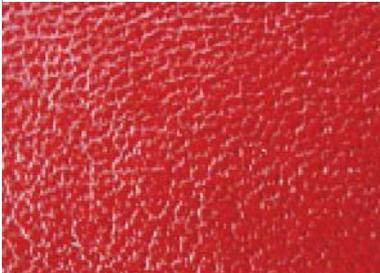
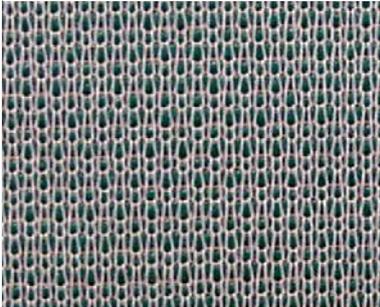
## Films

### Non-woven structure

In constructing a film, synthetic fibre chemicals are extruded as a sheet instead of filaments. These films are often laminated onto a fabric base, which is knitted or woven.

## Film fabrics

Film fabrics include pleather and vinyl

Fabric name	Non-woven structure	Properties	End-uses
Pleather 	<ul style="list-style-type: none"> <li>• Polyvinyl chloride/polyester backing</li> <li>• Film with knit fabric backing</li> <li>• Solution dyed</li> <li>• Reinforced film backed with a tricot knit for durability</li> </ul>	<ul style="list-style-type: none"> <li>• Impermeable to air and water</li> <li>• Strong</li> <li>• Poor drape</li> </ul>	<ul style="list-style-type: none"> <li>• Low-cost replacement for leather in apparel</li> </ul>
Right side 			
Wrong side			
Vinyl 	<ul style="list-style-type: none"> <li>• Polyvinyl chloride/polyester backing</li> <li>• Film with fibre web backing</li> <li>• Solution dyed</li> </ul>	<ul style="list-style-type: none"> <li>• Impermeable to air and water</li> <li>• Low cost</li> <li>• Resistant to soil</li> <li>• Strong</li> <li>• Poor drape</li> </ul>	<ul style="list-style-type: none"> <li>• Upholstery</li> <li>• Apparel</li> <li>• Marine upholstery</li> <li>• Industrial products</li> </ul>
Right side 			
Wrong side			

Photos courtesy of Textile Fabric Consultants, Inc. Swatch 93; [www.textilefabric.com](http://www.textilefabric.com)



9.9 Film fabrics

NelsonNet

Green bags case study  
TEXD11CS090042

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Give two examples of disposable non-wovens and two examples of durable non-wovens.
- 2 Briefly describe how true felt is made.
- 3 Briefly describe how Chux cloth is made.
- 4 Why are non-woven fabrics considered fabrics of the future?
- 5 Identify the three main steps in the production of a non-woven fabric.
- 6 Name a suitable non-woven fabric for the following end-uses: acoustics, dishcloths, protective clothing, upholstery, toys, curtains, supporting fabric in collars, surgical dressings, floor coverings, coats.

## Websites

- ☉ Association of the Nonwoven Fabrics Industry ([www.inda.org/about/nonwovens.html](http://www.inda.org/about/nonwovens.html)): The 'About' section of the website offers valuable insights into non-woven fabrics.
- ☉ Virginia Farm Woolworks ([www.virginiafarmwoolworks.com.au](http://www.virginiafarmwoolworks.com.au)): Based in Sydney, this company supplies felting, hand spinning and weaving requirements.
- ☉ Glenora Weaving & Wool ([www.glenoraweaving.com.au](http://www.glenoraweaving.com.au)): An online supplier of weaving yarns and accessories.
- ☉ Silksational ([www.silksational.com.au](http://www.silksational.com.au)): An Australian company based in Sydney with the aim to make textile art affordable and accessible to everybody.
- ☉ Marjolein Dallinga (<http://bloomfelt.com/home>): Textile felt artist.
- ☉ Gill Brooks ([www.handmadefelt.com.au](http://www.handmadefelt.com.au)): Textile felt artist.
- ☉ Wendy Bailye ([www.wendybailye.com](http://www.wendybailye.com)): Textile felt artist.
- ☉ Tyvek ([www.tyvek.com](http://www.tyvek.com)): The DuPont Tyvek website, which provides information about Tyvek in many industry applications.
- ☉ The Thread Studio ([www.thethreadstudio.com](http://www.thethreadstudio.com)): Supplier of felting requirements, Tyvek and heat guns.
- ☉ Unique Stitching ([www.uniquestitching.com.au](http://www.uniquestitching.com.au)): Tyvek and heat guns can be purchased from this site.



9.10 Non-woven fabrics  
palm cards



# Fabric testing

## Fibre and fabric tests

As consumers, it is important to be able to determine the fibre composition of the fabrics we use to make textile products. This will ensure that the most suitable fabric is selected for the end-use and the correct care procedures are followed. When you purchase fabric, the fibre content information is often available; however, when you are given fabric or use fabric from the classroom, there is no fibre identification information available.

To determine the fibre composition, you need to carry out microscopic or **burning tests**. Once you know the fibre type, you can refer to Chapter 5 to gain a broad understanding of the particular fibre's properties. It is also important to understand that the yarn structure and fabric structure also impact on the suitability of a fabric for a specific end-use. This means further testing may be required in relation to the fabric's aesthetic, durability, comfort and care properties.



Courtesy of DuPont

Fabric testing has changed significantly since the middle of last century. In the 1950s, DuPont volunteers tested the effects of nylon on the skin by wearing patches.

In Australia a number of organisations carry out textile testing for manufacturers and retailers. The CSIRO (Commonwealth Scientific and Industrial Research Organisation) has a textile testing laboratory to investigate the properties of fibres, yarns, textiles and related materials. The CSIRO's textile testing laboratory is the National Association of Testing Authorities (NATA), which is accredited to the highest Australian and international standards. They test:

- automotive specifications for interior fitting
- materials
- colour fastness



### 10.1 Textile testing in Australia

- flammability and protective clothing
- fibres
- yarns
- environments
- thermal and moisture vapour resistance.

The Royal Melbourne Institute of Technology (RMIT) University Textile Testing Services is an accredited textile testing and consulting facility. Services include:

- colour fastness testing
- chemical testing
- flammability testing.

## Extend your knowledge 10.1



Kmart textile testing video  
([www.youtube.com/watch?v=VeHEPHNbj80](http://www.youtube.com/watch?v=VeHEPHNbj80))

Watch the video clip about Kmart textile testing and answer the following questions.

- 1 What textile items does Kmart test?
- 2 Outline the textile tests that Kmart conducts.

## Fibre identification tests

### Activity 10.2 Fibre burn testing

Experiment courtesy of Southern Biological ([www.southernbiological.com](http://www.southernbiological.com)); supplier of fibre identification kits that contain all the necessary equipment to conduct a burn test.

When conducting a burn test you observe what happens as the fabric sample approaches a flame, how it behaves in the flame, and what happens as it leaves the flame. It is beneficial to work in pairs so that one person can conduct the test and the other can record the results.

Sight, touch and smell have important roles in this test. Burn test results may be conflicting if the fabric contains a fibre blend or has a fabric finish, and further testing will be required.

#### Aim

To identify the fibre composition by conducting a burn test.

*Note:* This experiment must be conducted in a well-ventilated area under strict teacher supervision.

#### Equipment

Fabric samples, metal tweezers or tongs, flame source, ceramic tile or plate.

*Note:* Do not use a match as the flame source as the smell of the match ignition can often interfere with the test itself. A Bunsen burner or disposable butane lighter is the most suitable flame source.

#### Method

- 1 Cut a strip of fabric measuring approximately 3 cm × 1 cm.
- 2 Position the tile or plate under your work so that any molten residue or ash is collected if it drops.
- 3 Pick up the first strip to be tested with the metal tweezers or tongs so that about 1 cm is held and 2 cm are exposed.
- 4 Move the fabric towards the flame.



Moving the fabric towards the flame

Photo courtesy of Southern Biological,  
[www.southernbiological.com](http://www.southernbiological.com)



### 10.2 Fibre burn testing

## Results

Answer the following questions.

- 1 Move the fabric towards the flame. Does the fabric shrink away from the flame or is it unaffected?
- 2 When the fabric enters the flame, what happens? Does it ignite? Is there a noise? Does the fabric melt? Is there a sense of bubbling? Is there smoke? What colour is the smoke?
- 3 Withdraw the fabric from the flame. If the sample was burning while in the flame, watch to see if the burning continues after being withdrawn. Does it burn or self-extinguish? Is there smoke? If so, what colour is the smoke? Waft a little of the air above the sample towards you and smell it. What does the smell remind you of?
- 4 Is there any residue after burning? What does it look like? Allow it to cool and then check what it feels like.



Withdrawing the fabric from the flame

Photo courtesy of Southern Biological,  
www.southernbiological.com

Fibre	On approach to flame	Inside flame	After removal from flame	Ash or residue	Smell
Cotton	Doesn't shrink away	Burns quickly with yellow flame	Continues to burn; afterglow	Light-grey ash	Similar odour to burning paper
Wool	Shrinks away from flame	Smoulders and burns slowly	Tends to self-extinguish	Crushable black ash	Similar odour to burning hair
Rayon	Doesn't shrink away	Burns quickly with yellow flame	Continues to burn; afterglow	Light-grey ash	Similar odour to burning paper
Polyester	Fuses and shrinks away from flame	Burns slowly with some melting and a black, thick smoke is apparent	Usually self-extinguishes	Hard, black bead	Sweet smell
Nylon	Fuses and shrinks away from flame	Burns slowly with some melting	Usually self-extinguishes	Hard grey or tan bead	Smells like celery
Elastomeric	Fuses but does not shrink away from the flame	Burns with melting	Continues to burn with melting	Soft, fluffy black ash	Chemical smell

Note: Photos of burn tests can be found for each fibre in Chapter 5.

## Conclusion

Compare your results to the table above. Make a judgement as to which fibre composition you think the fabric is made from.

### Activity 10.3 Microscopic fibre examination – longitudinal view

Experiment courtesy of Southern Biological, [www.southernbiological.com](http://www.southernbiological.com); supplier of fibre identification kits that contain all the necessary equipment to conduct a burns test.

Natural fibres have distinctive appearances, so examining fibres under a microscope is useful to identify the fibre type. However, many manufactured fibres have a similar microscopic appearance; therefore, further testing may be required.





## Aim

To identify the fibre composition by conducting a microscopic examination.

## Equipment

Fabric swatches, glass slides, coverslips, pipettes, mounted needle, Petri dish, water, compound microscope with magnification to 400x with built-in light source.

## Method

- 1 To view fibres under a microscope you need to unravel fibres from the fabric swatch. Remove a yarn from the fabric that is at least 100 mm long. Hold the yarn between your thumb and fingers of each hand. Holding one end still, carefully untwist the yarn whilst maintaining some tension so that the fibres slip past one enough to produce two short lengths, each with exposed fibres.
- 2 Repeat the process until you have a small cluster of untwisted fibres.
- 3 Place the fibres in a Petri dish. Check that the warp and weft contain the same fibres. If the fibres appear to be different, you should conduct a microscopic examination of both the warp and the weft to determine the fibre composition as the fabric may be made from a fibre blend.
- 4 Place a glass slide on the bench near the microscope.
- 5 Place several fibres onto the centre of the slide. Make sure the fibres are separated and not in a clump. You can use the mounted needle to spread them on the glass slide.
- 6 Add a single drop of water to the fibres and cover with a coverslip.
- 7 Place the prepared slide onto the microscope stage and select the lowest magnification. Move the objective lens to the lowest point (closest position to the slide) and then look into the microscope and adjust the focus. Swing the objective to the next magnification.
- 8 Note the shape of the fibre. Is it regular or irregular? Look for marks along the fibre.



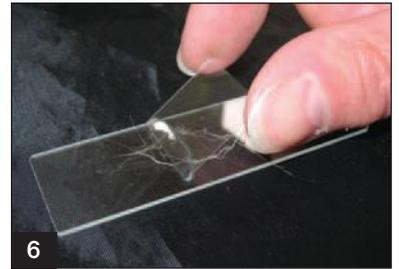
1  
Tensioning the yarns between the fingers to separate the fibres



2  
Small cluster of untwisted yarns



5  
Fibres being placed on glass slide



6  
Cover being placed on glass slide

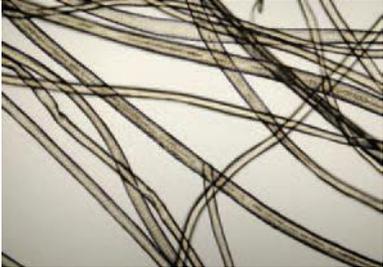
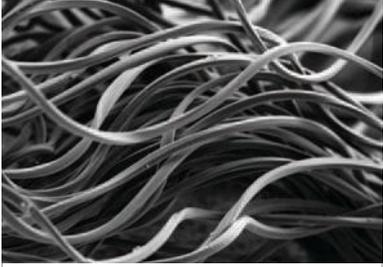
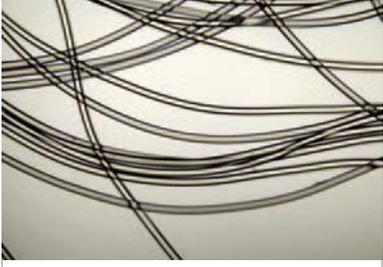
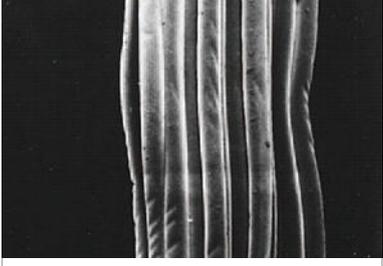
Photos courtesy of Southern Biological, [www.southernbiological.com](http://www.southernbiological.com)

## Results

Draw your observations and compare what you see with the following table.

Fibre classification	Fibre name	Longitudinal view	Longitudinal view photographs
Cellulosic	Cotton	<ul style="list-style-type: none"> <li>• Ribbon-like with convolutions that twist</li> <li>• No significant lengthwise markings or striations</li> <li>• Lumen can often be seen</li> </ul>	 <p>Cotton, 100x magnification</p>

iStockphoto

Fibre classification	Fibre name	Longitudinal view	Longitudinal view photographs
Protein	Wool	Surface scales are visible, although this may vary when the wool is treated for shrink resistance	 Wool, 100× magnification
Regenerated	Rayon	Rod-like with lengthwise striations with no cross markings	 Rayon, 100× magnification
Synthetic	Polyester	Rod-like with no obvious surface markings	 Polyester, 100× magnification
	Nylon	Rod-like with no obvious surface markings	 Nylon, 100× magnification
	Elastomeric	Flattish or broad with some lengthwise striations but no cross markings	 Elastomeric

## Conclusion

Compare the results of your microscopic examination with the table information above to determine the most likely fibre type of each fabric swatch. What end-uses would be suitable for each fabric?



10.3 Microscopic fibre examination – longitudinal view

# Fabric structure identification tests

A digital microscope will allow you to magnify a fabric structure so that it is easier to identify whether it is woven, knitted or a non-woven and to determine the particular type of structure. The microscope software can measure the individual yarns in the fabric and make annotations on the digital image.

## Activity 10.4 Microscopic fabric structure examination

### Aim

To determine the structure of a range of fabrics.

### Equipment

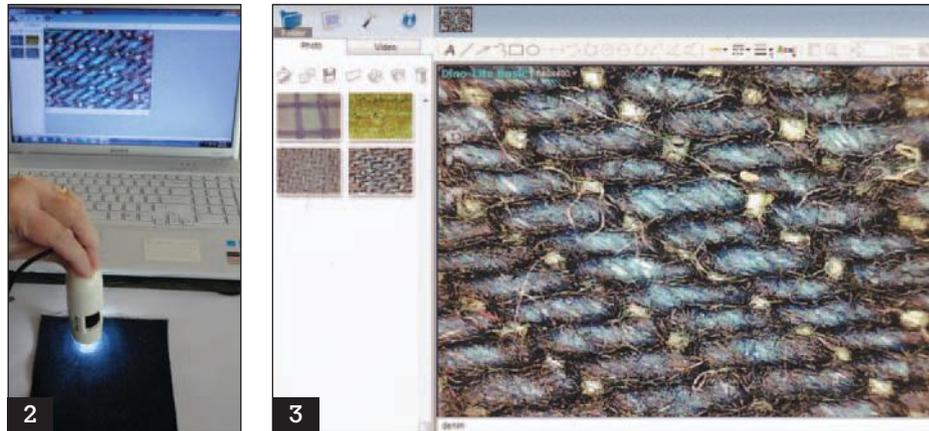
Fabric swatches 6 cm × 6 cm, digital microscope, computer, solid work surface.

### Method

- 1 Place your fabric swatch on a solid surface.
- 2 Hold the digital microscope steady over your sample. Adjust the focus and the magnification until you have a clear image on the computer screen.
- 3 Take a snapshot of the fabric structure.

### Results

Using the information in Chapters 7, 8 and 9, identify the fabric structure and read through the relevant information to gain an understanding of the fabric properties.



### Conclusion

Identify the fabric structure, the relevant fabric properties and suitable end-uses.



10.4 Digital microscope  
fabric structure examination

## Fabric properties testing

In each of the property tests you will need to complete a table of results and devise a conclusion based on those results. The table structure on page 157 can be used for all fabric property experiments.

Fabric Identify fabric name, weight and type. Is the fabric woven, knitted or non-woven?	Fibre type	Property observation For example, degree of drape: good or poor?
	100% cotton	
	100% wool	
	100% rayon	
	100% polyester	
	100% nylon	
	Cotton/polyester	
	Nylon/elastomeric	

It is preferable for each test to use similar fabric structures, weights and thicknesses with no finishes present. This will ensure the results represent the characteristics of the fibre, and are not influenced by the yarn or fabric structure.

## Testing for aesthetics

### Activity 10.5 Fabric property: lustre

**Lustre** is the gloss, sheen, sparkle or shine of a fabric caused by light reflecting from a surface.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: formal wear, bridal wear
- costume: theatre costumes, dance costumes
- furnishings: cushions, curtains
- textile art: wall hangings, museum dress
- non-apparel: evening bags, hats.

#### Aim

To determine which fabric exhibits the highest degree of lustre.

#### Equipment

Seven fabric swatches 10 cm × 10 cm (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric), light source.

#### Method

Hold a fabric swatch under a light source and observe the degree of reflected light. This indicates the lustre of the fabric.

#### Results

In a table of results, identify the fabric of each swatch and record the degree of lustre (low, medium or high).

#### Conclusion

Rank the fabrics in order from the highest degree of lustre to the lowest.

Shutterstock.com



Satin is a fabric with high lustre.



10.5 Fabric property: lustre



Drape experiment



10.6 Fabric property: drape

**Drape** is how a fabric hangs or falls.

### Aim

To determine which fabric has the highest degree of drape.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: formal wear, bridal wear, gathered skirts and dresses where fullness is required
- costume: medieval dress, stage costumes such as capes
- furnishings: curtains, four-poster bed canopy
- textile art: gathering, pleating and smocked areas of textile artwork
- non-apparel: not relevant.

### Equipment

Seven fabric circles 25 cm diameter (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric), tall glass, overhead projector, butcher paper, felt-tip pen.

### Method

- 1 Attach a sheet of butcher paper on the wall in front of the overhead projector. Stand a glass on the middle of the overhead projector.
- 2 Mark the centre of the fabric circle and lay the fabric over the glass. An image of the fabric's drapability will appear on the screen.
- 3 Draw around the image on the butcher paper. The smaller the image or greater the number of folds, the better the drape.

### Results

In a table of results, identify the fabric of each swatch and record the degree of drape (poor or good).

### Conclusion

Identify which fabric exhibits the highest degree of drape.

## Testing for durability

**Abrasion resistance** is the ability to withstand rubbing or wear and tear.

### Aim

To determine which fabric is the most hardwearing and durable.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: toddler overalls, work clothes, socks, stockings
- costume: stage productions such as *Mary Poppins*, where durability and the life of the costume are very important
- furnishings: couches, rugs
- textile art: not relevant
- non-apparel: tents, sleeping bags.

### Equipment

Seven fabric swatches 10 cm × 10 cm (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric), sandpaper, masking tape.

### Method

- 1 Tape the fabric to the edge of a table. Using a piece of sandpaper, rub in one direction across the fabric.



Abrasion resistance testing video  
[www.youtube.com/watch?v=kpNi\\_i099xE4NR=1](http://www.youtube.com/watch?v=kpNi_i099xE4NR=1)

- 2 Count how many rubs it takes before a hole appears in the fabric. The fabric with the highest number of rubs is the hardest wearing and most durable.

## Results

In a table of results identify, the fabric of each swatch and record the number of rubs per swatch.

## Conclusion

Rank the fabrics from most hardwearing and durable to least.



Testing for abrasion resistance using a sandpaper block to rub the fabric



10.7 Fabric property: abrasion resistance  
10.8 Fabric property: strength  
10.9 Fabric property: absorbency

## Activity 10.8 Fabric property: strength

**Strength** is the ability to resist breaking.

### Aim

To determine the strength of a range of fabrics.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: jeans, ski suits
- costume: circus costumes
- furnishings: outdoor upholstery
- textile art: not relevant
- non-apparel: kites, parachutes, umbrellas.

### Equipment

Seven strips of fabric 30 cm × 5 cm (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric), clamp.

### Method

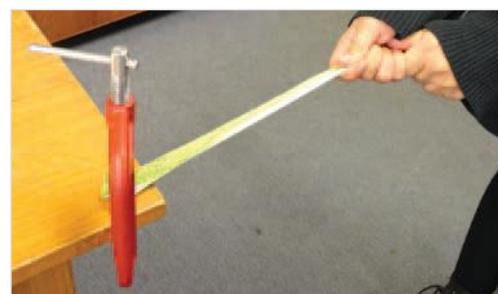
Fix one end of the fabric strip in a clamp and pull the other end. Note the amount of force required to tear the fabric.

### Results

In a table of results, identify the fabric of each swatch and record the strength (low, medium or high).

### Conclusion

Rank the tested fabrics from the strongest to the weakest.



Clamp test for strength



Tensile testing video  
([www.youtube.com/watch?v=N6gm4ljPY90](http://www.youtube.com/watch?v=N6gm4ljPY90))

## Testing for comfort

## Activity 10.9 Fabric property: absorbency

**Absorbency** is the ability to absorb moisture.

### Aim

To determine the absorbency properties of a range of fabrics.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: nappies, singlets
- costume: circus costumes, dance training costumes, such as leotards, historical costuming under harsh stage lighting





Testing for absorbency



Polartec wicking demonstration  
([www.youtube.com/watch?v=tptCllbSiBI&feature=related](http://www.youtube.com/watch?v=tptCllbSiBI&feature=related))

- furnishings: towels, dishcloths
- textile art: not relevant
- non-apparel: not relevant.

### Equipment

Seven fabric circles 5 cm larger than the circumference of glass jar (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric), seven glass jars, seven elastic bands, eye-dropper.

### Method

- 1 Attach the fabric circle to a glass jar, stretching it across the open top and holding it in place with a rubber band.
- 2 Using an eye-dropper, slowly drip water onto the fabric.
- 3 Count the number of water droplets needed before the water drips into the jar. If the water remains on the surface of the fabric, it is waterproof.

### Results

In a table of results identify the fabric of each swatch and record the number of water droplets.

### Conclusion

Rank the tested fabrics from the most absorbent to the least absorbent.

## Activity 10.10 Fabric property: thermal properties

**Thermal properties** refers to the ability to withstand and transfer heat.

### Aim

To compare the insulation properties of a range of fabrics.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: ski suits, winter jackets
- costume: cultural costumes
- furnishings: blankets, doonas
- textile art: not relevant
- non-apparel: sleeping bags.

### Equipment

Seven fabric pieces 8 cm wide (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric), seven test tubes, seven elastic bands or thread, boiling water, thermometers.

### Method

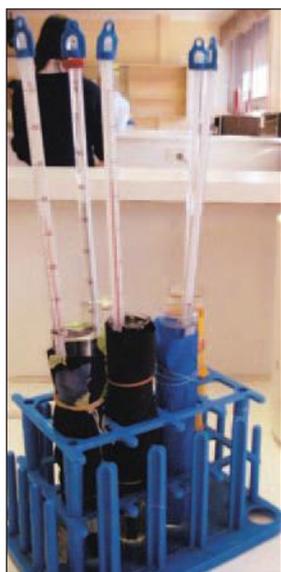
- 1 Wrap the fabric around the test tube and secure with a rubber band or thread.
- 2 Fill the test tube with boiling water and place a thermometer in the test tube.
- 3 Observe the time it takes for the water temperature to drop 5 degrees.
- 4 The fabric on the test tube that takes the longest to drop 5 degrees is a poor conductor of heat and therefore termed a 'warm' fabric.

### Results

In a table of results, identify the fabric of each swatch and record the time taken for the water to drop 5 degrees.

### Conclusion

Rank the tested fabrics from the one with the best thermal properties to the one with the least thermal properties.



Testing for thermal properties



10.10 Fabric property:  
thermal properties

## Activity 10.11 Fabric property: elasticity

**Elasticity** is the ability to return to an original shape after being stretched or compressed.

### Aim

To determine which fabric has the best ability to return to its original shape after stretching.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: leotards, gym wear
- costume: dance costumes
- furnishings: fitted upholstery
- textile art: not relevant
- non-apparel: not relevant.

### Equipment

Two fabric swatches 20 cm × 20 cm of each fibre type (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric).

### Method

One piece of each fabric is the control; the other piece will be tested. Stretch the test fabric in all directions. Compare the fabric with the control square and note the degree of change.

### Results

In a table of results, identify the fabric of each swatch and record the degree of change.

### Conclusion

Rank the tested fabrics from the best to the poorest elasticity.



10.11 Fabric property:  
elasticity

10.12 Fabric property:  
dimensional stability

## Activity 10.12 Fabric property: dimensional stability

**Dimensional stability** is the inability to stretch or shrink.

### Aim

To determine which fabric type has the best dimensional stability.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: swimsuits
- costume: theatre costumes, dance costumes
- furnishings: curtains
- textile art: wall hangings
- non-apparel: kites.

### Equipment

Two fabric swatches 10 cm × 10 cm of each fibre type (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric).

### Method

One piece of each fabric is the control; the other piece will be tested. Pull diagonally opposite corners of the test fabric. Hold for 5 seconds, still pulling. Compare the tested fabric with the control square and measure the degree of change.

### Results

In a table of results, identify the fabric of each swatch and record the degree of change.

### Conclusion

Rank the tested fabrics from the one with the best dimensional stability to the one with the least dimensional stability.

## Testing for care

### Activity 10.13 Fabric property: effect of chemicals (alkalis)

The effect of **alkalis** refers to the ability to withstand alkalis and solvents.

#### Aim

To determine the effect of bleach on a range of fabrics with different fibre compositions. *Note:* The main effect of bleach is to destroy colour, but it can also weaken the fabric fibres.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: laboratory coats, chlorine-resistant swimwear, chefs' uniforms, hairdressers' apparel
- costume: not relevant
- furnishings: beach towels, tea towels, outdoor furnishings
- textile art: not relevant
- non-apparel: shade cloth near swimming pools.

#### Equipment

Two coloured fabric swatches 2 cm × 5 cm of each fibre type (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric), seven small dishes, liquid bleach.

#### Method

One piece of each fabric is the control; the other piece will be tested. Place the test piece in a dish and cover with bleach. Leave to soak for at least 24 hours. Rinse and dry. Compare the test piece with the control and record the degree of change in the fabric's appearance and strength.

#### Results

In a table of results, identify the fabric of each swatch and record the degree of change.

#### Conclusion

Rank the tested fabrics from the least amount of change to the most in terms of colour and structure.



10.13 Fabric property:  
effect of chemicals – alkalis  
10.14 Fabric property:  
effect of chemicals – acids

### Activity 10.14 Fabric property: effect of chemicals (acids)

The effect of **acids** refers to the ability to withstand acids and solvents.

#### Aim

To determine the effect of food acid (vinegar, lemon or orange juice) on a range of fabrics.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: chefs' uniforms, kids' clothing
- costume: not relevant
- furnishings: tea towels, dishcloths
- textile art: not relevant
- non-apparel: upholstery.

#### Equipment

Two coloured fabric swatches 2 cm × 5 cm of each fibre type (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric), seven small dishes, food acid.

#### Method

One piece of each fabric is the control; the other piece will be tested. Place the test piece in a dish and cover with the acid. Leave to soak for at least 24 hours. Rinse and dry. Compare the test piece with the control and record the degree of change.

#### Results

In a table of results, identify the fabric of each swatch and record the degree of change.

## Conclusion

Rank the fabrics from the least amount of change to the most change in terms of colour and structure.

### Activity 10.15 Fabric property: sun resistance

**Sun resistance** is the ability to withstand deterioration when exposed to sunlight.

#### Aim

To determine the effect of prolonged exposure to sunlight on a range of fabrics. *Note:* When a fabric is exposed to sunlight, the effects can be similar to bleaching – loss of colour and strength; however, some fibres can actually become darker as a result.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: swimwear, beach towels
- costume: costumes for an outdoor theme park
- furnishings: curtains, outdoor upholstery, boating marine carpet
- textile art: wall hangings placed near windows
- non-apparel: hats, car seat covers, outdoor furniture, shade cloths over covered outdoor areas.

#### Equipment

Two coloured fabric swatches 2 cm × 5 cm of each fibre type (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric).

#### Method

One piece of each fabric is the control; the other piece will be tested. Place the test piece under direct sunlight for at least one week. Keep the control piece in a place not exposed to direct sunlight. Compare the test piece with the control and record the degree of change.

#### Results

In a table of results, identify the fabric of each swatch and record the degree of change.

#### Conclusion

Rank the tested fabrics from the least amount of change to the most in terms of colour and structure.



10.14 Fabric property: sun resistance

### Activity 10.16 Fabric property: colour fastness

**Colour fastness** is the ability to withstand colour change after exposure to heat or water.

#### Aim

To determine the colour fastness of a range of dyed fabrics. *Note:* A colourfast test is mainly applicable to dyed fabrics. Fabrics with poor colour fastness are likely to fade quickly and may stain other fabrics during washing as the dyestuff runs out of the fabric. This is not a meaningful test unless you are using coloured fabrics.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: coloured clothing, swimwear, ski wear
- costume: multi-coloured costumes
- furnishings: patchwork quilts, marine carpets, padded seating in outdoor areas
- textile art: wall hangings, textile installations
- non-apparel: artificial turf.

#### Equipment

Two coloured fabric swatches 2 cm × 5 cm of each fibre type (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric), seven glass jars, spoons.





10.16 Fabric property:  
colourfast  
10.17 Fabric property:  
shrink resistance

## Method

One piece of each fabric is the control; the other piece will be tested. Place the test piece in hot water and agitate. Leave soaking for 30 minutes. Compare the test piece with the control and record the degree of change. Also comment on the colour of the water.

## Results

In a table of results, identify the fabric of each swatch and record the degree of change and the colour of the water.

## Conclusion

Rank the tested fabrics from the greatest degree of colour change to the least.

# Activity 10.17 Fabric property: shrink resistance

**Shrink resistance** is the inability to contract or distort.

## Aim

To determine which fabric has the greatest change in size when washed.

It would be relevant to conduct this test on fabric being used for the following end-uses:

- apparel: all clothing
- costume: dancewear
- furnishings: seat covers
- textile art: fabric manipulations for textile artwork
- non-apparel: kites, shade sails.

## Equipment

Two coloured fabric swatches 2 cm × 10 cm of each fibre type (100% cotton, 100% wool, 100% rayon, 100% polyester, 100% nylon, cotton/polyester, nylon/elastomeric), washing machine.

## Method

One piece of each fabric is the control; the other piece will be tested. Place the test piece in a washing machine and wash using hot water. Compare the test piece with the control and record the degree of change.

## Results

In a table of results, identify the fabric of each swatch and record the degree of change.

## Conclusion

Rank the tested fabrics from the greatest degree of size change to the least.

# SiroFAST™ – Quality Assurance

SiroFAST™ (Fabric Assurance by simple testing) is a unique integrated set of instruments and test methods available for fabric objective measurement. SiroFAST™ measures the mechanical, dimensional and pressing performance properties of fabric. It can be used to predict performance in garment manufacture and the appearance of the garment in wear.

SiroFAST™ is a system of fabric measurement for assessing the appearance, handle and performance properties of fabrics. A simple series of tests can predict how a fabric will perform when made-up into a garment – providing invaluable information for fabric manufacturers, suppliers, finishers and garment manufacturers. The tests are simple and the equipment is easy to use; results can be obtained quickly and are provided in a graphical form which facilitates rapid interpretation and application.

SiroFAST™ has been developed in Australia by CSIRO Textile and Fibre Technology to meet industry's need for a simple reliable method of predicting fabric

performance. Despite SiroFAST's simple appearance it is based on considerable research into the relationships between measured fabric properties and fabric performance.

Fabric objective measurement, in particular SiroFAST™, is currently being used by fabric and garment manufacturers in many parts of the world in a wide variety of applications and has fast become the industry benchmark standard.

## BENEFITS OF SIROFAST™

The SiroFAST™ system is simple to use, robust and gives a reliable prediction of performance. As the time required for testing is short, SiroFAST™ is highly suitable for use by fabric and garment manufacturers.

SiroFAST™ can tell you how a fabric will perform in terms of compression, extension, bending, dimensional stability and pressing performance. Each test results in what is known as a 'Fabric Fingerprint' – essentially a plotted chart – and the results can be used for fabric specifications, developing

new fabrics, comparing fabric finishing routes, assessing the stability of finished fabrics and predicting tailoring performance and final garment appearance.

Abnormal Fabric Fingerprints pinpoint potential problem areas: early identification of problem fabrics allows remedial action to be taken before the cost of rejects becomes an issue. Better still, it enables the best finishing route to be selected from the outset, to produce the optimal tailoring performance.

During its introduction into Europe and the USA SiroFAST™ has proved to be a valuable tool in many aspects of fabric and garment manufacture including quality control, problem solving and product development. The greatest value of the system may prove to be in encouraging communication between fabric and garment manufacturers by allowing the exchange of objective information on performance of fabrics and removing some of the subjectivity from discussions.

Source: CSIRO Australia  
([www.csiro.au](http://www.csiro.au))

## Extend your knowledge 10.18

Use the information in the case study about the SiroFAST™ system to answer the following questions.

- 1 What is SiroFAST™?
- 2 Identify the fabric properties that SiroFAST™ can test for.
- 3 Why was there a need for SiroFAST™ to be developed?
- 4 Who uses SiroFAST™?
- 5 Briefly describe the benefits of SiroFAST™ to the manufacturer and the consumer.



10.18 Identifying fabric structure

## Review questions

Use the information in this chapter to answer the following questions.

**1** You are making one of the following items for your Major Textiles Project.

- Child's activity tent
- Irish dance costume
- African wall hanging
- Men's suit, including waistcoat and tie
- Doona cover and pillow

Identify the textile testing you would conduct before selecting the fabrics to construct the item. Justify your selection according to textile properties.

**2** Outline the value of performing fabric testing.

**3** Cotton and rayon have similar results when undergoing a burning test. What other test could be carried out to determine the fibre composition?

**4** Outline the tests you would carry out for fabric selected for the following end-uses.

- Year 12 formal dress
- Doona cover
- Tent
- Dance costume
- Wall hanging inspired by Africa

## Websites

- ☉ CSIRO Textile testing laboratory ([www.csiro.au/services/textiletestinglab.html](http://www.csiro.au/services/textiletestinglab.html)): CSIRO has the best-equipped textile testing laboratory in Australia for investigating the properties of fibres, yarns, textiles and related materials.
- ☉ RMIT Textile Testing Services ([www.rmit.edu.au/textiletesting](http://www.rmit.edu.au/textiletesting)): RMIT University is an accredited textile testing and consulting facility.
- ☉ Southern Biological ([www.southernbiological.com](http://www.southernbiological.com)): Supplier of fibre identification kits and microscopes.
- ☉ The Logical Interface ([www.logint.com.au](http://www.logint.com.au)): Supplier of digital microscopes for educators, researchers and industry.



10.19 Fabric testing palm cards



# Preliminary Textile Project

# 11

During the Preliminary course you will complete a minimum of two textile projects from different focus areas. It is important to reflect on your previous textile experience and ensure each project includes new and more complex techniques that are both functional and decorative. This will develop your textile skills so that you are able to create a high-quality Major Textiles Project in Year 12.

## Preliminary assessment task – skills project

### Outcomes for task

- P2.2 Develops competence in the selection and use of appropriate manufacturing techniques and equipment
- P2.3 Manages the design and manufacture of textile projects
- P3.1 Identifies properties of a variety of fabrics, yarns and fibres
- P3.2 Justifies the selection of fabrics, yarns and fibres for end-uses

### Course component and weighting

Properties and Performance of Textiles: 10% of final preliminary assessment

### Skills project: fabric textile skill book

It is essential to develop a strong understanding of the equipment in the textile room if you are to succeed in Textiles and Design in the HSC. The construction of the fabric skill book will allow you to develop a range of manufacturing skills in using the sewing machine, overlocker and embellishing machine. These techniques include:

- seams and seam neatening
- hem finishes
- methods to remove fullness, including gathering and shirring
- understitching and topstitching
- openings and closures, including zippers, buttons and buttonholes
- decorative machine stitching
- appliqué
- free-motion embroidery
- overlocking techniques, including 3- and 4-thread, narrow hem, rolled hem and flatlocking
- embellishing machine.



11.1 Textile profile  
11.2 Preliminary assessment task – skills project

NelsonNet

Examples of Preliminary Textile Projects  
TEXD11AD110043



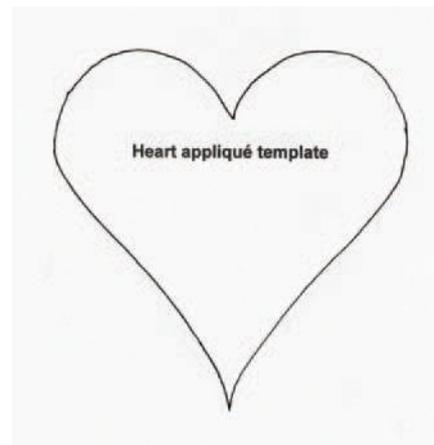
Textile skill book, designed and created by Lynda Peters

## Equipment list

- denim: 0.3 m
- printed cotton: 0.3 m
- Pellon (for cover): 0.3 m
- tulle: 0.3 m
- felt: 30 cm × 25 cm
- lycra: 10 cm × 15 cm
- organza: 12 cm × 5 cm
- polyester machine thread in contrasting colours to the fabrics selected
- 4 reels coloured overlocking thread
- 15 cm dress zipper
- 2 cm button
- fusible web: 10 cm square
- shirring elastic
- sari silk: 30 cm
- prefelt motifs



Textile skill book equipment



Use a photocopier to enlarge template to required size

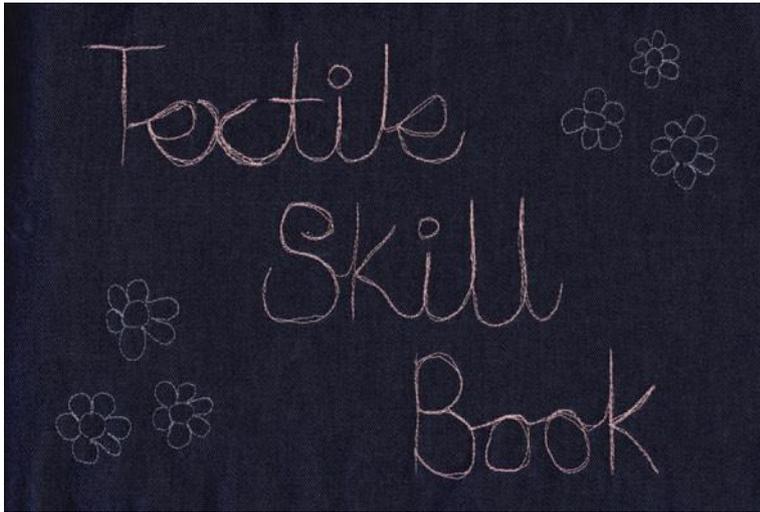
## Cutting list

Using an A4 sheet of paper as a template, cut the following for the book pages and cover:

- 6 × denim
- 3 × printed homespun
- 3 × Pellon
- 1 × felt
- 1 tulle: 22 cm × 62 cm
- 3 tulle: 22 cm × 31 cm

Cutting requirements for each skill page:

- pin-stitched seam – 2 denim: 8 cm × 10 cm
- zigzagged open seam – 2 denim: 8 cm × 10 cm
- topstitched seam – 2 denim: 8 cm × 10 cm
- understitching – 1 denim: 5 cm × 10 cm, 1 denim: 8 cm × 10 cm
- zipper – 2 denim: 20 cm × 15 cm
- buttonhole flap – 2 denim: 8 cm × 10 cm, 1 tear away stabiliser: 8 cm × 10 cm
- heart – 1 printed homespun (see template)
- gathering – 1 denim: 5 cm × 10 cm, 1 denim: 8 cm × 16 cm
- shirring – 1 denim: 8 cm × 16 cm
- blind hem – 1 denim: 10 cm × 10 cm
- twin-needled hem – 1 denim: 10 cm × 10 cm
- overlocking – 1 denim: 32 cm × 22 cm
- 4-thread – 1 denim: 12 cm × 10 cm
- lettuce edge – 1 lycra: 12 cm × 8 cm
- 3-thread – 1 denim: 12 cm × 6 cm
- narrow hem – 1 printed homespun: 12 cm × 4 cm
- rolled hem – 1 organza: 12 cm × 3 cm



Front cover of textile skill book

## Method

*Note:* 1.5 cm seam allowance is used throughout the project.

### Front cover

- 1 Iron the Pellon to the wrong side of one of the denim pages.
- 2 Thread the sewing machine with a contrasting thread. Use the same thread in the bobbin.
- 3 Set the machine to free-motion stitching. See Chapter 16 for detailed instructions on free-motion stitching.
- 4 Decorate the front cover of your book. Design suggestions: insert your name, the word *Textile* and the date, and decorate with motifs such as flowers, hearts or stippling.

### Page 1: machine stitching

- 1 Set the sewing machine to straight stitch (SW0/SL2.5). Make sure the needle position is set to the centre, the tension is correct and the drop feed is set to straight stitch and zigzag.
- 2 Iron the Pellon to the wrong side of one of the denim pages. This will stabilise the fabric and add bulk to create the cover.
- 3 Stitch a row of straight stitch along the short side of the fabric, 5 cm from the edge. Make sure you lower the presser foot before you start to stitch.
- 4 At the beginning and end of the row of stitching, reverse for 1 cm to secure your stitching. The sewing machine is only designed to reverse when stitching straight stitch; never reverse when stitching zigzag or a decorative machine stitch. Cut threads close to the edge of the fabric after stitching.
- 5 Stitch another row of straight stitch, parallel to the first row, using SW0/SL4. This machine setting is suitable for gathering. To ensure the row of stitching is parallel, line up the outer edge of the machine foot with the completed row of stitching.
- 6 Now practise zigzag stitch. Set the machine to SW3/SL3 and complete another row of stitching. Do not reverse. This machine setting would be suitable to neaten the edge of a seam.
- 7 Change the machine settings to SW3/SL0.5 and complete another row of stitching. This machine setting is called satin stitch.
- 8 Fill the remaining denim page with rows of decorative machine stitching. As you complete each row, record the machine settings.



Machine stitching – page 1

## Page 2: seams

- 1 Using the instructions in Chapter 3, complete a pin-stitched seam and open seam with zigzag seam finish.
- 2 Press the samples.
- 3 Using pinking shears, trim around the samples.
- 4 Position the samples onto the denim page with the wrong sides facing up. Attach the pin-stitched sample using straight stitch and the open seam sample using zigzagging.



Seams and seam finishes – page 2



Topstitching and understitching – page 3

## Page 3: topstitching and understitching

Topstitching is a decorative row of straight stitching that is visible on the right side of a garment. It is often completed in a contrasting thread. Understitching is a row of straight stitching that helps to stop the lining or facing rolling to the right side of the garment.

- 1 Using the instructions in Chapter 3, complete a topstitched sample.
- 2 Using the instructions in Chapter 3, complete an understitched sample. Press the seam allowances towards the smaller fabric piece and complete the understitching through the seam allowances.
- 3 Press the samples.
- 4 Using pinking shears, trim around the samples.
- 5 Position the samples onto the printed homespun page, right sides facing up, and attach using straight stitch.

## Page 4: openings and closures

- 1 The zipper in the fabric book will be applied using an open application so that the zipper teeth and pull are visible.
- 2 Overlock to neaten one 20 cm edge of each denim piece. Open the zipper. With the right sides of the denim and the zipper together, place the edge of the zipper on the overlocked edge of the denim. Pin in place. Using a zipper foot, stitch the zipper in place using straight stitch SW0/SL2.5.
- 3 Repeat for the other side of the zipper.
- 4 Topstitch along each side of the zipper.
- 5 The zipper will be in the middle of the fabric page.
- 6 Iron the tear-away stabiliser to the wrong side of one of the buttonhole flaps.
- 7 Pin the buttonhole flaps with the right sides together. Using straight stitch, stitch around three sides, leaving one 8 cm edge open. Use a 1 cm seam allowance. Cut across the corners to remove the bulk and pull through to the



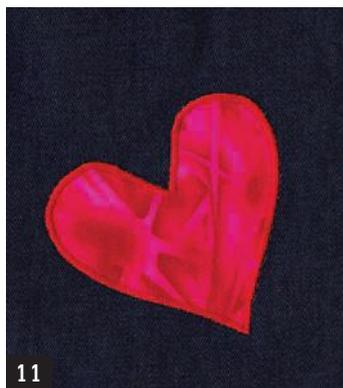
Zipper – page 4

right side and press. Stitch a buttonhole 2 mm larger than your button (refer to your sewing machine manual and set the machine as required). Position the buttonhole so that it is centred on the right-hand side.

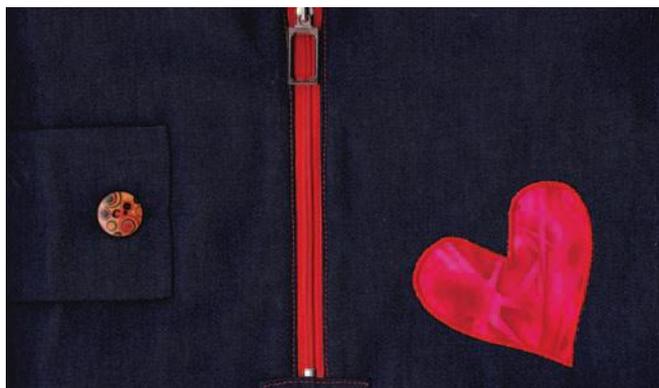
- 8 Use a stitch unpicker to slit the buttonhole.
- 9 Using straight stitch, attach the button flap to the edge of the denim page.
- 10 Stitch the button under the flap in the correct position.
- 11 Using the instructions in Chapter 16, appliqué a heart using satin stitch.
- 12 This page is stitched to a backing page. Lay the completed page onto a denim page. The wrong side of the completed page will be sitting on top of the right side of the denim page.
- 13 Stitch the two pages together 6 mm from the edge using straight stitch.



10  
Buttonhole flap and button  
– page 4



11  
Appliquéd heart – page 4



Completed page 4 with topstitched zipper flap – the zipper flap covers the opening between the end of the zipper and the fabric page

### Page 5: removing fullness

- 1 Using the instructions in Chapter 3, complete a gathering sample.
- 2 Using the instructions in Chapter 3, complete a shirring sample.
- 3 Press the samples.
- 4 Using pinking shears, trim around the samples.
- 5 Position the samples onto the printed homespun page, with the right sides facing up, and attach using straight stitch.



Removing fullness – page 5

### Page 6: hems

- 1 Using the instructions in Chapter 3, complete a blind hem sample.
- 2 Using the instructions in Chapter 3, complete a sample of a topstitched hem using a twin needle.
- 3 Press the samples.
- 4 Using pinking shears, trim around the samples.
- 5 Position the samples onto the printed homespun page, with the right sides facing up, and attach using a twin needle.



Hems – page 6

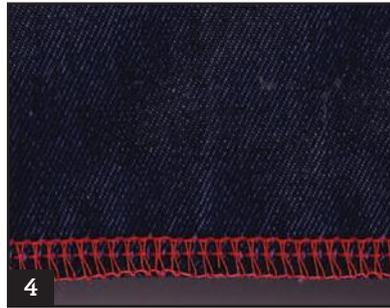
## Page 7: overlocker

As different brands of overlockers require different settings, it is important to read the manual of the overlocker in your classroom and become familiar with the settings. Many overlockers require the stitch plates and machine foot to be changed to enable different stitches.

- 1 Flatlocking is overlocking two layers of fabric together without trimming the edges, and then pulling them open until the stitching lies flat. A ladder-like stitch will appear on the right side of the fabric. This is a decorative stitch that can be used to create rows of stitching to embellish a garment.
- 2 The denim page cut for this sample is slightly larger than the other pages as the flatlocking will reduce the page size slightly.
- 3 Set the overlocker for 3-thread flatlocking. You will need to loosen the needle tension nearly all the way to zero and tighten the lower looper tension. Create a pattern on the denim page using flatlocking. You will be stitching on the right side of the fabric. Pull the flatlocking until it lies flat.
- 4 Set the overlocker to 4-thread overlocking. Stitch along the edge of the fabric.
- 5 Set the overlocker to 3-thread narrow hem. Lettuce-edge the lycra. As you stitch, stretch the fabric as much as you can to create fluting.
- 6 Set the overlocker to 3-thread overlocking. Stitch along the edge of the fabric.
- 7 Set the overlocker to narrow hem and stitch along the edge of the fabric.
- 8 Set the overlocker to rolled hem and stitch along the edge of the fabric.
- 9 Lay the overlocked samples on top of one another to create the pages in a book.
- 10 Position the overlocked samples in the middle of the denim page and flatlock to attach.
- 11 Once the overlocked page is complete, trim the page so that it is the same size as the other pieces.



Flatlocking – page 7



4-thread overlocking page 7



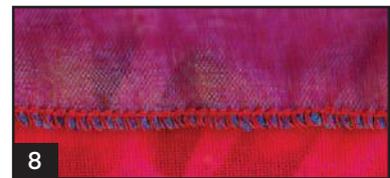
Lettuce edging – page 7



3-thread overlocking – page 7



Narrow hem – page 7



Rolled hem – page 7



Overlocked samples – page 7



Completed page 7

### Page 8: embellishing machine

*Note:* Detailed instructions on the embellishing machine can be found in Chapter 9.

- 1 Lay the sari silk on top of the felt page. Using the embellishing machine, attach the sari silk to the felt.
- 2 Arrange the felt motifs on the felt page and embellish in place.
- 3 Create flower centres using woollen yarn. Embellish in place.

### Fabric pages

- 1 Take a page and lay it onto of a piece of tulle (22 cm × 31 cm). Make sure that 1 cm of tulle is visible around all edges of the book page. Position another page directly under the first page. The wrong sides of the pages should be together with the tulle between them. Before you start stitching, check the pages have the right sides facing out.
- 2 Using satin stitch (SW4/SL0.5), stitch around the page. The satin stitch should be positioned so that it completely covers the raw edges of each page.

### Cover

- 1 Use the long piece of tulle (22 cm × 62 cm) and lay the book cover on the right-hand side of the tulle. Make sure that 1 cm of tulle is visible at the top, bottom and front edge. Position page 1 under the book cover. Make sure that the tulle is between the cover and the first page and that each page is the right way up. Pin in place.
- 2 Using satin stitch (SW4/SL0.5), stitch around the page. The satin stitch should be positioned so that it completely covers the raw edges of each page.
- 3 Leave a gap of 2 cm in the centre of the tulle (which forms the book spine) and position the back cover onto the left-hand side of the tulle. Make sure that 1 cm of tulle is visible at the top, bottom and back edge. Position page 8 under the cover. Make sure that the tulle is between the cover and the back page and that each page is the right way up. Pin in place.
- 4 Using satin stitch (SW4/SL0.5), stitch around the page. The satin stitch should be positioned so that it completely covers the raw edges of each page.



Embellishing – page 8



Satin stitch page edgings



Satin stitch cover



Textile skill book spine

### Creating the book

- 1 Fold the cover in half so that the back cover is sitting directly under the front cover.
- 2 Take each of the pages and slip them inside the cover.
- 3 Pin through the tulle spine of the book, holding all the pages in place.
- 4 Using straight stitch (SW0/SL3), stitch close to the satin stitch along the spine to hold all the pages in place.

Your textile skill book is now complete. The techniques selected relate to the techniques required for Preliminary project 1. Chapters 1, 3 and 16 contain many other techniques that you could include in your textile skill book.

### Supporting documentation

- 1 To construct your fabric skill book, you will have used:
  - two yarn types
  - three woven fabrics
  - two knitted fabrics
  - two non-woven fabrics.

Analyse these textile materials according to their:

- fibre composition
- yarn structure
- fabric structure
- textile properties – minimum of two identified
- end-use applications – minimum of three identified.

Justify your end-use applications according to textile properties. Include a sample of each textile material, neatly trimmed.

- 2 Complete a textile technique scaffold (11.3) for each of the techniques completed in the textile skill book. Present these in a display folder for marking.
- 3 Complete a reflection scaffold (11.4) for the project.



11.3 Textile technique scaffold

11.4 Reflection scaffold

## Marking guidelines

Criteria	Marks
<ul style="list-style-type: none"> <li>Utilises appropriate techniques in the construction and completes the item to a high standard of manufacture</li> <li>Completes item reflecting efficient time management</li> <li>Analyses the properties and performance of the fabric, yarn and fibres used in relation to the end-use application</li> <li>Provides thorough details of manufacturing processes used in the textile skill book</li> </ul>	9–10
<ul style="list-style-type: none"> <li>Shows proficiency in most areas of manufacture in relation to the construction</li> <li>Completes item but requires further attention to some finishing details</li> <li>Analyses the properties and performance of the fabric, yarn and fibres used in relation to the end-use application</li> <li>Provides details of manufacturing processes used in the textile skill book</li> </ul>	6–8
<ul style="list-style-type: none"> <li>Little proficiency is shown in the manufacture of the item to an appropriate standard</li> <li>Item shows incomplete sections, appears rushed with little evidence of time management</li> <li>Briefly describes some of the properties and performance of the fabric and/or yarn and/or fibres used in the textile skill book</li> <li>Provides basic detail of manufacturing processes used in the textile skill book</li> </ul>	3–5
<ul style="list-style-type: none"> <li>Elementary proficiency only is shown in the manufacture of the item</li> <li>Item incomplete, reflecting poor time management</li> <li>Lists some of the properties of the fabric, yarn and fibres used in the textile skill book</li> <li>Lists the manufacturing processes used in the textile skill book</li> </ul>	0–2

## Preliminary assessment task 1: denim story

### Outcomes for project

- P2.1 Demonstrates the use of a variety of communication skills, including computer-based technology
- P2.2 Develops competence in the selection and use of appropriate manufacturing techniques and equipment
- P2.3 Manages the design and manufacture of textile projects
- P3.1 Identifies properties of a variety of fabrics, yarns and fibres
- P3.2 Justifies the selection of fabrics, yarns and fibres for end-uses

### Course component and weighting

Properties and Performance of Textiles/Design: 25% of final preliminary assessment



11.5 Preliminary assessment task 1: denim story  
11.6 Skirt silhouettes throughout history

### Textile item: denim skirt/shorts

Design and construct a denim skirt or shorts using a commercial pattern that has been modified to create an original design.

This design project will allow you to develop a variety of manufacturing and presentation skills, including:

- experimenting with fibres, yarns and fabrics
- manipulating fibres, yarns and fabrics

- pattern block design modification
- storyboard generation
- apparel design
- fashion drawing
- decorative machine stitching, hand stitching and appliqué
- ICT skills.



11.7 Pant silhouettes throughout history  
11.8 Contemporary skirt silhouettes  
11.9 Contemporary pant silhouettes



Denim skirts and shorts

Shutterstock.com

## Extend your knowledge 11.1



Making blue jeans  
([www.youtube.com/watch?v=MTyEwUJPBA](http://www.youtube.com/watch?v=MTyEwUJPBA))

To help you design your project, watch the video clip about making blue jeans and answer the following questions.

- 1 When were jeans first developed and who wore them?
- 2 Which fabric and thread type are jeans made from?
- 3 Describe the jean-cutting process.
- 4 Outline the steps involved in the construction of jeans.
- 5 How long does it take to make a pair of jeans commercially?
- 6 How long will it take you to construct your first preliminary project?

### Equipment list

- commercial pattern for straight skirt or tailored pants
- approximately 1 m denim (depending on style chosen)
- 15 cm zipper
- polyester machine thread

The materials listed are the basics for the project. You may need additional items, depending on the design you have selected.

### Pattern generation

Patterns for your design will be created using a basic skirt or pants block. This block will be manipulated to create your own design. This is known as a two-dimensional flat pattern method.



11.10 Skirt block and pattern modification exercises



Pattern modifications may include:

- shortening or lengthening
- adding flare
- creating a yoke
- adding a frill
- adding pleats and tucks
- manipulating pockets
- lowering the waistline so that skirt or pants sit on hipline.

Before you complete the pattern modification for Preliminary project 1, it is important to analyse the chosen design so that you know what needs to be completed.

### Experimentation: manipulating denim for design

Denim is a strong, stable fabric. It is suitable for a wide variety of apparel end-uses as it is durable, serviceable and comfortable. The idea of the experimentation section of your project is to play freely with denim to see what effects you can create to add interest to your visual design.

Some examples of fabric manipulation include:

- appliqué
- buttons
- decorative stitching – machine and hand
- tucking – plain and frayed
- distressing – bleach and fraying
- pleats
- lace insertion.

You may wish to try the following example experiments or devise your own.

## Activity 11.2 Experiment example 1: plain and frayed tucks

### Aim

To remove fullness in the garment and create a design feature.

### Method

- 1 Using dressmaker's chalk on the right side of the fabric, mark the width of the tucks.  
Tuck 1 finished width 2 cm (markings 4 cm apart); tuck 2 frayed finished width 3.5 cm wide (markings 7 cm apart); tuck 3 finished width 2 cm wide (markings 4 cm apart).
- 2 On the right side of the fabric, pin the tucks into place, matching the markings.
- 3 Using straight stitch SW0/SL3, stitch the tucks using a contrast-coloured thread.
- 4 Press the tucks.
- 5 Make vertical cuts through the middle tuck and fray the edges for about 0.5 cm.



Tucks



Frayed tucks

### Conclusion

Tucks could be used to remove fullness around the circumference of the skirt. They could also be used as a feature on the pockets of skirts or shorts. Fraying and using a contrast-coloured thread to stitch the tucks could create a design feature.

## Activity 11.3 Experiment example 2: frayed hem

### Aim

To create a contemporary decorative hem finish suitable for shorts or skirts.

### Method

- 1 Trim the hem, leaving a 2 cm hem allowance.
- 2 Using a triple straight stitch SW0/SL3 and a contrast thread colour, stitch around the hemline 2 cm from the edge. Use the markings on the stitch plate to ensure the stitching is parallel to the hem edge.
- 3 Fray the edges close to the stitching.

### Conclusion

The triple straight stitch creates a feature at the hemline and stabilises the hem to prevent further fraying.



Frayed hem

## Activity 11.4 Experiment example 3: distressing using a bleach pen

### Aim

To create a design on the skirt or shorts by removing the colour from the fabric.

*Note:* Bleach weakens fabric, so carefully plan where you will use the bleach pen as the fabric may break down with wear and tear.

### Method

- 1 Create the bleach design before stitching the garment together.
- 2 Iron the fabric piece.
- 3 Working on a flat surface covered with a paper towel, use a bleach pen to write or create the desired design.
- 4 Leave for two hours. The longer you leave the bleach design, the whiter the fabric will become.
- 5 Rinse the fabric to remove all the bleach. Dry and press.

### Conclusion

The bleach pen is an easy and accurate way to create a design on denim. The disadvantage is the fabric will be weakened and may break down over time.



Fine-tip bleach pen used to distress denim



Brush-tip bleach pen used to distress denim



Bleach-distressed denim result

## Innovative methods of distressing denim

**Watt wash** is a unique way to distress denim. This technique uses a laser to fade the colour, as well as much less water than traditional distressing methods.

### Extend your knowledge 11.5

Watch the video clips about watt wash and answer the following questions.

- 1 Describe the process of watt wash.
- 2 What are the advantages of watt wash for the environment?

## Supporting documentation

### Design inspiration

- 1 Create two storyboards:

- denim
- skirts or pants/shorts.

The collages can be created by cutting and pasting magazine images and textile swatches, or by using a software application like Microsoft AutoCollage. Label your collages to identify the sources of inspiration. You should include a minimum of four sources of inspiration.



Denim storyboard created using Microsoft AutoCollage

- 2 Explain how your design inspiration has influenced the development of your textile item.
- 3 Analyse your sources of inspiration. Are they historical, cultural or contemporary?

### Visual design development

- In your creative journal, draw a series of at least three thumb sketches to show the development of your design. These sketches should clearly indicate the link between inspiration and design. Evaluate your thumb sketches using a PMI (positive, minus/negative, improvements/interesting) of the features.
- Complete a presentation drawing of your final design. Include the appropriate views. Your drawing should be fully rendered and labelled with the design inspiration and all design features.



Watt wash  
([www.youtube.com/watch?v=fKoei6SQYGk](http://www.youtube.com/watch?v=fKoei6SQYGk))  
Interview with designer François Girbaud about watt wash  
([www.youtube.com/watch?v=sbwCvRppDtM&NR=1](http://www.youtube.com/watch?v=sbwCvRppDtM&NR=1))



11.13 Create a storyboard with AutoCollage



Presentation drawing

Shutterstock.com

## Investigation, experimentation and evaluation

1 Complete the following tables.

Fabric	Sample	Fabric structure	Yarn structure	Fibre type	Fabric properties
Denim					

Yarn	Sample	Yarn structure	Fibre type	Yarn properties
Machine thread				

2 Complete three experiments to determine how you will manipulate the denim to create the desired result in your Preliminary project 1.

3 Complete the reflection scaffold (11.4).

## Marking guidelines for Preliminary project 1

Refer to the Board of Studies website ([www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au)) to gain an understanding of the marking criteria for textile items and the supporting documentation.

## Preliminary assessment task 2 – waspie

A **waspie** (sometimes referred to as a waist cincher) is a belt worn around the waist to make the wearer's waist physically smaller. Waspies were used in Victorian times. They have been reinvented in many subcultural and cultural dress forms.

Using a selected palette or theme, design and create a waspie that reflects your individual style and showcases your design and fabric manipulation skills.



Steampunk waspie (front)



Steampunk waspie (back)



Wedding dress waspie



Cyberpunk waspie

## Outcomes for task

P1.1 Describes the elements and principles of design and uses them in a variety of applications

P 2.1 Demonstrates the use of a variety of communication skills, including computer-based technology

P2.2 Develops competence in the selection and use of appropriate manufacturing techniques and equipment

P2.3 Manages the design and manufacture of textile projects

P3.2 Justifies the selection of fabrics, yarns and fibres for end-uses

## Course component and weighting

Design: 20% of final assessment

### Textile item: waspie

It is useful to develop a range of fabric manipulation skills that you may extend for later use in your Major Textiles Project. The construction of this waspie will allow you to develop a range of fabric manipulation and manufacturing skills using a sewing machine in conjunction with hand-sewn embellishments. These techniques include:

- seams
- boning
- digital printing
- fabric shrink art
- openings and closures, including loops or eyelets and Velcro
- decorative machine stitching
- beading
- hand embroidery
- ribbon roses
- ribbon weaving
- soluble fabric lace.

### Equipment list

- 0.3 m white cotton
- 0.3 m black cotton
- 0.3 m printed cotton contrast
- 0.3 m Shapewell interfacing
- boning (× 4): 20 cm × 9 mm
- bias binding (× 4): 30 cm × 12 mm
- bias binding (× 2): 60 cm × 20 mm
- polyester machine thread in black and white
- elastic looping (× 2): 20 cm
- silver Swarovski hot-fix crystals and assorted beads in black and white
- 3 m of 6 mm black ribbon
- 3 m of 6 mm white ribbon
- fusible web: 10 cm square
- assorted buttons
- A4 sheet of inkjet digital print cotton fabric sheet
- 2 pieces of shrink fabric
- assorted trims in selected palette

### Cutting list

Download the pattern pieces from the NelsonNet website and cut all pieces out three times as follows:

- First layer is the design layer. Arrange your colour palette as desired for your individual design. In this case the digital fabric print has been used as the design feature for piece 1.
- Second layer is cut from Shapewell. This forms a stiff inner layer to your waspie and ensures a firm surface for your design features.
- Third layer is the lining fabric.

Piece 1 must be cut on the fold each time.

*Note:* The waspie could be reversible; therefore, you could make your lining layer aesthetically pleasing as well. An extra layer of Shapewell could be used if you want the waspie to be extra firm. Coutile fabric is a great fabric to use as a corset inner layer, but it can be hard to source and quite expensive.



11.14 A family tree of corsets  
11.15 Waspie production  
cost sheet



Waspie – designed and created  
by Christine Castle



Waspie equipment

NelsonNet

Pattern pieces for the waspie  
project  
TEXD11TM110044



Reversible waspie – designed and made by Christine Castle

Once the layers are cut it is time to make your fabric manipulations to add to your design panels. The decision of what fabric manipulations to choose is up to you. The waspie shown below, by Hannah Burrell, includes digital printing, Swarovski crystal beading, couching, overlocking, Suffolk puffs, ruffling ribbon, solvy lace, decorative button application and pleating.



Waspie – designed and made by Hannah Burrell, St George Girls High, Year 11, 2010

### Method

Some basic manipulations will be outlined for this project; however, there are many fabric manipulations you could apply to this waspie. Chapters 1, 3 and 16 outline other techniques you could include.

*Note:* A 1.5 cm seam allowance is used throughout the project.

### Ribbon roses



Ribbon roses

Ribbon roses add dimension and texture to a project. In this waspie, the design features black and white embellishments, with the focus on a rose as the design motif. The ribbon roses will be applied at a later stage by hand stitching. The roses add a romantic notion to the design.

- 1 Cut a 20 cm piece of ribbon. The width of your ribbon affects the overall size of your rose.
- 2 Fold the ribbon at a right angle at the centre point and hold down in place with your finger.
- 3 Continue folding the ribbon over the top of itself at right angles until you reach the end of the ribbon. This method is known as a box chain streamer.
- 4 Twist the end of your ribbons together with a half turn and place on a steady surface.
- 5 Select one of the ribbon tails and gently pull the end through the other. The ribbon will concertina inside itself to form folds.
- 6 Carefully hand stitch into place. Put aside for application to the waspie later.



2 Fold ribbon at right angles.



3 Continue folding until you reach the end of the ribbon.



4 Twist the end of the ribbons.



5 The ribbon folds as you gently pull one of the tails, creating a flower.



6 Secure in place with some hand stitches.

### Shrink magic

Shrink magic is a unique way to add texture to your design surface area. You can be as precise or as random as you like with your sewing as each style results in a different effect. For this waspie, the shrink magic has been used to create a side back panel, which will be later highlighted with hand-sewn beading and hot-fix crystal application.

- 1 Cut the shrink magic and fabric to the same size, remembering to allow for shrinkage of up to 30%.
- 2 Place the shrink magic on the wrong side of the fabric. Sew the two together using straight stitching, meandering free-motion stitching or various open fancy stitches. The spaces between the stitches will result in different effects. You could try parallel lines, intersecting lines, grids or stippling.
- 3 Place the shrink side facing up on the ironing board. Hold a pre-heated steam iron about 3 cm above your stitching and apply steam to all areas. Watch as your fabric transforms.



1 Shrink magic behind white cotton



2 Random stitching with straight lines (SW0/SL2.5)



3 Steam iron held above fabric



Finished fabric effect



Computer screen capturing scan and DDP

## Direct digital printing

Direct digital printing (DDP) can be carried out at home on A4-sized pre-treated fabrics such as cotton, silk or silk organza. End-uses for this type of application include:

- apparel: T-shirts, rolls of fabric used for pyjamas, bags and dress fabrics
- furnishings: cushions, quilts
- textile arts: printing on art canvas with pigment dyes
- non-apparel: advertising and promotional banners.

In this waspie, DDP has been used to set the theme of the design. An image has been drawn and scanned, and then placed into an A4 document for printing. The print was given 16 hours to dry and then heat-set with an iron. The pattern for the centre front waspie was then cut to form the middle panel. Embroidery and hand beading will enhance the print.

## Constructing the waspie

- 1 Cut pattern piece centre front (1) on the fold from main fabric, Shapewell and lining.
- 2 Cut pairs of each pattern piece 2, 3, 4 and 5 from main fabric, Shapewell and lining.
- 3 Lay your design pieces onto the main fabric (shrink fabric panels and digital printed fabric) and cut to required pattern shape.
- 4 Place the Shapewell directly under your main fabric design and sew both fabrics as if they were one layer. Steps 5–9 should all have a 1.5 cm seam allowance using SW0/SL2.5.
- 5 Connect centre front (1) to middle front (2) with a seam.
- 6 Connect middle front (2) to side front (3) with a seam.
- 7 Connect side front (3) to side back (4) with a seam.
- 8 Connect side back (4) to back (5) with a seam.
- 9 Connect the lining fabric in the same manner using steps 5–8.
- 10 On the lining, sew 12 mm bias tape or ribbon over seams ready to use for boning casing. This can be done on the lining or the main fabric, depending on your design features.
- 11 Cut boning 4 cm smaller than the finished waspie depth to allow for top and bottom seam connection.



4 Connecting main fabric to Shapewell



Design of front panels ready for appliqué and embellishment



10 Sewing bias tape or ribbon in place for boning channels



12 Inserting boning into ribbon channels on lining



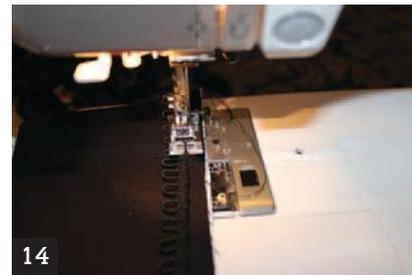
11 Cutting boning strips 4 cm shorter than the waspie depth

If boning is too close to the top and bottom seams it will abrade the seam allowance.

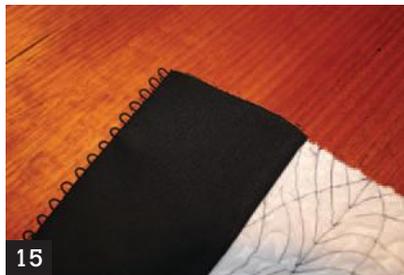
- 12 Using a nail file or sand paper, round off the edges of the boning and insert the boning into the ribbon channel.
- 13 Trim the main fabric and lining so that the shapes align.
- 14 Place right sides of corset and lining together, placing elastic loops in between the main fabric and lining fabric. Using 1.5 cm seam allowances, sew the loop tape into the seam.
- 15 Turn right sides out to reveal loops from back edges ready for lacing.
- 16 Trim corset a final time.
- 17 Attach bias tape to top and bottom seams and sew in place to finish top and bottom edges, using the folded heat-set edge as a guide for stitching. Turn the bias tape over the top edge of the corset and pin down to the other side. This binds the raw edges and is known as the 'sandwich' method of corsetry.
- 18 Hand or machine stitch bias in place.
- 19 Lace up your corset with ribbon or shoelaces. You can also use cord or crocheted yarns for a decorative feature.



13 Main fabric design and lining trimmed to match each other perfectly



14 Loop tape



15 Back edges finished and ready for looping



16 Sew bias tape in place

## Supporting documentation

To construct your waspie, you will use several different manipulations of fabrics, yarns or fibres to add visual appeal to your design.

- 1 Select three fabric manipulations and outline the steps you took to create your surface design. Take pictures of important steps in the development of your manipulation and record them in your supporting documentation. Take a picture of your final design panels before they are connected.
- 2 Analyse the three textile manipulations you chose for your waspie using the elements and principles of design and the basis for analysis of design:

### Elements of design:

- line and direction
- texture
- shape and size
- colour and value

### Principles of design:

- proportion
- emphasis
- balance
- contrast and harmony
- rhythm
- unity

- 3 Justify your end-use application according to your required design or theme.

Complete 11.16 to record the method for each technique included in your waspie. Complete a method sheet for each technique and submit with your supporting documentation for marking.



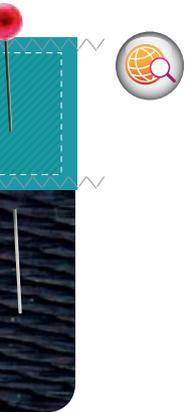
Completed waspie by Christine Castle



11.16 Methods in the waspie project

## Marking guidelines

Criteria	Marks
<ul style="list-style-type: none"> <li>Utilises appropriate techniques in the construction and completes the item to a high standard of manufacture</li> <li>Completes item reflecting efficient time management</li> <li>Accurately describes the elements and principles of design and uses them in a variety of applications</li> <li>Provides thorough details of manufacturing processes used in the waspie</li> </ul>	16–20
<ul style="list-style-type: none"> <li>Shows proficiency in most areas of manufacture in relation to the construction</li> <li>Completes item but requires further attention to some finishing details</li> <li>Identifies most of the elements and principles of design and uses them in a variety of applications</li> <li>Provides details of manufacturing processes used in the waspie</li> </ul>	10–15
<ul style="list-style-type: none"> <li>Little proficiency is shown in the manufacture of the item to an appropriate standard</li> <li>Item shows incomplete sections, appears rushed with little evidence of time management</li> <li>Briefly describes the elements and principles of design and uses them in a variety of applications</li> <li>Provides basic detail of manufacturing processes used in the waspie</li> </ul>	6–9
<ul style="list-style-type: none"> <li>Elementary proficiency only is shown in the manufacture of the item</li> <li>Item incomplete, reflecting poor time management</li> <li>Lists some of the elements and principles of design</li> <li>Lists the manufacturing processes used in the waspie</li> </ul>	0–5



### Websites

- ☺ Simplicity Patterns Australia ([www.simp.com.au](http://www.simp.com.au)): Supplier of paper patterns.
- ☺ Lincraft ([www.lincraft.com.au](http://www.lincraft.com.au)): Supplier of fabrics, haberdashery and paper patterns.
- ☺ Spotlight ([www.spotlight.com.au](http://www.spotlight.com.au)): Supplier of fabrics, haberdashery and paper patterns.
- ☺ Tessuti ([www.tessuti.com.au](http://www.tessuti.com.au)): Supplier of fabrics, haberdashery and paper patterns.
- ☺ Metro Fabrics ([www.metrofabrics.com.au](http://www.metrofabrics.com.au)): Fabric supplier and corsetry specialist.
- ☺ The Thread Studio ([www.thethreadstudio.com](http://www.thethreadstudio.com)): Supplier of bleach pens.

# Preliminary course

## Area of study: Australian Textile, Clothing, Footwear and Allied Industries

The following chapters will extend your knowledge of the Australian textile industry and the issues affecting the industry. An understanding of the textile industry will allow you to make informed decisions as a consumer of textile goods. You will also gain an understanding and knowledge of training and career opportunities in the industry.



Refer to the Board of Studies website for the Course Objectives, Outcomes and Content:  
[www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au).

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## The textile industry in the 19th century

The beginnings of textile production go back to the New Stone Age and archaeologists believe that human beings made textile items before they were able to write. The early processes of textile manufacturing were created by hand, using very basic equipment. The first sewing needles were made of bones or animal horns and the first thread was made of animal sinew. Iron needles were invented in the 14th century. The first eyed needles appeared in the 15th century.

The textile technology itself did not actually begin to develop until the invention of the spinning machine and mechanical loom in the 18th century. Textile manufacturing was a springboard for the industrial revolution.

### Extend your knowledge 12.1



The industrial revolution video  
([www.youtube.com/watch?v=3Efq-aNBkvc&feature=related](http://www.youtube.com/watch?v=3Efq-aNBkvc&feature=related))

Watch the video clip about the industrial revolution and answer the following questions.

- 1 Outline the development of the textile industry during the industrial revolution,
- 2 Describe the working conditions for children in the textile industry during the industrial revolution.

In 1733, Englishman John Kay invented the flying shuttle, which revolutionised the woollen and cotton industries by increasing their output considerably. This led to an increased need for yarn production, and in 1764 James Hargreaves invented the **spinning jenny**. The spinning jenny allowed 16 or more yarns to be spun simultaneously by one person.

In 1769, Richard Arkwright invented a spinning frame powered by a water wheel. It was known as the water frame. This machine was the first powered, automatic textile machine. The spinning frame produced a stronger yarn than previous spinning equipment did. The water wheel changed the textile industry from a cottage industry to a factory industry. Arkwright went on to build his first textile mill in 1774 in Cromford, England.



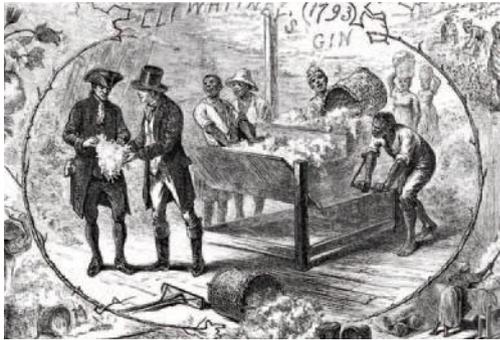
Spinning jenny



Richard Arkwright

Edmund Cartwright invented the first power weaving loom in 1787. It improved the commercial success of weaving because Cartwright's loom had greater productivity than a manually operated one. The loom produced only plain weave. Cartwright incorporated new features including a let-off motion, warp and weft stop motions, and the ability to size the warp while the loom was working. Over the next 10 years Cartwright continued to develop new features to improve the output of the weaving loom. He also invented the first manually operated wool-combing machine in 1792.

Eli Whitney invented the **cotton gin** in 1794. Whitney's machine consisted of a drum with fine, hook-shaped wires projecting from it. These hooks held the seeds back while the cotton lint was pulled away. The cotton gin could do the day's work of several men in one hour.

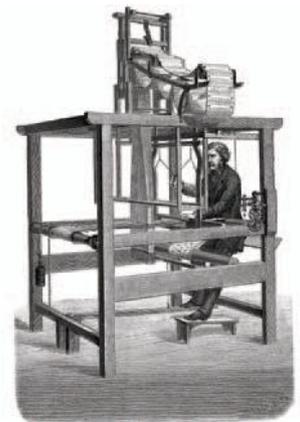


Cotton gin

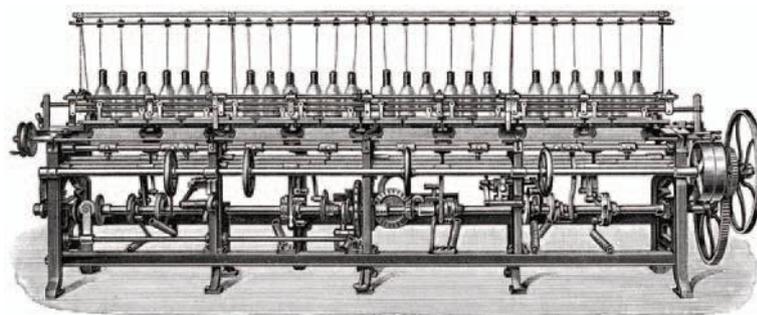
John Macarthur arrived in Sydney in 1796 and believed the land around Sydney could be used to produce high-quality wool. He imported Spanish merinos and began breeding to improve the quality of the fleece. By 1825, England was allowing wool from Australia to be imported duty-free. This made Australian wool desirable as it had a price advantage over other countries. The Australian wool industry flourished.

During the 19th century, textile equipment was the main area of innovation for the textile industry. In 1801, Joseph Jacquard developed the jacquard loom, which was the first loom to produce tapestry fabrics. The mechanism in the **jacquard loom** was controlled by patterns of holes in a string of cards. Silk weavers, who feared they would be deprived of their livelihood due to the labour-saving loom, fiercely opposed Jacquard's invention.

In 1828, John Thorpe patented the first system of ring spinning. This system of continuous spinning is still used in the cotton industry today.



Jacquard loom



Ring spinning

The first sewing machine was patented in 1846. In 1851, Isaac M. Singer patented an improved version. Singer built the first sewing machine where the needle moved up and down rather than side-to-side, and the needle was powered by a foot treadle. The development of practical sewing machines contributed to the growth of the ready-made clothing industry in the late 19th and early 20th centuries.



iStockphoto



Factory producing sewing machines

In 1856, William Perkin discovered the first synthetic dye. Up until this time all dyes had come from natural sources such as plants. Natural dyes tended to be light in hue and often faded quickly. Perkin originally named his dye Tyrian Purple, but it later became commonly known as mauve. He also developed other dyes, including Aniline Red (1859), Aniline Black (1863), and Alkalate Magenta (1864). In the late 1860s, Britannia Violet and Perkin's Green were added to the line.

In 1864, William Cotton patented the first flatbed weft knitting machine. The machine was powered using a steam engine. For the first time, large-scale factory production of fully fashioned garments was possible in the textile industry.

The first synthetic fibre was produced in France in 1884. It was named Chardonnet silk after its inventor, Count Hilaire de Chardonnet. Chardonnet started with mulberry leaves, which he turned into a cellulose pulp with nitric and sulfuric acids and stretched into fibres. The original fibre was highly flammable. By 1889 he had developed rayon.

## The textile industry in the 20th century

During the 20th century, new textile materials and processes were the main area of innovation for the textile industry. By the end of the century, textile manufacturers could design and develop fibres, yarns, fabrics and fabric finishes for specific end-uses.

In 1901, Edmund Thiele in Germany patented the stretch spinning of filaments. This enabled the manufacture of cuprammonium rayon filaments finer than silk by the company J. P. Bemberg. This improved Bemberg 'silk' went into production in 1908. Its early commercial success was mainly due to the flammability disadvantages of the Chardonnet process. This process is still used today, particularly by Asahi in Japan where sales of artificial silk and medical disposable fabrics provide a worthwhile income. However, the relatively high costs associated with the need to use cotton cellulose and copper salts prevented the silk from reaching the large-scale manufacture achieved by the viscose rayon process. Most producers had abandoned the approach by the outbreak of World War I in 1914.

Acetate was first developed in 1904 by Camille Dreyfus. The outbreak of World War I postponed the development of acetate continuous filament until 1921, when the first commercial cellulose acetate yarn was sold for crocheting, braids, novelty threads and for linings. Acetate fabric, due to its thermoplastic nature, could be permanently pleated, making it very popular for the clothing industry.

In 1928, a resin fabric finish process was developed to make cotton fabrics wrinkle resistant. This was the first fabric finish and the beginning of wash-and-wear clothing. Sanforising, another fabric finish, was developed in 1930. This finish was used to pre-shrink cotton fabrics.



Acetate was used during World War 1 to weatherproof the canvas-covered wings and fuselage of aeroplanes.

Wallace Carothers and his research team developed nylon in 1935 for the DuPont company. Rayon and acetate had been derived from plant cellulose, but nylon was synthesised completely from petrochemicals. It was the beginning of the development of synthetic fibres. DuPont began commercial production of nylon in 1940. The first experimental testing used nylon as sewing thread in parachute fabric and in women's hosiery. When the United States entered World War II in December 1941, the War Production Board allocated all production of nylon to be diverted to military use. After the war, nylon was used in hosiery, carpet and car upholstery.

In 1931, twist–detwist methods of yarn manufacture were developed. Acetate fibres were spun into a springy spiral. The new yarn no longer possessed the gloss and smoothness of synthetic silk, but was as soft and warm as wool. In 1947, the same process was applied to nylon. The new yarn was called Helanca. The higher elasticity of the yarn meant fewer stocking sizes needed to be produced. It could also be dyed in more brilliant and glossy colours.

Commercial manufacture of acrylic began in 1950. It was first used for outdoor end-uses, but today it is used mainly for apparel or carpet. Shuttleless weaving looms were developed in Switzerland in 1950. This loom used a flying projectile to insert the weft. This invention significantly increased the production rate for woven fabrics.

DuPont started to manufacture polyester fibres in 1953. Polyester is made from chemical substances found mainly in petroleum and is manufactured in fibres, films and plastics. Polyester was advertised as the miracle fibre that could be worn for 68 days straight without ironing and still look presentable!

In 1956, DuPont began commercial manufacture of the first man-made, synthetic elastomeric fibre. It could stretch at least 100% and return to its original size. It replaced rubber in its use in women's underwear.

From the early 1950s, the CSIRO in Australia has been involved in wool-to-textile research. The aim is to improve any technological weaknesses in the manufacturing process and to improve the marketability of the wool end-products to the consumer. The CSIRO has developed many innovations to improve the processing of wool, including the self-twist spinning machine, moth-proof and shrink-proof wool, and **Si-Ro-Set** to give permanent creases and pleats.

To allow natural fibres to compete with the newly manufactured fibres in the mid-20th century, there needed to be a reduction in manufacturing costs. Open-ended spinning machines were developed in 1965. They were used for the manufacture of short-fibre yarn, especially from cotton. These spinning machines increased productivity and reduced manufacturing costs.

The early 1970s saw an increase in consumer protection demands. One of the demands was for flammability standards on children's sleepwear. In the United States, the manufactured fibre industry spent \$20 million on flammability research and development in 1972 and 1973, and manufactured fibre fabrics became the predominant choice for this market.

Microfibres were introduced in 1986. Microfibres are a modification of polyester and possess extremely fine filaments while maintaining all of the strength, uniformity and processing characteristics expected by textile manufacturers and consumers.

Tencel, the trademark for lyocell, was first produced in the United States in 1993. It is an environmentally friendly fibre created from the wood pulp of trees. It is processed using a solvent spinning technique in which the dissolving agent is recycled, reducing environment effluents.



1940 saw the first sales of nylon hosiery



Polyester shirt



12.1 Development of the textile industry

# The modern textile industry

iStockphoto



Modern textile factory

Textile manufacturing has changed significantly over the last three centuries. The manufacture of 1 kg of yarn would have taken 110 hours by hand-spinning wheel, 60 hours by the manually operated spinning jenny, 9 hours by the later mechanised versions of the jenny, compared with about 36 minutes on a modern spinning machine. Similarly, 100 m of cloth would have taken 500 hours by hand-loom or 100 hours by fly-shuttle, compared with less than one hour on the latest weaving machines.

Today, clothing and textiles account for about 10% of world exports. More than a quarter of the world's textile production occurs in China. There has been a significant growth in the

use of synthetic fibres, especially polyester, but the production of natural fibres has remained static. Employment in the industry is reducing due to the use of new technologies that have resulted in improved productivity.

Major issues in the industry relate to the need to reduce the negative impact of the industry on the environment. Areas of concern include growing cotton, water and electricity consumption for textile processing, and textile waste. Social issues include the poor working conditions for low-paid workers in developing countries.

In the future there will be greater competition in the industry as the skill levels and investment in developing countries increases. Prices will then be reduced. Innovations will continue to ensure there are new manufacturing technologies to reduce production costs. The development of smart and intelligent textiles will continue to grow and there will be an increased consumer demand for environmentally friendly products.

As textile products become more innovative we need greater consumer education. Users need to understand which products are best suited for a specific end-use and how best to care for the products to ensure a long life.

Chapter 19 focuses on innovations in the 21st century in the textile industry.



12.2 Textiles in the  
21st century  
12.3 The textiles industry  
over time

## Extend your knowledge 12.2



Future textiles film clips  
([www.futuretextiles.dk/  
film-clips](http://www.futuretextiles.dk/film-clips))

Watch some of the video clips about future textiles and discuss future directions in the textile industry.

## Extend your knowledge 12.3



Visit Fashion Source ([www.fashionsource.com.au](http://www.fashionsource.com.au)) and Textile Source ([www.textilesource.com.au](http://www.textilesource.com.au)) to gain access to the latest in textile and fashion news for the ATCFAI and the international industry.

- 1 Select two ATCFAI articles and write a report.
- 2 Select one international article and discuss the impact on the industry.
- 3 Share your findings with the class. This will allow you to gain a greater understanding of the textile industry in the 21st century.

## Textiles in everyday lives

Textiles have been an integral part of everyday life since the New Stone Age. Due to their diversity, textiles perform many functions or roles in our lives. Textiles come in many different forms: from natural to synthetic, woven or knitted, dyed or printed. Textiles have different meanings in different cultures and can be used for protection, modesty, adornment and decoration.



12.4 Digital textile diary  
12.5 The Australian Textile, Clothing, Footwear and Allied Industries (ATCFAI)



Textiles used for protection



Textiles used for adornment and decoration – Hmong costume

Shutterstock.com

## The Australian Textile, Clothing, Footwear and Allied Industries (ATCFAI)

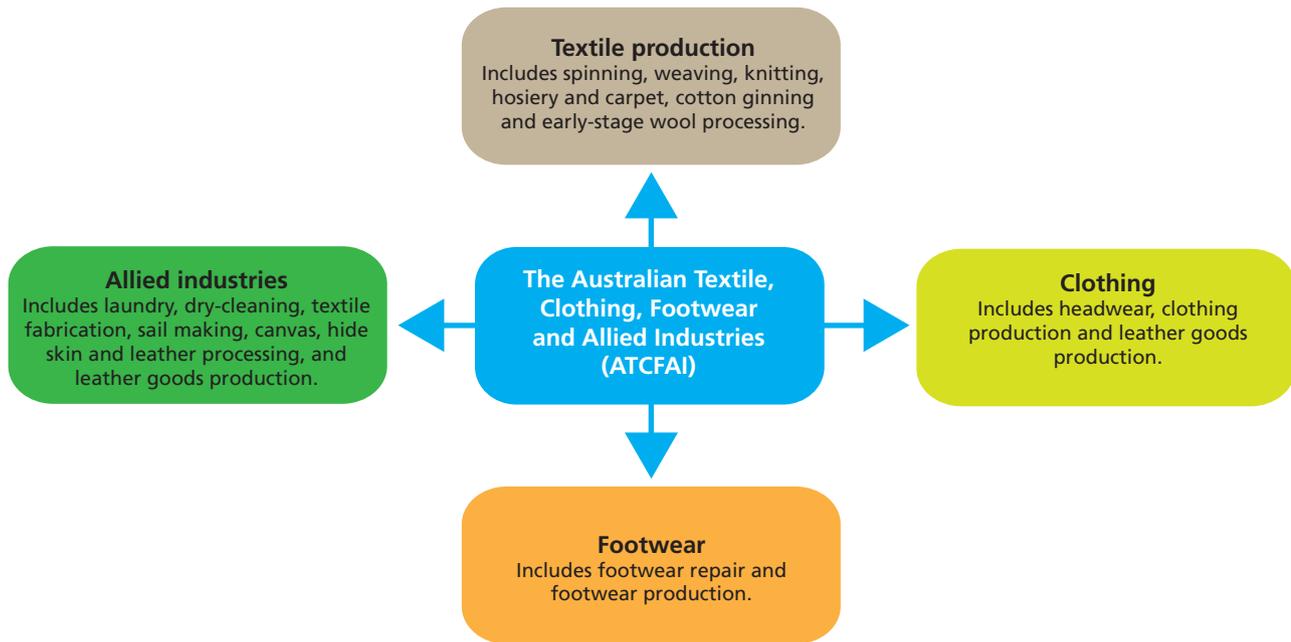
### Sectors

The **ATCFAI** comprises a broad range of activities, including the processing of natural fibres, production of synthetic fibres and manufacturing these natural and synthetic fibres into textiles. It also includes the manufacture of finished products, such as clothing and footwear, and the delivery of services, such as laundry and dry-cleaning. The activities within the ATCFAI are grouped into sectors, which define the related production techniques or products, and various allied manufacturing activities and services.

In recent years, the ATCFAI has increased its emphasis on high-value, capital-intensive and niche products, and decreased its emphasis on labour-intensive, standardised products. This new focus has led to an increase in non-manufacturing employment in the broader industry, particularly in the design, marketing, wholesale and logistics areas.

NelsonNet

Resources on the ATCFAI –  
textile sector  
TEXD11AD120045



The sectors of the ATCFAI

## Training and career opportunities

The ATCFAI is a diverse industry with many different training and career opportunities. Careers in the industry usually start at a production worker level but you can end up owning your own business. There are many opportunities in the industry to be trained and you will be able to use the skills anywhere in the world.

### Extend your knowledge 12.4



12.6 Career and training opportunities

Watch the video clips about careers in the textile industry and answer the following questions.

- 1 What are the personal qualities required to work in the textile industry?
- 2 Identify training that can be undertaken in the textile industry.



Career advice – fashion industry  
([www.youtube.com/watch?v=SLtD68JXLKA&feature=related](http://www.youtube.com/watch?v=SLtD68JXLKA&feature=related))

Career advice – textile designer  
([www.youtube.com/watch?v=hlToBvi1EJs](http://www.youtube.com/watch?v=hlToBvi1EJs))

Career advice – fashion publicist  
([www.youtube.com/watch?v=9q3DzKYb6qY&feature=related](http://www.youtube.com/watch?v=9q3DzKYb6qY&feature=related))

Career advice – pattern maker  
([www.youtube.com/watch?v=PQQ3sRXPn7Q](http://www.youtube.com/watch?v=PQQ3sRXPn7Q))

## Issues affecting the industry

### Environmental sustainability

**Environmental sustainability** is the ability to maintain the qualities that are valued in the physical environment. Most people want to sustain (or maintain):

- capabilities that the natural environment has to maintain the living conditions for people and other species (such as clean water, clean air and a suitable climate)
- aspects of the environment that produce renewable resources such as water, timber and solar energy
- the functioning of society, despite non-renewable resource depletion
- quality of life for all people and the livableness and beauty of the environment.

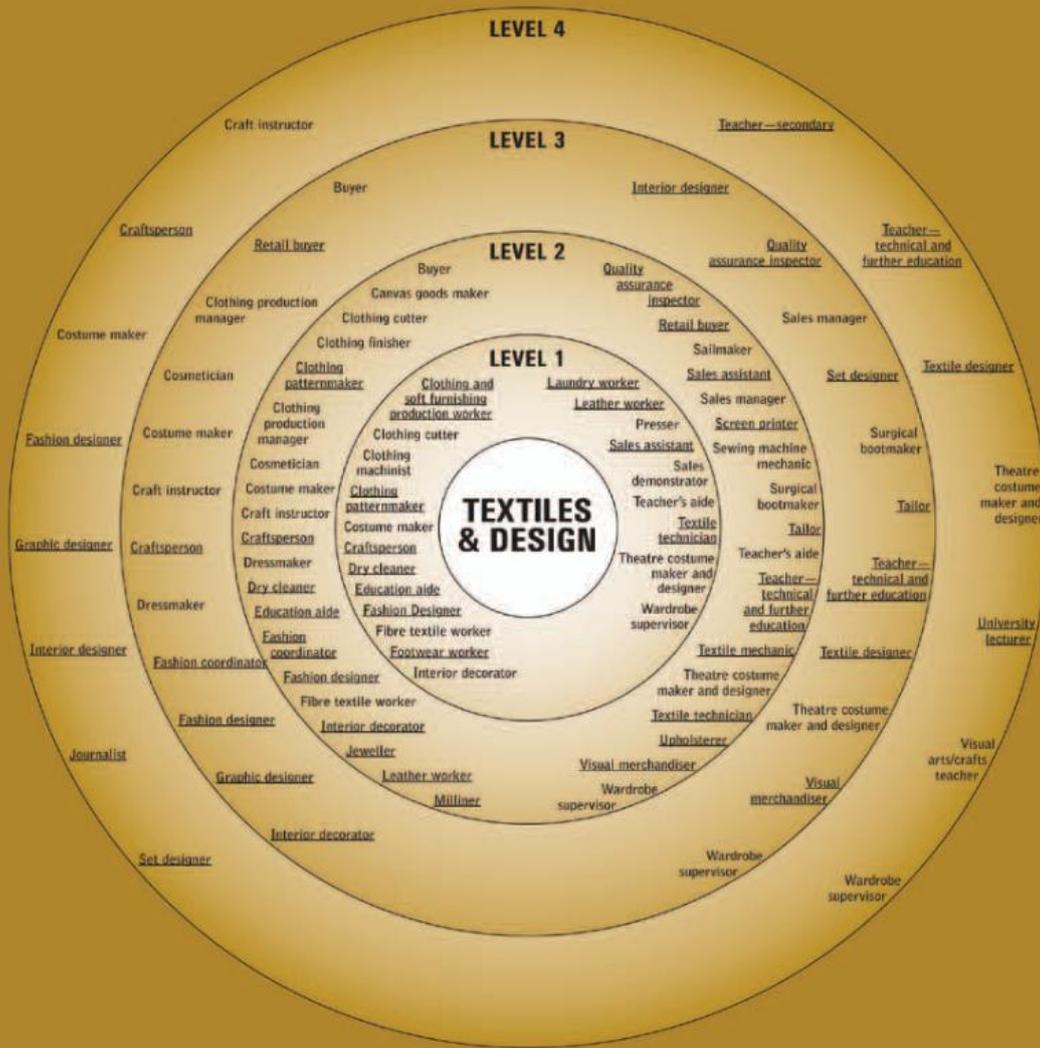
Sustainability issues arise wherever there is a risk of irreversible loss of objects or qualities of the environment that people value.



Australian Government  
Department of Education,  
Science and Training

# Do you enjoy or are you good at TEXTILES AND DESIGN?

Have you considered the following occupations?



## Usual training requirements

- |   |  |
|---|--|
| <p><b>LEVEL 1</b> Usually has a skill level equal to the completion of Year 10, the Senior Secondary Certificate of Education, Certificate I or Certificate II qualification. Australian Apprenticeships may be offered at this level.</p> <p><b>LEVEL 2</b> Usually has a skill level equal to a Certificate III or IV or at least three years relevant experience. Australian Apprenticeships may be offered at this level.</p> | <p><b>LEVEL 3</b> Usually requires a level of skill equal to a Diploma or Advanced Diploma. Study is often undertaken through TAFE or Registered Training Organisations. Some universities offer studies at this level.</p> <p><b>LEVEL 4</b> Usually requires the completion of a Bachelor Degree or higher qualification. Study is often undertaken at university.</p> |
|---|--|

This chart shows a selection of jobs that have some relation to the subject of Textiles and Design.

For further information visit [jobguide.dest.gov.au](http://jobguide.dest.gov.au) and [myfuture.edu.au](http://myfuture.edu.au). The four education and training levels are to be used as a guide only. These levels indicate the most common education and/or entry requirements for these jobs.

# Current and future sustainability challenges in the textile industry

## Travelling Textiles Report

PREPARED BY EMER DIVINEY AND SERENA LILLYWHITE AT THE BROTHERHOOD OF ST LAURENCE.

For the garment industry to achieve more responsible business practices, the key sustainability challenges include:

- Costs of sustainable production – Current limited production volumes for small and medium enterprises do not support affordable sustainable fashion.
- Managing relationships – Increased outsourcing, subcontracting and use of intermediaries make it harder to uphold responsible business practices throughout the supply chain.
- Consumer and fashion trends – The increasing number of fashion items (on-trend and low-cost) that are purchased and soon discarded add to the industry's environmental impact.
- Working conditions – Poor working conditions exist throughout the supply chain, in fibre cultivation, outwork in Australia and overseas, and factories in low-wage countries. Workers' health and livelihoods may be at risk.
- Energy and water consumption – The production of raw materials, yarn, textiles, and garments are water and energy intensive.
- Chemical and pesticide use – Intensive use of chemicals in the growing of cotton and wool and the production and processing of yarn and textiles impacts on the health of workers and consumers.
- Environmental degradation – The environment may be damaged by land clearing, over-grazing, and poor farming practices in fibre cultivation; and contaminated by pest and disease controls used in farming and by untreated effluents and air pollution from the textile production processes.
- Animal welfare – Animals may be subject to inhumane treatment in farming practices such as mulesing.
- Washing and care – Care of garments requires considerable energy and water, and may release washing detergent phosphates into local waterways, or may involve toxic chemicals such as those used in dry-cleaning.
- End of life management and textile waste – Clothing and textile waste (including packaging) may end up in landfill or be dumped in developing economies.
- Greenhouse gases – Methane and other gases are emitted by animal flatulence, production and agricultural processes, transport, and textile decomposition in landfill.
- Regulatory frameworks, standards and industry certification – Regulations and voluntary initiatives are often poorly monitored, but will become increasingly important to accessing markets and demonstrating responsible production to discerning consumers.



12.7 Environmental sustainability

Source: National Garment Industry Sustainability Roundtable, *Summary Report*, January 2010.

# Natural Fibre Garment

## Roadmap

**Sustainability Considerations:**

- Land degradation
- Lint and insecticide
- Pesticides
- Child labour
- Fair trade organic certification
- Water use

**Sustainability Considerations:**

- Transportation
- Social / Environmental impact of design
- Chemicals & dyes

**Sustainability Considerations:**

- Energy use
- Water use
- Emissions
- Dust & Noise
- Fibres
- Poor working conditions

**Sustainability Considerations:**

- Energy use
- Emissions with toxic substances
- Noise and dust

**Sustainability Considerations:**

- Energy use
- Solid waste generation
- Dust and noise
- Lint and insecticide
- Hazardous effluents

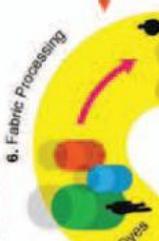
**01** Incorporating sustainable business practices at the design and production management stages significantly improves the economic, environmental and social impact of clothes.

**02** Wool and cotton are renewable resources, however both have significant environmental impacts including high water, pesticide and chemical use when conventional farming methods are poorly managed.



**03** Processes for cleaning fibres use considerable levels of energy. Wool scouring is water and chemical intensive and results in water degradation if effluent is untreated.

**04** Spinning is the process by which natural fibres or synthetic cellulose materials are turned into yarn. It is highly automated and labour intensive. Lubricants and conditioning agents applied to the fibres result in hazardous air pollutants and effluent containing toxic substances.



**05** Knitting and weaving are predominantly mechanical processes. Key sustainability issues relate to energy use, solid waste generation and dust and noise.

**06** Fabric processing is the final stage of textile production, and includes the printing and dyeing of textiles and the application of finishes. Processing is a major cause of environmental impacts in this phase – using significant quantities of water, energy and chemicals, and produces substantial amounts of effluent.



**07** The cut make and trim stage of production turns textiles into finished garments, and is a highly labour-intensive process. Key sustainability issues relate to labour rights and working conditions.

**08** Sealing garments has an impact on the environment. Transporting stock, customer travel, store fit-outs, packaging, lighting and heating, use resources and energy, pollute, and produce waste.



The National Responsible Business Practice Project is funded by the Federal Government, through Treasury to enable St James Ethics Centre to engage Australian businesses in identifying and adopting more responsible business practices.



www.thehub.ethics.org.au

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## Work, health and safety

New work health and safety (WHS) laws have replaced the occupational health and safety (OHS) laws in New South Wales from 1 January 2012. These new laws provide greater consistency, certainty and clarity, making it easier to understand workplace health and safety duties. Businesses and volunteer organisations that operate over several states are now able to initiate nationwide safety policies and procedures.

The new WHS laws may change the way work health and safety is managed in the workplace, but the basics of keeping the workplace safe will remain.

The essentials of keeping the workplace safe include the following.

- **Management commitment:** Company owners and directors must have up-to-date knowledge of WHS matters in relation to their business. They need to ensure appropriate resources and processes are provided to enable hazards to be identified and risks to be eliminated or minimised.
- **Consultation:** This must take place between employers and employees on all WHS matters, including making decisions about any WHS procedures.
- **Management of risk:** Risks must be managed to ensure they are eliminated or minimised, so far as is reasonably practicable.
- **Training and supervision:** All staff must be given training in relevant areas of workplace safety.
- **Reporting safety:** Procedures must be in place to report concerns about workplace safety and have issues thoroughly investigated.
- **Return to work and workers' compensation:** All employees have the right to receive the appropriate treatment and benefits, including assistance in returning to their normal duties in the event of a workplace injury or illness.

The major WHS issues for the textile industry relate to manual handling. The textile industry is labour-intensive and many workers suffer unnecessary injuries, such as sprains and strains, associated with hazardous manual handling. These injuries significantly increase costs for employers, but the human costs for injured workers and their families are far greater.

Other significant WHS risks in the textiles industry include chemical hazards, noise and hazards associated with plant or equipment, such as electrical, cutting, slicing, entanglement and crushing issues.

The benefits of addressing health and safety in the workplace are:

- reduced injuries
- reduced workplace disruptions
- improved productivity
- improved competitiveness
- improved morale
- reduced costs, including workers' compensation claims, replacement labour, lost working time, fines and penalties.

## Technological changes

Although the techniques of textile and apparel manufacture have not changed significantly over the centuries, improved technology has increased the speed, diversity and efficiency with which yarns, fabrics, dyeing, finishing, textiles and footwear are produced. New technologies have allowed various production stages to become one continuous process, resulting in higher quality and flexibility and thus a faster response to changing market conditions. **Computer-aided design (CAD)**, computer-controlled



12.8 Work health and safety  
12.9 Technological changes

Shutterstock.com



Heavy items should be lifted correctly to avoid unnecessary injury.

cutting systems and **computer-aided manufacture (CAM)** have also resulted in reducing labour costs, saving time and reducing materials used.

Technological changes in the textile industry have led to changes in employment. The impact of automation in particular on employment has been significant. The proportion of operators and unskilled labourers has decreased, while numbers of technical and management staff have increased. The new technologies require specialised skills in textile engineering, design, computer science, maintenance and marketing.

Detailed information on textile technologies and their impact on the industry can be found in Chapter 19.

### Trends and opportunities in the industry

The ATCFAI accounts for around 3% of the manufacturing industry in Australia.

Approximately 45 000 people are currently employed in the ATCFAI although employment in the ATCFAI has declined by 60% since 1990. Most of the decline can be attributed to global developments, particularly the increased availability and low price of Asian-produced goods.

Although the ATCFAI has undergone massive restructuring, some companies in the industry are expanding. These include companies that specialise in design and fashion, and in niche markets such as technical textiles and industrial footwear.

The Australian Government has implemented a **TCF** (textile, clothing and footwear) Innovation Package to support the industry through to 2014–15. The objective of the scheme is to foster the development of a sustainable and internationally competitive TCF manufacturing industry and TCF design industry in Australia. The package provides \$401 million to support the industry and includes the following.

- **TCF Strategic Capability Program:** Supplies grants to boost innovative capability in the industry. Eligible projects include innovation, research and design, accessing market opportunities, environmentally sustainable and ethical practices.
- **Clothing and Household Textile (Building Innovative Capability) Scheme:** Provides grants relating to eligible expenditure that is directly attributable to research and development activities and product development.
- **TCF Small Business Program:** Improves the business enterprise culture of established TCF small businesses. The program is open to companies in the industry with fewer than 20 employees.
- **TCF Post-2005 Strategic Investment Program (SIP) Scheme:** Offers building grants to companies for building expenditure, new plant or equipment.
- **TCF Industries Innovation Council:** Provides strategic advice on innovation priorities for the sector to the Minister for Industry and Innovation. The council promotes and encourages innovation in the TCF industries and builds links with other organisations.
- **National TCF Innovation Network:** Supports collaboration between companies, industry, researchers and educational institutions.



Fashion designer using CAD

# Textiles, Clothing and Footwear Industries Innovation Council

## strategic road map 2009–2014

### 2011 Milestones

- 1 Complete research, consider recommendations and seek in principle response from Minister on a possible TCF ethical quality mark.
- 2 Work with industry associations and the union to influence the implementation of climate change policy.
- 3 Promote and support increased TCF research opportunities for effective industry outcomes, including through 'Researchers in Business' program and related opportunities.
- 4 Identify and select opportunities to promote TCF innovation through existing award schemes and events.
- 5 Industry supplier advocate appointed and supported to get results.
- 6 Finalise industry capability map and identify capability vulnerabilities.
- 7 Establish a six monthly forum of industry associations, the TCF union and the innovation council with the purpose of expressing key industry issues with one voice.
- 8 Consider impact and opportunities of 'on line' sales and potential impacts and opportunities of the National Broadband Network on the TCF industries.
- 9 Promote clusters and consortia in the TCF industries to help bring ideas to market and build the commercial strength of companies.
- 10 Finalise university and training capability map. Identify gaps in industry needs and ways of strengthening education linked, innovative research and propose solutions.
- 11 Influence government procurement policy and practice to support TCF industry development, including through applying Ethical Clothing Australia principles to imports (as well as local manufacturers).

2014 Targets	2014 Outcomes
<ul style="list-style-type: none"> <li>• High quality</li> <li>• Unique products</li> <li>• Brand ambassador</li> <li>• Premium price</li> <li>• Climate change</li> </ul>	'Brand Australia' – certified, innovative, ethical, green
<ul style="list-style-type: none"> <li>• Increased sales and uptake</li> <li>• Recognised by press and awards</li> <li>• Sought after by companies worldwide, increase in new innovation</li> </ul>	Innovative products and processes
<ul style="list-style-type: none"> <li>• Equal tariff and non-tariff</li> <li>• Local sales and distribution</li> <li>• Partners</li> </ul>	Global and local competitive specialised niches
<ul style="list-style-type: none"> <li>• Manufacturing capability directory</li> <li>• Products can be made to saleable standard</li> <li>• Ability to supply government procurement</li> </ul>	Essential and critical manufacturing base

2014 Targets	2014 Outcomes
<ul style="list-style-type: none"> <li>• Effective industrial (supply chain) networks</li> <li>• New business models</li> <li>• New ways to relate to ultimate customers</li> </ul>	Innovative business models
<ul style="list-style-type: none"> <li>• Investment in skill recognition, education and training</li> <li>• Attracting new young workers to industry</li> <li>• Improved wages and conditions</li> </ul>	Highly skilled and visionary workforce
<ul style="list-style-type: none"> <li>• Policy endorsed by industry and government</li> <li>• Long term policy focused on consistent objectives</li> <li>• Harmonised between three layers of government</li> </ul>	Adaptive and supportive policy and regulatory environment

#### Pathways:

- Create a TCF identity and certification
- Create industry recognised ‘unified voice’
- Align government procurement with Australian made
- Accelerate commercialisation of Australian research and development
- Improve local and global market access
- Map the essential industry base
- Enabling emerging businesses
- Improve access to quality education and training



12.10 Industry trends and opportunities – TCF Innovation Package  
12.11 Industry trends and opportunities – innovation

Source: TCFIIC, *Strategic Road Map*, 19 April 2011.

## The contribution of textiles to local and global markets

The TCF industries are facing significant global competition. Successful Australian manufacturers have generally moved from producing commodity goods to manufacturing specialised, value-added goods that are differentiated by design or innovation.

International developments, such as free trade agreements, continue to present both opportunities and challenges for the ATCFAI.



12.12 The contributions of textiles to local and global markets  
12.13 History of textiles and the ATCFAI palm cards

### Review questions

Use the information in this chapter to answer the following questions.

- 1 Identify an invention in the textile industry over the last three centuries that you believe has changed the direction of the industry. Justify your answer.
- 2 Imagine you are writing a magazine article regarding the textile industry in the year 2055. What changes will have taken place over 50 years?
- 3 Explain the term *environmental sustainability*. Why is this so important for the textile industry?
- 4 If you could have any job in the textile industry, what would it be? Explain why you have selected this job.



## Websites

- ☺ Fashion Source ([www.fashionsource.com.au](http://www.fashionsource.com.au)): Access to the latest in textile and fashion news for the ATCF AI and the international industry.
- ☺ Textile Source ([www.textilesource.com.au](http://www.textilesource.com.au)): Access to the latest in textile and fashion news for the ATCF AI and the international industry.
- ☺ Cotton Australia ([www.cottonaustralia.com.au](http://www.cottonaustralia.com.au)): The peak body for Australia's cotton-growing industry, which aims to foster a sustainable Australian cotton industry that is valued for its environmental, economic and social contribution.
- ☺ The Hub of Responsible Business Practice in Australia ([www.thehub.ethics.org.au](http://www.thehub.ethics.org.au)): Funded by the federal government, this website has been designed as a consolidated space for engagement, interaction and connectivity to help build communities of responsible business practice in Australia.
- ☺ WorkCover NSW ([www.workcover.nsw.gov.au](http://www.workcover.nsw.gov.au)): WorkCover administers work health and safety, injury management, return to work and workers compensation laws and manage the workers compensation system.
- ☺ Department of Innovation, Science, Research and Tertiary Education ([www.innovation.gov.au](http://www.innovation.gov.au)): Up-to-date innovation on Government initiatives in relation to the ATCF AI.
- ☺ My Future ([www.myfuture.edu.au](http://www.myfuture.edu.au)): Australia's career information service, with information on careers in the ATCF AI.
- ☺ International Fashion Schools ([www.international-fashion-schools.com](http://www.international-fashion-schools.com)): A website for information on international fashion schools.
- ☺ Design Futurist ([www.designfuturist.com](http://www.designfuturist.com)): A design studio that creates innovative and sustainable clothes and accessories, from concept to completion, for the increasing number of modern brands choosing to go green.

# Quality of textiles

# 13

## What is textile quality?

Quality of textiles commonly refers to the total set of performance characteristics relating to a textile component, item or product. Overall total product quality is essential for a textile to remain competitive and successful in the global marketplace. When assessing total product quality it is often useful to break down areas and assess each component separately to evaluate the total attributes of the textile.

The concept of quality is not simple to define. Everybody has their own interpretation of what determines 'good' quality.

To maintain consistency and integrity in the term *quality*, various standards have been developed for the ATCFAI. Standards are documents that predetermine the set of performance characteristics and the appropriate level of compliance specifications that a manufacturer should meet. Some standards are considered good practice, whereas others are governed by legislation and enforced by law.

Common indicators for consideration when assessing total quality and assigning a value scale to the textile component, item or product include:

- aesthetics or appearance of the textile
- end-use applications and performance
- integration and/or interactions with component materials or other textile materials
- quality of fibres, yarns and fabric
- quality control
- quality assurance
- the absence of defects in design, materials or manufacture
- government legislation (including care labelling)
- trademarks
- consistency in design, materials, manufacture and quality if the textile is to be reproduced.

## Assessing quality

### Design

Design is the process that uses a combination of aesthetic and functional components to create solutions for identified needs. Design is an integral part of quality. A good design will be aesthetically pleasing and functionally appropriate to the specific end-use requirement.

Spinnakers – an example of quality textile design

Shutterstock.com



13.1 Quality of textiles

Shutterstock.com



Design is often thought of as a process involving a number of steps. At each step, evaluation or reflection must occur to ensure a quality item for a specific end-use is produced. The steps in the textile design process are:

- 1 design inspiration
- 2 visual design development
- 3 manufacturing specifications
- 4 investigation, experimentation, evaluation.

As you work through the design and manufacture of a textile item, you may change the order in which you complete the design process steps. All designers will start with design inspiration and develop some design ideas. Usually experimentation will happen next to gain an understanding of whether the design is feasible or if changes need to be made to the design concept. Investigation of materials and techniques as well as experimentation is required throughout the design process. Evaluation occurs at each step of the design process to ensure selection of the most appropriate design, materials and techniques.

## Extend your knowledge 13.1



The Design Institute of Australia (DIA) is Australia's professional membership body for designers and design businesses. Visit the DIA website ([www.dia.org.au](http://www.dia.org.au)) to find information on design disciplines, including interior, textile and fashion design.

Select an article from the *Spark* newsletter (in the 'Publicity' section of the website) that relates to textile design of a particular item and complete the following.

- 1 Name the textile designer.
- 2 Briefly describe the textile item.
- 3 What is the target market for this item?
- 4 What features make this item a quality textile product?



13.2 Quality of textile design  
13.3 Trademarks

## Trademarks

A **trademark** is a mark that is used for the identification of goods or services. It is required by legislation that a business register the mark with a local trademark office before it can gain protection under trademark law. The rules differ from country to country.

A trademark can be a word, phrase, letter, number, sound, scent, shape, logo, picture or aspect of packaging, or a combination of these. To indicate that a word, phrase or image is a trademark, the suffix TM can be used in superscript after the word or logo. This indicator has no legal status in countries where only registered trademarks are protected against use by others. A registered trademark is indicated with the ® symbol and is a way of determining quality in textiles. A trademark is a valuable marketing tool as a consumer will have expectations of quality assurance, familiarity and uniform production from a known trademark.



IP Australia trademarks



Australian Made trademark



Alamy



Cotton Australia trademark

## Trademarks

# Have you marked out your trade?

The importance of having registered trademarks in Australia has been experienced by a number of international brands, such as Diesel, who have found goods, which, while not copies of their styles, have featured their trade marks on items such as jeans, t-shirts and sunglasses. Having registered trademarks that protect all of your goods and services has allowed the brand owners to not only seize goods from traders dealing in the fake goods, but also to obtain court orders to allow searches of premises

where the goods are being made or imported to, to seize products and documents relating to how many goods have been sold, and where they are coming from. This information is invaluable to the brand owner who has then been able to identify other traders dealing in such goods.

Trademarks other than just brand names or logos should also be considered by designers. A number of denim designers, such as Bettina Liano and Levi's, have registered the distinctive pocket stitching

on their garments as trademarks. Other distinctive features may also gain trade mark protection. The Burberry check for example has been registered as a trademark, as has the red stripe on the heel part of a Prada shoe sole. While these other types of marks may be registered, it is through the use of them as trademarks that companies are able to distinguish their goods from those of other traders.

Source: [www.ipfashionrules.gov.au/minfo\\_casestudies.html](http://www.ipfashionrules.gov.au/minfo_casestudies.html).

### Extend your knowledge 13.2

In terms of quality, why is it important for fashion companies to protect their products with trademarks?

## Fabric quality

Fabric quality is of high importance in determining the overall quality of a textile item. The fabric quality is important to textile manufacturers, designers, retailers and consumers as it embodies the fabric's aesthetic, functional and specific end-use characteristics. A quality fabric should be free from defects and uniform in appearance and structure. Fabric quality determines the product price-point and can influence the total production cost, consumer satisfaction and aesthetic properties of a textile component, item or product.



A quality fabric should be free from defects and uniform in appearance and structure.

Shutterstock.com

Various standardised tests have been created to test the quality of a fabric for suitability of function and specific end-use. Professional organisations such as Standards Australia and the International Organisation of Standardisation have created performance assessment testing procedures so that fabric quality evaluations are consistent. They include tests for abrasion resistance, strength, wrinkle resistance, shrinkage during washing and colourfastness.

Refer to Chapter 10 for more detailed information on fabric testing and a case study on SiroFAST™.

SiroFAST™ is a fabric quality assurance system developed in Australia by CSIRO to meet industry's need for a simple, reliable method of predicting fabric performance.

It is currently being used by fabric and garment manufacturers in many parts of the world in a wide variety of applications and has fast become the industry benchmark.

## Legislation

From January 2011, there is one national law for fair trading and consumer protection – the **Australian Consumer Law (ACL)**. This means all consumers and businesses in Australia will have the same rights and obligations.



Australian Consumer Law

# The Australian Consumer Law

The Australian Consumer Law includes:

- a new national law guaranteeing consumer rights when buying goods and services, which replaces existing laws on conditions and warranties
- a new national product safety law and enforcement system
- a new national law for unsolicited consumer agreements, which replaces existing State and Territory laws on door-to-door sales and other direct marketing
- simple national rules for lay-by agreements
- new penalties, enforcement powers and consumer redress options.

Source: [www.consumerlaw.gov.au](http://www.consumerlaw.gov.au).

## Extend your knowledge 13.3

- 1 How does the ACL ensure you receive quality textile products?
- 2 What are your consumer rights and responsibilities if the textile products you purchase are not of an expected standard of quality?

Mandatory **safety standards** are another form of legislation to ensure you receive quality textile goods. They are developed for products that are likely to be hazardous or dangerous. In developing mandatory safety standards, the Australian Government protects consumers by specifying minimum requirements that products must meet before they are supplied. Safety standards require goods to comply with particular performance, composition, contents, methods of manufacture or processing, design, construction, finish or packaging rules.

Mandatory safety standards in the textile industry include the following.

- Mandatory standards for care labelling: These standards were introduced in 1980 and have been reviewed a number of times. Mandatory standards cover the following textile items: clothing, household goods, furnishings, piece goods made from textiles, plastic-coated fabrics, suede skins, leathers and furs.

- Mandatory standards for children's nightwear: Children's nightwear is categorised depending on the fabric type and style of the garment. All children's nightwear must have labelling attached to identify the fire danger.

On 1 January 2011 the Commonwealth's *Trade Practices Act 1974* was renamed the *Competition and Consumer Act 2010*. The *Competition and Consumer Act* is designed to protect you as a consumer in your dealings with business. It contains information regarding your consumer rights, how businesses should act when selling you goods and services, what steps you can take to resolve a problem or a complaint, and how to shop safely and reduce the chance of a problem arising.

## Care labelling

**Care labels** are used by businesses to convey important information about most goods, such as foods, clothing and packaged items. This allows consumers to make informed choices about the goods they are buying. Sometimes this information is required by law; for example, a mandatory product information standard under the Australian Consumer Law.

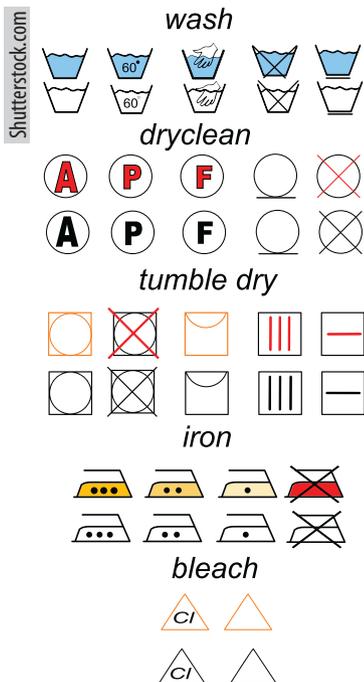
For the ATCFAI (including manufacturers, importers, wholesalers/distributors and retailers), compliance with the product information standard is mandatory. The industry must ensure its products comply with the care labelling requirements.

All products should include a label that provides instructions on how to care for that product. Generally, the requirements allow consumers to:

- be aware of the method and cost of caring for goods when they purchase them
- be aware of the best method of cleaning the product (for example, dry-clean only)
- increase the useful life of a product
- prevent damage from improper care.

Labelling also allows dry-cleaners to select the correct care treatments.

The care labelling system is intended to supply consumers and textile companies with correct information about the care treatment of textile products, so that the processes contained on the label will avoid any damage to the product. The care label should not be regarded as a quality seal.



Care labelling has the following guidelines.

- Care instructions must contain information related to washing, drying, ironing and dry-cleaning.
- Where an article can be laundered or dry-cleaned or both, care instructions for both treatments must appear on the label.
- The care symbols denote the maximum permissible treatment without irreversible damage.
- Each detachable or separate part of an article must have a care label, even if the care instructions are the same for all parts.

International care symbols – these care symbols are registered trademarks and the property of Ginetex, Switzerland.



13.4 Mandatory standards – children's nightwear  
13.5 Care labelling for clothing and textiles  
13.6 International care symbols

Shutterstock.com



Care label



## Quality assurance checks

**Quality assurance** checks are an important aspect within the total quality management of components, items and products supplied by the ATCFAI. It applies to the manufacturing process as a whole. Quality assurance maintains the standards from the beginning of the production process and ensures the product will be suitable for end-use application. Quality assurance ensures that a textile item is produced to a specified level of predetermined quality in a manner that is safe, cost-effective and efficient. The systems are designed to improve the quality and performance of the total manufacturing process.



### Extend your knowledge 13.4



Textile quality assurance  
([www.youtube.com/watch?v=CCR-lh\\_53Tk](http://www.youtube.com/watch?v=CCR-lh_53Tk))

Watch the video clip about textile quality assurance and answer the following questions.

- 1 Why is it important for textile companies to implement quality assurance checks?
- 2 List the quality assurance checks carried out by Bureau Veritas.
- 3 Visit the INSTYLE website ([www.instyle.com.au](http://www.instyle.com.au)) and watch the video titled *The Story of LIFE*. Then outline the measures INSTYLE textiles have in place to ensure that a quality sustainable textile product is produced. In your answer, discuss each stage of the product lifecycle.

## Quality control measures

**Quality control** is the inspection and checking of products and processes. Quality control measures are used to assess the quality of a product at various stages of the manufacturing process. These inspections are used to evaluate the product as it evolves.

Quality control measures ensure that each stage of development, manufacture, sales, marketing, processing or service has been evaluated to ensure it meets predetermined specifications before it passes to the next stage. Company standards are then determined and quality control measures are put in place to check the specifications at particular points in the product evolution.

Examples of quality control measures in the apparel industry can include matching checks along seam lines, zipper and closure function, fabric colour fastness, dimensional stability of fabric components, as well as maintaining consistency of product sizing and dimensions.

Quality parameters are set for the particular textile component, item or product. The product price-point and the end-use application then determine which key qualities will be tested along the production line to ensure that the product meets the required standard. The appropriate tests are then set in relation to the specifications set by Standards Australia and the International Organisation for Standardisation.

## Role of the manufacturer and consumer in determining quality

In Australia, standards for quality are developed by various committees of an organisation known as Standards Australia.

The ATCFAI relies on the recommendations of Standards Australia to ensure the quality of a textile component, item or product. Standards set by the International Organisation for Standardisation (ISO) may also be referred to. It is the role of the manufacturing company to uphold the standard of good practice, referring to the predetermined quality assurance and quality control measures and standards set by Standards Australia and the ISO.

The manufacturer may elect to exceed the standards set by Standards Australia. This is usually consumer-driven and ensures that the manufacturer's target market is satisfied with the quality of the textile it is presenting. Targeting consumer markets and meeting consumer demands is the key to the success of determining the quality of a textile product.

As a consumer, you have responsibilities when purchasing textiles goods and services. These include:

- acquiring the knowledge and skills to make informed, confident choices about textile goods and services
- shopping around to ensure you are receiving value for the money spent.

Increasing concerns from consumers in relation to the selection of textiles that are environmentally sustainable or environmentally friendly has led to the creation of many special accreditations in quality manufacturing. One such accreditation is the Quality Endorsed Company. The prestigious title of being a Quality Endorsed Company may be displayed by an organisation with its quality management system certified by SAI Global Limited.

Voluntary environmental labelling standards are developed and approved by the Management Committee and Stakeholder Council of Good Environmental Choice Australia (GECA) Ltd after a widespread consultation process. These standards specify the core environmental performance benchmarks against which products are assessed in order to receive the Good Environmental Choice mark.



Good Environmental Choice mark, Australia

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Define the term *quality* in relation to a textile product.
- 2 Why is good design essential when producing a quality textile product?
- 3 What is a trademark? Does a registered trademark equal a quality product?
- 4 Outline the legislation in place in Australia that ensures quality textiles are available in the marketplace.
- 5 Outline the processes that companies implement to ensure a quality textile product is produced.
- 6 Identify the role of the consumer in determining quality.

## Websites

- ☉ Design Institute of Australia ([www.dia.org.au](http://www.dia.org.au)): Visit this website to gain up-to-date information about all disciplines of textile design in Australia.
- ☉ IP Australia ([www.ipaustralia.gov.au](http://www.ipaustralia.gov.au)): Gain valuable information about how you can protect your intellectual property, including trademarks, patents and copyright.
- ☉ Australian Consumer Law ([www.consumerlaw.gov.au](http://www.consumerlaw.gov.au)): Learn all about the new Australian Consumer Law on this government website.
- ☉ Product Safety Australia ([www.productsafety.gov.au](http://www.productsafety.gov.au)): This website is for everyone who buys and uses consumer products, and for businesses that make, import and sell them.
- ☉ INSTYLE ([www.instyle.com.au](http://www.instyle.com.au)): An Australian company that produces innovative textiles.
- ☉ Ginetex Switzerland ([www.sartex.ch/en](http://www.sartex.ch/en)): A website with information about international care labelling.
- ☉ Good Environmental Choice Australia (GECA) ([www.geca.org.au](http://www.geca.org.au)): A not-for-profit organisation that exists to reduce environmental harm by promoting the production and consumption of environmentally preferable products and services.
- ☉ Standards Australia ([www.standards.org.au](http://www.standards.org.au)): An organisation that produces standards for Australian products.
- ☉ NSW Fair Trading ([www.fairtrading.nsw.gov.au](http://www.fairtrading.nsw.gov.au)): A government organisation that administers fair trading laws and looks after the rights of consumers, with the aim of achieving fairness for all in the marketplace.



13.8 Quality of textiles palm cards



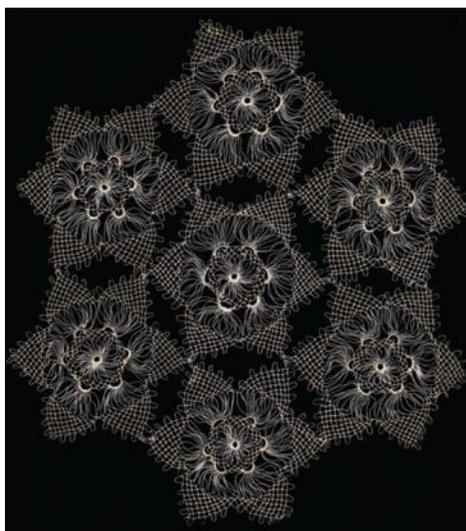
# Value of textiles

## What is textile value?

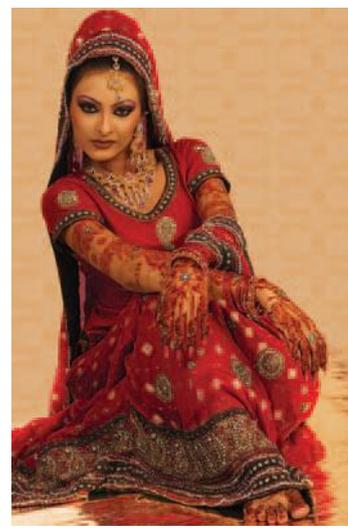
There are certain connotations attached to the definition of the term *value* that cannot be ignored. Determining value in textile, clothing, footwear and allied industries is subject to personal interpretation or perceived value, but can also be measured objectively and expressed as a monetary or significant resource value. To understand the value of certain textile items, it is helpful to consider and understand historical, cultural, contemporary and technological perspectives. The specific end-use requirement must, of course, also be considered.



Designer fashion is of high monetary value



Heirloom handmade lace of high sentimental value to the family of the maker



Indian wedding dress of high cultural value

Photos from Shutterstock.com

## Factors contributing to textile value

### Perceived value

**Perceived value** is the value that a buyer subjectively attaches to a textile item. In contemporary society, often the only thing that differentiates one product from a virtually identical competitor is the image or person advertising the product. This type of value depends on how the consumer or owner of the textile product feels about the item. It is personal taste or desire that drives the evaluation of worth of that particular textile item.

Perceived value can also be defined by fashion, fad or fantasy and its value can change over time. For example, consider the current trend of mixing vintage clothing with new items. The perceived value or worth of a textile item can often depend on the 'category' into which the item falls. Categories include heirloom, handcrafted, unique, designer label and technologically advanced textiles.

## Heirloom

An **heirloom** textile product usually refers to an object passed down, generally within the family, from generation to generation. It is often of worth only due to sentimental value.

An heirloom may be intentionally designed to be worn by several people in the same family. Miss Minnie Hillard designed and made a satin wedding dress featuring cornelli lace. Her sister, Miss Ethel Hillard, did the beading and work on the yoke and the dress was worn by three sisters – Olive, Betty and May Hincks – on their wedding days. After the weddings, the dress was cut down and made into three separate satin blouses for the sisters to wear.



Olive Hincks pictured with her mother, Florence Hincks, August 1946



Betty Hincks pictured with her husband-to-be, Bill Savage, February 1948



May Hincks pictured with her husband, Tom Cooper, March 1948

Photos courtesy of Christine Castle

## Vintage

**Vintage** textiles is a relatively new and interesting niche market in the ATCFIAI.

Vintage clothing refers to items that were in fashion several decades earlier than the present day.

The value of vintage-style items and the interest in them are increasing. One of the main sources of interest in vintage textiles has evolved with the revolution of the Internet and international auction sites such as eBay. Many vintage textile lovers source collections over a long period of time and from a wide variety of sources, including friends, family, auction houses, opportunity shops, garage sales, vintage and retro shops, websites and Internet auction sites.



Vintage clothing shop

While the main interest in vintage clothing centres on authentic vintage items, there is also a growing interest in newly designed items that are made to look vintage. Such items, especially T-shirts and shirts, are readily available on the Internet and some commercial clothing stores have even begun to stock such items.

## Handcrafted

**Handcrafted** textile items are considered of great value because they are usually not mass-produced. This makes them traditionally more unique and therefore special to the owner or the person who receives them as a gift. In addition to clothing, handcrafted items may also include toys, quilts, bed linen, hats, bags and textile art items. The Preliminary projects you make, as well as your Major Textiles Project, will be considered handcrafted items.



A vintage handcrafted 'Upside down doll' featuring Southern American women from the American Civil War era (1861–65)

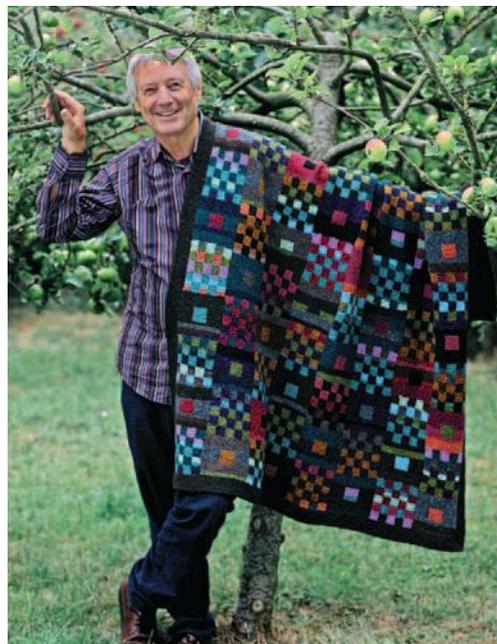


Major Textiles Project by Jennifer Peters

### Extend your knowledge 14.1

Watch the video clip about textile artist Kaffe Fassett and complete the following tasks.

- 1 Describe the handcrafted textile items created by Kaffe Fassett.
- 2 Outline the value Kaffe Fassett feels about his handcrafted items.
- 3 Visit Kaffe Fassett's website ([www.kaffefassett.com](http://www.kaffefassett.com)) to explore other handcrafted items he produces. Select one of these items and complete a short report, including a description and the value of the item.



Kaffe Fassett



Kaffe Fassett – textile artist video  
([www.youtube.com/watch?v=ZktTHOFv\\_mY&feature=related](https://www.youtube.com/watch?v=ZktTHOFv_mY&feature=related))

Image courtesy of Kaffe Fassett

## Unique

Items that are distinctive, quirky or unusual are usually highly valued, especially by collectors. One example of a unique clothing style is the Bent Clothing label. Bent Clothing was originally sold at Paddington markets in Oxford Street, Sydney, in the 1980s and 1990s. The clothing had a distinctive style and the unique items were highly sought after in the 'surfie' subculture. Items of Bent Clothing include jeans, jackets, shorts, sweatshirts and dresses. Each Bent item was an original, and the unique style ensured success in the niche marketplace. Bent Clothing has now moved into creating some mass-produced items, but its unique style is still apparent.



A pair of men's Bent jeans, back and front

## Designer label

Designers have a long association with consumers and the perceived value of textile items. Wearing a 'label' has a high prestige in society.



Designer label Prada

Designer labels are popular in contemporary textiles and collectors often search for labels from specific designers to complement or add to their personal collections. Museums and galleries also tend towards collections that can be accumulated with a designer profile and history. In Australia, the Powerhouse Museum actively seeks acquisitions of textile items from specific designer labels.

While vintage labels are popular with museums and collectors, other more modern labels are highly sought after by the general public.



Studibaker Hawk gown from Christine Castle's personal vintage collection, showing close up of hand screen-painted designs

Photos courtesy of Christine Castle

### Technologically advanced

Innovation is the key to successful marketing practices in the ATCFAI. Innovation can apply to all aspects of textiles, including fibre, yarn, fabric, manufacture, production and end-use application. Educating consumers about a product's capabilities and separating it from other alternatives is vital for success in the marketplace and adds value to the textile product. The performance and superiority of textile items are primary considerations in a consumer's choice to buy a particular textile item.

Textile materials and products manufactured primarily for their technical performance and functional properties, rather than their aesthetic or decorative characteristics, are considered technical textiles. Specific industry end-uses for technical textiles include space, automotive, engineering, marine, medical, environmental, military, safety, transport and geotextile industries.

Textile fibres, yarns and fabrics are continually becoming more sophisticated in manufacture, design and production. It is impossible to project how far the technology of producing items in the ATCFAI will evolve.

### Cultural value

**Culture** refers to a system of shared beliefs, values, customs, behaviours and artefacts that are unique and transmitted from generation to generation. The cultural value of a textile item is determined by how it relates to the historical, social and contemporary perspectives of a particular group of people. Cultural textiles express local identity and emphasise uniqueness. They may be worn to express a common religious or spiritual belief. Such textiles can define a sense of belonging and may be worn at events such as ceremonial occasions, celebrations, weddings, births, when in mourning or at funerals, and at dance or other types of festivals. Cultural textiles may even be worn to signify a national or regional identity.



14.1 Studibaker Hawk  
14.2 Value of technologically advanced textiles

Shutterstock.com



Traditional dance costume of cultural significance to the people of the Kerala state of India



## Religious significance

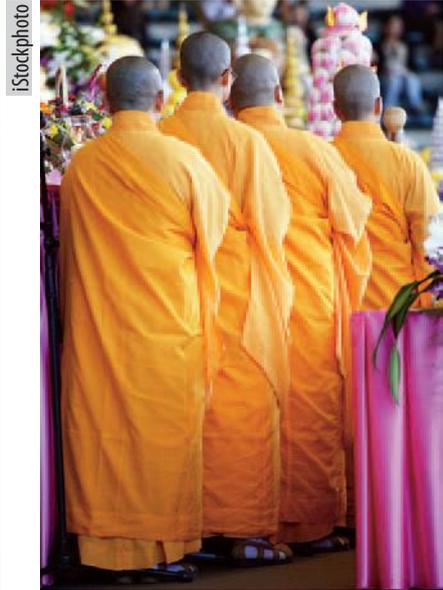
The terms *religion*, *faith*, *spirituality* and *belief* system are commonly defined as ideas relating to the supernatural, sacred or divine. Textile media are often used to create symbols, clothes, costumes, accessories or dress that reflect the moral codes, practices and institutions associated with such belief systems. Culture, religion and textiles often share a significant bond.



Young Jewish boy celebrating his bar mitzvah



Anglican wedding ceremony with traditional white wedding gown – Sylvia Nugent, 1941



Buddhist monks ready for a ceremony

Shutterstock.com



A child wearing the hijab, a symbol of the Islamic religion

## Social significance

Social significance refers to how we view textiles and textile products in relation to the changing values and attitudes in society. It also reflects the changing values and attitudes of different groups within society at any given time. It is interesting to consider how attitudes progress over a period of time. Social significance can be related to religious, cultural, political, economic, historical and technological perspectives and the context in which the item will be used or worn. What is appropriate to wear in contemporary society is often an unwritten dress code to which groups of people conform.

In 1965, Jean Shrimpton caused a media sensation in then-conservative Melbourne when she arrived for Melbourne Cup week wearing a daring white dress with a hemline above her knees. The Australian public was shocked as she was also without stockings, gloves or a hat – the socially acceptable dress code during the 1960s.

Consider the present-day social significance of swimwear and its perceived value over time. The way we value the UV protection in children's swimwear and children wearing hats in contemporary Australian society reflects our concern for health and welfare – protecting our children from the harsh Australian sun.

## Economic value

The **economic value** of textiles is determined by the market and how much people are willing to pay for goods or services. Value is added at each stage of textile production and the product becomes more desirable to the consumer. An example of value-adding is the processing of raw cotton to produce a pair of jeans.

## Value-adding to products for other industries

The ATCFAI also adds value outside its own industry, contributing various fibres, yarns and fabrics that are successfully integrated into a wide variety of products in other sectors of the Australian industry. These areas and some examples include:

- agriculture – membranes, geotextiles
- industrial – filters
- automotive – seats and soft furnishings such as carpets
- wooden furniture – upholstered seat manufacture
- marine industries – sails
- military – ballistic vests
- medical – smart textiles and compression suits
- occupational safety – fire-fighting suits.

## Review question

Use the information in this chapter to answer the following question.

- 1 Define the following terms in relation to the ATCFAI.
 

<ol style="list-style-type: none"> <li>a Economic value</li> <li>b Unique</li> <li>c Cultural value</li> <li>d Social significance</li> <li>e Heirloom</li> </ol>	<ol style="list-style-type: none"> <li>f Value-added</li> <li>g Handcrafted</li> <li>h Perceived value</li> <li>i Religious significance</li> </ol>
---	---

## Websites

- ☺ Kaffe Fassett ([www.kaffefassett.com](http://www.kaffefassett.com)): The website of London-based textile artist Kaffe Fassett.
- ☺ Powerhouse Museum ([www.powerhousemuseum.com](http://www.powerhousemuseum.com)): An extensive textile collection can be viewed when you visit the museum or access it online.

Shutterstock.com



Child wearing UV protection swimwear

Shutterstock.com



Textiles add value to the automotive industry.



- 14.4 Value adding textile industry
- 14.5 Value of textiles palm cards



# HSC course

## Area of study: Design

This area of study will allow you to develop an understanding and appreciation of the influences of historical, cultural and contemporary aspects of design in society.



Refer to the Board of Studies website for the Course Objectives, Outcomes and Content:

[www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au).

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# Historical design development

## Apparel in ancient times

### Ancient Egyptians

Garments in ancient Egypt consisted of a length of fabric that was wrapped around the body to create the shape of a garment and secured by tying the fabric ends together. Linen was the main fibre used for clothing and fabrics were often translucent. Women's clothing veiled the body rather than concealed it. Men wore a simple loincloth wrapped around their hips. Ancient Egyptian clothing featured draping with ornate jewellery used as decoration.



Egyptian clothing  
([www.youtube.com/watch?v=v2oGSYM4ljc&feature=related](http://www.youtube.com/watch?v=v2oGSYM4ljc&feature=related))



iStockphoto

Ancient Egyptian apparel recorded in artwork prepared on papyrus



Ancient Egyptian woman and man



15.1 Fashion era inspiration



Ancient Greek woman and man

### Ancient Greeks

The classical Greek dress was a **chiton**. It consisted of two rectangles that were joined at the shoulders and gathered into the body using a fabric tie. For warmth, a rectangle of wool was wrapped and draped over the body, and held in place by pins at the shoulder or by a waist belt.

### Ancient Romans

Ancient Romans wore a **tunic** and a cloak for warmth. The cloak or **toga** consisted of a semicircle of woollen fabric that was draped around the body. Women's clothing was similar to the Greek chiton but made of either silk or cotton.



Ancient Roman woman and man



Byzantine woman and man

## The Byzantine Empire

The Byzantine Empire controlled the trade routes between the East and West. In 552 CE a silk industry was started in Byzantium. Ornate silk fabrics were woven in a variety of colours, decorated with gold thread and precious stones.

Brocade was produced from the 6th century. Clothing styles were similar to Roman tunics except a decorative cloak was worn instead of the toga. Jewellery was also an important part of the dress of the Byzantine Empire.

## Saxons

Under Roman rule Britons wore similar clothing to the Romans, although the woollen fabrics were thicker to protect them from the cold. The Romans left Britain in the 6th century and fashion styles evolved. A tunic, usually made of linen or silk, was worn with a belt around the waist. Women wore a tunic with a waist tie. The edge of the tunic was decorated with a band of embroidery around the hem and neckline.



Saxon woman and man

Norman woman and man

## Normans

After the Norman conquest of Britain in 1066, fur and silk were used for clothing in Britain. Men wore tunics reaching just below the knee. This was longer than the women's tunics, which were layered and worn with a hood.

## Apparel from the 14th to 19th centuries

### The 14th century

The Middle Ages was a time of great prosperity and this was reflected in the clothing. Garments became more elegant and practical. A variety of fabrics were available and embroidery was used as decoration. For the first time there was a significant difference between men and women's clothing.

The tunic for men was close fitting, with a knee-length skirt worn with hose. Women's gowns were very long and worn with a close-fitting undergarment. They were usually made from wool, although the wealthy used silk, including velvet and taffeta.



14th-century woman and man

## The 15th century

Fashions in the 15th century took previous trends to the extreme. Fabrics were more ornate and extravagant.

Garments were decorated with jewels, embroidered with all-over patterns, trimmed with fur and slashed and puffed. Slashing involved cutting slits in the outer garment and pulling the contrast colour of the inner clothing through the slit.

Men's clothing was characterised by broad shoulders, large padded sleeves, tight jackets and padded thighs. Women's clothing consisted of flowing dresses with huge sleeves, high collars, elaborate headpieces and long, pointed shoes.



15th-century woman and man



Dress showing the slashed sleeve material with the contrasting undergarment pulled through

## The 16th century

Clothes in Europe at this time were made of sumptuous fabrics such as patterned silk, velvets richly decorated with jewels, lace and lavish embroidery. Wealthy men wore cloaks with broad shoulders and flat hats, giving them a square appearance. Shirts made from either linen or silk were introduced for the first time. Shirt neck-frills developed into starched **ruffs** for both sexes. As the ruffs became larger, they were stiffened with wire that was covered in silk or gold thread.

The second half of the 16th century in England and Europe is known as the Elizabethan era. It was a time of great wealth, which was expressed in the clothing. Men followed the fashions of Spain and wore truck hose padded around their thighs like balloons, and doublets with high necks.



16th-century woman and man



Elizabeth I, Queen of England from 1558 until her death in 1603

Rigidity and decoration were the main elements of Elizabethan clothing. Women achieved the fashionable triangular shape by wearing bodices or **corsets** stiffened with buckram, wood or metal. Skirts were supported by the Spanish **farthingale**, an underskirt made from cane, wire or whalebone hoops. Such undergarments made bending over virtually impossible.

Hats, as we know them today, were invented in the late 16th century for both men and women. Women's hats were often made from taffeta and embroidered and decorated with plumes and hatbands.

## The 17th century

During the 17th century there was political turmoil throughout Europe and civil war in England. Women's clothing was more restrained; the farthingale and elaborate detail on clothing disappeared. Gowns were made of plain silk with wide necklines and a separate broad collar of lace; the skirt, supported by petticoats, fell in deep folds from a tight-fitting bodice. The **muff**, usually made from fur, was introduced for the first time and became an indispensable item to protect women's hands against the cold.



17th-century man and woman



Anne of Austria, Queen of France and Navarre for a short period in the 17th century

Men's clothing was still quite elaborate. Long boots were worn, often reaching mid-thigh. The boots were decorated with fringed tops or lace ruffles and jewelled buckles. Men's doublets were short, showing the shirt.

Puritans wore simple clothing consisting of a plain brown or black gown with starched collar bands and cuffs. In 1660, Charles II came to power and introduced the 'vest' or calf-length coat.

In the late 17th century, Louis XIV dictated fashion in Europe. Clothing again became highly decorative with appliquéd motifs of gold and silver brocade, ribbons, bows and rich lace trimmings. France became the centre of the fashion industry and remained so until the second half of the 20th century.

## The 18th century

The 18th century saw huge developments in the textile industry with the inventions of the flying shuttle and spinning jenny. For the first time, block-printed coloured cottons were available and affordable to the general public. A middle class emerged and fashionable clothing became accessible for the majority, not just the aristocracy.

Men's clothing did not change much in the 18th century. They wore a full-skirted coat, waistcoat, narrow **breeches**, a wig (powdered white) and a three-cornered hat. By the mid-1700s the coat was cut away at the front and buttons were often omitted.



18th-century woman and man



Catherine II, the Empress of Russia (1729–96)

The shapes of women's clothing went through a variety of changes and women began to wear structures under their gowns to create different shapes. **Panniers** were popular; they were made from a basket-like material and sat on the hips, creating a silhouette with wide hips but flat at the front and back. Panniers were up to 180 cm wide and women needed to walk sideways to fit through doors. Bright-coloured tiny bows and frills were added to gowns. Around 1780, the inconvenient panniers were replaced by the **bustle**, with fabric bunched at the back. Muslin was used to create a shawl that was draped around the shoulders and tied around the back.

## The French Revolution: 1789–1815

The French Revolution had a profound effect on dress. Paris was the centre of the fashion industry and changes there were reflected throughout the Western world.

Both males and females wore simpler clothing inspired by Ancient Greece and Rome. Panniers, bum rolls, corsets and petticoats were no longer worn. Women wore slim, high-waisted dresses of the thinnest cotton, with low necks and tiny sleeves. They also wore simple sandals. Men no longer wore embroidered cloth or powdered wigs, now wearing styles similar to mid-17th century designs.

## The early 19th century

The early 19th century was a time of great change. The industrial revolution meant that for the first time birth did not dictate social status; wealth could be created through hard work. A powerful middle class emerged with lots of money to spend on clothes. Fashion journals appeared, describing the latest trends and where to buy fabric and accessories. Department stores opened in large cities and off-the-rack clothing appeared for the first time.



French Revolution woman and man

Women's skirts widened, and printed cottons and silks replaced lightweight muslins. The fullness under the skirts was created by up to ten starched petticoats. Waistlines dropped to the actual waist and became much tighter. The corset was introduced again, stiffened with either whalebone or steel. Puffed sleeves, including the **leg o'mutton**, became fashionable. For men, the cutaway coat was still popular but was gradually replaced with a double-breasted tailcoat. Men's fashion had the same goal as women's – narrow waist and wide hips.



Early 19th-century woman and man



Gown with 'leg o'mutton' puffed sleeves

## The late 19th century

### The crinoline: 1850–70

The 1850s saw the appearance of **haute couture**. This was the beginning of the fashion house. Charles Frederick Worth, an Englishman working in Paris, revolutionised the fashion industry by being the first to market fashion by displaying his collections on the catwalk and on mannequins in his shop.

The major change in fashion at this time was the invention of a **crinoline** that was affordable to all. Women of all classes wore the crinoline frame, but only the rich could afford the most extravagantly decorated dresses. The advent of the sewing machine in 1851 also made fashion more accessible to all classes.

Men's clothing underwent little change from this time until World War I. They wore a frock coat for daywear and tails for evening wear. Checks or plaids replaced embroidery for decoration. Full-length trousers replaced knee-length breeches.

### The bustle: 1870–1900

By the 1870s, the crinoline was no longer worn and the bustle of the 18th century returned. The skirt was ankle length in the front but had a small train at the back. The bustle of this time often consisted of two or three different fabrics, trimmed with folds, frills and pleats.

In the late 1880s, women's clothing took on a masculine feel with the introduction of separate skirts worn with blouses and jackets. The blouses had high collars and the jackets had wide sleeves. Women's clothing was very colourful, whereas men's clothing was very sober. The top hat became very popular.



Crinoline showing structure underneath



15.2 The crinoline reinvented  
15.3 A new look at the bustle

Stockphoto



Dress with a bustle



Princess of Wales, 1890



Victorian fashion: young 19th-century women

## Apparel in the 20th century

Since 1900, daily lives have been transformed by events such as the two world wars, conflicts, the beginning of new nations and the decline of some traditional cultures, post-war population explosions and the ever-shrinking boundaries of the world as a result of technological advances. Apparel in the 20th century has been a focal point of change and can be traced through photographs.

The 20th century saw great changes in the role of women in society and their clothing reflected these changes. Although clothing was still restrictive, it took on an S-bend shape, with the bust pushed forwards by a corset and the hips pushed backwards. Lacy fabrics were worn and accessories included a parasol and large hat.



Fashion history 1900–10  
([www.youtube.com/watch?v=tVqoUtvxSSI](http://www.youtube.com/watch?v=tVqoUtvxSSI))



1900s woman and man



Mason family, 1911

## Clothing in Australia

Australia, a vast country with an abundance of raw materials, has prospered under global changes. Australia is a multicultural nation as millions of people have migrated here in search of a better life, bringing with them their rich cultural heritage and ways of life. What we wear today is a basic characteristic of our many cultures and reflects our changing society. The history of apparel in Australia is an exciting one.

### Indigenous Australians

Prior to contact with British colonists, Indigenous Australians adapted to the climate of each region and clothing was not always considered essential. In colder climates such as Victoria, possum, kangaroo and wallaby skin cloaks were worn to give protection from the elements. In warmer regions, decoration rather than clothing, in a European sense, was customarily used for ceremonial purposes.



15.4 Cultural heritage



Indigenous Australians wearing animal skins, 1858



Indigenous Australians in European clothes

Photos from Getty Images

During the 20th century the kinds of clothes worn by Australia's indigenous population were influenced by European styles.

### Fashion silhouettes

The changing **fashion silhouette** can be often followed and studied in terms of historical, cultural and contemporary influences.

#### Historical influences

**Historical influences** relate to a particular era or historical period, and are often due to events, people and resources available during that particular period. Consider the year 1929, during the Great Depression. This world event had a major effect on the economy and the resources available during that time, and had a significant impact on the world leaders and their decisions for their citizens. The fashion silhouette was influenced as rations took their toll on design concepts.

#### Cultural influences

**Cultural influences** also affect textile design. The influence of a culture's dance and movement, art, social life and practising artists such as music icons or celebrities all become inspirational sources for designers to use in the fashion silhouette. A culture's architectural style may also impact on textiles and design as style and silhouette can be mirrored in clothing. For example, the columns and decorative carvings in ancient Greek architecture were re-created in their fabric drapes, folds and patterns.

Inventions and technology can affect design choices and the silhouettes created. The available resources, such as machinery and dye technology, affect what can be fashioned. This includes fibre, yarn, fabric and clothing manufacture, as well as the colouration and decoration of cloth.

Other significant contributions to the fashion silhouette include religion, belief, values, attitudes, travel and global cultural exchanges of ideas. These can alter the ideal of what is accepted in a society or what is celebrated in that culture. All silhouettes are affected by economics. At particular times politics will also influence style, silhouette and textile design. For example, leaders of a particular culture may pass laws to instruct a community to wear or refrain from wearing particular items of clothing in public.

## Contemporary influences

**Contemporary influences**, such as current trends, affect current fashion silhouettes. This is seen in our current concern for the environment and sustainability, and the attention to ecodesign. Technology and innovation influence future textiles, which in turn influences the fashion silhouette by making new opportunities to design different silhouettes using emerging technologies in machinery, finishing techniques and innovative fabrications.



1920s fashions  
([www.youtube.com/watch?v=1pwG-kRi0-Y](http://www.youtube.com/watch?v=1pwG-kRi0-Y))



15.5 Researching  
20th-century fashion



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Silhouettes of fashion

## The 1920s

The outbreak of World War I brought the fashion industry to a standstill. Women worked for the first time and required suitable clothing. Skirts became shorter and although corsets were still worn they were no longer as tightly laced. Elasticised pull-on **girdles** and separate brassieres appeared for the first time. By the mid-1920s, women's clothing had taken on a boyish look. Arms were bare, waists were on the hips and garments resembled loose tubes.

Coco Chanel was an important figure in the fashion industry in the 1920s. She specialised in attention to detail as the perfect cut and finish were essential for a quality garment.



1920s woman and man



Wedding in 1927 – Ivy and Norman White

## The 1930s

In the 1930s, the boyish look of women's clothing gave way to a flowing and more feminine look. Skirts were lowered to mid-calf length and often cut on the **bias**. Pleats and **godets** were incorporated below the knee for fullness. There was a distinction between the clothes worn during the day and clothes suitable for evening wear. Clothing was now designed for the activity being undertaken. Beachwear became popular. Women wore a swimsuit made from wool and covered it with a white towelling coat. Casual clothing was introduced and trousers were acceptable leisure-time clothing for women.

Cinema was an important influence. Many women tried to dress like their favourite movie star. Iconic women included Marlene Dietrich, Greta Garbo and Rita Hayworth. Iconic men included Cary Grant, Humphrey Bogart and Fred Astaire.



1930s fashions  
([www.youtube.com/watch?v=PnZCVkP7GIE](http://www.youtube.com/watch?v=PnZCVkP7GIE))  
1940s fashions  
([www.youtube.com/watch?v=W92Vxt0oFA0](http://www.youtube.com/watch?v=W92Vxt0oFA0))



1930s woman and man



iStockphoto

Young woman, 1935

## The 1940s

Once again, war halted the fashion industry. In 1941 the British government introduced 'utility clothing' regulations. Limits were placed on manufacturers in terms of the amount of fabric that could be used in a garment and the number of styles that could be created each year. The wartime silhouette featured a shortish skirt and a square-shouldered jacket. After the war ended, a young designer in Paris called Christian Dior introduced 'the New Look'. After the austere fashion of the war years, this fashion, with its wide, full skirts, was an instant success. The garments were made from a mixture of natural and manufactured fibres.



1940s woman and man

## The 1950s

Dior continued to be the most influential fashion designer in the 1950s. Skirts were full or pencil-thin. Full skirts were worn over stiff nylon petticoats. Knitwear became a high-fashion item. Nylon was now used for clothing.

Due to its thermoplastic properties, nylon could be set in a shape, making undergarments redundant for creating shape. Nylon stockings no longer had seams. Further developments in manufactured fibres resulted in wash-and-wear fabrics.



1950s woman and man



A well-dressed woman out to dinner, 1950

iStockphoto



1950s fashions  
([www.youtube.com/watch?v=Y1PYe4IRF-U](http://www.youtube.com/watch?v=Y1PYe4IRF-U))

1960s fashion, hairstyles  
and hippies  
([www.youtube.com/watch?v=Y62LbavwSI&feature=fvst](http://www.youtube.com/watch?v=Y62LbavwSI&feature=fvst))

1970s fashions  
([www.youtube.com/watch?v=1MIsJ2Kcjvw](http://www.youtube.com/watch?v=1MIsJ2Kcjvw))

## The 1960s

In the 1960s, young designers opened boutiques, especially in London. Paris no longer dictated fashion.

Young people were an important part of the fashion market. They were strongly influenced by what was around them, including film and music. Mini-skirts were popular, as were clashing colour combinations. Unisex clothing, especially T-shirts and jeans, were the clothes of the teenage population. Fashion was more about individual preferences and breaking established rules.

## The 1970s

In the 1970s, anyone could wear almost anything, anywhere. Jeans were popular for all occasions. Hemlines dropped back to the mid-calf. Floral prints or brightly coloured geometric designs were used for shirts and dresses. Ethnic fashions were popular, with full skirts, puffed sleeves and frills. Sports clothing, including tracksuits and lycra suits, were now worn as casual clothing.



1960s woman and man



1970s woman and man



1980s fashion  
(www.youtube.com/watch?v=iIMS\_U1WtE0)

1990s fashions  
(www.youtube.com/watch?v=4r0bz4Ugvl0&feature=related)

## The 1980s

The 1980s were a time of economic prosperity. Youth no longer controlled the fashion market. New technologies were developed, resulting in new easy-care fabrics. Big was seen as better. Women's suits were tailored but large shoulder pads exaggerated the shoulders. This type of look was termed 'power dressing' and suggested the increasing authority women had achieved in the workplace. Hairstyles grew larger to match the look. Strong colours – including purple, red, bright blue and hot pink – were popular. Appliqué was often used to decorate clothing.



1980s woman and man

1990s woman and man

## The 1990s

Casual clothing was the norm in the 1990s, with the focus on individuality. The 'hip-hop' look of loose cargo pants and baggy jeans was popular for teenagers. Fitness sportswear also became the clothing of youth.

Most women had a trouser suit in their wardrobe. Jackets were mid-thigh in length and trousers were straight. Undergarments became outer garments and corsets were a fashion item. Bra straps were no longer hidden – it was respectable for them to be visible.

Western fashion was influenced by Asia. Mandarin collars on straight dresses were popular. Garments were decorated with Asian embroidery and beading.

Black and neutrals were the colours of the 1990s.

Red carpet runways, show-stopping gowns, the Academy Awards, the Grammy Awards, designer names and celebrity stylists paved the way for iconic front-page magic. The fashion often centred on the press given for the style. Liz Hurley's famous Versace safety-pin dress in 1994 and Jennifer Lopez's daring Versace jungle-print dress in 2000 gave both ladies worldwide press with their associated fashion. Iconic women of this decade include Princess Diana, who had an impact on fashion silhouettes.

The logo also became a fashion must-have during this decade. Association with Gucci, Lagerfeld for Chanel, Dior, Burberry and Louis Vuitton were synonymous with high-class fashion. Designer bags also became fashionable, with names such as Louis Vuitton, Coach and Chanel being desirable. Patricia Field, stylist for the television show *Sex and the City*, brought about eclectic fashion mixes that incorporated designer labels, vintage and cutting-edge fashion.

iStockphoto



A dress worn by Diana, Princess of Wales

## 2000–11

Globalisation created the opportunity for fashionistas to keep up with changing silhouettes in apparel at the touch of a keyboard. Fashion houses and websites place runway collections on the Internet as they happen.

Technology and innovation in fibres, yarns and fabrics became the focus for the future. Avant-garde designers such as Hussein Chalayan, Christopher Kane, Gareth Pugh and the late Alexander McQueen combined futuristic design with technology to create innovative fashion. Often the garments are simple architectural styles made with exceptional digital image fabrics or laser-cut lace, or include mechanics or technology.

Sustainability and eco-concerns also became high on the fashion agenda. Organic fabrics were being sought after with more consumers being aware of their choices and the impact on the environment. Vintage fashions and retro looks were still enjoying success, partly due to the appeal of finding a unique one-off piece rather than a mass-produced import, as well as the importance of recycling to the current generation. Ethical clothing and fashion forums have informed consumers through websites, online blogs and e-commerce. Australian fashion designers Anna Plunkett and Luke Sales, with their label 'Romance was born', explored the parameters of digital printing as a surface design with great success.



Dita Von Teese, Fashion Week 2011, New York City



Prince William and Kate Middleton greet the crowd after their wedding, 2011

Photos from Shutterstock.com

## 2012 and beyond

Studying fashion timelines points to reinvention of past styles and themes. It is predicted this trend will continue in the future as people idolise past eras and the feelings they represent. Sustainability will continue to be an ongoing concern as designers look for a cleaner, greener carbon footprint. Technology will continue to affect fibres, yarns and fabrics, which will come in the form of amazing design surfaces and engineered fabrics for specific end-use, including medical, sporting and general apparel.

The Internet, especially social networking, does not appear to be slowing down. Online stores and designers enjoy great success using Facebook, Twitter or online blogs to generate market interest.

Style icons of this era so far include Kate Middleton, Lady GaGa, Katy Perry, Bambi Northwood-Blyth and Dita Von Teese. Television shows such as *Project Runway* and *Australia's Next Top Model* continue to keep designers' names on our minds. Drama productions such as *Home and Away* showcase Australian coastal life and surf-wear styles, while *Gossip Girl* sends us images of Manhattan's elite youth culture.

iStockphoto



Drew Barrymore wearing an Alexander McQueen laser-cut lace dress, 2009



2000s fashions  
([www.youtube.com/watch?v=fnz0d43pbCg](http://www.youtube.com/watch?v=fnz0d43pbCg))

Australian Fashion Week 2010  
([www.youtube.com/watch?v=NM1nQXKqfXo](http://www.youtube.com/watch?v=NM1nQXKqfXo))

Fashion documentaries  
([www.youtube.com/watch?v=C5hHXzfAy5E](http://www.youtube.com/watch?v=C5hHXzfAy5E))  
([www.youtube.com/watch?v=Zl-UVgcTlqM](http://www.youtube.com/watch?v=Zl-UVgcTlqM))  
([www.youtube.com/watch?v=HWqVG4iObTk](http://www.youtube.com/watch?v=HWqVG4iObTk))



15.6 Cutting-edge technology  
15.7 Future fashion

Shutterstock.com



Lady GaGa, an icon of the 21st century

# The history of swimwear



Woollen swimming dress with sailor collar, bloomers and mop cap, 1900–09



Sleeveless two-piece woollen tank suit, 1910–19



Short-leg swimsuit, 1920–29



Glamour swimsuit inspired by the film industry, 1930–39



Two-piece spotted halter-neck swimsuit, 1940–49

## Pre-1900

In 1833 the New South Wales government passed an act prohibiting swimming in Sydney Harbour from 6 a.m. to 8 p.m. Women were not allowed to swim in public. If men went swimming, they wore one-piece wool flannel suits that covered them from neck to knee.

## 1900–09

By the turn of the century, people were defying the ‘no daytime’ swimming laws. In the early 1900s people at the beach were wearing bloomers with a woollen overdress. Women sewed lead weights into the hem of their swim dress to prevent the garment from floating up and exposing the legs. To cover their legs they also wore black stockings and lace-up shoes. Men and women swam in separate areas at the beach. In 1907, Annette Kellerman was arrested for wearing a one-piece swimsuit. The swimsuit challenged society’s concept of morality.

## 1910–19

The desire to sunbathe rather than swim brought about style changes in swimwear after World War I. Swimwear became more fitted, although swimsuits were still made from wool.

## 1920–29

By the 1920s, going to the beach had become very popular. Laws were introduced stating what could be worn at the beach. Skin-tight tubular swimsuits made from wool jersey became the style. These swimsuits bared arms and backs.



Shirred one-piece swimsuit, 1950–59



Striped high-waisted bikini, 1950–59



Skirt bikini, 1960–69



Crocheted bikini, 1970–79



String jersey knit bikini, 1970–79

### 1930–39

Lifesavers bared their chests for the first time in the 1930s. Swimwear designers used movie stars, including Esther Williams, to promote their designs. Necklines became lower, hemlines higher and cutout sections were popular. Shoulder straps could also be lowered for sunbaking.

### 1940–49

The bikini was patented in 1946 by Louis Réard. Corsets or bra cups were built into swimsuits to create shape. Zippers were still used in the centre back of swimsuits.

### 1950–59

A new swimming pool culture developed in the 1950s – it was acceptable to sit and sunbake by the pool but not get wet.

### 1960–69

Lycra and nylon were introduced to swimwear in the 1960s. These fabrics gave stretch to swimwear and there was no longer a need for zippers. Elastic was used around edges to hold them in place.

### 1970–79

In the 1970s, Australia became a leader in bikini designs. A surf culture evolved with its own music, values and surf brand clothing.

### 1980 onwards

By the 1980s it was acceptable to wear anything to the beach, including one-piece swimsuits, bikinis, wetsuits and tan-through fabrics.



Fashion swimwear



15.8 Swimwear in the 21st century

Source of images: Karen Pini in style department and Modelling Studio, [www.karenpini.com.au](http://www.karenpini.com.au)

# The history of jeans

Mary Evans/Classic Stock/H. Armstrong Roberts

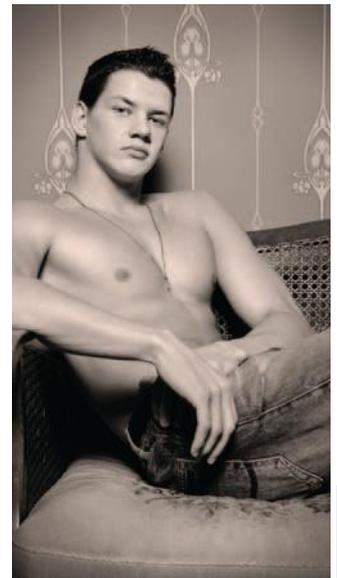


Men wearing workwear jeans during the Great Depression, 1930–39



Alamy/Tony Rusecki

High-waisted jeans with side fastening, 1940–49



iStockphoto

Jeans became symbolic of youth culture and rebellion, 1950–59



Farm labourer wearing denim work overalls, 1900–29

## Pre-1900

In the 16th century sailors from Genoa, Italy, used a 'jean' cloth material for clothing. Around the same time in England, a material was produced for clothes that would later be called denim. Levi Strauss and Jacob Davis made a deal in 1873 to patent a new copper-riveted waist overall. It wasn't long before all types of working men were buying the innovative new pants and spreading the word about the new durable and comfortable 'Levi' overalls.

## 1900–29

Jeans were mostly worn in the form of work overalls for labourers and fruit pickers. By the 1920s, jeans were the most popular men's work pants, although still used only by labourers.

## 1930–39

During the Depression jeans were mostly used as workwear. They were loose fitting and mainly worn in rural or farming communities as they were not considered a fashion item. Denim was used for children's clothing as it transcended age but not gender. Levis Strauss and Co. depicted a female model in jeans in a 1936 edition of *Vogue Magazine*.

## 1940–49

During World War II jeans were introduced to women, who vamped up the style by rolling the bottom of the jeans up or cutting them off to make the infamous high-waisted denim shorts of the 1940s' pin-up style. Jeans were considered appropriate work pants for both men and women to wear in factories during wartime. For women's jeans, the zipper went down the right side instead of the front.

## 1950–59

Rock and film stars like Elvis Presley, James Dean and Marlon Brando sported jeans, making jeans internationally desirable in the 1950s. Jeans became associated with rock-and-roll and pop music, suggested rebellion and reflected a youth culture.

iStockphoto



Levi 501s, button-fly front jeans, 1960–69

Shutterstock.com



Hand-embellished and personalised jeans with flared or bell-bottom legs, 1970–79

Alamy/PYMCA



Stone-washed, ripped jeans, 1980–89

Shutterstock.com



Hipster jeans, 1990–99

## 1960–69

Pre-shrunk jeans were introduced in the 1960s. Levi's 501s sourced inspiration from traditional button-fly jeans designed in the Victorian era.

## 1970–79

Individuals began to personalise jeans by decorating them with patches, floral embroidery, metal eyelets, studs and graffiti. Flared, bell-bottom versions of jeans became popular. Jeans were a great hit with flower people and the hippie revolution.

## 1980–89

By the 1980s, ripped, frayed and torn jeans were very fashionable. Coloured jeans from white through to pastels were also popular. Stone-washed and acid-washed blue jeans became a must-have fashion item. Designer label jeans also became an important fashion icon.

## 1990–99

Manufacturers added lycra to jeans to increase elasticity and comfort, and the skinny jean returned. The era started off with the over-dyed dark denims and ended in very faded, almost white denim. The hipster jean also returned.

## 2000–10

During this decade the handpicked denim marketplace was flooded with coded urban symbols and not-so-subtle stitching of logos blazoned across the jeans. The status of designer jeans was of high importance.

## 2011 and beyond

Fibres, yarns and fabrics continue to be heightened by technology. Eco-conscious fashion buyers will look for jeans made of organic cotton and bamboo, as well as recycled treasures at vintage shops. Ethical consumers are recognising the need to buy jeans that have been manufactured under ethical employment.



Urban jeans

Shutterstock.com



15.9 Focus area timelines

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Define the following terms: historical design, cultural influence and contemporary influence.
- 2 Draping fabrics is a common practice in historical silhouettes, cultural design and modern-day and contemporary design. Define the term *draping* and describe how draping is used in one of the design eras.
- 3 The history of the fashion silhouette can be an inspiring starting point for a modern design. Select an era of your choice and explain how the designs from this era could be reinterpreted into a contemporary design.
- 4 After reading the history of jeans, research the current trends in jeans. This may be done as an Internet search, or you may like to take a short survey of styles, colours and designs available in your local shopping centre. Write your findings down as a one-paragraph conclusion of current trends.
- 5 Reflect on the nature of historical design on design inspiration. Which silhouettes do you think you might use in the development of your Major Textiles Project? Explain why you have selected these particular historical eras.

## Websites

- ☉ Fashion-Era ([www.fashion-era.com](http://www.fashion-era.com)): A comprehensive site that documents the fashion history of many eras and highlights silhouettes. This site includes a substantial list of resources, including blackline historical silhouettes.
- ☉ Australian History Research ([www.australianhistoryresearch.info/victorian-fashions/](http://www.australianhistoryresearch.info/victorian-fashions/)): This section of the Australian History Research site is dedicated to Australian fashion in the Victorian era.
- ☉ The Australian Dress Register ([www.australiandressregister.org](http://www.australiandressregister.org)): A collaborative, online project about dress in New South Wales pre-1945. This includes men's, women's and children's clothing ranging from special occasion clothes to everyday wear.
- ☉ Powerhouse Museum ([www.powerhousemuseum.com](http://www.powerhousemuseum.com)): A brilliant resource for historical, cultural and contemporary textiles.
- ☉ Speedo ([www.speedo.com.au](http://www.speedo.com.au)): A great resource for the history of, and current trends in, swimwear.
- ☉ Levi's ([www.levi.com.au](http://www.levi.com.au)): The 'About Levi's' section of this website outlines the history of Levi's 501 jeans.
- ☉ Nobody ([www.nobody.com.au](http://www.nobody.com.au)): The website of the ethically accredited Australian jeans brand Nobody.



15.10 Historical design  
palm cards



# Fabric colouration and decoration

# 16

## Applying colour – printing and dyeing

Colour is probably the most important aspect in design inspiration and perceived aesthetic value of textiles. Colour, in its intensity, depth and reflection, is a powerful visual element. Fabric can be coloured by printing or dyeing methods.

The development of coloured cloth has been well documented throughout history. Making dyes from plant and animal substances dates back to the very beginning of civilisation. Indigo (from the leaf of *Indigifera tinctorial*) gives a very fast blue dye that has been known to the people of Asia earlier than 3000 BCE. Tyrian purple (derived from shellfish) was the most highly prized and expensive dye of ancient times. Cochineal (from the cochineal beetle found on the cactus plant) was originally cultivated in Mexico and gave outstanding reds and purples depending on the **mordants** used.

In the 21st century, dyes and pigments are mostly synthesised and manufactured from coal or petroleum-based organic compounds. The contemporary textile industry is aware of the consumer's desire for 'just the right colour' – the current fashion fad or trend of the time. Manufacturers are also aware that consumers are particularly irritated if the colour of a garment is not maintained for the anticipated life of the product. This is referred to as colour fastness. Labels are added to garments where colours are 'designed to fade'.

## Work health and safety – printing and dyeing

All chemicals need to be treated with care and common sense. Dyestuff and printing pastes must be handled, stored and used following the maker's instructions.

To maintain safe working practices when dyeing and printing:

- always wear rubber gloves and a protective covering, such as an apron or old shirt
- avoid inhaling dust from dry dye powders and vapours from dye pots
- do not consume food in the work area
- store dyes and chemicals in a suitable place and in a suitable container
- when mixing dyes with water, always add the dye to the water and never the other way around
- work in a well-ventilated area
- keep the containers and equipment for dyeing and printing only for that purpose
- dispose of dyes carefully, considering environmental hazards.

iStockphoto



Workers dyeing wool in the dyers' souk, Marrakech, Morocco



Colour fastness is an important factor in contemporary textiles, such as children's brightly coloured clothing.

## Printing

A pigment is an insoluble, coloured substance that is applied to the surface of the matter to be coloured. It is usually attached by some form of binding material. Printing paste tends to be quite viscous.

**Printing** is the textile art of imparting a surface decoration design via a pigment-based paint that allows for greater flexibility in colouration of patterned fabrics. Printing designs on a fabric is an economical way to colour or pattern that fabric. Printed designs can also form the basis of embroidery design work. Printing is a part of cultural and contemporary textile colouration and patterning of yarns and fabrics. Printing enables multi-coloured patterning of an intricate design. Printed designs can be applied to yarns, fabric or finished products.

### The principles of printing

There are various methods of printing but the basic principles involved are very similar.

- 1 A printing bed is prepared using a soft resist underneath a hard surface.
- 2 A viscous printing paste is applied to the raised surface of a print tool.
- 3 The print tool is then pressed directly and firmly onto the fabric. Sometimes a rubber mallet is used to ensure even contact with the textile material.
- 4 Often the printed design is repeated. Aligning the print is known as registration.
- 5 Printed fabric is then heat-set via steaming or ironing to ensure the print paste penetrates the fibres.
- 6 Printed fabrics are then washed to remove any debris, residue or non-fixed colour.

### Direct printing

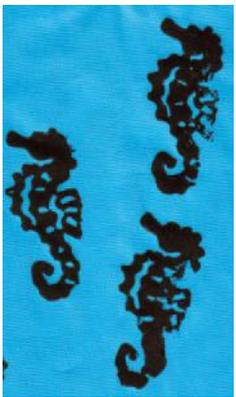
Direct printing is the most common printing technique, where a textile material has a design directly printed on the surface of the fabric. This can occur at fabric or yarn stage. Types of direct printing include block printing, roller printing and warp printing.

### Block printing

Block printing is one of the oldest methods used to print patterns onto textile materials. Blocks can be made out of a variety of materials, such as potato, wood, foam, metal or lino. A design is carved into the block medium. The patterns are usually hand-carved and are unique. Block printing tends to be slow and time-consuming, and it is often difficult to align design work when repeating patterns. Most block prints are mono-colour, but several colours can be achieved if necessary.

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Hints for successful printing  
TEXD12AD160046



Seahorse carved in EVA foam  
block print mounted on wood  
– monotone print



Fabric block-printing –  
Rajasthan, India  
([www.youtube.com/watch?v=LZ4-0shRurE](http://www.youtube.com/watch?v=LZ4-0shRurE))



Wood-mounted blocks for hand printing of patterns on fabric



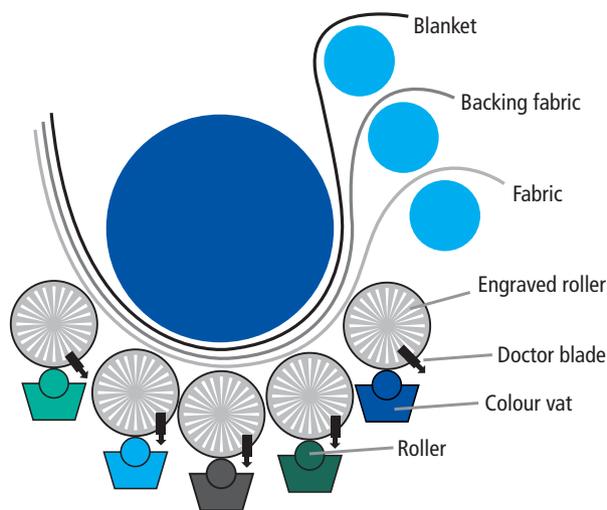
Detail of block-printed elephant in vegetable dyes –  
Rajasthan, India

iStockphoto

## Roller printing

Roller printing is another method of direct printing. Roller printing allows multi-colour printing. It is a cheaper method of printing than block printing as it is less labour-intensive. Roller printing is a continuous mechanical process that can produce large quantities of fabric.

The rollers are engraved or etched with designs that are subsequently rolled onto the fabric to repeat the pattern. Up to 16 colours can be used in roller printing, as each roller holds a different colour. The printed designs can be intricate and fine, which allows complex patterns to be created. The rollers pick up the single colour from the colour vat, which is then transferred to the etched roller. Any excess printing paste is scraped from the engraved roller by a small blade to ensure a sharp print. The design from the engraved roller is then printed directly onto the fabric. The role of the blanket is to ensure a sharp print and the backing fabric absorbs any excess colour from the printing process.



This roller printer diagram demonstrates a five-colour printed fabric system, with each roller etched or engraved with a different pattern.

Another roller printing method involves the colour being printed onto a paper. The paper print is then transferred to the fabric using **sublimation printing**.

## Warp printing

Warp printing is used to print designs onto warped yarns, which are then woven with plain-dyed weft yarns. The printed yarn produces a fabric with soft, blurry, muted-tone designs. This process is used on taffeta, cotton and furnishing fabrics.

## Resist printing

Resist printing uses a resist to prevent the printing paste being applied to the fabric. Resist printing methods include batik, stencil printing, screen printing and Ikat.

### Batik

Wax is the printing medium of **batik**. The wax is stamped using a tjap, or drawn on the fabric using a tool known as a tjanting. Batik is later dyed, and the process of applying wax and then dyeing can be repeated several times to produce different effects and colours. After dyeing, the wax resist must be scoured from the cloth. Batik is a slow, labour-intensive manual process. Batik requires careful planning of design work to achieve the desired result.



Making Ikat fabric video  
([www.youtube.com/watch?v=vL52KdgvzQ](http://www.youtube.com/watch?v=vL52KdgvzQ))

Sublimation rotary heat press video  
([www.youtube.com/watch?v=RlxN8bHSV9g](http://www.youtube.com/watch?v=RlxN8bHSV9g))

How to do batik video  
([www.youtube.com/watch?v=ohJxPCte\\_FM](http://www.youtube.com/watch?v=ohJxPCte_FM))

iStockphoto



Batik – the tjanting tool used to paint the wax design onto the fabric to produce a resist

iStockphoto



A tjap is a copper stamp used to create wax-printed designs for batik

## Stencil printing

Stencil printing uses a resist such as acetate, plastic, contact paper or masking tape. The design is cut into a sticky resist paper or film, then stencilling brushes or sponges are used to apply the printing paste and colour to the design.



Intricate contemporary batik textile art featuring ballet dancers – signed with the artist's name, B. Victor



Stencil design – butterflies



Nottingham city flag video  
([www.youtube.com/watch?v=omiNRTXj87C](http://www.youtube.com/watch?v=omiNRTXj87C))

## Hand or manual screen printing

Screen printing was developed from stencilling, and can be carried out by hand or machine. Hand screen printing involves labour-intensive work and excellent skills in registration, especially where different colours are involved in the design work. A screen is made for each colour to be used in the design. The frame is laid down onto the printing bed and a squeegee is used to force the printing paste through the designed areas on the screen mesh. The screen must then be carefully lifted from the fabric and repositioned for the next print.



Original hand drawing of a seahorse is photocopied



The seahorse copy and the mesh are fed through a thermal fax machine where the carbon from the copy bites into the RISO screen mesh and leaves tiny gaps where the printing paste can seep through.



Screen printer in action

Photo courtesy of Signature Prints

## Machine or flat-bed screen printing

Screen printing can also be completed by machinery and the basic principles of manual screen printing still apply. The screens of silk, nylon or polyester are coated with a photosensitive emulsion. This emulsion acts as a sealer or barrier to prevent the printing paste from coming through the screen. The design to be printed is then photographed. Photographic plates for each colour are made. The photographic print is then placed on the screen and exposed to light. A chemical reaction takes place and the residual photosensitive emulsion is simply washed away.



Contemporary hand screen-printed RISO seahorse print

The fabric to be printed is placed on a conveyor belt. A series of flat screens are positioned above the conveyor belt and lowered automatically. Careful positioning of the screens is required to register the print. Often small colour blocks are placed along the selvedge to aid in print alignment.

The printing paste is forced through the screen with the aid of automated squeegees and the design is then printed onto the fabric. The process is repeated for each colour required in the design. The fabric then continues to move along the conveyor belt to be heat-set or cured in drying ovens. Flat-bed screen printing is used for wide fabrics.

### Rotary screen printing

The mechanisation of a rotary screen printer allows a continuous operation, unlike the stop-start action of flat-bed screen printing. Rotary screen printing uses cylindrical screens. The printing paste is forced through the inside of the roller via automated squeegees. Rotary screens are much cheaper to produce than the copper rollers used in roller printing. Most fabrics are screen printed in this manner, but the design is limited to the size of the roller so wide fabrics cannot be printed using this method.

### Ikat

**Ikat** resist printing is created by binding the yarns at intervals along the length of the yarn. The design is then printed or painted onto the surface of the yarn using dyes. Designs can be created on warp yarns, weft yarns or both yarns, which is known as double ikat. Double ikat requires careful planning and designing to achieve the desired effect. The binding is then removed and the yarns are woven into fabrics. The resultant ikat resist fabric has noticeable blurred or fuzzy edges where the resist has been used to design the print.



Ikat tied yarns resist the dye.



Ikat fabric



Rotary screen printing  
([www.youtube.com/watch?v=NQpmFFarsZA](http://www.youtube.com/watch?v=NQpmFFarsZA))

### Heat transfer printing

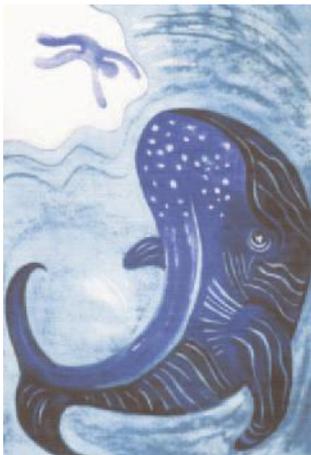
Heat transfer printing requires the use of a specially printed paper. The designs are heated at a high temperature with no steam, and pressure is used over a short period of time to transfer the design to the fabric. This printing method relies on the principle of **sublimation**, where the dye changes from a solid to a gas without passing through the normal liquid stage in between. This means the textile fabric does not require wetting out.

The design is printed onto paper using disperse dyes. The printed paper is placed on the face of the fabric and passed through pressure-heated rollers. The dyes sublimate and the print is passed onto the surface of the fabric. As this process does not require heat-setting or water, it is an economical and environmentally friendly printing method. The waste paper can also be recycled.



QualiJet XL 320 – extra-large digital textile printer  
([www.youtube.com/watch?v=nxjL2317NQ&NR=1&feature=fvwp](http://www.youtube.com/watch?v=nxjL2317NQ&NR=1&feature=fvwp))

Image courtesy of Kim Carpenter



Direct digital print featuring Kim Carpenter's original drawing for *Lullie the Iceberg-Soul of the Ice*

## Direct digital printing

**Direct digital printing (DDP)** involves printing directly onto fabric using inkjet technology and innovative CAD systems and programs. This technology allows DDP to produce the best possible results in all aspects of the design process and its application to textiles. Reactive dyes are used to print onto natural fibres such as cotton, silk, rayon and viscose. Disperse dyes are used to print onto polyester.

Currently the technology remains an industry application of decorative design for large-scale continuous printing, as DDP requires the use of high-end, large-scale specialist print machines capable of printing directly onto widths of fabric. DDP designs can be created on a home computer and printed directly onto fabric that has been treated with bubble jet solution, or printed onto commercially prepared fabric sheets. The use of DDP designs is limited only by the size of your printer.

## Discharge printing

Discharge printing is completed after the fabric has been dyed. The print paste contains a chemical that destroys the dye molecules from the print area and discharges the dye. It is usually used on dark fabrics featuring white designs. The discharge print usually contains a bleaching chemical, so it is necessary to remove all discharge print residue to ensure the printing paste does not weaken the fabric.

## Dyeing

A dye is a soluble colour that is applied from a solution called the dye liquor (or dye solution). It penetrates and combines with the fibre, yarn or fabric being dyed.

**Dyeing** can be defined as the process of applying a comparatively permanent colour to a fibre, yarn or fabric via immersion in a dye bath.

## Types of dyes

Dye type	Fibre type
Direct	Cellulosic
Reactive	Cellulosic, wool, silk, acrylic and nylon
Sulfur	Cellulosic
Azoic	Cotton and some polyesters
Vat	Cellulosic
Acid	Wool, silk, nylon, modified rayon, acrylic and polyester
Basic	Acrylic, polyester, nylon and discharge prints on cotton
Disperse	Polyester, nylon and synthetic fibres
Natural	Primarily used on natural fibres

## The principles of dyeing

There are various methods of dyeing, but the basic principles are very similar.

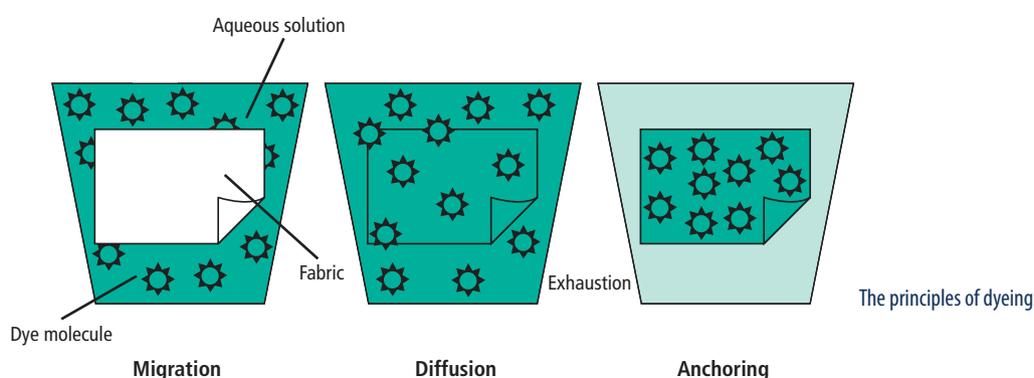
- 1 The quantity of dye is made by dissolving the dyestuff in a given quantity of water, usually determined by the weight of the fabric to be dyed. This is known as the dye solution or dye liquor.

- 2 The fibre, yarn or fabric is then traditionally wetted out, which helps the fibres to swell and causes the polymers to move apart slightly. This in turn makes the uptake of the dye slower and easier. The swelling also provides an enhanced consistency and a more even dye uptake.
- 3 The fibre, yarn or fabric is then immersed in the dye solution in a vessel, often called a dye bath or vat. The dye solution can also be applied as an emulsion or foam. Traditionally, water has been used, as it was the cheapest carrier of the dye.
- 4 The dye solution is agitated to assist dye uptake.
- 5 The dye solution then goes through migration, where the dye molecules are attracted and move towards the textile fibre, yarn or fabric. The dye solution loses its colour as the textile becomes dyed. This process is referred to as exhaustion.
- 6 Dye molecules then undergo diffusion. The dye molecules move or diffuse into the amorphous regions of the textile, and may be anchored in a variety of ways by a fixation process. Diffusion depends on the size of the dye molecule and the dye sites available in the fibre, and can be assisted by increasing the temperature and adding carrying agents. Anchoring of the dye is assisted by the natural forces and bonds that exist between the polymers of the fibre and the dye, the closing of the swollen fibres as the temperature of the dye bath is lowered and the dye is trapped inside the fibre, and by the use of mordants.

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Hints for successful dyeing  
TEXD12AD160047

It is important to understand that not all fibres, yarns and fabrics dye easily. Fibres that have good absorbency are considered good fibres to dye because they are generally more amorphous and have a greater number of dye sites in their molecular structure.



## Stages of dyeing

Stage of dyeing	How it is achieved	Advantages	Disadvantages
Pre-fibre	<ul style="list-style-type: none"> <li>Solution or dope dyeing</li> <li>The pigmentation of the solution prior to extrusion through the spinneret</li> </ul>	<ul style="list-style-type: none"> <li>Excellent for hard-to-dye fibres</li> <li>Outstanding colourfastness</li> <li>Solid, uniform colour</li> </ul>	<ul style="list-style-type: none"> <li>High cost</li> <li>Only available for manufactured fibres</li> </ul>
Fibre	<ul style="list-style-type: none"> <li>Stock or fibre dyeing</li> <li>The loose fibres are dyed before spinning</li> <li>Top dyeing is where tops or loose ropes of combed fibres are dyed</li> </ul>	<ul style="list-style-type: none"> <li>Good dye penetration</li> <li>Two tone or <b>heather patterning</b> can occur</li> <li>High quality</li> </ul>	<ul style="list-style-type: none"> <li>High cost</li> <li>Fibre dye uptake can vary</li> </ul>

Stage of dyeing	How it is achieved	Advantages	Disadvantages
Yarn	<ul style="list-style-type: none"> <li>Skein or beam dyeing</li> <li>The yarns are wrapped on cones or beams and then submerged into dye machinery vats; the dye is circulated through the yarn</li> </ul>	<ul style="list-style-type: none"> <li>High quality</li> <li>Used to create patterned fabrics</li> <li>Good dye penetration</li> </ul>	<ul style="list-style-type: none"> <li>High cost</li> </ul>
Fabric	<ul style="list-style-type: none"> <li>Piece dyeing, including: <ul style="list-style-type: none"> <li>– cross dyeing: a fabric made from two different fibres uses the properties of affinity and resistance of the dye to create colour combinations and patterning</li> <li>– union dyeing: the goal is to achieve uniformity of solid, even colour in the fabric</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Produces solid colour fabrics</li> <li>Lower cost</li> <li>Quick responses to fashion trends can be made</li> </ul>	<ul style="list-style-type: none"> <li>Requires well-prepared materials</li> <li>Requires excellent knowledge of dyeing technology and a sound knowledge of fibre, yarn and fabric properties</li> </ul>
Product	<ul style="list-style-type: none"> <li>Apparel or other finished products</li> </ul>	<ul style="list-style-type: none"> <li>Least expensive process</li> <li>Quick responses to fashion trends can be made</li> </ul>	<ul style="list-style-type: none"> <li>Requires well-prepared materials</li> <li>Seam or design areas where layers are evident may have uneven penetration</li> <li>threads, trims, fasteners etc. are difficult to match</li> </ul>

## Methods of dyeing

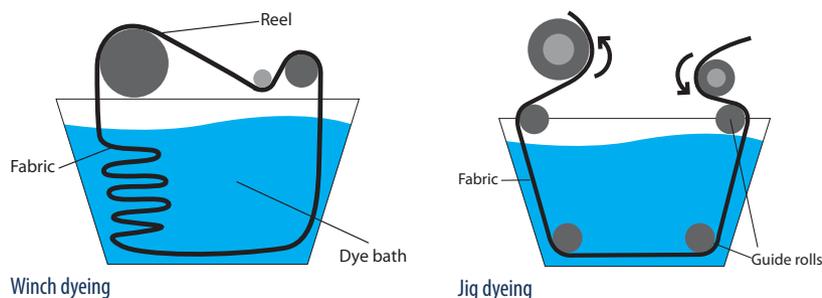
Methods of dyeing depend on the fabric weight, fibre content and type of dye required to obtain the best result for the finished product. Dyeing can be carried out in batches, continuously or in short lengths. Industry must adhere to strict controls to minimise the environmental impact of textile dyeing at all stages of the colouration and production process.

### Batch dyeing

Batch dyeing, sometimes referred to as exhaust dyeing, can be used at any stage of production. The fibre, yarn, fabric or end-product is circulated through a dye bath. This type of dyeing is excellent for short runs of textile materials. It is low cost and has the advantage of flexible colouring selection and temperature control.

### Winch dyeing

Winch dyeing is one of the oldest forms of dyeing. The fabric is sewn together at the ends and lifted in and out of the dye bath by a reel. Lightweight fabrics are dyed using this method. The dye penetrates the fibre due to continuous immersion in the dye bath. This type of dyeing is done on short runs of fabric.



Dyeing wool for rug production  
([www.youtube.com/watch?v=0Yn03vKBRKk&feature=related](http://www.youtube.com/watch?v=0Yn03vKBRKk&feature=related))

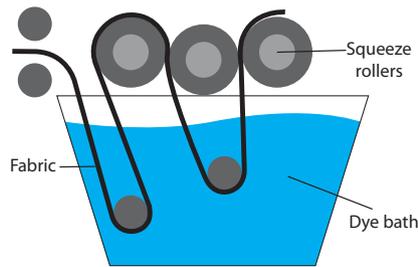
Rapid winch dyeing  
([www.youtube.com/watch?v=DZ4L7asjKMg](http://www.youtube.com/watch?v=DZ4L7asjKMg))

### Jig dyeing

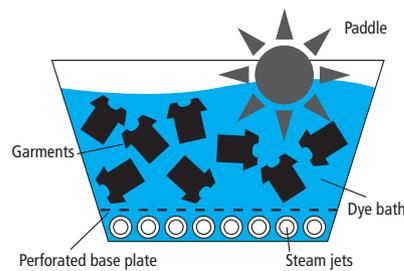
Jig dyeing requires two rolls situated above the dye bath. The fabric is carried around the rolls in an open width and rolled back and forth through the dye bath at regular intervals. Care must be taken ensure to even dyeing takes place. This type of dyeing can be used for larger runs of fabric up to 6000 m at a time.

### Pad dyeing

In pad dyeing, the fabric is run through the dye bath in an open width where it passes through a series of rollers. These rollers pressure pad the surface and force the dye into the fabric. The fabric passes through another chamber where it is heat-set and steamed to fix the dye. Pad dyeing allows quick runs of large amounts of fabric and uses a small quantity of dye solution. It is a very economical way to dye fabric lengths.



Pad dyeing



Paddle dyeing

### Combination dyeing

Combination dyeing requires circulation of the dye bath and the textile item. Techniques that use this type of dyeing include jet dyeing, paddle dyeing and continuous dyeing.

### Jet dyeing

Jet dyeing uses the principle of jet propulsion to achieve maximum dye penetration. The sealed vats use high-pressure jet streams of dye. Fine fabrics can be dyed this way, as there is no tension on the fabric lengths.

### Paddle dyeing

Paddle, rotary drum and tumble dyeing systems are predominantly used for product dyeing. Both the dyes and the paddles or drums rotate to allow maximum dye penetration to all areas of the finished product.

### Continuous dyeing

Continuous dyeing can dye yarns and fabrics. Continuous machines are used to wet out, dye, treat, wash and rinse the textile material. This type of dyeing can be used for long runs of fabric.

### Foam dyeing

Foam dyeing is economical and environmentally friendly as it uses less water in the dyeing process, leading to less water wastage and run-off.

### Artistic dyeing

Artistic dyeing describes a pattern of colour made by preventing the dye from reaching some areas of the fabric while dyeing others. This is known as a resist technique.

Folding, tying, stitching, binding, crumpling and twisting the fabric inhibit the flow of the dye to some areas. Tie dyeing, for example, is an art that has been practised by many cultures. It is known in Japan as shibori, in Indonesia as plangi and in India as Bandhani. It is also practised in many cultural clothing forms in Africa.



Padder dyeing video  
([www.youtube.com/watch?v=NS7E6HYWaos&feature=related](https://www.youtube.com/watch?v=NS7E6HYWaos&feature=related))

Dye jet video  
([www.youtube.com/watch?v=l-96hviTJns&feature=related](https://www.youtube.com/watch?v=l-96hviTJns&feature=related))

Laboratory dyeing machine  
([www.youtube.com/watch?v=WLOV9CP4E-U&NR=1](https://www.youtube.com/watch?v=WLOV9CP4E-U&NR=1))



16.1 Designer dyeing  
16.2 Natural and synthetic  
dye experiments



Indian saris drying on the riverbanks in Agra



iStockphoto

African woman wearing a tie-dyed head wrap and a block-printed garment

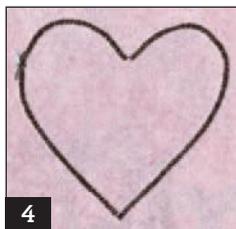
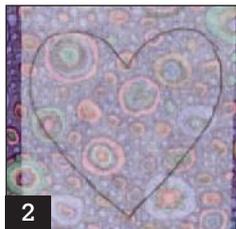
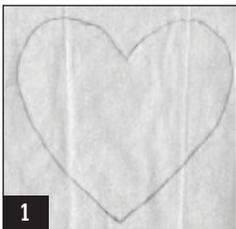
## Appliqué

**Appliqué** is the technique of applying fabric shapes to a fabric backing. Aside from thick pile fabrics, most fabrics are suitable for appliqué. It is important to wash appliqué fabrics to pre-shrink them and ensure the fabric is colourfast. Most types of appliqué use the same preparation method, with the exception of knit fabrics. Fusible web is used to stabilise the fabric and prevent it from stretching. The edges of the appliqué shapes can be finished using methods such as satin stitch, straight stitch, blanket stitch or free-motion stitching.

### Methods of finishing appliqué

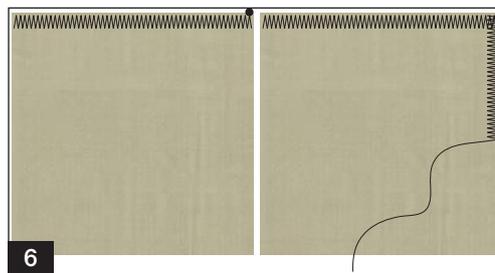
#### Skill development 16.1 Satin stitch

The following is a step-by-step guide to create satin stitch appliqué.

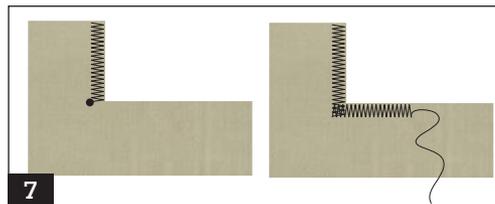


- 1 Draw an appliqué design onto the paper side of the fusible web. Remember the design will be in reverse when completed.
- 2 Iron the fusible web to the wrong side of the appliqué fabric. Cut out the appliqué shape.
- 3 Peel off the paper backing from the fusible web. Iron the appliqué shape to the right side of the background fabric.
- 4 Iron the tear-away stabiliser to the wrong side of the backing fabric under the appliqué shape.
- 5 Stitch around the edge of the shape using satin stitch (SW2.5/SL0.5). Remove the tear-away stabiliser.

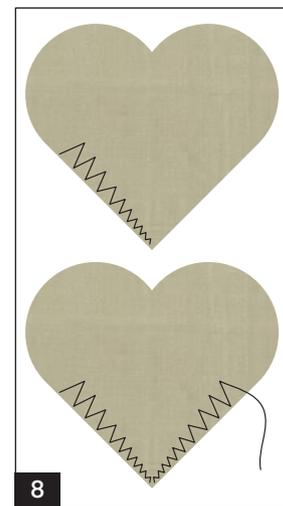
**6** When stitching around an outside corner, lower the needle into the outside edge of the corner and raise the presser foot. Pivot the fabric so the presser foot is parallel with the edge of the appliqué and continue stitching.



**7** When stitching an inside corner, lower the needle into the inside edge of the corner and raise the presser foot. Pivot the fabric so the presser foot is parallel with the edge of the appliqué and continue stitching.



**8** To remove the bulk at a point, gradually reduce the stitch width as you are stitching into the point. When you reach the point, lower the needle and pivot the fabric so you are in position to stitch down the other side. Gradually increase the stitch length as you are stitching away from the point.



### Hints for success

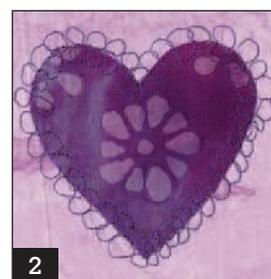
- Always stabilise the backing fabric.
- Test the satin stitch before commencing the design. The smaller the appliqué shape, the smaller the stitch width.
- Lower the top tension so that the bobbin thread is not visible on the right side.
- Three-quarters of the satin stitch should be on the appliqué fabric and one-quarter should be on the backing fabric. When finished, you should not be able to see the edge of the appliqué fabric.
- Never reverse. Use a needle to take the top threads through to the wrong side and tie the top and bobbin threads together. Cut close to the knot.

### Variations

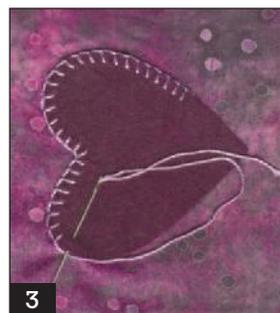
**1** Straight stitch appliqué: Following the method for satin stitch appliqué, use straight stitch (SW0/SL3) and stitch 2 mm from the edge of the appliqué fabric.



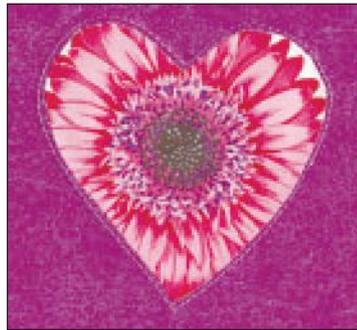
**2** Free-motion appliqué: Following the method for satin stitch appliqué, set the machine to free-motion stitching and create a decorative edge to the appliqué shape.



**3** Blanket stitch appliqué: Following the method for satin stitch appliqué, use blanket stitch to neaten the edge of the appliqué fabric. Do not use a tear-away stabiliser.

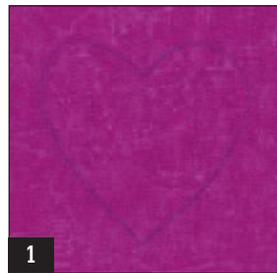


When completing reverse appliqué, do not use fusible web or tear-away stabiliser. The following is a step-by-step guide to reverse appliqué.



Reverse-appliqué heart

- 1 Use a fabric pen to draw a shape onto the right side of the fabric.
- 2 Lay the right side of the appliqué fabric to the wrong side of the fabric under the shape. Using straight stitch (SW0/SL3), stitch around the shape.
- 3 Carefully cut close to the straight stitching using embroidery scissors, making sure you do not cut through the appliqué fabric underneath.



1



2



3

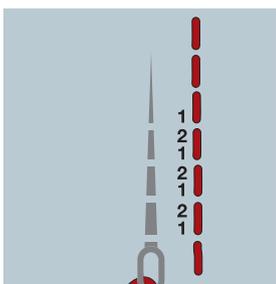
## Embroidery

**Embroidery** is the method of decorating or embellishing a base fabric with yarns. Most fabrics are suitable for hand or machine embroidery, although the fabric may need to be stabilised to achieve the desired effect. A wide variety of yarns are suitable for embroidery, whether natural or manufactured, smooth or textured, single hue or variegated. It is essential to experiment with a variety of fabrics and yarns to create an original design.

### Hand embroidery

#### Running stitch

Running stitch is a simple outline stitch. The length of the stitch and the space between each stitch should be identical. Running stitches can be worked by picking up a number of stitches on the needle before pulling the needle and thread through the fabric. It is often worked on even-weave fabric to ensure uniformity of stitch size, and can also be used for hand quilting.



Running stitch – bring the needle out at 1, insert at 2 and then repeat a few more stitches before pulling the needle and thread through the fabric.



Running stitch – silk dupion and stranded metallic thread



Running stitch letters and back stitch heart – cotton Homespun, stranded cotton thread

## Straight stitch

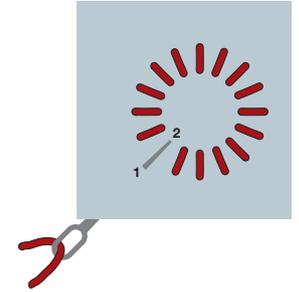
Straight stitch consists of single-spaced stitches, which may be even or irregular, long or short. It is important that the stitches are not too loose or too long. Straight stitches worked closely together actually form a satin stitch. Care must be taken to ensure the stitches are smooth, with an even tension.



Straight stitch sunflowers with French knot centres – even-weave linen, silk ribbon embroidery thread



Short and long straight stitch used to create shell design



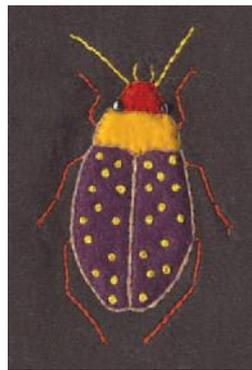
Straight stitch – bring the needle out at 1, insert at 2 and then bring the needle out again to begin the next stitch.

## Back stitch

Back stitch is used as an outline stitch. This stitch is worked in a backward motion from right to left.

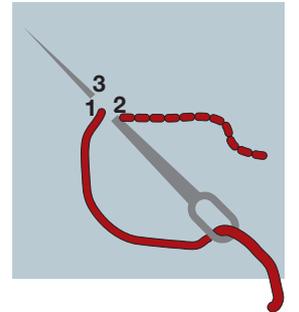


Back stitch was used to outline the beetle and create legs, chain stitch antennae – linen, stranded cotton thread



Back stitch was used to outline the beetle and create legs, couched antennae and French knot detail – wool felt, stranded cotton thread

Image designs by Jane Nicholas,  
[www.janicholas.com](http://www.janicholas.com)



Back stitch – bring the needle out at 1, insert at 2 and then bring needle out at 3 ready to form the next stitch. The distance between 2 and 1, 1 and 3 should be identical.

## Stem stitch

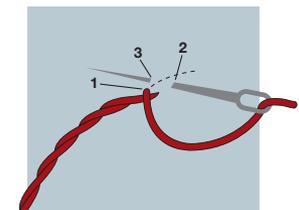
Stem stitch is another outline stitch but may also be used to create flower stems. The stitches are worked in a backward motion, like back stitch, but with the yarn to the left of the needle.



Stem stitch was used to create lavender stems – even-weave linen, silk ribbon embroidery thread.



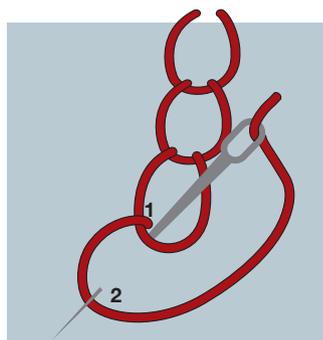
Stem stitch created using gold purl – silk dupion



Stem stitch – bring the needle out at 1, insert at 2 and then bring the needle out half a stitch length back at 3.

## Chain stitch and lazy daisy stitch

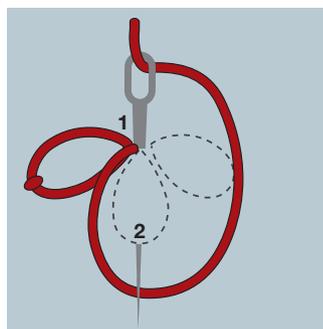
Chain stitch is a looped stitch used to outline or fill in an area. Lazy daisy stitch is a detached chain stitch, worked in a circle to give the look of flower petals.



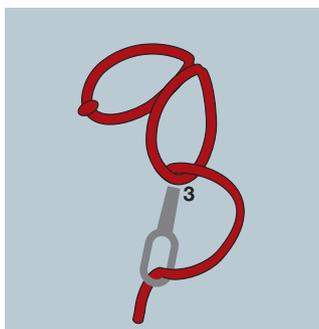
Chain stitch – bring the needle out at 1, insert the needle back in the same hole at 1 and then bring out at 2, making sure the thread is under the needle. Point 2 is now the start of the next stitch.



Chain stitch – silk dupion, metallic stranded thread



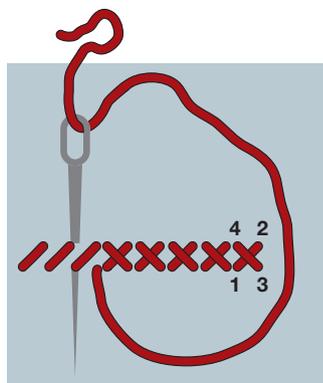
Lazy daisy stitch – bring the needle up at 1 and insert the needle back into same hole at 1. Bring the needle out at 2, ensuring the thread is under the needle, and insert the needle at 3 over the thread to complete the stitch. Bring the needle out at 1 again ready to start the next stitch.



Lazy daisy stitch – silk dupion, metallic stranded thread

## Cross-stitch

Cross-stitch is often worked on even-weave fabric, like Aida cloth or gingham, and the stitches are usually worked in rows of slanted stitches. The first row lays down half the crosses and the second row completes the cross.



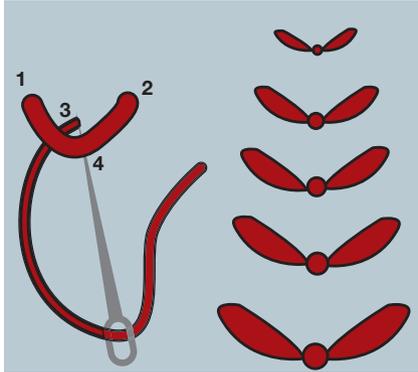
Cross-stitch – bring the needle out at 1, insert at 2 and then bring the needle out again at 3. Insert the needle at 4 to complete the cross.



Cross-stitched Tweety Bird with black back stitch outline – Aida cloth, stranded thread

## Fly stitch

Fly stitch is a Y-shaped looped stitch used to fill an area.



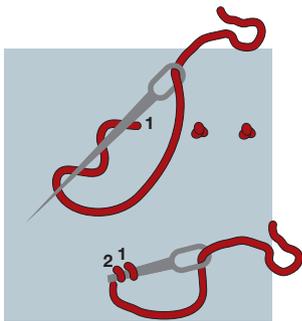
Fly stitch – bring the needle out at 1, insert at 2 and then angle the needle out at 3. Points 1, 2 and 3 should be an equal distance apart. Complete the stitch by inserting the needle at 4.



Fly stitch – silk dupion, stranded metallic thread

## French knot

A French knot is a raised stitch used to fill an area. The size of a French knot depends on the number of times the thread is twisted around the needle.



French knot – bring the needle all the way out through the fabric at 1. Holding the thread taut with the left hand, wrap the thread around the needle twice. Insert the needle at 2 and pull through. Note 1 and 2 are very close together.



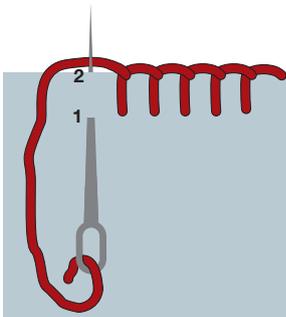
French knot jacaranda tree – silk, rayon embroidery thread



French knot wisteria – silk, rayon embroidery thread

## Blanket stitch and buttonhole stitch

Blanket stitch is used to finish edges or create a border. The stitches should be the same distance apart and the same height to ensure consistency. The stitch is worked in a backward motion. Buttonhole stitch is similar to blanket stitch except the stitches are created close together to form a firm edge.



Blanket stitch – start with the thread at the front of the fabric. Insert the needle at 1 and bring it out again at 2, making sure the thread is behind the needle. Point 2 is the beginning of the next stitch.



Appliquéd shape neaten with blanket stitch



Buttonhole stitch – silk dupion, metallic gold stranded thread



Buttonhole stitch used to create a cord – silk dupion, metallic gold stranded thread

## Couching

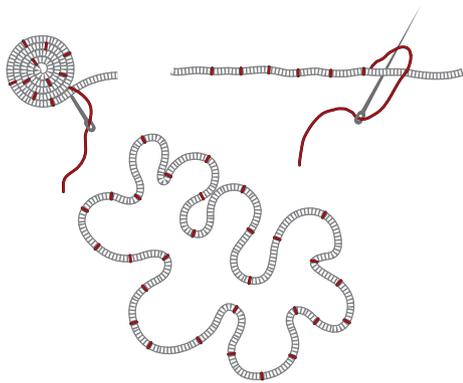
Couching is completed using two different threads. A heavier thread is laid down onto the base fabric and a contrast thread is used to stitch it in place. Couching can be used as an outline or to fill in an area.



16.3 Hand embroidery sampler



Circular couching – silk dupion, gold thread



Couching



Couching – Christmas tree

## Machine embroidery

Although the sewing machine is mainly used for functional stitching, it can also be a highly decorative tool. Most sewing machines have some decorative stitches. Utility stitches can also look decorative when they are created using rayon embroidery thread or metallic threads.



Sewing machine as a decorative tool: stitches include triple straight stitch, satin stitch, blind hem and stretch stitches – silk dupion, rayon and metallic machine embroidery threads.



Free-motion embroidery demonstration  
([www.youtube.com/watch?v=v8VP\\_YWi0h4](http://www.youtube.com/watch?v=v8VP_YWi0h4))

## Free-motion machine embroidery

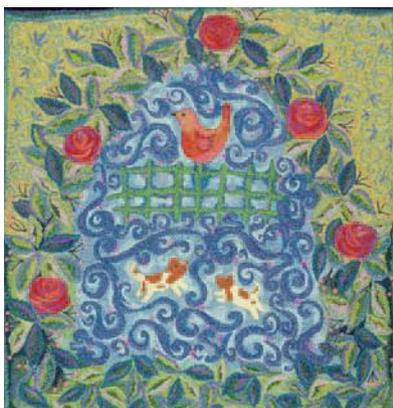
Free-motion sewing on the machine allows you to stitch in any direction by lowering the drop feed and attaching a darning foot. The most common stitch used is straight stitch, but zigzag can also be used. The machine operator determines the length and width of the stitch. The most important thing to remember is ‘fast foot, slow hand’ to ensure a consistent and short stitch length. If the machine speed is too slow the stitches formed will be very long.



16.4 Sewing machine as a decorative tool

## Hints for success in free-motion machine embroidery

- Read the sewing machine manual to find out how to lower the drop feed and determine which is the best presser foot and stitch setting to use. If the manual does not have information on free-motion stitching, refer to darning.
- You may need to change the needle to ensure the thread does not split and break as you are working.
- Use polyester thread in the bobbin. If you intend to do lots of machine embroidery, fill the bobbin with bobbinfill. This is a very fine polyester bobbin thread with exceptional strength, allowing more thread to be wound onto the bobbin. This results in fewer bobbin changes and greater machine efficiency.
- Hoop your work or stabilise with tear-away stabiliser to ensure the fabric lies flat and does not pucker.
- If the bobbin thread is visible on the right side, lower the tension. Make sure you complete a sample to ensure the stitch formation is correct.
- To secure your work, stitch in the same place for a few stitches and cut the thread close to the fabric.



Images courtesy of Morgan James,  
[www.craftact.org.au](http://www.craftact.org.au)

Machine embroidery samples created by Morgan James: *Rosie and Ripley*, *Foliage*, *Leadlight and Roses*

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Why is colour considered one of the most significant design elements?
- 2 Work health and safety is extremely important when working with dyes and paints. List the steps you can take to look after your personal safety when undertaking colouration methods that use dyes and paints.
- 3 Describe the printing method of colouration and outline the principles of printing.
- 4 Describe the dyeing method of colouration and outline the principles of dyeing.
- 5 Define the term *appliqué* and suggest three stitches you could use to finish an appliqué design.
- 6 Describe the process of embroidery and outline three methods of embroidery.

## Websites

- ☺ Textile Exchange ([www.teonline.com](http://www.teonline.com)): Visit the knowledge centre of this website for a comprehensive overview of printing methods.
- ☺ Dylan ([www.dylon.com.au](http://www.dylon.com.au)): A comprehensive site about dyeing and dyeing designs.
- ☺ Shibori ([www.shibori.com](http://www.shibori.com)): This website features beautiful examples of artistic dyeing.
- ☺ The Embroiderers' Guild NSW ([www.embroiderersguildnsw.org.au](http://www.embroiderersguildnsw.org.au)): A comprehensive embroidery site that includes resources, education, competitions and links.
- ☺ Applicuts ([www.applicuts.com](http://www.applicuts.com)): An interesting site that includes laser-cut appliqué designs ready for applying to your textile work.
- ☺ Colour Streams ([www.colourstreams.com.au](http://www.colourstreams.com.au)): Supplier of hand-dyed silk embroidery threads, ribbons and kits for textile arts and designs.
- ☺ The Thread Studio ([www.thethreadstudio.com](http://www.thethreadstudio.com)): Supplier of unusual and interesting embroidery threads and textile art supplies.
- ☺ Morris and Sons ([www.morrisandsons.com.au](http://www.morrisandsons.com.au)): Supplier of an amazing array of specialised threads for embroidery purposes.



16.10 Fabric colouration and decoration palm cards



### NelsonNet

Fabric colouration and decoration crossword

TEXD12IN160060

Fabric colouration and decoration word search

TEXD12IN160062

# Influence of culture on design: Hmong people of South-East Asia

# 17

## Hmong people

The **Hmong people** are also known as the Meo, Miao or Meau. A desire for independence dominates the lives of the Hmong. It is believed the Hmong people came to China from Mongolia, Tibet or Siberia. Hmong legends talk about ancestors living in cold lands where they experienced long winter nights. They settled on the banks of the Yellow River but hostility from the Chinese and lack of fertile land forced them to migrate in search of freedom and better farming land. About 95% of Hmong people are now located in southern China, Laos, Burma, Vietnam and Thailand. A small percentage migrated to America, Australia, France and Canada after the Indochina Wars.

There are six major groups of the Hmong people:

- 'Hmong Dub or Hmong Den' (Black Hmong)
- 'Hmong Do' (Red Hmong)
- 'Hmong Deaw' (White Hmong)
- 'Mong Njua' (meaning Green Hmong, but usually referred to as Blue)
- 'Hmoob Txajj or Moob Txajj' (Striped Hmong)
- 'Hmong Lenh or Hmong Hoa' (meaning flowery cloth, so referred to as the Flower Hmong).

The names relate to the dominant colouring of their traditional clothing and headdress, and the provinces they came from.

The Hmong people live in southern China, Laos, Burma, Vietnam and Thailand.



NelsonNet

Cultural study of Japan  
TEXD12CS170048

## Extend your knowledge 17.1

Watch the video clip about the Hmong history and produce a flowchart that documents the history of the Hmong people.



Hmong history  
([www.youtube.com/watch?v=2hYuXbtIvHg&feature=related](http://www.youtube.com/watch?v=2hYuXbtIvHg&feature=related))

## Textile production and textile art forms

Textile production relates to raw materials, fibres, yarns and fabrics produced by a particular culture. These fibres, yarns and fabrics are then used to create textile art forms. Textile art forms are the artistic or creative expression of ideas and thoughts through a textile medium. Often textile art forms are unique to a culture as they are generally influenced by geographical location, technological developments, available resources, religious practices, workers' skills and status. Textile art forms are valued for a variety of qualities, including the technical skills required to produce the item, the richness and colour of the design, the tactile properties and the end-use of the item.

## Hmong textile production

The Hmong people often live in mountainous regions where there is not a vast amount of land available for textile crops. The main fibres they use for their textile items are hemp, cotton, **ramie** and sometimes silk. Ramie is a plant from the same family as a nettle. It is harvested throughout the year and spun like hemp. It produces a lighter and softer fabric than hemp. The White Hmong use ramie for their white pleated skirts. Silk is used as yarn to decorate clothing and is rarely woven into fabric.

Traditionally, village women made their own textiles, from fibre to fabric to product, with each family having their own plot of hemp and indigo. Today many tribes buy or barter for their cotton and hemp fabric.

### Hemp production

Hemp is sown in March and harvested in August after it has flowered, when the plants are about 2m tall. The leaves are removed from the stems and the stems are left to dry in the sun for about a week. They are turned every couple of days to make sure they are thoroughly dry throughout the thickness of the stem.

The stems are then stripped back to remove the fibres and soaked in boiling water and ash. The women then beat the fibres to soften them and wind them into a skein ready for weaving.

iStockphoto



Hemp plant



Hemp fibre being beaten and softened by Hmong women

Robert Harding



Adding twist to the hemp yarn

Robert Harding

### Hmong weaving

Weaving happens in the cooler months of autumn and winter when there is less work in the fields. The Hmong women use two types of looms: a combination back-strap and foot treadle technique, and a mechanical self-tensioning wooden loom. If using a back-strap loom the female weaver sits on a bench with one end of the loom attached to a belt. She controls the tension with her back while shifting the warp threads with foot treadles. The finished cloth is 4 to 5 m in length and up to 30 cm wide. The more modern frame-tension mechanical loom allows the use of both

feet to press treadles to shift the pair of heddles, and some modern looms also have a mechanical shuttle that conveys the weft thread back and forth between the warp threads. The fabric produced is of plain weave structure. The narrow bands of fabric are stitched together to make garments specially designed for the narrow fabric width.

iStockphoto



Hmong back-strap loom

## Extend your knowledge 17.2



Hmong weaving  
([www.youtube.com/watch?v=SWq-Pcx82Nk](http://www.youtube.com/watch?v=SWq-Pcx82Nk))

Watch the video clip about Hmong weaving and comment on the process. Include information on the equipment used and the steps in the weaving process.

## Indigo dyeing

The Black Hmong are famous for their indigo-dyed fabrics. Indigo plants are cultivated in plots near the tribal houses. The indigo plant grows to about 60 cm high and can yield two crops each year. The dye is produced from the leaves and the stems, which are soaked in water for about four days to draw the colour from the plant matter. Powdered lime is added to the vats to increase the oxygen content and accelerate the fermentation process. The water is drained from the dye sediment that settles at the bottom of the vat. The insoluble dye is stored as either a paste or powder.

The dye is used to colour skeins of cotton yarn and fabric. There are a number of substances that may be added to make the indigo dyestuff soluble, including the urine of children, lye, lime and rice wine. When the dye bath is boiling vigorously the yarn or fabric is immersed and agitated for about 30 minutes. The process is repeated until the fabric changes from indigo blue to black. This can take up to a month of daily dyeing.

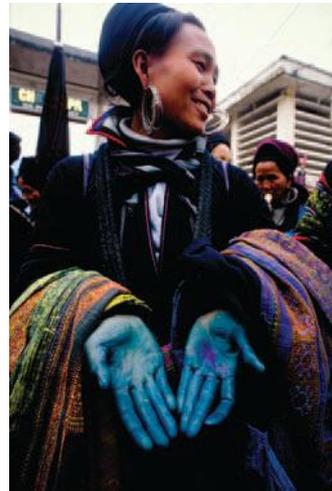


17.1 Hmong hemp fibre and fabric production



Alamy/frans lemmens

Black Hmong women drying the dyed indigo fabric



Steve MacAulay Photography

Hmong women with coloured hands from indigo dyeing



Alamy/frans lemmens

Black Hmong woman indigo-dyeing fabric



Shutterstock.com

Indigo batik fabric

## Hmong indigo batik

Batik is a wax resist method of dyeing. The textile artist draws the design on a length of white fabric using a charcoal pencil. A bamboo pen with a copper nib is dipped in melted wax. The artist then goes over the charcoal design. Patterns include traditional motifs of zigzags, dots, lines, spirals, stars, flowers and animal designs. When the design is dry, the fabric is soaked in a cold vat of indigo dye. This process is repeated until the desired colour is achieved. The dye vat is then heated and the wax on the fabric melts and floats to the top of the vat. It is removed and reused for the next batik design. The wax forms a resist so the resultant fabric is white where the wax was applied and blue where the dye penetrated the fabric.

### Extend your knowledge 17.3

Watch the video clip about Hmong batik and comment on the colours and designs produced by the indigo batik technique.



Black Hmong indigo dyeing  
([www.youtube.com/watch?v=2LcoB8tQIF8](http://www.youtube.com/watch?v=2LcoB8tQIF8))

Hmong batik  
([www.youtube.com/watch?v=JVkMN6iuejI](http://www.youtube.com/watch?v=JVkMN6iuejI))



## Hmong textile art forms

The textile art forms of the Hmong people have evolved over hundreds of years. The textile art forms include belts, baby carriers, jackets, sashes, skirts, tunics, leggings, hats, turbans, headdresses and ‘story cloths’.

The predominant colours of Hmong textile arts include the natural colours of undyed cotton and hemp, and indigo colours ranging from black to different shades of blue depending on the number of times the fabric is dyed. Contrast and focal points are created in the Hmong textile art forms through the use of bright colours for embroidery and appliqué.

### Hmong clothing

Although the Hmong live in the tropics, it is often very cool at night and in the winter season due to the high altitude. The Hmong clothing styles are functional to protect people from the cold. The most distinctive feature of women’s clothing is the voluminous pleated skirt that reaches below the knee. It is sometimes called ‘the skirt of a thousand pleats’, but most have about 200 pleats.

The skirt is made from more than 6 m of fabric and is fastened with two ties. There are three sections or strips to the skirt. The top section at the waistline is usually plain white or cream. The centre section is the widest strip and the bottom strip is the most decorative.

To stiffen the pleats, a mixture of rice starch and water is poured over the skirt and left for up to a month. The accordion pleats are stitched down with herringbone stitch or chain stitch. The centre section of the Blue Hmong skirt is about 30 cm wide and is decorated with batik and dyed in indigo. A 15 cm strip of plain fabric is attached to the top of the batik strip. The hem is made from attached embroidery strips, which are usually bright-coloured cross-stitch. The skirt of the White Hmong is made from plain white pleated hemp without decoration. The women wear the skirt on special occasions and black trousers for everyday clothing.

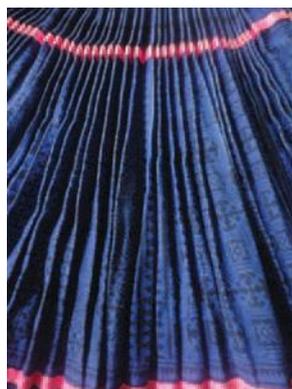
istockphoto



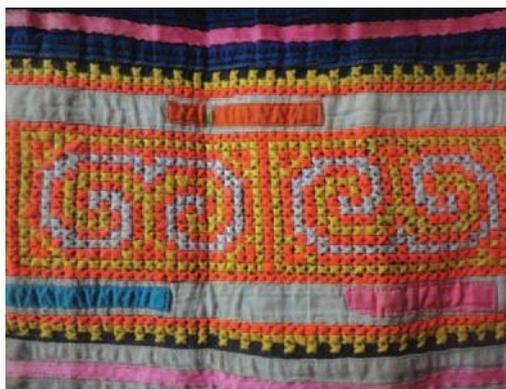
It is believed an open *latania* leaf from the palm tree inspired a Flower Hmong woman to make the first pleated skirt.



Blue Hmong skirt



Indigo batik detail on centre section of pleated Hmong skirt



Cross-stitch embroidery of hem strip



The indigo batik centre panel is joined to a plain white strip at the waistline.

Photos courtesy of Adrienne Cobby

### Extend your knowledge 17.4



Hmong pleated skirt  
([www.youtube.com/watch?v=37qwtcETDjU](http://www.youtube.com/watch?v=37qwtcETDjU))

Watch the video clip about the Hmong pleated skirt and compare and contrast the colours and designs.

The pleated skirt is worn with a short jacket that is embellished with decorative edge panels and an embroidered collar at the back. The Blue Hmong jacket is usually made from black cotton but on special occasions velvet is used. The jacket is a T-shape and is embellished with embroidery and appliqué.

Photos courtesy of Adrienne Cobby



Hmong jacket



Embellishment on the front of a Hmong jacket

The collars are a rectangle about 12 cm by 16 cm and are usually stitched to the jacket. Women spend many hours making the decorative collars in a range of patterns and techniques, and usually have a number of them ready for wear. Many collars are made using the technique of reverse appliqué or embroidery.

Photos courtesy of Adrienne Cobby



Hmong collars



Black Hmong women wear a black apron over their skirt for everyday wear. Festive aprons are elaborately embroidered and appliquéed, and have red, pink or orange ties with long tassels at the back. The White Hmong women wear a black apron front and back that is trimmed in blue. They also have a festival-style bib apron that is embellished with embroidery and reverse appliqué with long magenta tassels at the back.

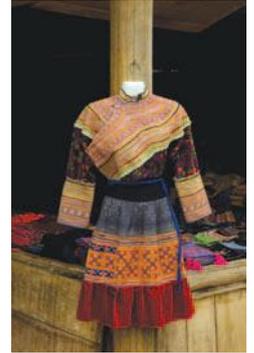
Men wear loose trousers with a similar style of embroidered jacket to the women. The trousers are Chinese in style, and are so full they resemble a long skirt. Men wear wide sashes, up to 6 m long, which are carefully wrapped around the body so the embroidered ends are visible in the front and look like an apron.

The most eye-catching feature of the Hmong women is their hair. Usually, it is tied up in a bun and decorated with a strip of cloth or turban.



Traditional clothing of the Flower Hmong women

iStockphoto



Ethnic costume of the Hmong in Vietnam

iStockphoto



Hmong woman wearing a rectangular apron with blue trim

iStockphoto



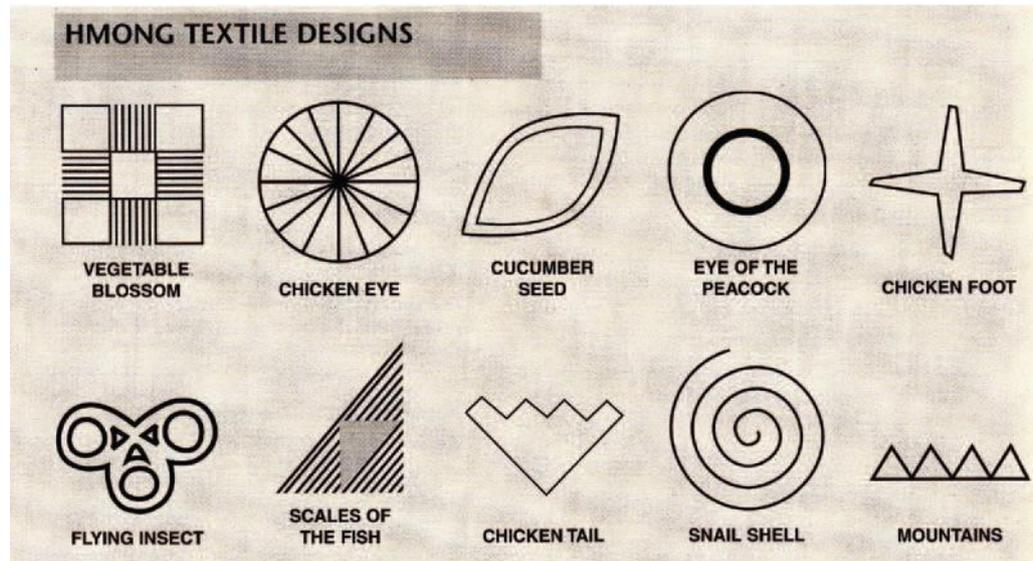
Hmong family



Hmong turban



Hmong embroidery



## Hand embroidery

Detailed hand embroidery is used to embellish the clothing of all family members. This work occupies most of the spare time of tribal women. Hmong girls start to learn embroidery under the guidance of their mothers and sisters at the age of seven. They learn to embroider small and simple works, and as they gain experience they start to embroider their wedding dress. Embroidery stitches include chain stitch, satin stitch, weave stitch, horizontal and vertical stitch, and cross-stitch.

### Extend your knowledge 17.5



Hmong embroidery  
([www.youtube.com/watch?v=ir-WIQeqb-A](http://www.youtube.com/watch?v=ir-WIQeqb-A))

Watch the video clip about Hmong embroidery and compare and contrast the techniques, colours and designs.

## Carrying cloths and baby hats

Hmong mothers devote their finest skills to make carrying cloths and caps for their babies. A carrying cloth resembles a bibbed apron and is made from two rectangular pieces of fabric: a large one at the bottom and a smaller, more decorative panel at the top. They are joined together with decorative borders. Traditionally, they have long red straps attached to the top corners to tie the baby to the mother. The Blue Hmong use indigo batik for the large rectangular piece. This is trimmed with strips, squares

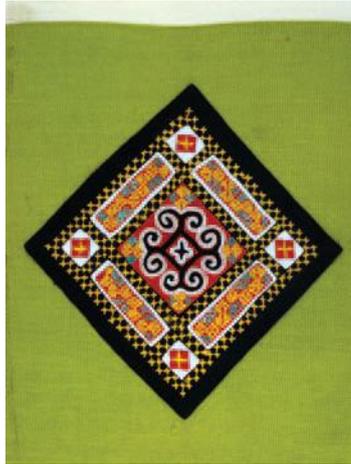
and triangles of bright-red appliquéd pieces. The smaller top rectangular piece is embellished with cross-stitch embroidery and pompoms. The White Hmong embellish their baby carriers with embroidery and reverse appliqué.

Children's clothing is a miniature version of adult apparel.



Getty Images

Hmong baby carrier



Alamy/Rick Piper Photography

Flower cloth

## Flower cloth

The traditional needlework textile art of the Hmong is known by the term *paj ntaub*, which means 'flower cloth'. Women create beautiful designs by taking two layers of cloth, cutting a design in the top layer so that the bottom layer shows through (reverse appliqué), and embroidering the resulting design. Traditional designs are drawn from nature. Names of designs include 'elephant foot', 'snail' and 'dragon tail'. The embroidered and appliquéd designs are added to jackets, collars, headdresses and other clothing. Traditional *paj ntaub* patterns are learned from watching others and never written down. The completed *paj ntaub* contains vertical and horizontal line symmetry, and most designs also contain rotational symmetry.

## Story cloth

Perhaps the best-known form of Hmong needle art is *paj ntaub tib neeg*, also called **story cloth**. These pictorial embroideries developed very recently in Hmong history. Hmong men drew elements of traditional Hmong stories to help make sure they would be remembered during the times of change. Women embroidered these stories onto cloth. These embroidered cloths include the stories and daily life of Hmong culture, and also record the Hmong people's experiences during the Vietnam War and their escape to Thailand. '*Kawm Ntaub Kawm Ntauw*' is a famous phrase used to encourage the young generations. It means '*Learn the cloth, learn the scripts*': when you learn the cloth, you will learn the scripts and the history of the Hmong people.



17.3 Hmong textile art forms

## Extend your knowledge 17.6

Watch the video clip about Hmong story cloth and complete the following activity.

- 1 Describe the scenes featured in the story cloth.
- 2 Identify the stitches used to create the story cloth scenes.



Hmong story cloth  
([www.youtube.com/watch?v=SKTZitFAPVs](http://www.youtube.com/watch?v=SKTZitFAPVs))

# A legend about Miao Hmong embroidery

There is a legend about Miao Hmong embroidery. It is said when the Miao Hmong were migrating to south China driven by the tribe of Huang Di and Yan Di, a female leader named Lan Juan used colourful threads to embroider on her clothes what Miao Hmong ancestors experienced as a way to record history since there were no

written transcripts. When crossing the Yellow River, she embroidered with yellow threads, when crossing the Yangtze River, she embroidered with blue threads and when tramping over mountains, she also embroidered it to make a mark. She embroidered from the beginning of the immigrating till they finally settled and so her clothes were full

of embroidery from collar to the bottom of her dress. Thereafter, as tradition when a Miao Hmong girl gets married, she will dress in her embroidered clothes to recall homeland and honor their brave and intelligent ancestors.

Source: China Unique Tour,  
[www.chinaunique.com](http://www.chinaunique.com).

## Factors influencing Hmong textile design

### External factors

#### Economy

The Hmong people seek economic independence and will use armed force when threatened. They are industrious people, and want the freedom to follow their own lifestyle.

The Hmong are very independent and live in remote villages, so they are not directly affected by the economy of the country where they live. As transport and communication systems improve they are coming into greater contact with the outside world, resulting in increased education for their children and opportunities to sell their produce, including textile items, to a larger market.

#### Political life

Each Hmong tribe is an autonomous unit but members of the tribe may move to another tribe if they believe it is more economically stable. Each village has its own area or territory. Although there are no written laws there are codes of conduct, which are handed down from generation to generation. The tribe elects a political headman who represents the village in government issues.

After World War II the Thai Government began to develop initiatives to support Hmong tribes. Due to their isolation it was very difficult to involve them in the politics of the country. Even today many of the tribes feel they do not really belong within the state. This situation is improving as the younger generations have greater access to education and gain a greater understanding of the laws of the nation.

#### Social life

The family unit is the most important social group among the Hmong tribes and is often made up of three or more generations. Married sons often remain with their

family, together with their wives and children. The tribal village is ideally a very close-knit community in which each member is dependent on the others for the safety and wellbeing of all. The extended family is the basic cultural and political unit, with the eldest male having unlimited authority over the other members.

Respect for age is of greatest importance, especially the father–son link. Both the men and women work in the fields but it is the women’s role to produce the textile items. This involves the processing of the fibre into yarn and cloth, and stitching and embellishing the final item.

## Ecology

The Hmong live closely with the land and understand the importance of living in harmony. The Hmong practise slash-and-burn agriculture where farmers clear a piece of land, burn the vegetation, and then plant crops such as hemp and indigo. After several years they move on to a new field to allow the old fields to reforest. In most cases they move back and forth, recycling the fields they left many years earlier, so that their environment can be kept in balance and deforestation kept to a minimum. Shifting cultivation is the reason for the Hmong’s semi-migratory way of life.

## Cultural factors

### Geographical location

The Hmong live in villages consisting of one tribe or sub-tribe in South-East Asia. Many of the villages are located on a gradual mountain slope. The surrounding jungle is not cleared so there is protection in times of danger. There must be an adequate water supply and enough land to cultivate crops. Often due to the slope, the land is terraced to allow for crop cultivation. The jungle provides raw materials in the form of building materials for the houses, firewood, plants and small animals for food, as well as products that are sold at markets.

Most villages are arranged in a horseshoe shape. Every house faces downhill and no two houses are in direct line with each other as it would prevent the good spirits from entering. There are usually six to eight houses in the village.

iStockphoto



No tribal group exists in isolation but the mountainous terrain means the tribes are quite scattered.

Aerial view of a Hmong village

### Resources available

The Hmong live in isolated villages in mountainous regions. They farm the land, with rice being the main crop. They also hunt and collect jungle produce. The land is poor for farming and the terrain difficult. As tribal people are forced to farm more and more marginal land and shorten the periods for recovery of slash-and-burn mountain fields,

food supply is not sufficient. Conflicts within and between villages have become more serious as competition for land is stepped up.

In terms of textile resources, each tribe has their own hemp and indigo plot used to produce cloth for its textile products. With improved roads, many Hmong now travel to markets to purchase fabric for their textile items.

Today, some of the Hmong tribes supplement their income by selling jackets, shoulder bags and panels to tourists.

### Technological developments

In the tribal villages in Thailand today, most families have a sewing machine. Very few clothes are hand stitched. Often printed fabrics that resemble intricate woven, batik and embroidered designs are sold in markets. These fabrics are much cheaper to produce, as printing is a faster process than weaving or embroidery.

With increased accessibility in even remote mountainous areas, Western-style dress is starting to be worn. Jeans and T-shirts have reached the Hmong.

### Religious practices

Isolation of the Hmong people means they have been mostly unaffected by world religions such as Christianity, Islam, Buddhism and Hinduism. Their myth and ritual beliefs relate to their relationship with the natural environment and with the spirits that affect the wellbeing of their communities. Rituals assisted by the shaman or spiritual leader are associated with good health, birth and death.

The ceremonial head of the village and the tribal elders decide on the exact location of the village. Each tribe has its own method of determining whether the spiritual forces – the owners of the land – agree to a village being located in a particular area. Often rice is left in a hollow in the ground and covered with a bowl. If the rice is left undisturbed for a few days, the Hmong believe the site meets with the approval of the spirits.

Hmong worship a variety of household spirits, of which the *spirit of the door* is particularly important. The Hmong also believe in a local deity who rules the surrounding area of forest and hill.

The Hmong apparel items, designs and colours all have a spiritual significance. The red topknot on hats worn by boys and men defends the wearer against illness, injury or death. Baby carriers are highly embellished with red, yellow and pink embroidery to protect the child from bad spirits.

Funeral robes appropriate to the tribe are used to dress the dead so that their ancestors can recognise and claim them, and they are not left to wander aimlessly through the afterlife.

iStockphoto



Hmong baby hat created to mislead the bad spirits into thinking they are flowers



Red is used in Hmong clothing as a message of defence to the spirit world.

iStockphoto



The rows of triangles used as border designs are often referred to as either tiger teeth, intended to defer attacks, or as protecting mountains to ward off bad spirits.

Shutterstock.com

## Workers' skills and status

Hmong women produce clothing, and men make the tools and utensils. Men and women often share the making of baskets and mats. Tribal groups place considerable status on their blacksmiths who produce and repair tools and weapons. Silversmiths are also of high status.

Traditionally, the Hmong have not considered their textile crafts as marketable but this is changing as tribal handicrafts are now valued on the world market. There are a number of organisations that promote the craftwork of the Hmong. These include Thai Craft Fair Trade Company, Artisans of Asia and Thai Tribal Crafts.



17.4 Hmong textiles in the world market

## Textiles as a medium for self-expression and communication between people

Hmong textiles are a medium for self-expression and communication. Women make the family's textile items, with the techniques passed down from mother to daughter. The skill and imagination of the maker means each textile item is unique.

Photo courtesy of Adrienne Cobby

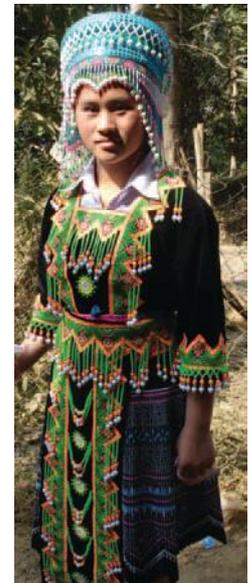


Pom-pom colours identify the hill tribe of the maker.



A headdress reflects the wearer's age and social position.

iStockphoto



Hmong teenage girl at the New Year festival

Photo courtesy of Adrienne Cobby

### Extend your knowledge 17.7

Watch the video clip about Hmong culture and give examples of how Hmong textiles are used as a medium for self-expression and communication between people.

Hmong young people of marriageable age wear the most elaborate clothing. The teenage girls traditionally create their own clothing, including their wedding trousseau, by weaving, sewing and embellishing items with embroidery. The fabric border strip on the Hmong skirt is wider for teenage girls than for older women, allowing greater decoration. Mothers take special care when making clothing for their bachelor sons in the hope they will be attractive to the girls.

It is believed that wearing old clothes on New Year's Day will bring poverty throughout the year so the finest clothing is worn at the New Year festival.

The motifs of Hmong textile items are based on plant and animal life around their villages. Motifs are created in a range of techniques, including appliqué, cross-stitch and satin stitch. Motifs include:

- tiger paw prints, to represent the spirit imprints
- butterflies, to represent the souls of the dead



Hmong culture  
([www.youtube.com/watch?v=8nKBWUWTZyY](https://www.youtube.com/watch?v=8nKBWUWTZyY))



Hmong male at the New Year festival

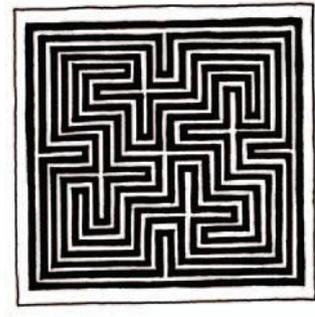
- tortoises, to bring advice from the spirit world and ancestors to the people on Earth
- triangles, to represent teeth, fish scales, dragon scales, fences, mountains or protective barriers to keep good spirits in and evil spirits out
- pumpkin seeds and snail patterns on children's hats, to stop young souls wandering and bond a child's soul to their head until it is used to its new environment
- a fish hook, to symbolise a young girl's hope of finding a suitor.



The snail is a symbol of family growth and interrelatedness. The centre coil of the snail's shell symbolises the ancestors. The outer spirals are the successive generations and the double snail shell represents the union of two families.



Elephant foot motif – elephants are respected for their strength and the Hmong avoid saying anything to hurt them lest the elephants come and damage a family's property.



Dream maze motif



17.5 Threads of life

The paj ndau, with its distinctive colours and designs, is the way a Hmong woman shows her tribal group. It also indicates her wealth, diligence and availability for marriage.

Colour is symbolic to the Hmong people. The colours red and black are used in Hmong funeral clothing, with white headbands worn for death and mourning.

## Effects of Hmong culture on textile design in contemporary society

The Hmong motifs and elements of traditional Hmong clothing design can be seen in contemporary design in a range of apparel and furnishing textile art items. These include:

- reverse-appliqué panels on quilts
- indigo batik clothing
- pleated wraparound skirts
- cross-stitch wall hangings.

Contemporary designers also find inspiration in the Hmong culture.

### Extend your knowledge 17.8



Ika Butoni's 2011 *Butterfly Momma* collection  
([www.youtube.com/watch?v=3UxINqbiQLk](http://www.youtube.com/watch?v=3UxINqbiQLk))

Read the article extract on the next page and watch the video clip of Ika Butoni's *Butterfly Momma* collection to complete the following activity.

- 1 Explain how Ika Butoni has used elements of the traditional Hmong design in 21st-century fashion.
  - design features
  - textile materials incorporated in the design
  - use of colour, shape, line and texture
  - surface embellishments.
- 2 Select one of the apparel items featured in the *Butterfly Momma* collection and comment on:
  - design features
  - textile materials incorporated in the design
  - use of colour, shape, line and texture
  - surface embellishments.
- 3 Design your own *Butterfly Momma* apparel item. Render your design and label the source of inspiration incorporated in your garment and design features.

# Ika Butoni – Butterfly Momma collection

Ika Butoni is an Indonesian-born designer based in Hong Kong. Her philosophy is to always inject creativity into design. Ika Butoni's 2011 collection was inspired by the Hmong/Miao culture.

The creation of the world according to the folklore of the Miao people revolves around the myth of Butterfly Mother. Central among many mythical Ancestors, Butterfly Mother was impregnated by the froth of breaking waves, and laid twelve eggs upon the boughs of a sweet gum tree. Over the course of twelve years, the eggs would hatch into various animals of the zodiac, as well as a boy called JiangYang and his sister, considered the procreators

of the human race. Consequently, the Miao people consider the butterfly the creator of all living things.

The Miao people also believe that everything, animate or inanimate, is 'born', and possesses a spirit; be it the mountains, rivers, and creatures, as well as metals, plows, and drums. Because of this, it is common to find elements of their culture manifesting itself into the embroidery for bibs, handbags, hand-pleated skirts, leg wraps, headgear, and baby slings. Set upon a background of simple indigo-dyed fabric using ancient techniques to treat the material to a point of glossy sheen, making the stunningly

vibrant palette of the embroidery even more pronounced.

Taking inspiration from Miao culture and folklore, Ika seeks to modernize these traditional fashions and bring them forward fully into the 21st century. Combining these age old techniques with contemporary trends in women's high fashion, we see the ancient myth of Butterfly Mother transcend into a chic *Butterfly Momma*.

Source: [www.ikabutoni.com](http://www.ikabutoni.com).

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Compare and contrast textile production and textile art forms, giving examples from the Hmong culture.
- 2 Explain how the following cultural factors influence Hmong textile design.
  - a Resources available
  - b Technological developments
  - c Religious practices
- 3 Describe how textiles are used as a medium for self-expression and communication by the Hmong people.



17.6 Hmong culture as a source of inspiration  
17.7 Influence of culture on design palm cards

## Websites

- ☺ Flowering Moon ([www.floweringmoon.com/hmonghemp.html](http://www.floweringmoon.com/hmonghemp.html)): A website page containing detailed information of the Hmong people with lots of coloured photos.
- ☺ Valerie Kirk (<http://members.ozemail.com.au/~yeulee/Other/costviet.html>): A personal website containing an article with detailed information of the Hmong people written by Australian Valerie Kirk.
- ☺ Ika Butoni ([www.ikabutoni.com](http://www.ikabutoni.com)): Website of fashion designer Ika Butoni.



## Factors influencing contemporary designers

Designers in the ATCF AI need many different types of skills if they are to succeed. Significant and ongoing structural changes to the industry over the last 10 years have resulted in designers requiring the following skills to forge a successful career:

- design skills and expertise, to ensure the textile items developed are unique and meet consumer needs or wants
- manufacturing knowledge, so the textile items produced meet consumers' demands for quality and value for money
- business skills, so the designer can successfully manage finances, facilities and staff
- knowledge of the marketplace, to ensure there is a need for the textile product
- technological skills, to allow the designer to maximise the benefits of computer-aided design and computer-aided manufacture in their business.

## Factors that determine the success or failure of designers

### External factors

#### Political environment

Designers do not work in isolation – they are influenced by the policies of the government in power. Since the late 1980s, Australian governments have pursued a policy of reducing the level of protection to the textile industry. Previously, tariffs were charged on imported textile products, raising the price of imported goods. Consumers therefore found locally manufactured goods better value for money. The reduction of these tariffs resulted in a greater number of imported textile products. The high cost of labour in Australia has meant the consumer can now purchase goods manufactured overseas at a lower price than locally produced goods. To be successful in this political environment, designers need to focus on areas of design, branding, innovation and customer service.

To help the ATCF AI through the restructuring, the Australian Government has developed a long-term assistance package valued at \$747 million. The main component of this package is an extension of the TCF Strategic Investment Program through to 2015. The Textile, Clothing and Footwear Post-2005 Strategic Investment Program Scheme (TCF Post-2005 (SIP) Scheme) aims to foster the development of a sustainable and internationally competitive TCF manufacturing industry and TCF design industry in Australia by providing incentives that will promote investment and innovation.

## Economy

The economy of the time is reflected in the clothing. During the Depression and World Wars, clothing styles were very basic. Clothing designs were fitted, using less fabric with minimal surface decoration. Women entered the workforce for the first time and required suitable attire. When the economy is booming, clothing styles are more colourful and elaborate in design.

The value of the Australian dollar is important to designers as it affects the costs of importing raw materials and exporting the finished product. The relatively high value of the Australian dollar means that the export market is weaker because the cost of Australian products are very competitive on the overseas market, but also means that the cost of importing raw materials is lower.

## Society

Designers of textile items must take into account the values and attitudes of the society for which they are designing. Varying social values mean that different clothing styles are acceptable in different cultures.

Print and electronic media are another social factor with a big impact on design, especially for the teenage market. Current fashion trends are often the result of designs copied from movies, music or the clothes worn by celebrities.

## Ecology

Consumers today are more aware of the effects on the environment of the growing of fibres and manufacture of textile products. There is a greater demand by consumers for environmentally friendly products. Designers need to be aware of these demands and design and develop products that meet these requirements. Suitable products are identified by the Good Environmental Choice Mark label. Some retail stores only sell environmentally friendly textile products, such as hemp and organic cotton products.

## Technological

Designers today must embrace technology if they are to succeed. Through the use of technology, it is now possible for fibre, yarn and fabric manufacturers to develop a product to meet a specific end-use. Designers can use this technology to create unique and original products to ensure they are a step ahead of their competitors.

Computer-aided design (CAD) allows designers to develop their work on screen, easily changing design features, fabric colours and prints to ensure the final product is the right one. They can also save a design for future editing. This greatly shortens the design cycle and reduces costs for the designer. Computer-aided manufacture (CAM) incorporates a variety of automated manufacturing processes. Although the initial setup costs are high, in the long term CAM reduces the length of the manufacturing process and allows the designer to push products into the marketplace quickly. CAM also reduces labour costs.

Many companies today use the Internet to market their products. Consumers can now purchase textile items from around the world in the comfort of their own home. This has expanded the retail market for designers.

## Internal factors

### Expertise

Designers may develop their skills by completing courses at TAFE or university in design and/or manufacture. Other designers are self-taught and gain their skills through on-the-job training. Depending on the size of the company, designers may

work alone or collaborate as a member of a team working towards a common design goal. To be successful, all designers need to understand the marketplace to ensure their final products meet a consumer need or want.

The sectors of the textile industry are diverse and designers usually specialise in a particular design area, such as surface decoration, costume or interior design. To ensure future success, designers must continue to develop their skills and expertise to keep up to date with current trends in the industry.

## Facilities

The facilities available to designers depend on the financial resources of an individual designer or design company. Today, most designers complete the design aspect of the production process in Australia but manufacture the product overseas where labour costs are lower. If a company is small, staff will have multiple skills and complete a variety of tasks. Larger companies will use a variety of technologies to make the process more time- and cost-efficient.

## Financial issues

For most designers, success is not instant; they start out small and gradually build up their business. Starting up a business requires a large initial input of capital to rent or buy suitable premises from which to operate, to pay wages, to purchase materials and to market the finished product. All these things must be paid for before the business can start to make a profit.

Often a designer will employ a business partner to manage the administration part of the business. As part of the Australian Government's assistance package for the Australian TCF industry, businesses can apply for two different grants. Type 1 grants are for new plant and equipment/building expenditure, trade showings and in-store promotions (brand support), and for clothing and finished textile entities the grants are for non-production related information technology. Type 2 grants are for research and development, including innovative product development activities. These grants will help companies to develop and compete successfully in the international TCF industry.

### Case study

## Designer profile – Dion Lee

Dion Lee has been emerging as one of Australia's most inspirational and promising young modernist designers of the 21st century. As of 2011, Dion has designed and created six

collections, and produced three prominent shows at Australian Fashion Week. He has provoked a heightened sense of anticipation and expectation within the Australian fashion industry, and has set a new standard that has been unmatched by any other designers of his age and experience. Dion exhibits an intrinsic talent for creating women's garments that are extraordinarily natural while also being contemporary and progressive, earning him international recognition.

### Sources of inspiration

Dion's collections use industrial technologies that harmonise highly skilled tailoring with accents of unexpected elements, such as unique draping techniques or an explosion of original digital print fabric design. He is able to confidently implement new and varied techniques, involving experiments with digital printing, plastic, leather,



Getty Images

Dion Lee

binding, acid and other fabric treatments with the tailoring mastery of a skilled craftsman. Dion's signature industrial style has sourced inspiration from traditional tailoring, laser cutting, innovative digital printing, folds, pleats, sculptural fabrics and zips contrasted with delicate glass and metal details. Dion Lee's collections are wearable, prominent and ingenuous. The silhouettes are very restrained yet highly designed.

Features of Dion Lee's work include:

- detailed cut and construction
- draping
- tailored garments
- unexpected applications of pattern, such as the Rorschach ink blot
- collaborative partnerships with other arts, such as CUE
- natural fibres, such as wool, silk and cottons
- minimalistic, architectural styling
- technically developed prints that challenge the capabilities of fibre, yarn and fabric
- silhouettes that push design parameters
- texture
- working with the internal structure of a garment
- sculptural elements, both soft and highly constructed
- digitally printed designs developed using photographs and digital art designs
- architectural elements, such as line, symmetry, asymmetry, balance and transparency
- extreme counter-balance of incongruent design concepts.

Dion's inspiration varies widely, but many of his design concepts express a unique modern and contemporary theme. Designs incorporate fresh and innovative fabrications intertwined with traditional tailoring. His particular design sensibility draws upon an extreme counter-balance of design concepts that ultimately support each other in a harmonious design aesthetic.

## Internal factors influencing Dion Lee

# Dion Lee's expertise

Dion Lee studied Fashion Design at the Sydney Institute of Technology, where he graduated in 2007. Experimenting with fabric, shape and cut, he is greatly inspired by the construction of garments and as such, his collections focus primarily on innovative pattern and cut. Often woven and intertwined, Dion Lee's garments achieve structured yet fluid tailoring, transparency and opacity. Functional detailing is added to achieve a modern balance of innovation and wearability.

Dion held his second solo show at Rosemount Australian Fashion Week on Thursday May 6 [2010] at the Sydney Opera House. The iconic building's impressive

architecture and incredible outlook provided the perfect location for Lee's progressive, modern vision. The show resulted in international acclaim and coverage from the likes of Style.com, Vogue.com, Dazed Digital and Jak & Jill. In addition Lee has been picked up by online retailer Net-A-Porter and a number of other international retailers.

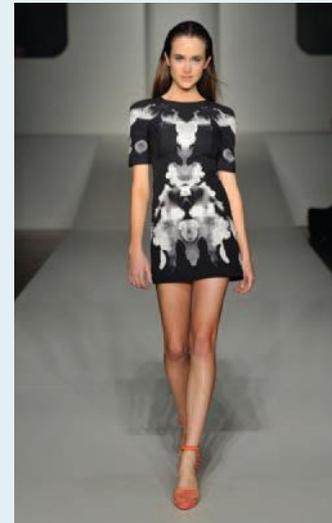
Dion Lee has been the recipient of the Prix de Marie Claire Award for Best Up and Coming Designer (2009), winner of the L'Oreal Melbourne Fashion Festival Designer Award (2010) and also winner of the QANTAS Spirit of Youth Awards in the Fashion Category (2010).

In spite of the buzz and excitement surrounding Dion Lee, the designer remains humble and dedicated to his work, an attitude that has him unwittingly rallying support and summoning enthusiasm from all corners of the industry. Dion's vision strikes a balance of modern yet classic, a thoroughly exciting designer now on the international radar.

Source: Rosemount Australian Fashion Week.



YouTube videos:  
Dion Lee  
Dion Lee at Rosemount  
Australian Fashion  
Week 2010  
Dion Lee interview with  
*Marie Claire* magazine  
Dion Lee discussing the  
Sydney Institute of TAFE



Getty Images



Photos from Getty Images



## Facilities

Although relatively new, Dion Lee has made a noticeable impact on the ACTFAI. Regarding employment, he has hired more staff as his success has grown. Dion's facilities include his own workroom, website and online store. Stockists of Dion Lee's designs can be found all over Australia as well as Hong Kong and Singapore.

## Financial issues

Ongoing success has ensured the income to run his business and showcase work at three Australian Fashion Week events. Careful planning, offering interviews and winning awards have helped Dion remain a current interest within the Australian textile industry. Producing amazing look books to market his incredible collections has been a great tool.

In March 2011 the doors were opened to collaboration between Dion Lee and an iconic Australian heritage brand, CUE. This collaboration will also create a new perspective on quality, functionality, design integrity and add more to Lee's financial success.

Dion's label is listed with online stockists such as Net-a-Porter. Net-A-Porter stocks everyone who is anyone in the fashion business and launches a label on an international scale. More than 2.5 million customers view the site each month.

Dion is currently developing a website that will also aid in marketing for financial success.



Dion Lee's Australian Fashion Week show  
Dion Lee interview with Style Me Romy  
Behind the scenes – Dion Lee

## External factors influencing Dion Lee

### Political environment

Australian Fashion Week allows Dion to showcase his work to overseas buyers who would be attracted by the Australian market. This extends the potential for export sales and increases interest in Dion's designer profile, which leads to domestic demand for local labels. This exposure has in turn led to more designer labels being available to consumers in department stores such as David Jones.

The government assistance received by the CSIRO has enabled them to develop machine-washable wool, which has indirectly affected Dion as he uses and markets this wool successfully in his designs.

### Economy

Due to the small amount of finance he had starting up, Dion had to consider the cost and amount of fabrics bought. He now employs a team of workers – it is impossible for him to manage his business on his own. The added costs of employing staff have to be regained somehow, so once his business started gathering momentum he began to outsource part of the garment manufacturing overseas. This strategy helps him remain competitive in the Australian and international textile market.



Getty Images

## Society

The evolution of contemporary culture into modern chic garments has influenced contemporary Australian fashion. Dion's garments reflect Australian society and culture, blending styles and influences and expressing the importance of technology in creating innovative, cutting-edge design. Dion's signature prints have been an inspiration for other designers.

## Ecology

Dion concentrates on using natural fibres in his design work, using synthetic accents to supplement his collections. He also alters contemporary fabrics by distressing or chemically treating them to create a futuristic look.

## Technology

Dion maintains a website where consumers can view his most recent work and find the address of the closest boutique at which his work is sold. This directly leads to his success as a designer. Dion also imports fabrics that utilise cutting-edge technology, such as silk from Japan and Italy, as well as beautifully designed laser-cut leathers and digitally mastered prints. These high-tech graphic art fabrics have qualities that attract consumers.



18.1 Apparel – Dion Lee

### Case study

## Designer profile – Lizzy Gardiner: costume

Lizzy Gardiner grew up in Australia and after high school she went on to study costume and fashion design at Florence's Academia Italiana. Once Lizzy returned to Australia she designed for the fashion industry, and created music videos and costumes for a television series. In 1994 she accepted her Oscar for best costume design for *The Adventures of Priscilla, Queen of the Desert* and stole the show with her famous Gold Amex dress.

### Sources of inspiration

Lizzy sources inspiration from many and varied sources. Her dynamic career and history of apparel and costume design have inspired her choices. The story being told is always of paramount importance for a costume designer. Understanding the characters and the physical requirements of the performance is extremely important in producing a costume that can portray the character. Images, books, theatre, movies, textures and fabrics are all important aspects of the creative process. Inspiration comes from everywhere: music, art, film, literature, history, culture, artists and performers. The sources are endless.

Lizzy's costuming calls for an infinite range of textures and finishes, from period textile prints and patterns to high-tech materials. Costumes are painted, printed, dyed, distressed and decorated using a full range of fibres and fabrics. Costumes for some performances often need to last for an extended period, and the maintenance of costumes often needs to happen quickly, with repairs being done on stage wings. Quick changes are essential, so Lizzy has to be innovative about her sources of inspiration for closures.

When working on the costumes for *The Adventures of Priscilla, Queen of the Desert* Lizzy cites some of her inspirations as being anything from the 1970s, fun, wonderful times, Australia, Donna

WWD/Condé Nast/Corbis



Lizzy Gardiner

Summer (in particular her Afro hairstyle), music and discos. The costumes are huge, colourful, flamboyant and outrageous, which reflects both the flamboyance of the drag queen characters and showbiz. Each costume also has an Australian element, like the huge thongs, or the essence of an Australian animal like the emu or frill-necked lizard.



Getty Images



Lizzy Gardiner interview with *MORE* magazine  
Behind the scenes with Lizzy Gardiner  
*Priscilla Queen of the Desert – the Musical* costumes in action on *The View*  
*Priscilla Queen of the Desert – the Musical* – initial sketches and final costumes

## Internal factors influencing Lizzy Gardiner

### Expertise

Lizzy is an expert in her chosen field, combining her passion for textiles, fashion design, directing and costuming to be a successful designer. In addition to being an award-winning costume designer for film and theatre production, she has also been involved in the costume design for many Australian and international television commercials.

### Facilities

Lizzy designs from the United States and Australia. She works with associate Tim Chappel and sometimes other freelance assistants hired on a needs basis.

### Financial issues

As a successful freelance costume designer, Lizzy must ensure all work is done within the limit of individual budget constraints. The producing company via an agent pays her fees, and an agent helps negotiate contract terms and ensures fees and royalties are paid. In terms of working within budgets, it's usually a contractual obligation that you deliver a design that can be realised within the confines of the budget stated in the contract.

Lizzy manages not only the financial side of wardrobe planning, understanding the impact of purchases and upkeep of costuming, but also costume maintenance throughout the performance season.

## External factors influencing Lizzy Gardiner

### Political environment

Governments set up grants for individuals and production groups through the Australia Council of the Arts and individual state arts bodies. These may allow for further training or study for established artists, or assist in funding the production of work or the touring of produced works. The government always determines the level of available arts funding.

# Government Applauds Priscilla

WRITTEN BY TROY DODDS, JUNE 2011

Minister for Major Events and the Arts, George Souris, has warmly congratulated the Australians who have distinguished themselves at today's Tony Awards given for excellence in Broadway stage productions.

'The award of best costume design to Lizzy Gardiner and Tim Chappell, two people from rural New South Wales, shows the depth of talent we have in this State and country...and it is something the Coalition Government intends to nurture and promote,' Mr Souris said.

Gardiner and Chappell won the coveted Tony for their brilliant and outlandish costume designs for the stage production of *Priscilla Queen of the Desert* which has been delighting Broadway audiences.

'This celebrated duo has also won an Oscar in 1995 for its costume design of the movie of the same name and who could forget Lizzy Gardiner's appearance at the

Oscars wearing a dress she designed made entirely of gold American Express cards,' Mr Souris said.

'It is a matter of great pride that two people from country NSW, Lizzy Gardiner from Dubbo and Tim Chappell from Lismore, have won such world acclaim and we should be extremely proud of their achievements.

'I would also like to congratulate Tony Sheldon for his Tony Award nomination as leading actor in a musical for his role as Bernadette in *Priscilla Queen of the Desert*.

'Again it demonstrates the depth of world-class talent in this country and reminds us that when it comes to the entertainment industry, we can do it as well as anyone anywhere.

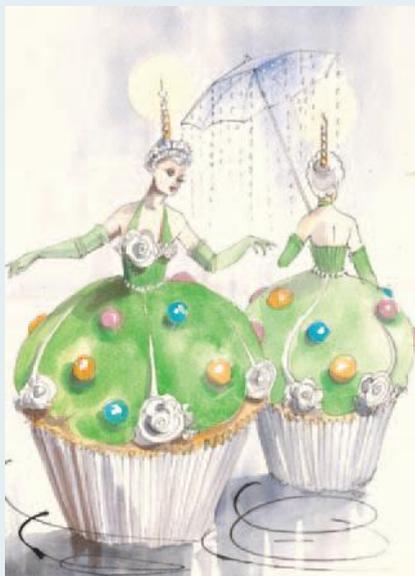
'That's why the Coalition Government is determined to turn around 16 years of indifference and inactivity and return Sydney to its pre-eminence as Australia's live production capital.

'To this end, we have rationalised our bidding and marketing process by announcing the Establishment of Destination NSW which will consolidate the roles of Events NSW and Tourism NSW to bid for and attract the world's major stage productions which will greatly enhance tourism and the State's vibrancy.

'We have already witnessed the announcements of Sydney winning the rights to such productions as *Legally Blonde*, *The Addams Family*, *Strictly Ballroom*, *La Traviata* and *Annie* ... and there is more to come.

'We have among the world's most talented actors, singers, dancers, directors and production staff and we have Australia's only international city. I can assure you that Sydney is back in the game in a big way for first run stage productions.'

Source: [www.aussietheatre.com](http://www.aussietheatre.com).



Corbis/Bob King



## Economy

When the economy is buoyant it supports the general public: the people who attend theatrical productions. The cost of procuring a performance site, predicting audiences, employing actors and artists and running a business all add to the cost of a ticket for a theatre production. Lizzy's success relies on the collaborative nature of theatrical arts groups and on theatre audiences who are willing to pay the ticket prices, which often reflect the increasing cost of economic demand.

## Society

The social commentary of clothing in a production can be a costume designer's niche. Costumes in *Priscilla Queen of the Desert The Musical* remain faithful to the original 1994 movie, but feature new and innovative costumes that bring the stage alive with colour. Current costume trends can be the result of designs inspired from movies, music or the clothes worn by celebrities. Costumes can also be made to shock, entice or entrance an audience. The success of Lizzy's costume designs is related to her ability to connect the audience within the social context of the production or to challenge conventional notions of costume design.



Lizzy Gardiner's portfolio

## Ecology

Lizzy creates costumes that must sustain long periods of production. The costumes are used repeatedly in performances across cities and must sustain multiple uses.



18.2 Costume –  
Lizzy Gardiner

## Technology

Lizzy's portfolio is made up of digital montages hosted by her agency. Her work can be sourced on the Internet.

## Case study

# Designer profile – Catherine Martin: furnishings



Catherine Martin  
Bazmark Inq

Catherine Martin was born in Sydney, Australia. She began to study at the Sydney College of the Arts but decided to change direction and went on to work for a small Sydney fashion design house called *Jaoquin*, as well as design costumes for a small theatre company. Catherine gained a place at the National Institute of Dramatic Art (NIDA) where she began collaborating on various projects with Baz Luhrmann and Angus Strathie. Catherine later married Baz Luhrmann and continued working closely with Angus Strathie.

Catherine has established herself as one of Australia's most talented costume and set designers. She collaborated with Baz Luhrmann on *Strictly Ballroom*, *Romeo and Juliet* and *Moulin Rouge!* The three pieces are known as the red curtain trilogy due to the strong links with the theatrical world. Baz and Catherine co-founded their Sydney-based production company Bazmark Inq, and Catherine has received numerous awards for costume and scenic design. Catherine worked alongside Luhrmann in their epic production *Australia* and is currently working on *The Great Gatsby*.

Heralding a new chapter in Australian design, Catherine has partnered with Designer Rugs to launch her home wares range.

## Sources of inspiration

Through her investigation of Australiana and in celebration of native flora and fauna, children's patterns and lace designs, Catherine effortlessly combines unusual and striking elements; they work together in her home wares range in a sophisticated and complementary way.

Catherine says researching often begins with a collection of inspirational ideas from a wide variety of sources. She believes that research stems from the initial consultations and gathers momentum as the project evolves. Each design project begins its own journey through direction, self-direction and collaboration to create a logistical product that connects with the market.

## Internal factors influencing Catherine Martin

### Expertise

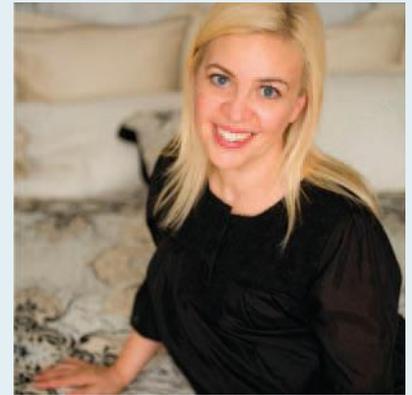
Catherine won two Academy Awards for *Moulin Rouge!* – Best Art Direction and Best Costume Design. She also created the set and costume designs for the Broadway production of *La Boheme*, where she won a Tony Award for Best Scenic Design of a Musical.

### Facilities

Catherine Martin lives and designs in an old Surry Hills mansion called *The House of Iona*. She works in collaboration with Designer Rugs on her interior rug collection.

### Financial issues

Catherine is a highly successful designer who manages the financial side of her furnishings business collaboration with Designer Rugs.



Catherine Martin



Catherine Martin's collection at Designer Rugs



Photos from Designer Rugs



Designer Rugs

## External factors influencing Catherine Martin

### Economy

Since the 2008 launch of the new CM brand, Designer Rugs' target market has evolved and grown. Catherine sells to retail and trade, both domestically and internationally. CM is a luxury brand. The company's consumers value good design and appreciate the craftsmanship involved.

Catherine's business also holds a significant place within the Australian design market, with Australians now recognising that their design products can compete with what is being produced in other parts of the world. Buyers consider Australian heritage and cultural icons as features worth investing in. Catherine's rug designs feature a collection of interior furnishings that showcase iconic Australian images including acacia and eucalyptus flora.

### Society

Catherine holds great significance in strengthening the local and international design industry, and builds relationships with Australian suppliers and manufacturers. In addition to running a thriving costume business, Catherine is committed to establishing Australian design as a serious competitor in the international market. She is also dedicated to improving Australia's awareness of its own creative talent.

### Ecology

All CM designs by Designer Rugs are exclusive. Catherine's range includes contemporary and traditional hand-tufted and hand-knot ranges in New Zealand wool, wool blends, viscose and pure silks. Selected products in the collection have a Green Star rating (an environmental rating system).

### Technology

Catherine runs her own website and online contacts. She also works collaboratively on projects that have websites, which adds to her success as a designer. The manufacturing of her designer rug collection uses CAD and CAM to capture her original designs and transfer them onto high-quality manufactured rugs.



Green Star rating system



18.3 Furnishings – Catherine Martin

## Case study

## Designer profile – Kirry Toose: textile art

© Janet Tavener



Kirry Toose

Kirry Toose trained as a dress designer, and qualified at the National Art School in Sydney. This has laid a very strong foundation for the development of her creative machine work.

Kirry is a prolific exhibitor and her amazing creations are housed in many Australian and international galleries. Her work has international appeal as has been exhibited at the World of Wearable Arts in New Zealand. Kirry maintains that teaching is her passion, driven by her insatiable love of textile arts.

Kirry constantly challenges herself with the creation of every new textile art piece, focusing on streamlining a new technique or product or extending a concept further. Her research and experimentation become a significant component in her innovative design work.

Traditional design elements come intuitively. The successful combination of traditional skills, such as hand embroidery, with paint and technology are part of Kirry's current strategies in design and creation.

## Sources of inspiration

Kirry is inspired by a myriad of varied sources. As she states on her Thread Studio profile:

In my personal approach to design, the use of 'line' is of utmost importance, with the Art Nouveau and Art-Deco periods being a strong influence in my work.

Source: The Thread Studio, [www.thethreadstudio.com](http://www.thethreadstudio.com).

Kirry is continually inspired by competition themes, such as her entry in the *Art U Wear 2011* show with the 'Circus Bersekus' theme.



New Zealand's World of  
Wearable Arts

# Dress for success

BY TRACEY FINDLAY

A STUNNING, circus-inspired outfit designed by a Cowan resident will take centre stage at Australia's biggest craft fair this month.

It took Kirry Toose 300 hours to make her colourful creation which is a finalist in the 2011 Art U Wear Challenge, part of this month's Sydney Craft and Quilt Fair.

The Circus Bersekus themed challenge includes an eclectic mix of entries inspired by acrobats, clowns, contortionists and other circus characters.

Ms Toose's work is called Tilly the Tightrope Walker and was created 'to put a smile on people's faces'.

'With such a fun theme, I wanted to have madness in colour and joy in movement, which is how Tilly was born,' Ms Toose said.

The outfit comprises 54 triangle panels and involved countless hours of hand stitching. The skirt's hemline braid is almost 30 m long and took 12 hours to complete.

'I don't know how many coloured silks I have got into it - the only colour I couldn't get was burnt orange,' she said.

Ms Toose, 56, studied dressmaking after leaving school and then trained as a designer and patternmaker.

'Over the years I have done a lot of costumes and sold them,' she said.

'You will never be rich (as a textile artist) but you do get huge job satisfaction.

'There's a real joy from my perspective in being creative.'

Source: *Hornsby and North Shore Advocate*, June 2011.

## Internal factors influencing Kirry Toose

### Expertise

Kirry attributes the ability to draft patterns, plus the extra skills gained through courses in millinery, fine needlework, silk screen and photographic printing, numerous fibre and textile workshops, as having broadened her horizons as a textile artist.

Numerous articles have been published about Kirry's work. She is also a member of numerous textile-related groups and participates in Internet computer groups.

### Facilities

Kirry has her own design studio where she creates her textile art pieces. She loves to spend time teaching, especially teens, creating and exploring textiles in her studio. Kirry promotes her love of textiles via competitions like *Fashion Fantasia* and actively participates in the Australian Textile Arts and Surface Design Association (ATASDA).

## Financial issues

Financial issues in creating textiles arts are on a different scale to other aspects of the ATCFAL. When the design being created is a one-off, and if the method of construction is particularly labour-intensive, there is usually only a very limited market prepared to pay what the finished product is worth.

Often a textile artist may find that they have to rely on quite a number of different streams of income in addition to selling their textile art works. Related sources of income could include exhibitions, workshops and arts grants, or the artist may find that to fund their more creative pursuits they might become an agent or retailer for some of the materials that they work with. Others may take up writing articles, patterns and books. During an interview for *Fashion Fantasia* Kirry said:

The last eighteen months have been fantastic for me. Finally realising I am a product and that I need marketing, trying to establish myself on a more national level as an Artist and tutor. Believing that the best way to market myself as a tutor (as I would never make money with a production line) I entered Fashion Fantasy, held in Tasmania's Wrest Point Casino. The two garments entered won my sections and took out Supreme Award of the competition/exhibition. Feeling very elated and now with the belief that my garments were 'working' for me, I entered Fashion Flair and Fantasy, held at the National Museum of Canberra. This time my breath was completely taken away (and I am still smiling) I entered three Sections, won my three sections and was Supreme Award Winner of the Competition/Exhibition.

Source: [www.fashionfantasia.com.au](http://www.fashionfantasia.com.au).



Fashion Fantasia 2010

© Kirry Toose



## External factors influencing Kirry Toose

### Political environment

The current political climate is not a major factor in the success of Kirry Toose's work as a textile art designer as her products are designed for a niche market.

### Economic

The high value of the Australian dollar means the cost of imported yarns and fabrics, especially from America, has decreased.

### Society

Textile artists are often able to make a social statement. Themes or inspiration work can be turned into a social commentary. Kirry's exhibited art evokes a social response. The actual art of the exhibition lends itself to social outings, which stimulate conversations and inspire other artists.

### Ecology

An insight into Kirry's latest workshop explains her passion for recycling, reclaiming and reusing. The workshop encourages her students to recycle, deconstruct and use pre-loved items from op shops.

Kirry's workshop, titled *Flash Trash*, is explained on the next page.

# Flash Trash ... or is it Steampunk ... or just Trashion?

This is not for the faint hearted! ... or if you have the need to stay in your comfort zone! Have you the desire to create uniquely individual garments? Then, this workshop is for you! Through the deconstruction and recycling of previously loved or Op-shop garments and working with personal themes or concepts, develop your art through play, with re-cutting and assembling, embellishing, insertion and addition. Have lots of fun by the breaking boundaries; whilst learning to problem solve through design, extending your sewing skills, exploring numerous techniques and products: plus, acquiring basic patternmaking knowledge. Be inspired by the 'Masters' and current trends in one's personal creative journey.

Research little known topics such as 'Steampunk', drown the senses with the fashions of Alexander McQueen, Lacroix, Galliano and Zandra Rhodes. The workshop is especially useful for those undertaking a major project in Art or Textiles. Students will experiment and explore the many varied design options and their potential, technical skills - sewing, knitting, crochet and the use of products that are not usually considered in the context of a garment.



18.4 Textile arts – Kirry Toose

Source: Fibre Arts Australia,  
[www.fibrearts.jigsy.com/kirry-toose](http://www.fibrearts.jigsy.com/kirry-toose).

## Technology

Kirry's work is featured on many websites, although she does not currently maintain her own. Her interest in technology, digital printing and computerised machine embroidery is incorporated into her textile art work.

### Case study

## Designer profile – Kim Carpenter: non-apparel

Kim Carpenter is a theatrical designer, costume and puppet expert and artistic director. He possessed a natural gift to draw and paint from the age of four, and practised his talents by drawing on walls and footpaths in coloured chalks. He excelled in art at school and was deeply interested in drama. He always liked to play the showy, most evil characters. In primary school, Kim had a glove puppet show that he took around the school.

Kim decided to focus on art in high school and continued on to study a production course at NIDA, which included design. He graduated by directing and designing Antonin Artaud's *Spurt of Blood* as visual theatre.

After NIDA, Kim became resident designer for the Old Tote Theatre Company (predecessor of the Sydney Theatre Company) at age 19. But Kim was too young for such responsibilities and



Kim Carpenter

after a year went to London to study a postgraduate course in design at the English National Design School at Sadlers Wells under Motley – the famous English theatre designer.

After two years in London, Kim was offered the position of resident designer at the Melbourne Theatre Company. This was the beginning of his career as a designer of sets and costumes for theatre, dance, opera and television.

Kim began seriously directing his own vision when he became a Co-Artistic Director at Nimrod (now Belvoir). Following the Nimrod period, he freelanced as a director–designer around Australia in theatre, dance and opera.

Kim founded Theatre of Image in 1988 after being inspired by the work of visual theatre director and designer Robert Wilson in the USA. Theatre of Image eventually dedicated itself to becoming a mainstage theatre company creating new works for young people and families – intergenerational theatre.

## Sources of inspiration

Kim Carpenter says:

I am continually inspired by a wide range of visual and written stimuli, including visual arts, painting, sculpture, installations and films. Good live theatre. Books, including children’s books that have beautiful and inventive synergy between text and pictures, adult books and poetic, imaginative novels; for example, David Malouf and Angela Carter.

Application of my initial inspiration and source material is layered and often subconscious, with the usual process of drawing a lot to find the right image, shape or character. Colour, texture, line and eventual final medium that the drawings are rendered in suggest a type of fabric. Fabric swatches are sourced and often treated and tested with dye and paint and then chosen. Most costumes and puppetry designs are dyed or painted on in some way in my productions to unify them to the bigger picture of set, digital projector and props.

Source: Interview with Christine Castle, 2007.

## Internal factors influencing Kim Carpenter

### Expertise

Kim is a highly gifted and talented individual with a passion for creating theatrical magic for Australian and international audiences. Kim has designed over 60 productions in drama, dance and opera and is the director–designer of many Australian productions. Theatre of Image was awarded the 2006 Helpmann Award for Best Presentation for Children for its production of *Stella and the Moon Man* with the Sydney Theatre Company and Australian Youth Orchestra. Theatre of Image has toured regionally, nationally and internationally, and has collaborated with major performing arts companies in Australia, Canada and Japan. The success of *The Book of Everything* will tour the New Victory Theater in New York from April 2012.

### Facilities

Kim works predominantly from his home studio and office in Pyrmont, Sydney. His work also requires travelling overseas for research and development of theatrical ideas, and for cultural exchange of ideas and inspiration.



*The Book of Everything*



In any theatrical design business, a production team is necessary to ensure success. Each production requires a creative team of people who are auditioned and who bring different skill sets to each artistic endeavour. Kim also has a permanent team of people at Theatre of Image who work tirelessly to realise his artistic enterprises and help his creative journey become a success.

Kim uses rooms at NIDA for workshops, training and conferences. He also uses the facilities of the Sydney Theatre Company, the Seymour Centre and Parramatta Riverside Theatre to present his productions in Australia. Kim runs workshops for children in drama, art and music at the University of New South Wales.

## Financial issues

As the artistic director of Theatre of Image, Kim is on a salary. The creative teams, other designers, composers, writers and choreographers are all paid fees per production. All performers are paid salaries for the duration of their employment on a single show, usually a period of eight weeks. Theatre of Image's income is from government grants, philanthropy, private donations and box-office proceeds. International tour costs are shared between Theatre of Image and the country and organisation that invite them.



## External factors influencing Kim Carpenter

### Political environment

Theatre companies regularly apply for cultural grants from government bodies. Being well established, Theatre of Image has a fairly regular success rate in receiving such funding. To apply for grants, a company must justify its artistic success and show audience and box-office figures. These are judged in context with the sector.

### Economy

Theatre of Image tickets are reasonably priced for such visually stunning theatre. Attending the theatre tends to be somewhat of a luxury in Australia for most people; however, while the economy is good, people are more likely to spend money on such luxuries.

The cost of procuring a performance site, predicting audiences, employing actors and artists and running a business all add to the cost of a theatre ticket. Kim has made the theatrical experience available to a wider group of people by allowing special school visits at a fraction of the cost of a usual ticket. The fact that children in Australia are able to attend the theatre for a reasonable price is both exciting and culturally rich. This in turn adds value to Kim's success with Theatre of Image, as his primary target group is children and their families.

### Society

The attendance of theatre, the social experience and etiquette required is a valued cultural experience. Children attending Theatre of Image performances are often treated to their first social experience with live theatre. It is interesting that Kim himself has noted that before each performance the children in attendance are asked to turn off their mobile phones. This reflects an aspect of contemporary children's society in Australia.

### Ecology

In 2006–07, Kim and Richard Tulloch, in association with Japan's Kageboushi Theatre Company, helped to create the script for *Lulie the Iceberg – The Soul of the Ice*, adapted from the book of the same name by Princess Hisako of Takamado. The performance was based around themes



Theatre of Image  
Theatre of Image – video  
of productions

that included worldwide ecological systems and fragile environments, in particular the interdependence of all life on Earth. One strong message of the play was that water is the most precious thing on Earth – a timely message that transcended culture about the living Earth and the environment.

Kim uses the resources of Reverse Garbage for the workshops he presents in association with Theatre of Image.



## Technology

Kim's most recent production connects the world of digital design and live theatre using Macromedia Director. The technology of digital animation was an integral part of the success of the live productions. Connecting young audiences with fast-moving digital media on such a large scale makes them feel as though they are part of the production. The interactive screens in the production of *Go Pinocchio!* exposed the audience to a kind of live video game. Young audiences were engaged, and remained so throughout the entire production.

Connecting the world of costume design, set design and puppetry in live theatre is an innovative and unique idea. This method allows students to study and think about character analysis, character portrayal, theme and how those are affected in turn by the production set and the artistic direction of the live theatrical performance. The fact that Kim's creative costume and masterfully

rendered costume designs are available on the Theatre of Image website also provides a unique insight into live theatrical performance. This endorses the connections of the ideas from paper to realisation in theatrical performance. The costumes on the website are true representations of Kim's original designs brought to life. The website technology also helps to convey advertising for workshops, productions and resources.



18.5 Non-apparel –  
Kim Carpenter



18.6 Influence of designers  
18.7 Natural sources  
of inspiration

## What inspires designers?

Inspiration is the stimulus, motivation or encouragement for designers to start a design project. Inspiration may come in many different forms and the source of inspiration will most likely change from project to project.

### Nature

Look around you: nature provides a diverse range of design ideas. The colours and shapes of flowers and leaves, the texture and colour of bark, and the images of landscapes can all inspire designers to create amazing designs.



Photos from Shutterstock.com

## Manufactured items

Items created by people can also inspire textile projects. Think about the decoration on buildings, wrought-iron fences, paintwork and stained-glass windows, and how they might act as inspiration. Industry also provides the stimulus for design. Mechanical items, such as a clock or a car, can be viewed as a whole or broken down into their parts then analysed as inspiring man-made objects.



Photos from Shutterstock.com



- 18.9 Historical sources of inspiration
- 18.8 Manufactured sources of inspiration
- 18.10 Cultural sources of inspiration

## History

Very little in design is completely new; designers draw inspiration from what has been created in the past. Often designers will take elements from past designs and put them together to create a modern interpretation. Sometimes designers will re-create a historical item using modern fibres, yarns and fabrics.



Photos from Shutterstock.com

## Culture

Exploring different cultures allows designers to gain new design perspectives and often can inspire new ideas. Traditional designs and techniques are unique to each culture. Architectural styles also vary from culture to culture. Colour and shape are also important aspects in cultural designs.



Photos from Shutterstock.com



18.11 World events, feelings and emotional sources of inspiration

## World events, current events and emotions

What happens in the world influences the thoughts of designers, which is often reflected in their work. Times of prosperity may be reflected through the use of bright colours and positive images. Designers may use their work to make a statement about current issues, including global warming, drought, endangered species or war. Personal feelings may also be reflected in a designer's work: the joy of a wedding or the birth of baby. Music and the media also give designers the inspiration to create.



Fire



Freedom, fun and play



Arts and entertainment

Photos from Shutterstock.com

## Review questions

Use the information in this chapter to answer the following questions.

- 1 What types of skills are required for textile designers to excel in business?
- 2 Discuss the external factors that determine the success or failure of designers.
- 3 Discuss the internal factors that determine the success or failure of designers.

## Websites

- ☉ Dion Lee ([www.dionlee.com](http://www.dionlee.com)): This website features present and past collections and fashion parades of this young Australian designer's work.
- ☉ Lizzy Gardiner ([www.2c.com.au](http://www.2c.com.au)): The website of Lizzy Gardiner's agent features Lizzie's amazing costume illustrations.
- ☉ Catherine Martin ([www.catherinemartin.com](http://www.catherinemartin.com)): Catherine Martin's interior design collection of rugs.
- ☉ The Thread Studio ([www.thethreadstudio.com](http://www.thethreadstudio.com)): The gallery section of this textile supplies website features Kirry Toose as a textile artist.
- ☉ Theatre of Image ([www.theatreofimage.com.au](http://www.theatreofimage.com.au)): New South Wales' premier mainstage theatre company for children and their families – visit the teacher resources section for a link to textile activities for students.



18.12 Contemporary designers palm cards



# HSC course

## Area of study: Properties and Performance of Textiles

This area of study will allow you to develop a knowledge and understanding of scientific and technological developments. A critical approach towards the effects of innovations and emerging technologies is a major part of this area of study.



Refer to the Board of Studies website for the Course Objectives, Outcomes and Content:  
[www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au).

<b>Chapter 19</b>	Innovations and emerging textile technologies	288
<b>Chapter 20</b>	End-use applications	316



# 19

## Innovations and emerging textile technologies

### Textile innovations

Two types of innovation are involved in new textile technologies: innovative product and innovative process. Product innovation occurs to meet consumer demands, whereas process innovation leads to lower costs, higher production rates or improved quality.

In the 21st century we have the technology to develop innovative textile products for specific end-uses. Fabrics and garments have been developed that can control body temperature, incorporate technology such as music and telephone systems, and monitor the state and condition of our bodies. Technical textiles are concerned with function rather than aesthetics.

CSIRO Manufacturing and Materials is the leading technology supplier to sectors of the Australian textile industry (including wool, cotton and technical textiles) at the fibre, yarn, fabric and garment stages.



CSIRO Manufacturing and Materials



19.1 Textile innovations

#### Extend your knowledge 19.1 Textile innovations

Conduct an Internet search on each of the following terms: smart textiles, medical textiles, intelligent textiles, sustainable textiles and technical textiles. List four interesting facts you discover about each of these terms.

### Use of textiles to enhance performance

Textile innovations have led to the development of new products and variations on previous products that perform in a superior way to their less technologically advanced counterparts. In your HSC course of study you are required to study a total of six textile innovations in the categories of fibre, yarn and fabric innovation. Microfibres, bicomponent yarns and washable webs are compulsory topics, and you must also study another innovation in each category.

Category	Compulsory innovation	Additional innovation in this textbook	Additional innovation on NelsonNet
Fibre innovation	Microfibre	Bamboo – 100% pure	Sorona
Yarn innovation	Bicomponent yarn	NILIT EcoCare yarn	Vectran
Fabric innovation	Washable webs	Cordura	Gore-Tex



The Philips Lumalive couch is a light-emitting textile to be used in home or professional environments.

Image courtesy of Philips

## Fibre innovation: microfibre

### What is microfibre?

Fibres less than one denier thick are known as **microfibres**. A yarn made from microfibres may have as many as four times as many fibres in its length than that of its regular fibre equivalent. Colours are brighter as the yarns have more surface area due to the numerous filaments that make up each yarn.

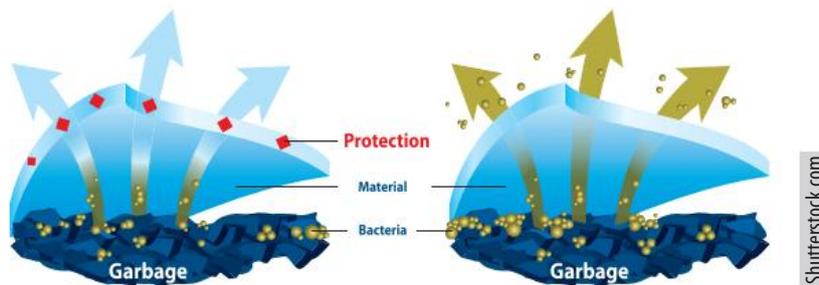
Microfibres are created by modifying the spinning process or separating filaments by modifying the spinneret shape. Polyester, nylon, acrylic and rayon can be used for microfibres in both staple and filament form.

Microfibres are not necessarily new, but they are being used in different ways.

### How microfibre enhances performance of fabric and end-product

The enhanced performance potential of microfibre is due to the following qualities:

- ultra-fine – finer than the most delicate silk
- lightweight
- extremely high drapability
- very soft and comfortable, with luxurious handling and a silken or suede touch
- washable and dry-cleanable
- shrink resistant
- high strength (except rayon)
- excellent heat-setting ability – for example, pleat retention
- can be woven tightly and insulates well against wind, rain and cold
- fine yarns packed tightly together – it can be used to create a waterproof and water-resistant fabric without the use of synthetic resin coatings.



Close-up action of an antibacterial microfibre cleaning cloth

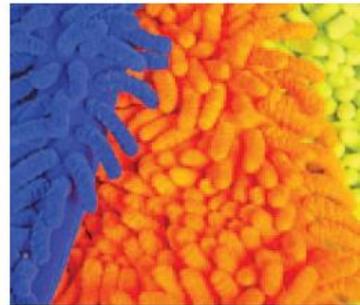
### End-uses

Microfibre has many end-uses, including:

- apparel – hosiery, blouses, dresses, sportswear, high-performance clothing, ties, scarves, menswear, intimate apparel, active wear, swimwear, outerwear, rainwear
- furnishings – curtains, draperies, upholstery, sheets, towels, blankets.

Specialised environmentally friendly microfibre cleaning products can be used on multiple surfaces, including kitchens, glass, plastic, wood and ceramics. It is the shape of the spinneret and the resulting extruded microfibre that makes microfibre clean so efficiently. The fibre's wedge-shaped filaments follow the surface, lift up dirt and then trap the particles inside the fibres. Microfibre cleaning cloths eliminate the need for harmful cleansers, as they remove 98–99% of all dirt, bacteria and grime without any kind of chemical spray. The capillary effect between the filaments and nylon core creates a high absorbency, which in turn enables this cloth to clean and polish at the same time.

Shutterstock.com



Polyester microfibre

## Impact of microfibre

Impact on:	Advantages	Disadvantages
Consumer and society 	<ul style="list-style-type: none"> <li>• 'Suede' texture gives a soft feel so the fabric is appealing to touch</li> <li>• Suitable for travel as it is lightweight and resilient</li> <li>• Looks like fine silk but is easier to care for and has luxurious drape</li> <li>• Due to its fineness, microfibres provide the wearer with greater coverage and are more wind resistant</li> <li>• Easy to launder – can be gently machine-washed and dries quickly</li> <li>• Can be dyed in a variety of colours</li> </ul>	<ul style="list-style-type: none"> <li>• Fairly expensive to purchase and may not be as absorbent or comfortable as natural fibres</li> <li>• Manufacturing of petrochemical fibres concerns the environmentally aware consumer</li> <li>• Consumer confusion – need for consumer education so they understand the differences between fibre properties and suitable end-uses</li> </ul>
Supplex, 100% nylon; synthetic filament microfibre		
Manufacturer	<ul style="list-style-type: none"> <li>• Allows manufacturers to control quality as fibres are engineered to meet specific end-use or desired performance</li> <li>• Allows manufacturers to combine microfibres with regenerated yarns and natural fibres for specific end-uses</li> <li>• Manufacturers may use a fabric finish such as an antibacterial finish to improve performance and enhance the fabric quality, improving its success in the marketplace</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive to establish machinery</li> <li>• Employees must be trained to work with machinery</li> <li>• Takes away market for other fibres such as fine silks and high-quality cottons</li> </ul>
Employee	<ul style="list-style-type: none"> <li>• More job opportunities from new fibre technologies</li> <li>• Possible need for highly skilled labour to operate machinery, which could lead to higher incomes for employees</li> </ul>	<ul style="list-style-type: none"> <li>• Structural unemployment – for example, workers may be replaced with machines or more highly skilled labour</li> <li>• Work hazards – noise pollution, chemical pollution, dust</li> </ul>
Environment	<ul style="list-style-type: none"> <li>• Not dependent on natural resources for its existence</li> <li>• Detergents and cleaning chemicals are not required in the manufacture or finishing of this product</li> <li>• Microfibre cleaning cloths eliminate the need for harmful cleansers</li> </ul>	<ul style="list-style-type: none"> <li>• Fabric production requires the operation of machinery, which uses energy, emits noise and in some cases air pollution, which may affect surrounding residential areas and natural ecosystems</li> <li>• Transport vehicles create air pollution</li> <li>• Carbon dioxide released into atmosphere contributes to the greenhouse effect, which ultimately leads to global warming</li> <li>• Water waste and chemical residue may end up in river systems</li> </ul>

NelsonNet

Sorona case study  
 TEXD12CD190049

## Fibre innovation: bamboo

The fashion world is constantly seeking new innovations in fibre, yarn and fabrics to enhance consumer interest in design. This, coupled with interest in ecotextiles and the importance of sustainability of our fragile Earth, has given rise to interest in fibres such as **bamboo**. While bamboo has been used mainly as fibrous weaving in traditional Asian cultural textile production for centuries, it is only through recent developments in technology that bamboo has been manufactured into fibres so fine they are compared to the luxury of silk and cashmere.



Shutterstock.com

Bamboo forest

Bamboo is the fastest-growing woody plant. It can be grown in conjunction with other crops, such as vegetables, which makes it beneficial for rural livelihood. Bamboo can be harvested within four to five years after planting and is excellent for restoring degraded lands and protecting against soil erosion.

### How bamboo fibre is created

Bamboo fibre is created in a similar way to regenerated cellulosic fibre. It is produced from raw materials of bamboo pulp using a specific patented technology and a high-tech process.

There are two main ways of processing bamboo: mechanical processing (similar to producing linen) and chemical processing (similar to producing a regenerated cellulosic such as rayon).

Bamboo pulp is refined from bamboo through a process of hydrolysis-alkalisation and multi-phase bleaching. Bamboo pulp is then processed into fine bamboo fibre. Bamboo can be spun purely or blended with other materials, such as cotton, hemp, silk, Tencel, Modal, and other manufactured fibres, such as polyester.



Microscopic longitudinal appearance of bamboo fibre



Bamboo fibre roving, ready for spinning

Pure bamboo is a natural antimicrobial fibre. It can thrive without the use of pesticides and is seldom eaten by pests or infected by pathogens as it contains a unique antimicrobial agent called **bamboo kun**. Fabric produced from pure bamboo fibre maintains the bamboo kun as it is bound very closely to the bamboo cellulose molecular structure.

Bamboo fibre is exceptional in both an antimicrobial and deodorising nature. The Japan Textile Inspection Association found that bamboo fabric processed from pure bamboo maintained these qualities even after 50 washes. These properties make it exceptional for use in intimate apparels, such as underwear, babies' nappies and nappy liners, and non-woven textile medical applications, such as medical masks, surgical clothes, sanitary towels and absorbent pads.

The natural **antibiosis** function of bamboo fibre means finished products do not require any artificial antimicrobial agent, and therefore minimises skin allergies associated with chemical-finishing processes. Bamboo fibre also remains a competitive price-point in the textile marketplace, which is another definite advantage.



Bamboo baby clothing



Bamboo towels



Bamboo wrap



Bamboo quilt

## Properties of bamboo

Fibre properties		Properties of pure bamboo
Aesthetic	Lustre	<ul style="list-style-type: none"> <li>Natural sheen and a soft lustre</li> </ul>
	Drape	<ul style="list-style-type: none"> <li>Soft drape and silky softness</li> </ul>
Durability	Abrasion resistance	<ul style="list-style-type: none"> <li>High abrasion resistance – perfect to spin into lustrous, fine and strong yarns</li> </ul>
	Strength	<ul style="list-style-type: none"> <li>Very strong – has been compared to steel in strength</li> </ul>
Comfort	Absorbency	<ul style="list-style-type: none"> <li>High degree of absorbency due to the cross-section of bamboo fibre, which is filled with various micro-gaps and micro-holes</li> <li>Hydrophilic – absorbs more water than other conventional fibres, such as cotton</li> <li>Outstanding wicking ability that enables it to pull moisture away from the skin – often used for apparel, intimate apparel, bedding, towels and nappies</li> <li>The microstructure enables the garment wearer to feel cool and comfortable in hot conditions and warm in cool conditions</li> </ul>
	Elasticity	<ul style="list-style-type: none"> <li>Resilient</li> </ul>
	Thermal properties	<ul style="list-style-type: none"> <li>A cool fibre as it is a good conductor of heat</li> <li>Breathes easily, making it comfortable to wear against the skin</li> <li>Smooth and round fibres that do not irritate the skin – sometimes referred to as hypo-allergenic</li> <li>Can be ironed with a hot iron</li> <li>Ignites and burns quickly as it is made from cellulose</li> </ul>
	Dimensional stability	<ul style="list-style-type: none"> <li>Excellent dimensional stability</li> </ul>
Care	Effect of chemicals	<ul style="list-style-type: none"> <li>Chlorine bleaches will yellow the fabric and should not be used</li> <li>Gentle washing of garments with a mild detergent in cool to warm water up to 60°C is recommended</li> <li>Dry-cleaning is not recommended</li> <li>Can be dried in a machine dryer on cool setting, but line drying is preferred</li> </ul>
	Sun resistance	<ul style="list-style-type: none"> <li>Stable to sunlight and line drying, although continual exposure will degrade the fibre</li> <li>Ease of degradation means pure bamboo is highly praised for its eco-friendly nature and biodegradability</li> </ul>
	Colour fastness	<ul style="list-style-type: none"> <li>Easily dyed as it is hydrophilic</li> <li>Excellent colour fastness</li> <li>Reactive dyestuffs are recommended due to bamboo's lower wet tensile strength</li> </ul>
	Shrink resistance	<ul style="list-style-type: none"> <li>Excellent shrink resistance when cared for correctly</li> </ul>

### Eco-friendly

Blended bamboo fibre products do not have the same eco-friendly properties as pure bamboo. The more complex the blend of fibres in a fabric, the harder the fibre is to degrade.

### Protection from ultraviolet radiation

In Australia, protection from harmful ultraviolet radiation is a desired property in textile fabrics. Fibres made from pure bamboo fibre can absorb ultraviolet radiation in various wavelengths, thus reducing harm to the human body.



19.2 Use of textiles to enhance performance  
19.3 The future of bamboo fibre innovation

# Green & biodegradable

Bamboo fibre is a unique biodegradable textile material. As a natural cellulose fibre it can be 100% biodegraded in soil by microorganisms and sunshine. The decomposition process does not cause any pollution to the environment. 'Bamboo fiber comes from nature

and completely returns to nature in the end'. Bamboo fiber is praised as 'the natural, green and eco-friendly new-type textile material of the 21st century'.

Source: Bamboo Yarns & Fibers, Swicofil,

[www.swicofil.com/bamboo.pdf](http://www.swicofil.com/bamboo.pdf).

## Extend your knowledge 19.2 Bamboo



Bamboo Clothing company  
BambroTex  
Bamboo Textiles Australia  
Swicofil

Visit the bamboo websites to learn more about bamboo (refer to page 315 for websites). Complete the table to gain an understanding of the advantages and disadvantages of bamboo fibre to the consumer and society, the manufacturer, the employee and the environment.

Impact of bamboo on:	Advantages	Disadvantages
Consumer and society		
Manufacturer		
Employee		
Environment		

## Yarn innovation: bicomponent yarn

### What are bicomponent yarns?

**Bicomponent yarns** consist of two filaments, staples or natural fibres that are either chemically or physically different. Two kinds of polymer are extruded together and spun as a multifilament. Because the two halves of the bicomponent yarn are different they create a crimp when exposed to heat. The filament will curl and assume a wave-like configuration.

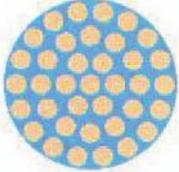
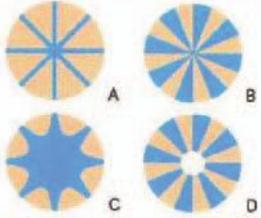
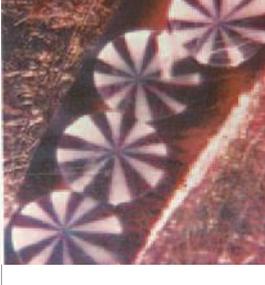
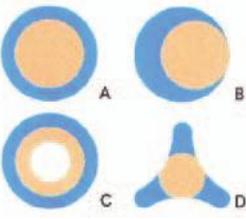
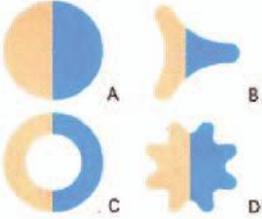
Complex cross-sections can be created using a spinneret with shaped holes, resulting in a yarn with desirable properties for the particular end-use. For example, naturally coloured cotton with a core of another fibre, natural or synthetic, staple or filament, will look and feel like cotton but be stronger or have other desirable properties due to the hidden core.

DuPont introduced the first commercial bicomponent application in the mid-1960s. It was made from two nylon polymers that formed a highly coiled elastic fibre.

Bicomponents are produced through three different methods.

- 1 Side-by-side extrusion: The yarns are produced side by side.
- 2 Core-and-sheath extrusion: The core yarn is produced in the middle, covered or sheathed by an outer yarn produced around the core yarn (polymer surrounded by another polymer).
- 3 Biconstituent fibre extrusion: Fine fibrils of one polymeric substance are embedded in the matrix of another.

## Bicomponent yarns

Spinneret	Cross-section	Photomicrograph of the cross-section
<p>Spin pack – sea-island</p> 		
<p>Spin pack for split spinning</p> 	 <p>Shape of cross-section:  <b>A</b> octalobal  <b>B</b> orange  <b>C</b> gear  <b>D</b> hollow orange</p>	
<p>Spin pack for sheath-core</p> 	 <p>Shape of cross-section:  <b>A</b> sheath-core concentric  <b>B</b> sheath-core eccentric  <b>C</b> sheath-core hollow  <b>D</b> sheath-core trilobal</p>	
<p>Spin pack for side-by-side (s/s)</p> 	 <p>Shape of cross-section:  <b>A</b> s/s round  <b>B</b> s/s trilobal  <b>C</b> s/s hollow  <b>D</b> s/s gear</p>	

Spinneret images courtesy of Sossna; Photomicrograph images courtesy of Hills Inc.

## How bicomponent yarns enhance performance of fabric and end-product

Bicomponent yarns have enhanced performance potential because the yarn is soft, lofty, bulky and inexpensive. They are light to medium weight, non-fraying, very durable and abrasion resistant.

### End-uses

Bicomponent yarns have many end-uses, including pantyhose, knitwear, knitting yarns, socks and baby wear. These yarns can also be used for upholstery, floor coverings and specialty industrial fabrics for stabilising and for its soft handle.

Technology means that a hollow yarn can be created. This means that conductive metal oxides can be inserted into the core, making the yarns electrically conductive for specific end-use purposes.

## Impact of bicomponent yarns:

Impact on:	Advantages	Disadvantages
Consumer and society	<ul style="list-style-type: none"> <li>• Produce a bulking or crimping effect that is useful in the construction of stretch garments</li> <li>• New equipment and machinery reduces the time taken for processes, from fibre production to fabric finishing and garment assembly</li> <li>• Results in lower consumer price and increase supply and availability of product</li> </ul>	<ul style="list-style-type: none"> <li>• Fabrics made up solely of bicomponent yarns often do not have the desired visual effects, texture, soft hand, and stretch and recovery</li> </ul>
Manufacturer	<ul style="list-style-type: none"> <li>• Production of more desirable fabrics that consumers will want to purchase</li> <li>• High market share if advertised well as there would be a large demand for the yarns</li> <li>• Many methods to choose from; could be chosen according to cost-saving or ease of labour</li> <li>• In making colour items, colour concentrate is needed only for the outer component, thus reducing colouring costs</li> </ul>	<ul style="list-style-type: none"> <li>• Expenses of developing fibre components</li> <li>• Must train employees to work with machinery</li> <li>• Takes away market for other fibres</li> <li>• Additional processing time and equipment that results in increased costs and capital expenses of setting up new equipment</li> </ul>
Employee	<ul style="list-style-type: none"> <li>• Chance to be trained in more innovative techniques; skill acquisition</li> <li>• More job opportunities</li> </ul>	<ul style="list-style-type: none"> <li>• Less pay due to decreased skill/technical requirements</li> <li>• Decrease in human interaction</li> <li>• Changes to current work practices that may reduce job opportunities</li> <li>• Training depends on employee's skills and ability to be retrained</li> </ul>
Environment	<ul style="list-style-type: none"> <li>• Clean, environmentally friendly</li> <li>• Many of these yarns are recyclable</li> </ul>	<ul style="list-style-type: none"> <li>• Many of the chemical components are not biodegradable so cause pollution, add to landfill</li> </ul>

## Yarn innovation: NILIT EcoCare yarn

Case study

### Nilit EcoCare yarn

# NILIT® EcoCare

At Nilit, we have long been concerned about our impact on the environment. We take this responsibility seriously to ensure that we leave the Earth a better place than we found it.

To meet the global awareness for eco-friendly processes, Nilit introduces Nilit® EcoCare recycled nylon 6.6 (patent pending) with deep, uniform colour. Our Nilit EcoCare yarns bring together our philosophy with the sophisticated R&D for a breakthrough in yarn engineering and production.

NelsonNet

Vectran case study  
TEXD12CS190050

# Nilit EcoCare fast facts

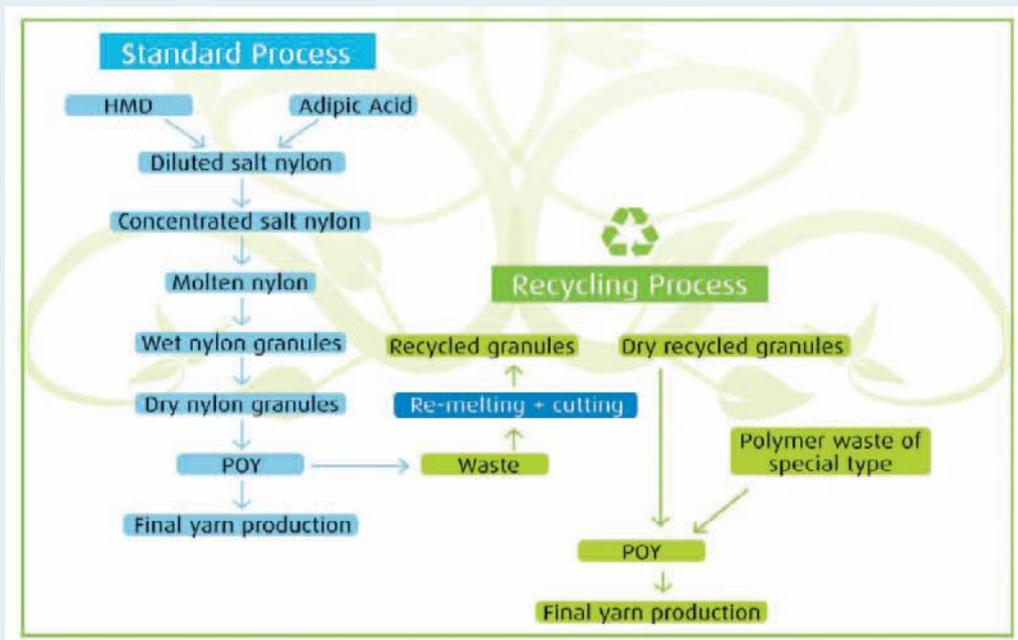
- High-quality recycled polyamide chips retain the properties of virgin fibres
- Excellent colour depth and uniformity in regular dye process
- No variability in the properties of the recycled yarn
- Applications in intimate apparel, legwear, activewear, ready-to-wear



Nilit

## A simple process produces meaningful results

Over the years we have consistently looked for ways to operate a cleaner enterprise – conserving or re-using water, decreasing emissions, reducing and recycling waste. Producing our Nilit EcoCare recycled yarns significantly conserves resources that improve the environment. From the yarn waste of our standard process, our highly efficient recycling procedure reduces energy and water consumption compared to our standard practice.



19.4 Nilit EcoCare Yarn

## Nilit's environmental policy

Since Nilit's founding over 30 years ago, consideration for the environment has been a cornerstone of our business. We are committed to 'zero waste' in all of our facilities around the world.

We have engineered our operations to produce the best nylon in the world in the most eco-friendly manner possible.

Source: Nilit EcoCare information booklet.

## Fabric innovation: washable webs

### What are washable webs?

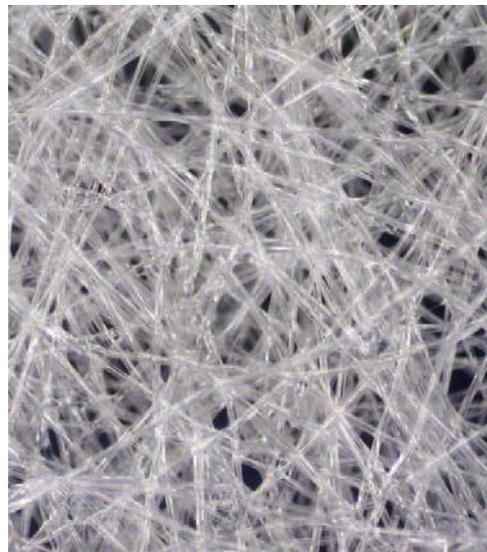
**Washable webs** refer to fabrics manufactured from non-woven sources. Refer to Chapter 9 for information on manufacturing non-wovens.

To create washable webs, webs of synthetic fibres are bonded together with heat or adhesives. The result is a cheap fabric, but it is not as strong as a woven or knitted fabric.

Washable webs are easy to sew, crease resistant, do not fray, and are stable when washed or dry-cleaned.



Needle-punched felt



Interfacing

### How washable webs enhance performance of fabric and end-product

Washable webs have enhanced performance potential due to the following qualities:

- light to heavy in weight and can be engineered for specific end-uses
- do not fray
- durable, abrasion resistant and highly absorbent
- can withstand multiple wet applications.

### End-uses

Washable webs have many end-uses, including:

- apparel – interlining, interfacing, clothing and glove insulation, bra and shoulder padding, handbags
- non-apparel – nappies, blankets, industrial filters, teabag covers, Chux super wipes, Enjo, Enviro shopping bags
- specialised apparel – medical textiles, surgical equipment, masks, gowns, head covers, feet covers
- army apparel – uniforms, equipment, parachutes, tents, duffel bags, tarps, shelters.





Disposable nappies



Medical textiles

## Impact of washable webs

Impact on:	Advantages	Disadvantages
Consumer and society	<ul style="list-style-type: none"> <li>• Low cost</li> <li>• Does not fray</li> <li>• Crease resistant</li> <li>• Stable to washing and dry-cleaning</li> </ul>	<ul style="list-style-type: none"> <li>• Not lifelong, mostly single or limited-use products</li> <li>• Not as strong as knitted or woven, technological developments attempt to compete with this downfall</li> </ul>
Manufacturer	<ul style="list-style-type: none"> <li>• Cheap to produce</li> <li>• Can be combined with many fibres to create 'super fabrics' – medical membranes impermeable to blood and other bodily fluids</li> <li>• Many military applications</li> </ul>	<ul style="list-style-type: none"> <li>• Low durability</li> </ul>
Employee	<ul style="list-style-type: none"> <li>• Work is easier from new technology, less labour-intensive work needed to produce man-made fibres than needed for natural fibres</li> <li>• CAD and CAM, work rate quicker and easier, less manual felting</li> </ul>	<ul style="list-style-type: none"> <li>• Process may use CAD and CAM technology rather than labour</li> </ul>
Environment	<ul style="list-style-type: none"> <li>• Non-woven bags last longer than normal plastic bags; have almost replaced common plastic bags</li> </ul>	<ul style="list-style-type: none"> <li>• Waste product and landfill</li> <li>• Must take into account waste and disposal of medical textiles</li> </ul>

NelsonNet

Gore-Tex case study  
 TEXD12CS190051

NelsonNet

Cordura fabric fact sheet  
TEXD12AD190052



Invista  
Cordura – Defend Your Base

Case study

## Invista's Cordura

# Innovations in high tenacity yarn

BY SHARON BIRK, CINDY MCNAULL AND ALLEN MORTIMER,  
CORDURA BRAND TEAM

**INVISTA's CORDURA®** brand, renowned for its durability and strength, has been standing firm in the fibre industry for more than 30 years. Outdoor and workwear industries, as well as the world's leading military forces, have capitalized on the exceptional quality that CORDURA brand products offer in protective apparel and equipment solutions, such as packs and bags, battle dress uniforms, load carriage systems, boots, body armor covers, and knee and elbow pads.

In line with INVISTA's commitment to innovation, the company has recently launched products including the CORDURA brand Baselayer, CORDURA Colourlock fabric technology and Solution-Dyed Nylon (SDN) yarn with built-in NIR signature reduction.

### CORDURA Baselayer fabric

INVISTA's latest innovation in high tenacity fibre has been to combine the durability of its CORDURA brand with comfort. Constructed with a unique blend of INVISTA T420 nylon 6,6 fibre and cotton, the CORDURA Baselayer fabric helps protect soldiers when exposed to heat in flash fire situations by forming gels and charring around the cotton. This creates an entirely new fabric structure that does not drip or melt onto the skin underneath, which is typically what happens with materials such as polyester.

In addition to its thermal properties, the Baselayer fabric's combination of nylon and cotton offers excellent moisture management performance by drying 2.5 times faster than a 100 percent cotton t-shirt.

CORDURA Colourlock fabrics are available in more than 200 colours. The fabrics have set an industry standard by allowing the colour to be permanently built into the fibre, eliminating the need to piece-dye fabrics and providing excellent stain resistance, colourfastness and long-lasting, durable performance.

Products made with CORDURA Colourlock fabrics look newer longer than topically dyed fabrics, even when exposed to intense sunlight or the extreme temperature of industrial laundering. These characteristics make CORDURA Colourlock fabrics an excellent design and performance option for packs, bags, luggage, outdoor apparel and workwear applications.

INVISTA created a SDN yarn with built-in Near Infrared (NIR) signature reduction for use in CORDURA fabrics for the U.S. military, engineered to match Natick's colour (Desert Sand 503) and NIR signature reduction requirements. To provide maximum enhanced concealment, the exact colour and NIR signature are permanently built into the fibre, utilizing nano- and micro-sized particles to provide permanent long-lasting colour and NIR durability.

Source: *International Fiber Journal*,  
August 2008, Vol. 23, No. 4.



19.6 Cordura

# Use of machinery to improve construction or save time

Different types of machinery have been developed that improve construction of textile products or save time in their manufacture.

## SYMCAD 3-D Optifit

### What is SYMCAD 3-D Optifit?

SYMCAD 3-D Optifit enhanced body measurement system is an innovative system that is able to automatically digitise the body in three-dimensional shape. The body is scanned and automatic measurements are taken with efficient accuracy. This is completed in less than 30 seconds.

### End-uses

The SYMCAD 3-D Optifit is designed for made-to-measure clothing. It is suitable for use in apparel and is specifically useful for corporate clothing, uniforms or retail applications. The efficient machine can measure up to 50 people in an hour.

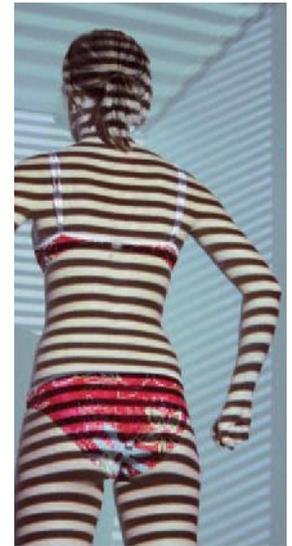
### Impact on the textile industry

#### Advantages

- Saves time, which is a major factor
- Low cost to set up
- The machinery creates a consistent measurement database
- Accuracy allows consistency in corporate and uniform clothing issues
- Ensures improvement in garment fit
- Generates a more consistent body measurement and completely automates the chain between measurement and personalised garment manufacturing, minimising the amount of time spent trying on different sizes of clothing and reducing the cost of alterations
- Exists in a mobile version, a compact machine that takes up limited floor space, which can be used in the workplace
- Offers the customer a Bodycard containing measurement details, which can be inserted at a retail outlet and, based on the data on the card, a selection of clothing that would fit the customer can be recommended; this minimises time searching through racks of clothing
- Adaptable to new emerging technologies, such as modelling three-dimensional realistic avatars, allowing the person to 'virtually' try on clothes

#### Disadvantages

- No need for skilled tailors to be employed for traditional fit and measurement procedures, therefore loss of skilled labour force and job opportunities



Model inside SYMCAD 3-D scanning booth



Image capturing measurement system after SYMCAD 3-D body scan



SYMCAD



19.7 SYMCAD

Photos courtesy of SYMCAD 3D TELMAT Industries

## Bodymetrics

Bodymetrics is a system that involves digital image technology for taking fast, efficient and accurate body measurements for made-to-measure clothing. It has been integrated into the well-known Harrods store in London.



19.8 Bodymetrics

# Made to measure at Harrods

Ever struggled to find the perfect suit? Well look no further. Bodymetrics at Harrods will provide the ultimate women's made-to-measure suits, in collaboration with the UK's leading designers and tailors. Vivienne Westwood, Nick Tentis and Nick Holland will offer styles exclusively for women. Customers can choose, for example, an ideal black suit, and add couture elegance and quirky personal design details such as photo buttons. Inspired by the traditions of Savile Row tailoring and the use of cutting-edge technology, Bodymetrics provides an extraordinary way of buying made-to-measure suits, hand-tailored to the contours of your body but requiring as little as a few seconds to secure the most accurate body measurements in existence.

The breathtaking Bodymetrics space at Harrods is a fusion of superlative aesthetics and groundbreaking technology, which will enhance the client experience. The Bodymetrics service employs unique software which scans the body with rays of light, capturing over 200 000 data points, and producing a digital virtual replica of its dimensions. This incredibly accurate scan is then used to produce a pattern for garments which are tailored to the exact lines of your body – a unique method many times faster than traditional bespoke.

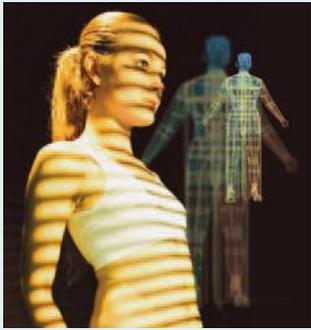
The Bodymetrics service offers more than a fit beaten only by skin. Following a quick scan, a consultant will design the

perfect suit for the customer – offering choices of styles, fabrics and fit. Consultants are trained stylists, who will be able to guide customers towards a perfectly fitting and flattering design.

### Vivienne Westwood

Vivienne Westwood is considered a symbol of the British avant-garde and is well known for her innovative ideas. She now finds inspiration in traditional Savile Row tailoring techniques, British fabrics and 17th and 18th century art. The philosophy behind her collections – ‘new discoveries in design come from studying tradition’ – and the orb logo, which symbolises ‘taking tradition in to the future’ make Vivienne Westwood a perfect partner for this new project. The Vivienne Westwood for Bodymetrics collection has two ranges: made-to-measure and couture. The made-to-measure skirt-suit starts from £1500 with a selection of wool/cashmere suiting for day-wear and velvet for evening-wear. A couture collection will be available in two styles – a trouser-suit and a skirt-suit – with a large selection of luxury fabrics. The client will be scanned at Harrods, but will need to attend a further private appointment and fitting. A Vivienne Westwood for Bodymetrics couture suit will start from £3000.

Source: Tania Fauvel,  
Bodymetrics London.



Inside the Bodymetrics pod



A Vivienne Westwood suit made-to-measure using Bodymetrics pod at Harrods, London



Bodymetrics

## Computer-linked sewing machine

### What is a computer-linked sewing machine?

Computer-linked sewing machines or CNC (computerised numerical control) sewing machines are controlled by computers. The pattern, stitch types and stitch positions are entered into the computer, which uses the information to control the sewing process.

Top-of-the-range home sewing machines offer a range of computer-aided systems to enable the home sewer to have access to industry-type stitches and embroidery.

### End-uses

The computer-linked sewing machine is suitable for use in all types of textile construction. It can also be used for embellishment such as embroidery.



Singer Futura sewing machine

## Impact on the textile industry

### CNC sewing machines

#### Advantages

- Ease of use
- Low training costs
- High production
- Accuracy/uniformity of design and stitches, such as repeat design of a company logo or school crest on a uniform
- Fast operation and application of design work

#### Disadvantages

- Costly to set up
- Loss of jobs
- Specialised technicians required for maintenance and machine repair

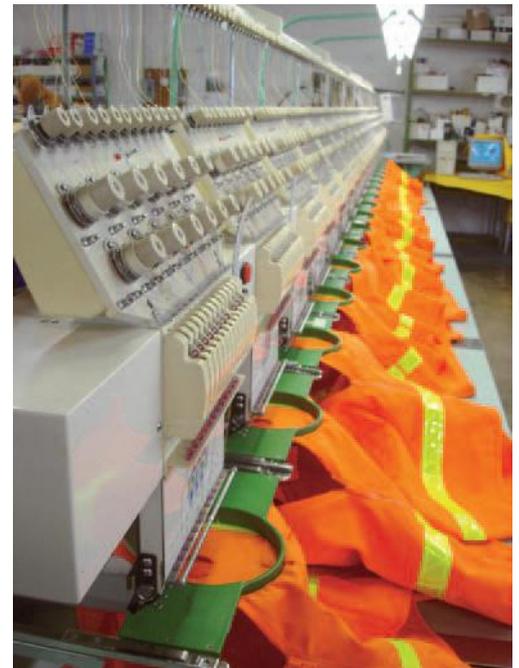
### Computer-linked home sewing machines

#### Advantages

- Allows the use of industrial-type stitches on the home sewing machine
- Endless possibilities for embroidery, including photos, fonts and cross-stitch
- Fast, accurate, uniform embroidery can be produced
- Ability to create unique and professional apparel and furnishing items

#### Disadvantages

- Relatively expensive to purchase
- Specialised technician or mechanic required to fix machine problems



Computerised embroidery machine embroidering a logo on safety vests

## Seamless technology

### What is seamless technology?

**Seamless technology** is the process of making seamless garments. It requires cutting-edge circular knitting machines that complete whole garments based on computer programs. The products are fully finished or part-finished garments, usually with no side seams. The knitting machines can be programmed to create a variety of stitches and tensions that suit the apparel design, and add fit and shape to the contour of the garments.

Seamless technology has been used for intimate apparel since 1997 and is now gaining more attention in other types of apparel for the outdoor and fitness markets.

Seamless knitting is often completed on Santoni machines. These machines produce complete garments with minimal finishing steps. Weft knitting technology is also used, and is created on body-sized circular knitting machines that have similar features to pantyhose and sock-knitting machines.

These machines allow the creation of finished products ready to be put into commercial distribution channels and reduce the usual steps of the production process. This means a significant saving on industrial and working costs. This technological development sees the fusion of two fields: hosiery and knitting technology.

### End-uses

Ultimately, seamless technology can create comfortable clothing that is quick to make and is accurately fitted to body shape. There are no unsightly seams that dig into the body. The types of textiles that can be produced using seamless technology include:

- apparel outerwear
- underwear
- sportswear
- gym wear
- swimwear
- medical textiles.

Image courtesy of Santoni Seamless world



Santoni single-feed jersey machine



BONDS Women's Seamfree Campaign



BONDS Men's Seamfree Campaign

Images courtesy of BONDS Australia

## Impact on the textile industry

### Advantages

- Can be knitted with elastic waistbands or lace effects
- Comfortable, as there are no seams
- Combines texture and levels of compression in innovative ways – especially enhances the performance of medical textiles as well as form-fit garments
- Beneficial for both outerwear and underwear
- Better fit
- Designs are not limited by seams
- The comfort and softness of seamless knitwear made with antimicrobial and hydrophilic yarns create the best features for an activewear garment
- Fewer lines under clothing
- No seam failures, hence less faulty goods
- Seamless-knitting machines can virtually transform yarn into complete garments and minimise the traditional labour-intensive steps of cutting and sewing
- Coloured patterns and logos can be knitted into the garment
- Fabric structure, pattern contractions, measurements, fibre specifications and brand name logos can be pre-programmed into the machines
- One-piece garments can be mass-produced with minimal sewing to finish the garment
- Endless design possibilities as a variety of different stitches are possible in the one garment with different types of knits – for example, rib, jacquard and mesh
- Uniqueness is a benefit to retail stores
- Consumer satisfaction once he/she tries on seamless garment

### Disadvantages

- Cannot alter seams or sizing of garments
- Having no seams could limit aesthetics of design
- Price of finished product is higher than for other apparel
- Alterations are not easily made to faulty garments

## Use of decorative techniques to enhance design

New technological developments in textiles have also meant that new decorative techniques have been developed. These techniques can be used to enhance the visual appeal of a design.

### Digital image transfer

#### What is digital image transfer?

**Digital image transfer** refers to a process where a digital image is transferred to a textile item using a paper medium and heat.

- Printing is formatted to at least 254 dots per inch (dpi).
- Designs are created on the computer or digital photographic images can be used.
- Fabric is pre-washed and ironed.
- Designs are printed onto fabric via transfer paper using a medium, such as inkjet fantasy or HP digital transfers.
- Fabric is dried and pressed with baking paper over the top to set or cure the inks.



19.9 Seamless technology



Santoni  
Bonds  
LM Australasia



## End-uses

This method of application is mostly used by cottage craft and home industry, as the ACTFAI now prefer to use digital direct printing.

End-uses for this type of transfer include:

- apparel – T-shirts, caps, singlets
- furnishings – cushions, wall hangings, quilts (such as photographic memory quilts)
- textile arts – the reproduction of artworks for embellishing by textile artists.

## Impact on the textile industry

### Advantages

- Ease of use – most homes have an inkjet printer so this type of textile decorative design no longer needs to be outsourced to the industry as it was in previous years.
- Digital imaging heat transfer paper is now readily available.

### Disadvantages

- A great deal of wastage around the outside of printed design area.
- Difficult to control use – with domestic equipment, images may not adhere to the fabric or the result is an uneven application of design work.
- Transfer paper is expensive.

## Direct digital printing

### What is direct digital printing?

Direct digital printing (DDP) refers to the process of printing directly onto fabric using inkjet technology and innovative CAD systems and programs. This technology allows DDP to produce the best possible results in all aspects of the design process and its application to textiles.

Reactive dyes are used to print onto natural fibres such as cotton, silk, rayon and viscose. Disperse dyes are used to print onto polyester.



DuPont

The DuPont Artistri is a fully integrated, production-capable, digital textile printer.

# Sublitech



## Sublitech and sublimation technology

Sublitech specialises in the printing of high quality images onto a wide variety of fabrics using large-format digital dye-sublimation technology.

Sublitech uses advanced digital equipment that allows us to reproduce an incredible range of colours, including high resolution, vibrant photographic images, on materials ranging from sheer organza to heavy-duty canvas. It also allows us to personalise and customise according to your needs.

Sublitech stock a comprehensive range of pre-tested fabrics suitable for most requirements.

Some of the many applications they have produced images for are: banners, flags, fashion fabrics, backdrops, tablecloths, sportswear and uniforms, branded promotional products including monitor, spectacle wipes, and gaming felts.



Sublitech

### What is sublimation?

Sublimation describes the process of a solid substance changing directly into a gas or vapour, without first passing through the intermediary liquid state.

In the printing world, the term sublimation is used to describe heat-activated inks that change into a gas under the application of heat and pressure, and have the ability to bond with polyester or acrylic surfaces. Sublimated images are extremely washable and dry cleanable.

Printing with sublimation ink is not new; sublimation transfers have played an important role in the printing world for decades. What is new to the printing world is the ability to digitally print sublimation inks rather than screen-printing them.

Heat transfers created with colour laser, ink jet, or wax thermal printers use a polymer coated transfer paper to fuse ordinary toner or ink particles onto the surface of a substrate. The result is a 'decal-like' transfer that can peel, crack, fade, and discolour over time. Sublimation transfers instead rely on special transfer inks or toners to transfer below the surface of a substrate. The result is a 'tattoo-like' transfer that will not peel, crack, or fade and will last for many years.

Direct printing involves printing directly to a coated fabric with an ink jet printer. The finishing process for direct printing requires both steaming and washing. Coated fabrics for direct printing are more expensive and easily wasted. Moreover, sublimation transfers will generally offer more detail and sharpness than direct printing.

Sublimation inks and toners transfer well to white or light coloured, synthetic surfaces such as polyester and acrylic. They do not transfer to natural surfaces such as cotton, or dark coloured surfaces. Over long periods of time, sublimation inks and toners have limited colourfastness when exposed to direct sunlight.

Over long periods of time, sublimation inks and toners, like most forms of process colour printing, have limited colourfastness when exposed to direct sunlight. Generally we have found that it will take 18 months or more of constant, direct exposure to sunlight before a gradual fading can be detected. Bear in mind that the sublimation process is used to print all AFL and NRL jerseys, as well as many top brand swimsuits.

### **Digital dye-sublimation**

Digital dye-sublimation is the process by which water-based dyes (or inks) are printed onto a release paper, and then transferred onto a substrate, or surface. These can range from fabrics to ceramics, metals, timber, leather and many other materials – as long as they are treated with a polymer, or acrylic coating.

Sublimation simply means a change from a solid to gaseous state and back to a solid without becoming a liquid. Thus the dye particles migrate from the paper as a gas, to bond with a polymer – the fabric or other material – and become solid again.

The transfer is affected using high heat (205°C) and pressure thus guaranteeing that the image penetrates and becomes an integral part of the substrate.

### **Totally green and clean**

You can't get a more green or clean printing process than dye sublimation. We use only water-based dyes that are so environmentally friendly they can be safely poured down the sink. Traditional screen-printing involves large amounts of wasted water, first to expose the screen by washing away the emulsion, and then to clean the screen of excess inks.

### **Digital quality**

Digital technology, being computer driven and controlled, ensures that there are no set-up costs and that just one item can be printed successfully and economically. It also means vibrant, sharp, reliable and repeatable print results.

We use the latest large-format equipment capable of printing to 158 cm wide by up to 100 m long, and the software will tile an image into individual panels, which are then sewn together where larger prints are required. This process is known as panelling. Our largest print to date is a theatre backdrop measuring 15 m by 7 m (illustration). Print resolution is 720 dpi.

The original image to be reproduced may consist of flat colours (or vector art as used in Illustrator®) or a continuous tone image such as a photograph (also known as bitmap or raster images, as used in Photoshop®) or a combination of both image types.

All cutting, sewing, pattern making and grading, insertion of rods and eyelets, packaging in cardboard tubes, are done in-house to guarantee quality and fast service.

Source: [www.sublitech.com.au](http://www.sublitech.com.au).



## End-uses

DDP technology on a large-scale run of fabric is currently an industry application of decorative design. It requires the use of high-end, large-scale specialist print machines that are capable of printing directly onto widths of fabric. DDP can be carried out at home on A4-sized pre-treated fabrics such as cotton, silk or silk organza.

End-uses for this type of application include:

- apparel – T-shirts, rolls of fabric used for apparel applications such as pyjamas, bags and dress fabrics
- furnishings – cushions, quilts
- textile arts – printing on art canvas with pigment dyes
- non-apparel – advertising banners and promotional banners, such as those outside buildings to advertise events.

## Impact on the textile industry

### Advantages

- Enables rapid prototyping of design work
- Allows complex and subtle effects to be produced in fabric designs
- Low start-up costs
- Carrying of stock is not required as designs can be printed on demand
- No limit to the colours produced
- No minimum print runs
- Fast and accurate image reproduction
- Completed in a short time without having to reprint each colour
- Easy to use with digital photos – high demand for photos in fabrics in designs
- Wide range of colour schemes
- Easy for the design to be altered
- Possible to make one-off custom products practically and cost-effectively
- Fast production speed
- Photographic quality in image reproduction
- Ideal for short runs, designer or engineered prints, or customised designs
- Continuous digital printing direct from the computer onto the fabric

### Disadvantages

- Process is not fast enough to be economically efficient for full production.
- Design size is limited to the size of the printer.
- For the individual or small-scale designer it may be too expensive

## Use of finishing techniques to enhance fabrics

**Finishing techniques** are processes that improve the properties of fibres, yarns or fabrics. Finishes can be permanent or temporary, durable or renewable. Some are very subtle while others change the original textile considerably. As a result of advances in technology, we can now produce fabrics with enhanced performance. Examples include crease, moth and stain resistant, non-iron, easy-care, permanently pressed, stretchable, windproof, waterproof and breathable fabrics. Some finishes also enhance the appearance of fabrics.

Finishes that enhance appearance		
Delustering	Titanium dioxide powder is added to synthetic fibre solutions before extrusion through the spinneret to reduce the lustre of synthetic fibres. Sometimes a high lustre in textiles is considered a cheaper look, so a low-lustre finish will enhance the fabric. End-uses: apparel and furnishing fabrics, carpet	Permanent
Mercerising	Cotton fibres, yarns or fabrics are immersed in an alkali solution. This causes the fibres to swell and straighten, removing the convolutions and creating a fibre with a circular cross-section. This increases lustre, strength and dyeability. End-uses: sewing thread, apparel, furnishing fabrics	Permanent
Napping	Yarn or fabric is passed over barbed rollers that raise the fibre ends, resulting in a soft surface with better insulation. End-uses: fleecy, flannelette, blankets, flannel	Permanent
Finishes that improve dimensional stability		
Sanforising	Damp cotton fabric is stretched around rollers and heated, reversed to compress the fabric, and heated again. This results in cotton fabric with less than 1% shrinkage. End-uses: cotton T-shirts, baby clothes	Permanent
Superwash wool	The superwash finish allows wool to be machine-washed and dried. A mild chemical treatment is applied to the fibre to form a permanent microscopic film of resin that spreads evenly over the fibre surface, coating the scales of the wool fibre. The finish reduces friction and fibre entanglement, and eliminates felting shrinkage that usually occurs if wool garments are machine-washed and dried. End-uses: school jumpers, knitting wool	Permanent
Finishes that give protection from environmental conditions		
Water repellent	Hydrophobic chemicals, in the form of silicones, are applied to fabrics to make them waterproof. The water droplets remain on the surface of the fabric. The breathing ability of the fabric is retained. It is an invisible finish. End-uses: raincoats, umbrellas, ski wear, outdoor furnishings	Temporary/ renewable
Fluorochemistry	Fluorochemicals can be applied at either the fibre or fabric stage to give an invisible barrier to stains and oils. This does not change the fabric weight, look, breathability or colour. Although this process is not new, the technology has only recently been applied to textiles. End-uses: carpet, upholstery, uniforms, suits, luggage Manufacturers: Teflon – <a href="http://www.teflon.invista.com">www.teflon.invista.com</a> Scotchgard – <a href="http://www.scotchguard.com">www.scotchguard.com</a>	Permanent or temporary/ renewable
Antimicrobials	This is a chemical treatment applied to fibre or fabric to control the growth of bacteria, fungi and dust mites. It does not change the properties of the textile and is washable, low-cost and has no odour. End-uses: bed linen, bedding, clothing, shoes, hosiery, carpets, floor coverings, air filters Manufacturers: Microban – <a href="http://www.microban.com">www.microban.com</a>	Permanent



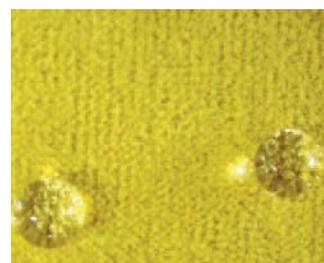
Mercerised cotton fabric



Napped yarn



Fabric made from napped yarns



Water-repellent fabric



Nano-Tex case study  
TEXD12CS190054



19.12 Teflon



DuPont

# Teflon®

## Teflon® fabric protector

When products carry the Teflon® brand, you know they're going to make your life easier. That's because DuPont has been introducing innovative, easy-care solutions for over 50 years. As long as there are busy, active people, Teflon® will be finding new ways to make products that clean easier, work better and last longer.

From apparel and outerwear, to bedding and upholstery, Teflon® fabric protector provides durable, long-lasting protection against oil- and water-based stains, dust and dry soil. Fabrics with Teflon® stay looking newer longer, and are easier to care for. All without impacting the look, touch, feel, colour or breathability of the fabric.

### How it works

No matter what you're looking for, Teflon® fabric protector repel and release technologies can make every product perform its best. In apparel, Teflon® fends off soil, stains and spills on wool, cotton and blends without impacting the fabric's weight, look, feel, colour or breathability. Indoors, Teflon® makes it easier to keep upholstery, draperies, bedding and linens looking fresh and clean. Outdoors, Teflon® provides continuous protection for awnings and patio furniture cushions. Other companies have been working hard to duplicate it, but they cannot match the superior stain protection of Teflon®.

### Repellent technologies

Fabrics treated for repellency fight off dry soil and nasty, unpredictable spills and splashes, allowing liquids to bead up and roll off.

Liquid spills can easily be wiped away when blotted with a clean cloth, and dry soil can be brushed off easily.

Great for ready-to-wear, outerwear, upholstery, luggage, outdoor and contract fabrics.

### Environmental advantages of Teflon®

Because Teflon® fabric protector helps repel and release stains, it can reduce the need for laundering and dry cleaning. That means you'll be doing less washing, using lower wash and dry temperatures and have less wear and tear on fabrics. By helping you reduce your water and energy usage and increasing the fabric's usable life, Teflon® fabric protector helps you have less impact on the planet.



Teflon fabric finish

AAP Image/Stefan Thomas



Teflon repels liquid stains

iStockphoto/Scott Hunt

In testing, items treated with Teflon® fabric protector:

- Helped prevent the need to wash or spot clean because liquids beaded up and rolled off.
- Eliminated ring around the collar, reducing detergent use and repetitive washing.
- Removed stains at lower wash temperatures versus untreated fabrics.
- Allowed fabrics to dry 25% faster than untreated fabrics using either tumble dry or air dry.

### **General tips for cleaning fabrics treated with Teflon® fabric protector**

- Always treat stains promptly.
- Sponge the stain, never rub. A gentle blotting action with an absorbent cloth or sponge is most effective. Work inwards from the outside edges to avoid spreading the stain.
- Blot up wet or oil-based spills quickly with an absorbent cloth, tissue or sponge. For solid or semi-solid spills, lift off excess before treating, using a dull knife or spatula.
- If the stain has already dried, gently brush off any excess material, then dab gently with a damp cloth or sponge until it disappears.
- Never try to remove the stain with household detergents.
- Vacuum carpets and upholstery regularly to remove accumulated dirt, which can fade colours and accelerate wear.
- When vacuuming upholstery, use special brushes and nozzles provided for more effective cleaning.
- It is recommended carpets and furnishings are professionally cleaned from time to time.
- Never use water or liquid detergents on velvets.

Before cleaning or treating stains, see the manufacturer's care instructions. When removing a stain, test any stain-removing product (including water) on a hidden part of the furnishing to ensure fabric and/or color is not affected. For large or serious stains, consult a professional upholstery cleaner.

Source: DuPont, [www2.dupont.com](http://www2.dupont.com).

#### Case study

## Trevira CS

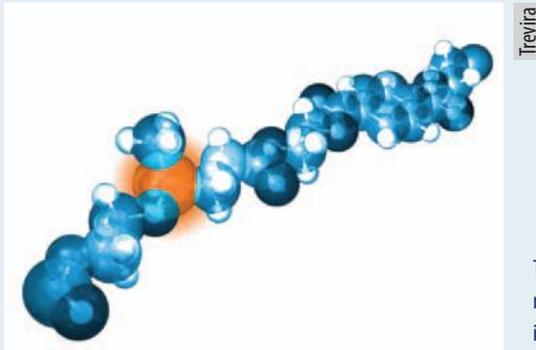
# Flame retardant textiles – Trevira CS



Trevira

Comfort and safety, the two most important requirements in home textiles were first successfully combined in 1980: with flame-retardant Trevira fibres and yarns.

Textiles made from these fibres and yarns bear the trademark Trevira CS and are permanently flame retardant. Unlike fabrics that receive a surface treatment at a later stage, Trevira CS textiles offer long-term security.

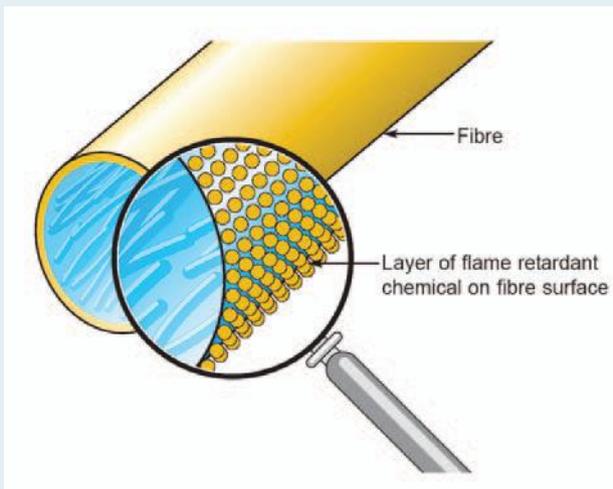


The flame-retardant properties are firmly anchored in the molecular chain of the fibre and cannot be affected by external influences.

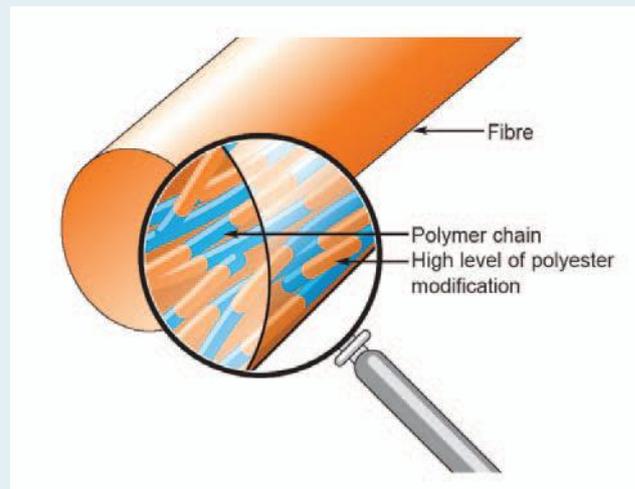
This small but decisive difference results from the chemical structure of the polyester fibre. Due to the morphology of the fibre, the flame-retardant properties are able to be firmly embedded into the fibre structure. It is not possible for external influences to affect them.

Fibres given an additional flame protection finish (below) can lose the protection as a result of wear, age or frequent washing. Flame-retardant Trevira fibres (below) are inherently flame retardant. For this reason materials made from these fibres and filament yarns are likewise permanently flame retardant. This is an important argument from the ecological aspect as well. Apart from their environmentally friendly manufacture materials in Trevira CS require no additional fire protection treatment, such as normally combustible materials need. Treatments of this kind are harmful to the environment. Flame-retardant Trevira fibres and filaments are, furthermore, certified to Oekotex 100 Standard. In comparative terms only very slight amounts of toxic fumes develop in the event of a fire. This is particularly important, since in a fire the danger of suffocation from smoke fumes is greater than the risk of injury from flames.

Images from Trevira



Fibre from a fabric given a flame protection finish



Flame-retardant Trevira CS fibre

## Fields of application Trevira CS

Trevira CS fabrics are used in all textile applications:

- drapes
- decorative fabrics
- upholstery fabrics
- vertical blinds
- roller blinds



- sliding panels
- wall coverings
- room dividers/partitions
- bedding
- table linen.

The large range of Trevira flame-retardant fibres and filaments, together with fancy yarns, offer unlimited opportunities for innovative ideas in fabric design.

In these areas flame-retardant textiles are subject to high demands in terms of safety or legal requirements:

- hotels
- public buildings
- hospitals and care
- maritime
- air travel
- rail
- private market.

Source: Trevira, [www.trevira.com](http://www.trevira.com).

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Define the following terms and give two examples of end-use products.
  - a Innovation
  - b Microfibre
  - c Bicomponent
  - d Washable web
- 2 Processing pure bamboo has been described as a 21st-century development in fibre production. Explain how pure bamboo is processed, and outline the characteristics of the fibre that make it such a successful innovation.
- 3 Critically evaluate the innovations of Nilit and Cordura in relation to meeting the specific end-use target of the yarn and fabric innovation respectively.
- 4 Explain the effectiveness of SYMCAD 3-D OPTIFIT and Bodymetrics as an innovation in textile machinery and tailoring of garments.
- 5 Describe the benefits of seamless technology.
- 6 Define the term *finishing techniques*. Name one finish that enhances a textile product's resistance to soiling, and one that enhances a textile product's fire-retardant qualities.





- ☺ Bamboo Clothing company ([www.bambooclothing.co.uk](http://www.bambooclothing.co.uk)): An online shop from which male and female bamboo clothing can be purchased; also provides useful information on the benefits of bamboo clothing.
- ☺ Bamboo Textiles Australia ([www.bambootextiles.com.au](http://www.bambootextiles.com.au)): Highlights the advantages of 100% pure bamboo fibre.
- ☺ BambroTex ([www.bambrotex.com](http://www.bambrotex.com)): A leading manufacturer of bamboo raw materials.
- ☺ Swicofil ([www.swicofil.com](http://www.swicofil.com)): A useful site for technical textile innovations and details.
- ☺ Invista ([www.invista.com](http://www.invista.com)): Contains information on innovations in fibres, yarns, fabrics and finishes.
- ☺ Nilit ([www.nilit.com](http://www.nilit.com)): Provides information about Nilit fibres, plastics and EcoCare yarns.
- ☺ Telmat Industrie ([www.symcad.com](http://www.symcad.com)): This website outlines innovation in textiles machinery.
- ☺ Bodymetrics ([www.bodymetrics.com](http://www.bodymetrics.com)): A company specialising in body-mapping technology, an innovation in textile machinery.
- ☺ Santoni ([www.santoni.com](http://www.santoni.com)): An Italian company that has become a worldwide leader in the production of electronic machines for garments without seams.
- ☺ Bonds Australia ([www.bonds.com.au](http://www.bonds.com.au)): This website provides further information about advances in machinery for seamless technology.
- ☺ LM Australasia ([www.lmaust.com.au](http://www.lmaust.com.au)): A major pioneer in seamless technology.
- ☺ Sublitech ([www.sublitech.com.au](http://www.sublitech.com.au)): This company specialises in printing high-quality images onto a wide variety of fabrics using large-format digital dye-sublimation technology.
- ☺ Longina Phillips Designs ([www.lpd.com.au](http://www.lpd.com.au)): This Australian design company website provides further information about the use of decorative techniques to enhance design for digital printing.
- ☺ DuPont ([www2.dupont.com](http://www2.dupont.com)): Further information about the use of finishing techniques to enhance fabrics.
- ☺ Trevira ([www.trevira.com](http://www.trevira.com)): Further information about the use of finishing techniques to enhance fabrics.

## Determining suitability of end-use

Before selecting a fabric for a particular end-use, it is important to consider the suitability of the fibre, yarn, fabric and finishing technique used in the production. Fabric properties are determined by fibre composition, yarn structure, fabric type and finishing technique applied. Each of these properties must be examined, as each production method brings particular properties and performance to the product.

A useful way of determining the suitability of a specified end-use is to analyse and evaluate the functional criteria of the item in question. This will assist in determining what fibre, yarn, fabric and finishing properties you will be looking for to contribute to your item. Usually there are a number of alternatives that will achieve the desired end-use application.

This chapter will consider a variety of items from each of the focus areas and will analyse the functional and aesthetic criteria, design features, and suggest fibres, yarns, fabrics and finishes in terms of the end-use of each item.



Textile fibre technology video  
([www.csiro.au/multimedia/Textile-Fibre-Technology-Video.html](http://www.csiro.au/multimedia/Textile-Fibre-Technology-Video.html))



20.1 Wool: the technical textile

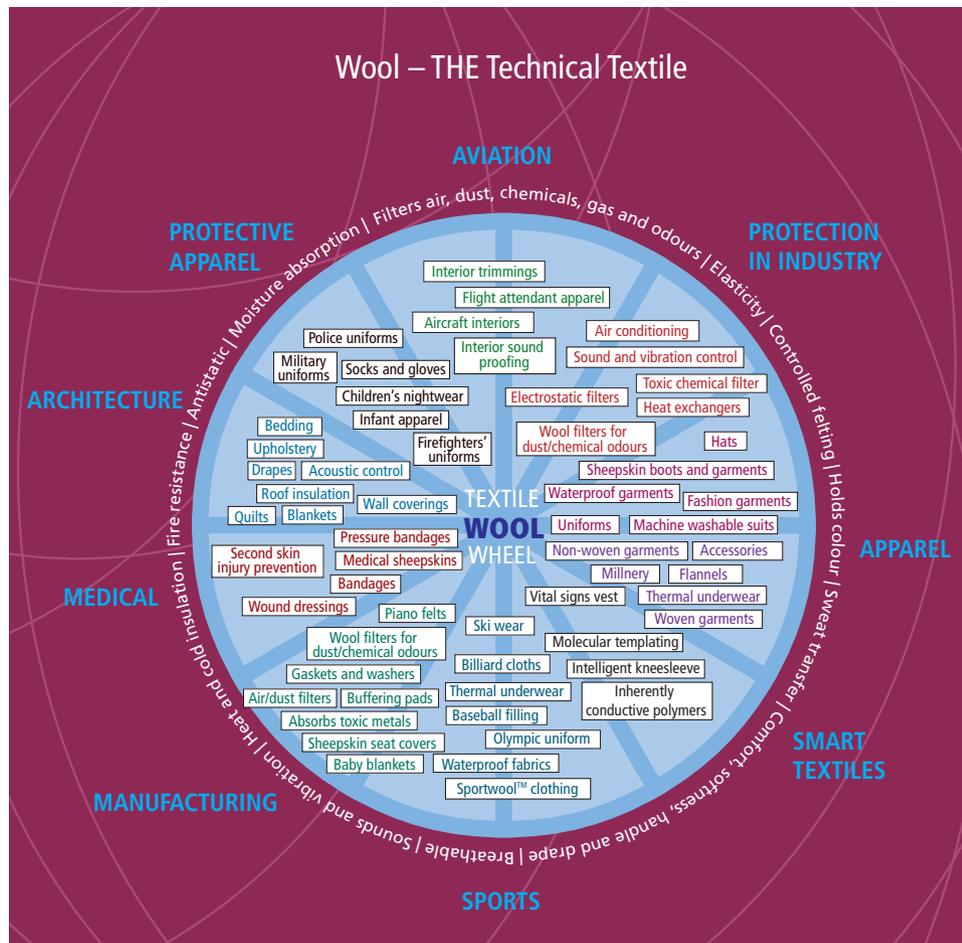


Image courtesy of CSIRO

Textile wool wheel

# Analysing end-use: apparel

## Ski apparel

### Description

'Outer shell' ski apparel refers to ski-suits, gloves, jacket or pants. Ski apparel is generally made to be worn over the top of other clothing when skiing or when outside in an extremely cold environment. It is very important to put on layers of clothing in extreme environments. Ski apparel is usually known as the outer shell and is made from wind-resistant and water-resistant (waterproof) fabric.

### Functional criteria

- Resilient
- Strong
- Absorbs moisture from skin but not snow
- Firm hand
- Pill resistant
- Colourfast (bright colours are often used for safety reasons)
- Good insulator to keep the body warm in the cold climate
- Breathable
- Resists biological attack
- Comfortable when skiing to allow for movement
- Wind resistant
- Water resistant or waterproof

### Aesthetic criteria

- Fashionable colours
- Stylish design
- Fitted so that the item does not look too bulky

### Design features

- Hood
- Sleeves
- Pockets
- Snap fasteners
- Drawstrings
- Zippers with tie tabs for easier handling with gloves
- Reinforced seam structures
- Padded
- Lined



Suggested fibre	Suggested yarn	Suggested fabric
Nylon	Smooth filament, low-twist yarn	High yarn count, plain weave
or	or	or
Nylon or polyester	Smooth filament, low-twist yarn	Gore-Tex – a microporous membrane laminate that makes fabric absorbent close to the skin, allowing water vapour through. Won't absorb snow. Windproof and lightweight

### Suggested finishing techniques

- DWR (durable water repellent finish)
- Sylon (water repellent finish for ski wear)
- Dryon (super water repellent finish)

## Speedo – R&D facility

# Aqualab Technologies



Speedo – Technologies  
([www.speedo.com.au/en\\_au/aqualab\\_technologies/aqualab/fastskin\\_lzr\\_racer/index.html](http://www.speedo.com.au/en_au/aqualab_technologies/aqualab/fastskin_lzr_racer/index.html))



20.2 Aqualab Technologies case study

Speedo invest heavily in technologies and materials.

Aqualab, a dedicated team of swim technology experts, are leading the market in innovation both in terms of design and material capability. The LZR Racer is the most significant leap forward for swimwear technology in more than 20 years.

Speedo products go through rigorous testing, with many put through their paces by brand ambassadors like Michael Phelps.

Elite swimmers know the difference between first and everything after comes down to the tiniest margins.

The LZR Racer is the pinnacle of elite competition swimwear, featuring the latest technologies and materials to crush personal best times and finish the final lap faster.

Leading the range is the LZR Racer Elite, reengineered by Speedo Aqualab in line with the latest FINA regulations. The Elite features a fully bonded construction for seamless movement through the water – it's unquestionably Speedo's most advanced suit.

The LZR Racer Pro incorporates many of the outstanding technical features of the original

LZR Racer, including LZR Pulse fabric to reduce muscle oscillation and skin vibration through powerful compression. It's lightweight and water repellent, making your powerful strokes that much more effective.

With its 3D, 3-piece pattern to fit to your body shape comes the LZR Racer Comp. Fast-drying, water-repellent fabric technology means you get back in the water dry and ready to smash your personal best.

Source: Speedo,  
[www.speedo.com](http://www.speedo.com).



Getty Images

## School uniform

### Description

A school uniform is a symbol of 'belonging' to a certain social group: a school. It creates conformity and allows for uniformity as opposed to distinctive choices in design and style of dress. A school uniform for males and females in Australia typically consists of a combination of hat, summer dress, skirt, shorts, blouse, shirts, winter tunic, pants, shirt, jumper and blazer. For the purpose of this exercise we will concentrate on a girl's summer dress.

### Functional criteria

- Durable
- Lightweight
- Pill resistant
- Colourfast
- Breathable
- Resists biological attack
- Comfortable
- Excellent washability
- Non-iron or low-maintenance

### Aesthetic criteria

- Serviceable colours
- Suitable for all figure types

### Design features

- Zipper
- Overlocked seam structures
- Adjustable for growth, such as large hems for letting down as student gets taller

Suggested fibre	Suggested yarn	Suggested fabric
Cotton/polyester	Medium twist, staple spun yarn	Twill weave – most durable, good drape, less likely to wrinkle

### Suggested finishing techniques

- Soil-resistant finish

## Analysing end-use: furnishings

### Cushion cover

#### Description

A cushion cover can be defined as a removable slip used to cover a soft mass that can be used for functional or aesthetic purposes. Alternatively, a cushion cover could be less functional and more aesthetic, and be highly decorated with elaborate beading. For the purpose of this exercise, we will qualify the cushion as an everyday cushion, placed on a lounge for comfort and as a point of interest.

#### Functional criteria

- Absorbent
- Durable
- Firm, soft hand
- Pill resistant
- Colourfast to withstand constant laundering
- Dimensional stability
- Resists soiling and perspiration acid
- Resists biological attack
- Comfortable



20.3 Analysis of men's business suit  
20.4 Analysis of formal dress



iStockphoto



## Aesthetic criteria

- Fashionable colours
- Stylish design, practical shape
- Fitted, so the insert does not look saggy

## Design features

- Closures such as zippers, button, Velcro or ties for ease of removal
- Reinforced seam structures

Suggested fibre	Suggested yarn	Suggested fabric
Cotton/polyester blend	Blended medium twist yarn	High yarn count, plain weave
or	or	or
Cotton	Combed yarn with medium twist	Jacquard weave

## Suggested finishing techniques

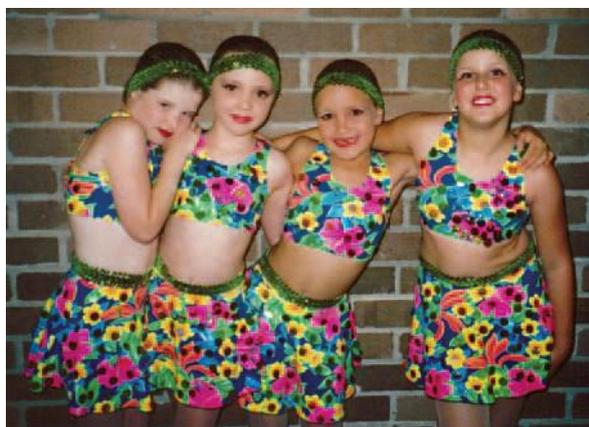
- Soil-resistant finish
- Scotchguard

# Analysing end-use: costume

## Theatrical dance costume

### Description

Costume can refer to many different dimensions of dress and adornment. Costume, in general, is fascinating and reflects historical, cultural and contemporary aspects of society. It is a form of artistic self-expression. A costume needs to meet both functional and aesthetic criteria to be successful.



## Functional criteria

- Durable
- Lustrous, sparkling
- Resilient
- Colourfast
- Good drape
- Resists perspiration acid
- Elasticity to allow movement
- Comfortable

## Aesthetic criteria

- Bright, eye-catching colours and/or colour combinations
- Accentuated silhouette
- Dynamic, recognisable thematic design, reflecting performance

## Design features

Easy to get on and off for quick changes between dance routines or scenes

Suggested fibre	Suggested yarn	Suggested fabric
Cotton/elastomeric blend	Textured filament yarn with low twist	Double knit structure that has two-way stretch and a relatively high dimensional stability

## Suggested finishing techniques

- Bleaching of cotton to achieve a white balance suitable for an aesthetic, brightly coloured print

### Case study

## Ballets Russes

# Ballet Russes – the art of costume

NATIONAL GALLERY OF AUSTRALIA, 2011

This exhibition of costumes from the National Gallery of Australia collection marks the centenary of the Ballets Russes, the company that revolutionised the world of dance and stage design during the tumultuous decades of the early 20th century. Driven by the vision of its founder, Serge Diaghilev, the work of its accomplished designers and artists, choreographers, dancers and composers generated excitement, critical discussion, technical innovation and glamour wherever it appeared.

The original productions now exist only through costumes and sets, photographs, music,

choreography, published memoirs and the direct memory of a dwindling few performers and collaborators. One hundred years after those first performances the term 'Ballets Russes' signifies not just the history of this particular ballet company but also the triumph of artistic audacity and creative vision.

The surviving costumes of the Ballets Russes offer some of the most tangible links to these endeavours. Intimate, intricate, sensuous in material and form, the costumes bear the evidence of hard and continuous use. They are poignant reminders of the visions of their designers, the

experienced hands of their makers, and their wearers' physicality and performances. Diaghilev showed that creative collaboration and cultural inclusiveness was the future. From the vantage point of the Ballets Russes' centenary we can see how its legacy and legend continues to challenge and delight.

Source: National Gallery of Australia, [www.nga.gov.au](http://www.nga.gov.au).



National Gallery of Australia  
– Ballet Russes exhibition



20.7 Ballet Russes  
case study



The Blue God's costume from *Le Dieu Bleu*, designed by Léon Bakst, was purchased by the National Gallery of Australia in 1987

Léon Bakst, *Tunic from costume for the Blue God* c. 1912, National Gallery of Australia, Canberra, Purchased 1987.

## Costume for the Blue God c. 1912

Set in mythical India, the Ballet Russes *Le Dieu Bleu* (*The Blue God*) opens at a shrine of the Blue God. The Blue God's costume, worn Russian ballet dancer Vaslav Nijinsky, is made of hand-coloured silk and satin. It is embroidered with a closed lotus flower and rays of metallic gold thread and studs. The intricate appliqué and embroidery are reminiscent of body jewellery seen in Hindu sculpture, while the stiff conical silhouette was created to echo Nijinsky's performance of sculptural poses rather than active dancing.



Illustration of the Blue God's costume from the official program of the Ballets Russes at the Theatre du Chatelet, c. 1912



Vaslav Nijinsky as the Blue God

The Art Archive/Private Collection Paris/Gianni Dagli Orti

Getty Images

## Analysing end-use: non-apparel

### Tent

#### Description

A tent is a temporary or sometimes semipermanent shelter. A tent structure is usually comprised of sheets of fabric draped over or attached to a rigid or flexible frame. Tents are usually portable. Nomadic people, hunters, hikers and army personnel use tents as their temporary homes. In contemporary Australia, the tent's main application is camping.

#### Functional criteria

- Durable
- Colourfast
- Sun resistant
- High dimensional stability
- Resists environmental acid
- Resists biological attack
- Poor drape
- Non-absorbent

#### Aesthetic criteria

- Bright, eye-catching colours and/or colour combinations if to be used in arctic environments (for safety reasons).
- Often colour-controlled green, khaki or brown if to be used in natural environments, such as bushland (for camouflage)



Shutterstock.com

## Design features

- Fly-screen mesh inserts
- Zippers
- Lightweight
- Easy to assemble and pack up

Suggested fibre	Suggested yarn	Suggested fabric
Nylon	Smooth filament yarn with high twist	Fabric is made from a tightly woven, double RipStop weave
		RipStop – a fabric with heavier yarns laid in regular intervals in the warp and weft directions

## Suggested finishing techniques

- Polyurethane surface treatment, as a water seal
- UV-protection treatment
- Anti-mildew coating



20.8 Analysis of a kite – non-apparel  
20.9 Analysis of a doll – textile arts

# Analysing end-use: textile arts

## Wall hanging

### Description

The textiles arts category is one in which an individual's character, personality and message can be conveyed to an audience. Artistic use of fibre, yarn and fabrics are combined to produce a kaleidoscope of effects. The colours and textures of each new season of the year inspired this wall hanging, created by Jenn Peters for her Textiles and Design HSC.



Image courtesy of Jenn Peters

## Functional criteria

- Durable
- Colourfast
- Good sun resistance
- Good absorbency (easy to dye)
- Flame resistant
- Resists biological attack
- Dimensional stability

## Aesthetic criteria

- Combinations of line, colour, texture, shape and size
- Artistic interpretation as individual designers see fit

## Design features

- Visually stimulating
- Thematic designs
- Story-telling using fibres, yarns and fabrics

Suggested fibre	Suggested yarn	Suggested fabric
Cotton for borders and backing	Smooth, combed cotton, high-twist yarn	Twill weave – most durable, good drape, less likely to wrinkle

## Suggested finishing techniques

- Chemical flame retardant finish, such as Proban

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Why is it important to consider the end-use of a fibre, yarn, fabric structure and finishing technique?
- 2 The costume focus area requires fabrics to meet a specific end requirement. Select a fibre, yarn, fabric and finishing technique suitable for a leotard to be used in a high-energy jazz ballet dance in the 21st century.
- 3 Describe the functional criteria required from an outdoor shadecloth.

## Websites

- ☺ National Gallery of Australia ([www.nga.gov.au/Exhibition/balletsrusses](http://www.nga.gov.au/Exhibition/balletsrusses)): A stunning visual and audio record of the amazing Costumes of Ballet Russes.
- ☺ Speedo ([www.speedo.com/en/technologies\\_2/technology/index.html](http://www.speedo.com/en/technologies_2/technology/index.html)): A comprehensive website suited perfectly to address the designing for specific end requirements.



20.10 End-use applications  
palm cards



# HSC course

## Area of study: Australian Textile, Clothing, Footwear and Allied Industries

Studies in the Australian Textile, Clothing, Footwear and Allied Industries (ATCFI) will enable you to make decisions about factors affecting the consumer, producer, manufacturer and retailer.



Refer to the Board of Studies website for the Course Objectives, Outcomes and Content:  
[www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au).

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# 21

## Appropriate textile technology and environmental sustainability

### Environmental impact of the textile industry

In the 21st century there is an increased consumer demand for textile products produced with minimal impact on the environment. The textile industry generates large volumes of waste and consumes large amounts of energy and water. The degree of environmental impact varies between the different stages of production, fibres and specific end-uses. Cotton has a large environmental impact during its growth, while the environmental impact of synthetic or manufactured textiles is related to the amount of energy used during production. Because clothes need to be laundered, the environmental impact associated with clothing is greatest during its actual use. Furniture and interior textiles tend to have the greatest impact during production.

In 2001 the Australian Government released an initiative called *Product Innovation – The Green Advantage*. This initiative was developed to ensure the ongoing sustainability of Australian businesses and to increase the availability of innovative and environmentally sustainable products.

For a typical product, 70% of the cost of development, manufacture and use is determined in its design phase. By integrating environmental considerations into the upfront product design a company can increase efficiency, reduce the wastage of materials and energy, and reduce costs.

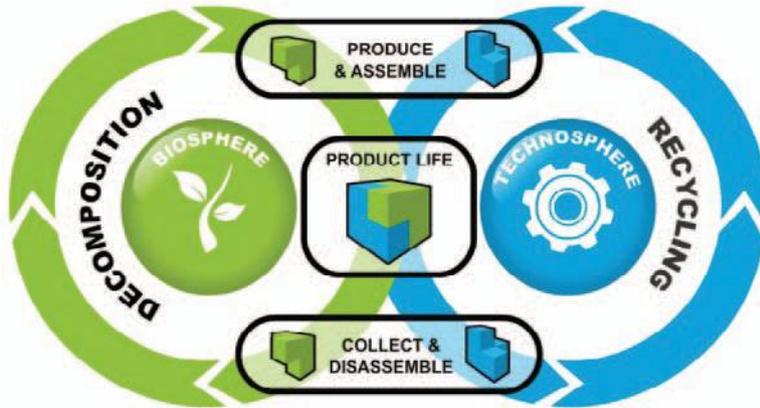
### Design for Environment

**Design for Environment (DfE)**, sometimes called **ecodesign**, is an initiative that encourages businesses to give greater thought to the design of products. DfE aims to avoid or minimise significant environmental impacts and increase resource efficiency at all stages of a product's lifecycle: from raw material extraction and processing, manufacturing, packaging and distribution, through to product use and end-of-life. This is sometimes referred to as cradle-to-grave analysis.

New environmentalist theorists, William McDonough and Michael Braungart, suggest that with our growing knowledge of the living Earth, design can reflect a new spirit. They call this cradle-to-cradle analysis. That is, all resources can be creatively reused, recycled or reinvented to create innovative designed products.



Cradle-to-grave analysis



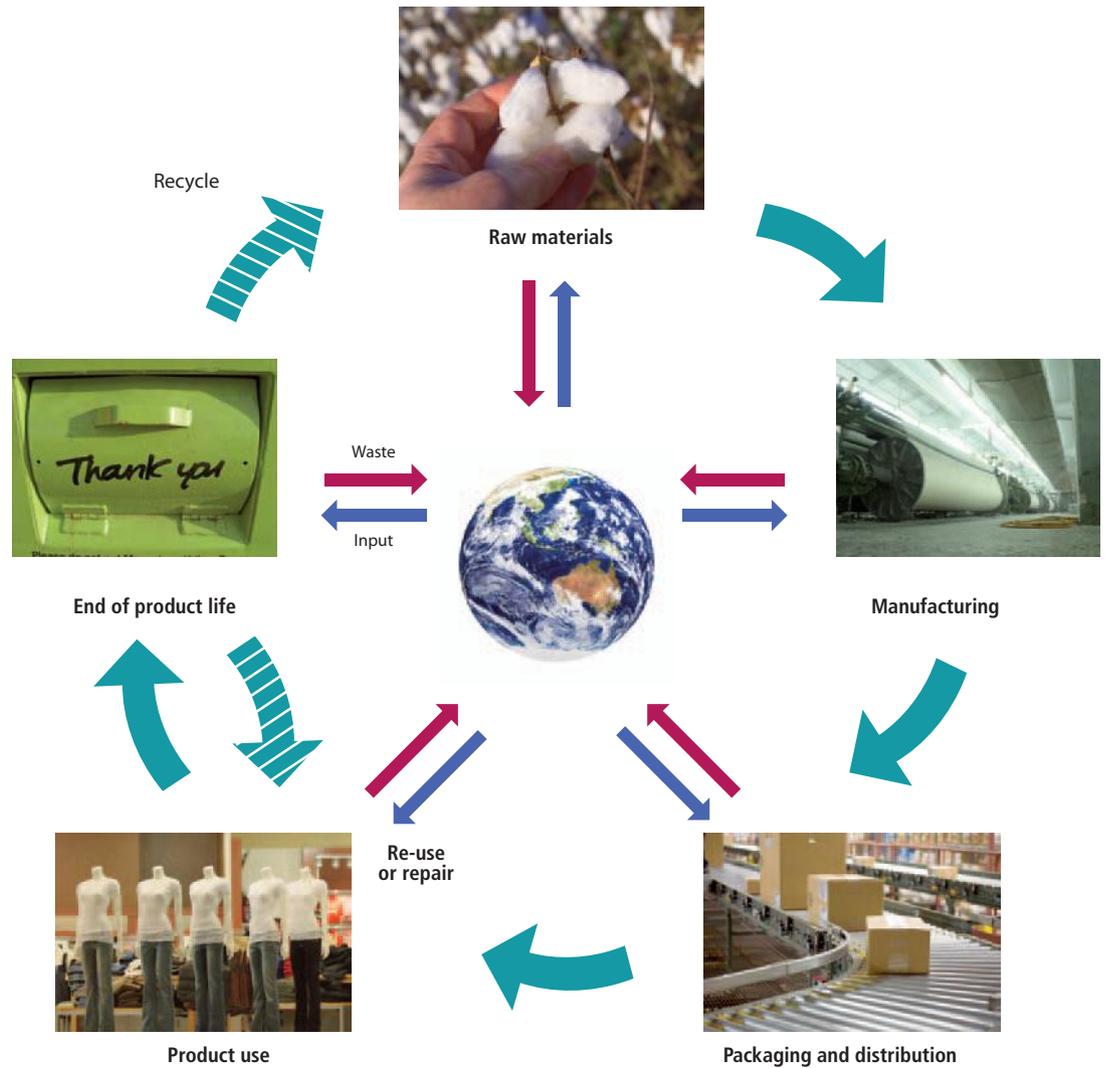
Cradle-to-cradle analysis

The National Centre for Design at the Royal Melbourne Institute of Technology (RMIT) has identified a series of DfE strategies to reduce environmental impacts at each stage of the lifecycle of a product.



### Design for environment strategies

Stage	Strategies for design
Raw material extraction and processing	<ul style="list-style-type: none"> <li>• Resource conservation</li> <li>• Low-impact materials</li> <li>• Biodiversity conservation</li> </ul>
Manufacturing/packaging and distribution	<ul style="list-style-type: none"> <li>• Cleaner production</li> <li>• Low-impact packaging</li> <li>• Efficient distribution</li> </ul>
Product use	<ul style="list-style-type: none"> <li>• Energy efficiency</li> <li>• Water conservation</li> <li>• Minimal consumption</li> <li>• Low-impact use</li> <li>• Service and repair</li> <li>• Durability</li> </ul>
End-of-life	<ul style="list-style-type: none"> <li>• Reuse</li> <li>• Re-manufacture</li> <li>• Disassembly</li> <li>• Recycling</li> <li>• Safe disposal</li> </ul>



The relationship between stages of the product lifecycle and the inputs and waste that affect the environment. A dashed arrow between two stages indicates that this link, while growing, remains relatively weak for most materials.

## Resources, impacts and alternatives

The DfE philosophy is to encourage industry to alter some of its processes to make less of an impact on the environment. The following table outlines the environmental impact of various resources and processes in the textile industry, and suggests some alternative strategies to make those processes more environmentally friendly.

Resources and processes in the textile industry	Environmental impact	Alternatives
<b>Raw material extraction and processing</b>		
Growing of natural fibres 	<ul style="list-style-type: none"> <li>Displaces land for crops</li> <li>Leaches nutrients from soil</li> <li>Contaminates soil with chemicals</li> <li>Uses energy and water</li> </ul>	<ul style="list-style-type: none"> <li>Use organic materials wherever possible – organic fibres are grown without the heavy use of potentially toxic synthetic insecticides, herbicides or fertilisers</li> </ul>

Resources and processes in the textile industry	Environmental impact	Alternatives
Processing of synthetic fibres 	<ul style="list-style-type: none"> <li>• Uses petroleum, coal and oil</li> <li>• Toxic by-products</li> <li>• By-products become landfill</li> <li>• Chemical pollution of air, water and land</li> <li>• Odour affects breathing</li> </ul>	Investigate alternative fibre sources – hemp can be grown organically and has the strength of polyester; Tencel is plantation pulp extruded through a recycled solvent process
<b>Manufacturing/packaging and distribution</b>		
Fabric production 	<ul style="list-style-type: none"> <li>• Uses finite resources</li> <li>• Dust and noise</li> <li>• Fumes from chemicals</li> <li>• Uses energy and water</li> </ul>	<ul style="list-style-type: none"> <li>• Keep informed of the latest environmental developments in materials, components and manufacture</li> <li>• New technologies and rediscoveries of old techniques for green design are occurring constantly</li> <li>• Consider the use of chemical-free natural materials</li> </ul>
Finishes 	<ul style="list-style-type: none"> <li>• Toxic by-products</li> <li>• Handling health hazard</li> <li>• Storage of used dye</li> <li>• Uses energy and water</li> </ul>	<ul style="list-style-type: none"> <li>• Use unbleached materials – bleaching requires toxins harmful to marine and water-based life</li> <li>• Use undyed materials – many dyes leach heavy metals into groundwater and waterways during production, home-washing and landfill disposal</li> <li>• Use naturally coloured material – green and brown cotton can be grown without dyeing; wool can be naturally black, grey, brown, fawn and ecru</li> <li>• Use synthetic dyes that are colourfast and completely biodegradable</li> </ul>
Apparel production 	<ul style="list-style-type: none"> <li>• Waste from off-cuts</li> <li>• Dust</li> <li>• Chemical residue</li> <li>• Plastic packaging waste</li> </ul>	<ul style="list-style-type: none"> <li>• Maximise fabric yields and minimise fabric wastage by carefully checking lay plans and garment design</li> <li>• Investigate simple patterns – extravagant pattern shapes can lead to a high amount of wasted material</li> <li>• Lay up with cardboard patterns instead of using computer-generated lay plan paper – manufacturing needs new throwaway paper plans every time a new cut is done, whereas cardboard can be used repeatedly</li> <li>• Use natural renewable components – buttons and jewellery can be made from tagua nuts from the Amazon rainforest or plantation wood</li> <li>• Use recycled and/or recyclable components – examples include recycled PET cords, labels, webbings and 100% polyester recyclable zippers and recycled glass as buttons and toggles</li> <li>• Investigate methods of reducing material waste in the production process – short roll ends can be sold to staff, clean cutting scraps given to Reverse Garbage for school projects, natural fabric scraps composted</li> </ul>

Resources and processes in the textile industry	Environmental impact	Alternatives
<b>Product use</b>		
Consumer use of product 	<ul style="list-style-type: none"> <li>• Packaging waste</li> <li>• Excess of changing fashion</li> <li>• Chemical care of products</li> <li>• Energy and water use</li> </ul>	<ul style="list-style-type: none"> <li>• Make long-lasting clothing – the more durable a garment, the greater the time span before replacement, therefore fewer resources are used</li> <li>• Design clothing with classic lines – fashion styles are transient fads that require constant redundancy; classic styling equals a long life</li> <li>• Provide concise information on material content and care/laundry on permanent garment labelling – educated customers will value their garments and treat them with respect, leading to a longer useful garment life</li> <li>• Avoid materials or construction detailing requiring special laundering – dry-cleaning is an expensive process that uses toxic solvents linked to ozone depletion</li> </ul>
<b>End-of-life</b>		
Manufacture from renewable or recycled materials 	<ul style="list-style-type: none"> <li>• Reduce the amount of landfill</li> </ul>	<ul style="list-style-type: none"> <li>• Use recycled materials with a high Post Consumer Waste (PCW) recycled content – examples include PET drink bottles recycled into polyester yarns, unwanted charity shop items shredded to make new yarn, rubber tyres recycled into shoe soles</li> <li>• If using synthetic materials, use homogeneous (all the same) materials – if a garment is 100% polyester, including labels, trims and thread, it can be recycled without contaminants</li> </ul>
Safe disposal of textile products 	<ul style="list-style-type: none"> <li>• Increase in landfill</li> </ul>	<ul style="list-style-type: none"> <li>• If using natural materials, use all naturals – it should be possible to compost 100% natural garments (especially unbleached, organic materials) after their long, useful lives</li> </ul>



### 21.2 Sustainable textiles

## Recycling and reusing textile products

What happens to textile products no longer required by industry or the consumer? When textile products go into the garbage bin they end up as landfill. Textiles that are 100% natural will slowly decompose over time, but synthetics remain as landfill and will never decompose. Reusing or recycling textile products is a better alternative for the protection and preservation of the natural environment. There are a variety of ways to reuse or recycle textile materials.



### Reverse Garbage

## Reverse Garbage

Reverse Garbage is a not-for-profit cooperative that sells industrial discards, off-cuts and over-runs to the public for creative and practical uses. Businesses, manufacturers

and government institutions donate their reusable materials to Reverse Garbage where they are sorted and then sold.

One of Reverse Garbage's objectives is to reduce landfill. Reusing products saves resources and the energy needed to produce new materials, and does not involve the energy consumption or waste associated with recycling. Textile products available from Reverse Garbage include fabric off-cuts, swatches, sample books, fake fur and felt. Haberdashery items include bias binding, cushion filling, cotton and wool thread, belts, shoulder pads, braid, ribbon and buttons.

## Australian Museum sustainability and design competitions

Every year the Australian Museum runs the Fashion Less Waste competition for students. Entrants must design and create an outfit made from materials originally bought and used for a non-clothing purpose. The competition aims to raise awareness of sustainability issues in the fashion industry.



Fashion Less Waste  
([www.australianmuseum.net.au/Fashion\\_Less\\_Waste](http://www.australianmuseum.net.au/Fashion_Less_Waste))

NelsonNet

Rachael Cassar case study  
TEXD12CS210057



21.3 Fashion Less Waste

### Case study

## Bird Textiles

Case study information courtesy of Bird Textiles, [www.birdtextile.com.au](http://www.birdtextile.com.au)

Bird Textiles, often known simply as Bird, is the brainchild of designer Rachel Bending. It is an Australian climate-neutral business with the aim to create awareness about sustainability among consumers.

### Sustainable design

Sustainable design describes a design philosophy that values the natural environment as an integral factor in creating new products or modifying old ones. Sustainable designs try to maximise overall efficiency with surrounding resources, such as transportation, as well as energy efficiency, habitat preservation and restoration, natural and renewable energy sources, water conservation, recycled, local and non-toxic materials, and healthy and productive interiors.

Sustainability is complex and critical in nature. It requires commitment, ongoing education and passionate people to think deeply about the use of resources, design and manufacture of products. It is important to be aware that we have choices as consumers and we need to be responsible and well informed. Sustainability means devising creative ways to overcome the challenges facing our world, meeting the needs of our society without destroying the needs of future generations. Reducing our footprint and being responsible and informed consumers means that in the 21st century we can all work together towards a sustainable future.

Sustainable design is currently an area of high significance for designers and those concerned with the way we live and how it will affect our future. The approach towards environmental issues by passionate designers such as Rachel Bending provides a captivating subject for Textiles and Design students.



Bird Textiles  
Rachel Bending: Bird Textiles  
– sustainable design  
Rachel Bending: Bird Textiles  
– inspiration



Fat quarters

Bird Textile



Hoop bags



Rachel Bending, designer and owner of Bird Textiles

## Biography

Originally from the United Kingdom, Rachel studied textile design at the Glasgow School of Art in the early 1990s. In 2002 she established her first sustainable fashion brand, Slingfings, producing bags from vintage fabrics using solar power, and became Australia's first climate-neutral business in 2004. Rachel launched Bird Textiles in 2006, maintaining a continuation of the Slingfings brand ethos with the Bird brand, which is widely recognised for its environmental consciousness.

Bird Textiles' organic *Man On The Lake* fabric

Beach umbrellas

Bird Textile



Tennis dress from Bird Textiles' fashion range

Bird Textile



Lampshades

Bird Textile

## Rachel's vision, values and products

Bird's collection is a range of luxury eco-products for those who appreciate quality and style, and care about the planet on which they live. All products are handmade on the edge of the rainforest, in the Byron Bay hinterland, on the coast of northern New South Wales.

Bird Textiles' vision is to pioneer sustainable practices in design with the guiding principles of social harmony and environmental responsibility. The business ethos is to promote low-impact, environmentally friendly local production. Fabrics are all hand printed in Australia on certified organic cotton using water-based dyes from designs created in-house. Gift-wrap is printed on recycled paper using soy inks. Additional production materials are sourced from locally owned small businesses wherever possible.

Bird Textiles uses the three Rs as a basis of all aspects of its business:

**Reduce:** reduce the impact wherever possible.

Bird uses water-based and AZO-free chemical dyes for their coloured base cloths. Water-based screen-printing inks, heat fixing and a three-fold rinsing system before the water reaches the sewer ensures a responsible approach to waste or run-off management in the printing process.

The passive solar principles used in the building of Bird Textiles' studio negate the need for air-conditioning, and significantly reduce the heating required in winter.

**Reuse:** recycle wherever possible.

Bird uses a cyclic pattern and cutting policy. Their homewares range was started as a way to use off-cuts from their fashion range, and their gift range uses waste from the homewares range. All scrap fabric is recycled and either made into buttons, brooches or smaller gift items.

**Renew:** use renewable energy/water sources

When Bird first started they used two old car batteries and a solar power panel to power the domestic sewing machines, lights and computer. As the movement towards green energy has become more available, they now use a wide selection of wind, solar and hydro energy. The studio was built using passive solar principles and straw bale walls for insulation. Power is provided by solar panels, water is harvested from the roof and stored in tanks, water is solar heated, sewage is treated through a grey-water reedbed system and the toilets function as a waterless compostable unit.



21.4 Rachel Bending case study



Bias binding



Brooches

## Vintage clothing and accessories

'Vintage' is another way that you can reuse and recycle clothing. **Vintage clothing** usually refers to items over 25 years old. This type of clothing has become popular for Hollywood movie stars and the younger generation to wear. Vintage items are usually found at opportunity shops or online auctions ... or in your parents' or grandparents' wardrobe! You can reclaim fabrics, trims and braids from discarded textile items.



21.5 Vintage clothing



Reclaimed vintage buttons

1980s vintage sequin dress

Shutterstock.com

## Clothing recycling bins

Textile items that are no longer wanted can be placed in clothing bins. Good quality items are usually resold in charity shops like the Smith Family or St Vincent de Paul. Approximately 10% of textile items placed in clothing bins are resold. High-quality clothing, manchester and soft toys are also exported to Asia-Pacific, African and Middle Eastern markets. However, about 25% of the textile items placed in clothing bins are damaged either by stains or wear and tear and are unsuitable for further use. Unfortunately these items become waste and go to landfill.



The Smith Family

The Smith Family charity is attempting to reduce waste caused by clothes that are not suitable for resale. At their Villawood non-woven manufacturing plant, garments are recycled back to their fibre form. Fabrics made from acrylic, wool and polyester/cotton are recycled to make non-woven fabrics. The non-woven products are used for acoustic felts, filtration products, soil or water erosion prevention and ground covers, and items for the health and hygiene industry. Textile items placed in the Smith Family clothing bins that are not suitable for resale or recycling are cut into wiping rags and sold to industry.

## Pollution and the textile industry

**Pollution** is the contamination of the natural environment (including air, water or land) by harmful substances. Pollution can be minimised or overcome with greater awareness of pollutants and the implementation of preventive methods. Industry is a major cause of air pollution, releasing pollutants into the air that cause smog, haze and acidification. Water pollution is caused by land-based contaminants being released into the water supply. Poor agricultural practices, pesticide use and the haphazard disposal of urban waste all contribute to land pollution.

The textile industry is one of the most complicated industrial chains in the manufacturing sector as it consists of many sub-sectors, including fibre processing, yarn and fabric development, dyeing and printing. The major pollution concern for the textile industry is waste water that contains chemicals, which is produced throughout the lifecycle of textile products. The textile industry is a minor source of air pollutants when compared to other industries. Land waste is less hazardous, and is a result of fabric and yarn scrap, packaging waste and cutting-room waste ending up in landfill.



## Potential pollutants during textile manufacturing

Process	Air pollution	Water pollution	Land pollution
Fibre growth	Few or no emissions	Insecticides, herbicides and fertiliser	Contaminates soil with chemicals
Fibre processing	Few or no emissions	Little or no waste to contaminate water	Fibre and packaging waste
Yarn manufacture	Few or no emissions	Little or no waste to contaminate water	Fibre, yarn and packaging waste, cleaning and processing waste
Weaving and knitting	Few or no emissions	Little or no waste to contaminate water	Packaging and yarn waste, fabric scraps, used oil
Scouring	Solvents	Insecticides, residues, detergents and oils	Little or no land waste
Dyeing	Volatile organic compounds	Colour, metals and salt	Little or no land waste
Printing	Solvents and gases	Solvents, colour, metals and heat	Little or no land waste
End-product manufacture	Few or no emissions	Little or no waste to contaminate water	Fabric scraps
Consumer use	Carbon released from textiles in landfill, contributing to global warming	Alkalis used to clean textile products	Unwanted textile products

### Government legislation

Australian governments, at both federal and state level, have introduced environmental legislation to reduce and control the amount of pollutants being released into the air and water supply. Strict guidelines for the disposal of waste products have been introduced.

The *Environment Protection and Biodiversity Conservation Act (EPBC Act) 1999* (Cwlth) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places that are defined in the EPBC Act as matters of national environmental significance. In New South Wales, the Office of Environment and Heritage (OEH) is responsible for administering environmental legislation.

### Overview of environmental legislation in New South Wales

- *Environmentally Hazardous Chemicals Act 1985* – sets up the Hazardous Chemicals Advisory Committee, whose functions include advising the OEH in relation to the assessment and control of chemicals that are environmentally hazardous. The OEH may make chemical control orders (CCOs) that may regulate activities such as the manufacture, processing, conveying, buying, selling or disposal of the chemical or declared waste.
- *Ozone Protection Act 1989* – provides a broad power to make regulations to control or prohibit the production and use of substances that deplete stratospheric ozone when emitted into the atmosphere.
- *Contaminated Land Management Act 1997* – enables the EPA to respond to contamination that is causing a significant risk of harm to human health or the environment, and sets out criteria for determining whether such a risk exists.



21.6 Pollution reduction strategies



OEH Act summaries



### 21.7 Government legislation

- *Pesticides Act 1999* – controls and regulates the use of pesticides in New South Wales.
- *Waste Avoidance and Resource Recovery Act 2001* – promotes waste avoidance and resource recovery and establishes a scheme to promote extended producer responsibility in place of industry waste reduction plans.
- *Protection of the Environment Operations (Clean Air) Regulation 2002* – deals with emission of air impurities from activities and plant, and sets maximum limits on emissions for a number of substances, including oxides of nitrogen, smoke, solid particles, chlorine, dioxins, furans and heavy metals.

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Explain the importance of environmental impact in design choices for the 21st century.
- 2 What is *Green Advantage*?
- 3 Define the term *DfE*.
- 4 Explain three ways textile products could be recycled.
- 5 What measures has the Australian Government put into place to try to overcome some of the issues associated with environmental harm and the Australian textile industry?



### 21.8 Textile technology and sustainability palm cards

## Websites

- ☺ RMIT School of Fashion and Textiles ([www.rmit.edu.au](http://www.rmit.edu.au)): Interesting innovations in textile research.
- ☺ Office of Environment and Heritage ([www.environment.nsw.gov.au](http://www.environment.nsw.gov.au)): Australian Government resource site for all concerns relating to the environment.
- ☺ Design for Environment ([www.resourcesmart.vic.gov.au/documents/DfE\\_brochure.pdf](http://www.resourcesmart.vic.gov.au/documents/DfE_brochure.pdf)): A resource for the consideration of the environment in future design.
- ☺ Bird Textile ([www.birdtextile.com.au](http://www.birdtextile.com.au)): Australian designer Rachel Bending and her amazing eco-friendly business.

# Current issues that affect the textile industry

# 22

## Globalisation of design, manufacture, distribution and markets

**Globalisation** refers to the increasing worldwide connection, integration and interrelatedness of the economic, social, technological, cultural, political, and ecological spheres. Globalisation of the economy depends on the role of human migration, global trade, global communication, movement of capital via global trade and integration of financial markets.

Look at the labels of the clothes you are wearing. Where were they made? Chances are they were made in a developing country such as Fiji, China, Thailand or Sri Lanka.

Globalisation, driven by improved technology and reduced trade barriers, is rapidly increasing the connections between people around the world. There are new opportunities to address poverty but also increased awareness of human rights and environmental issues. Many developing countries are offering major manufacturers tax breaks, low-cost land and labour to build factories in areas known as Export Processing Zones. This creates new employment opportunities and income for poor families and export income for the country but sometimes working conditions are exploitative.

The textile, clothing and footwear (TCF) industry is labour-intensive and factories in developing countries are often associated with the term 'sweatshop'. The working conditions are very different from those in richer countries with labour, health and environmental regulations. Workers are treated poorly with low wages, long hours and poor safety conditions. Fair trade campaigns such as FairWear Australia and Ethical Clothing Australia have led to codes of conduct and certification of goods from these factories, which are a positive step, but have also forced the closure of some of these factories and left already poor people with no work.



22.1 Globalisation  
group activity

## FairWear Australia

FairWear addresses and works to eliminate the gross exploitation of homeworkers (outworkers) in the Australian clothing industry, recognizing that this is just as much of an issue at home as abroad.

The FairWear campaign actively encourages Australians to think critically about where the clothes

we wear are produced and under what conditions. Recognising that the conditions of outworkers in Australia are a result of changes in the global garment industry, our concern extends to the international garment supply chain.

Homeworkers are mostly women who make clothes in their

houses situated in the suburbs of Australia for as little as \$3 to \$4 an hour. They often work up to 18 hours a day, 7 days a week. Homeworkers make clothes for our major retailers, designers and even suppliers of school uniforms. They are some of the lowest paid and most exploited Australian workers.





In 1995 there were an estimated 300 000 people regularly working as outworkers in the garment industry in Australia, including the family members of outworkers often called upon to help finish last minute orders.

Currently, outworker advocates are reporting high rates of unemployment amongst outworkers from particular communities and

outworkers are facing downward pressure on their wages as a result.

Many of these workers still work intermittently as outworkers, but it is expected that far less are receiving the regular work they were in 1995. It is more accurate to say that there still exists a large labour pool of thousands of outworkers.

FairWear is a campaigning organisation that aims to give

you the tools you need to support the rights of outworkers and sweatshop workers in Australia and internationally. The FairWear campaign supports Ethical Clothing Australia as a tool to help clean up supply chains in the Australian textile and clothing industries.

Source: Textile Clothing & Footwear Union of Australia, <http://tcfua.org.au/outworkers/fairwear>.

# Ethical Clothing Australia: a better deal for clothing workers

## Unfortunately ‘Australian-made’ does not always mean ethically-made.

The word ‘sweatshop’ is often associated with countries such as China and India, but sadly much of the Australian fashion and clothing industry also operates with little regard for even the basic laws and standards. Many clothing workers in Australia, particularly home-based workers, are paid as little as three or four dollars an hour and do not receive entitlements such as superannuation or annual leave.

## Working together for an ethical local industry

To tackle underpayment and poor conditions in the industry, various business and union representatives have come together as Ethical

Clothing Australia (previously known as the Homeworkers Code of Practice and the No Sweat Shop label) to help local clothing businesses ensure that Australian workers making their products receive fair wages and work in decent conditions.

## A voluntary accreditation and labelling system

By registering with Ethical Clothing Australia, clothing businesses are committing to take certain steps to keep their Australian-based supply chains transparent and ensure that they and any sub-contractors are compliant with the relevant Australian laws.

Once compliant, accredited brands are licensed to display the Ethical Clothing Australia trademark on their Australian-made

products, providing consumers and buyers with a way to identify and support ethical Australian-made products.

## Look for the label

When you see the Ethical Clothing Australia trademark on a product, it means it was made in Australia and everyone involved in its production received, as a minimum, the legal rates of pay and conditions.

Source: [www.ethicalclothingaustralia.org.au](http://www.ethicalclothingaustralia.org.au).



Ethical Clothing Australia

# globalisation

## means...

### global trade

- Trade with many countries
- More open economies and trade agreements
- Rising standards of living increase demand for consumer goods
- Lower business costs
- Multinational and international corporations

### global migration

- People moving to other countries
- Cheaper flights and sea transport
- People working overseas
- International tourism

- Cultural exchange and understanding
- Products from many markets
- Global advertising
- Cultural exports
- Global organisations like the UN promote co-operation

### global culture

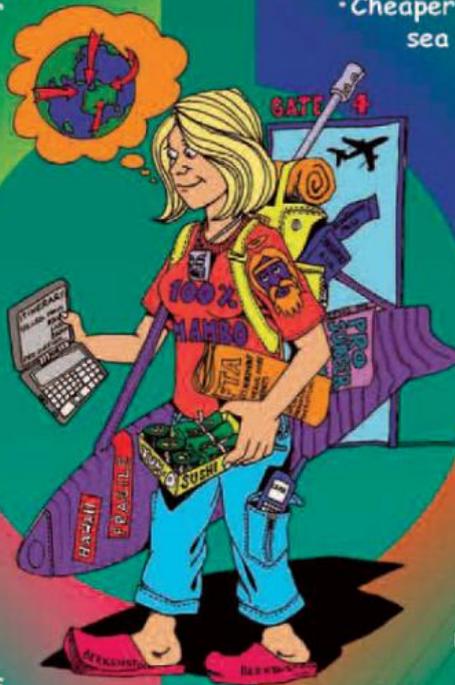
- Internet access
- Cheaper, faster global communication

- Global media networks

- New technologies

- Increased awareness of international issues

### global communication



Australian Government  
Austrade

[www.austrade.gov.au/studentcentre](http://www.austrade.gov.au/studentcentre)

Globalisation is the increasing economic and social integration of different people and countries



## Design

Global migration, global trade, global culture and global communication have all contributed to the expansive marketplace opportunities open to designers. In particular, increases in global networking associated with the Internet have increased the

'cultural exchange rate' and allowed designers to operate on a multicultural or global level.

Designers can create authentic cultural designs incorporating cross-cultural references to generate new, sophisticated and innovative design ideas. Australian fashion designer Akira Isogawa uses his traditional understanding of Japanese culture and fashion and fuses it with Russian embroidery influences and his Australian identity. Celebrity and designer Gwen Stefani embraces her American culture, pop culture and Japanese Harajuku fashion to create a unique look for her fashion label L.A.M.B.

## Manufacture

The TCF industries are facing significant global competition and have been undergoing structural adjustment for some time. Successful Australian manufacturers have generally moved from

producing commodity goods to manufacturing specialised, value-added goods that are differentiated by design or innovation.

The TCF industries are diverse and cover a range of different products, including made-up textiles, clothing, carpet, footwear and technical textiles. The official 2010 statistics for the industries show that they contribute over \$4.5 billion in industry value-added goods, which is around 4% of all manufacturing value-added goods.

International developments, such as free trade agreements, will continue to present both opportunities and challenges for the sector.

Australian companies often manufacture their goods overseas due to the high cost of labour and manufacturing in Australia (the cost of labour, wages and facilities are cheaper overseas). This allows companies to manufacture their goods at a lower cost and ship them back to Australia at a cheaper rate than if they were manufactured in Australia. Manufacturing goods offshore can also give companies access to various government assistance packages. This includes the Extended Overseas Assembly Provisions (EOAP), which enables companies to assemble clothing in low-cost labour countries from garment pieces that are pre-made in Australia, and import them through customs duty-free.

The enhanced innovation package recognises the importance of the TCF industries, which employ over 45 000 Australians and underpin regional economies around the country. It aims to make the TCF industries stronger and more sustainable by supporting the development of new products and processes, especially at the high-tech, high-value end of the market.

Under the package, the Australian Government has:

- introduced a new \$35 million TCF Strategic Capability Program in 2010–11 to support large projects that will boost innovation capacity and performance at the enterprise and workplace level
- established a Clothing and Household Textile (Building Innovative Capability) scheme to support investment and innovation – based on the TCF Strategic Investment Program, with \$25 million in additional funding



Gwen Stefani's fashion label  
L.A.M.B

- established a TCF Industries Innovation Council to bring together business, unions, researchers and government to champion innovation in the sector and provide strategic advice
- established a National TCF Innovation Network within Enterprise Connect to support collaboration between companies and between industry, researchers and educational institutions
- retained the TCF Small Business Program to improve business enterprise culture
- commissioned the TCF Industries Innovation Council to provide further advice on the introduction of a voluntary ethical quality mark, voluntary national sizing standards for clothing and footwear, and a national anthropometric (measurement of the human body) database; and proceeded with the 2010 TCF tariff reductions already enshrined in legislation.



Textile manufacturing



Internet shopping

Photos from Shutterstock.com

## Distribution

The new drivers for globalisation include the interaction between information and communication technologies in association with increased distribution. The rapid response time using e-commerce business connections means businesses can reach new markets, receive electronic orders with 24-hour access, pay online, network with allied businesses and reduce time, money, travel and marketing costs. For example, a textile-based product such as a basic T-shirt can be distributed from worldwide storehouses accessed through one Internet business connection point via a website.



22.3 Internet trading –  
One Teaspoon

## Markets

The ATCFAI are responding to the continual changes in the marketplace due to globalisation by becoming proactive in seeking new marketplace opportunities. Responding to change, understanding marketplace activity, trends and opportunities, and appropriating strategies will ensure that Australia will continue to gain access to overseas markets. The development of strong export markets is essential if Australia is to remain competitive on a global scale.

The Australian Government has established organisations such as Austrade to assist Australian companies to export their goods and services. Austrade's mission is to contribute to community wealth by helping more Australians succeed in export and international business. They provide advice, market intelligence and support to Australian companies to reduce the time, cost and risk involved in selecting, entering and developing international markets. In addition, Austrade provides advice and guidance on overseas investment and joint venture opportunities.

Austrade also administers the Export Market Development Grants scheme, which provides financial assistance to eligible businesses through partial reimbursement of the costs of specified export promotion activities.

Austrade is represented in more than 140 overseas locations in over 60 countries and throughout Australia.



Catalogue marketing: High Tea with Mrs Woo from the 'Seven Sundays' collection



Catalogue marketing: High Tea with Mrs Woo from the 'Under the Bluegum' collection

# TCF Strategic Investment Program Amendment (Building Innovative Capability) Bill 2009

## Overview of the TCF Industry

Australia's TCF industry has remained competitive in a high exchange rate environment through restructuring and innovation. Assisted by the TCF Strategic Investment Program (SIP) Scheme and TCF Post-2005 (SIP) Scheme, the industry has restructured and survived due its design capability, niche marketing and growing linkages with global supply chains.

However, the industry has steadily been declining over the last decade with employment levels falling by more than 50% and investment almost halving.

### Key points

- ABS figures for 2008–09 show that the industry contributed around \$5.2 billion in industry value-added which is around 5% of all manufacturing value-added.
- In 2008–09, TCF imports (\$10.6 billion) were more than five times that of exports (\$1.9 billion).

- Export levels of all categories of finished TCF goods are small and are declining, except for leather.
- New Zealand is the largest export destination of TCF exports, followed by China and the United States.
- Competition from Asia in particular has affected the size and vitality of the industry, with a number of Australian TCF industries sourcing product overseas or moving production offshore.

## TCF Industry performance 1999–2009

	1999–2000	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09
Industry value added (\$m)	7511	7333	7059	7011	6911	6079	5497	5522	5760	5162
Employment (000s)	78.3	70.6	59.2	55.4	46.9	42.4	39.2	40.5	30.1	35.2
Exports (\$m)	2589	2936	2740	2758	2155	1924	2185	2272	2208	1921
Imports (\$m)	6852	7388	7421	7841	7367	8069	8059	8950	9249	10643
Investment (\$m)	191	223	186	200	173	238	155	139	111	112
Business enterprise expenditure on R&D (\$m)	18	27	22	28	41	35	39	31	NA	NA

Source: Parliamentary Library Bills Digest, 1 February 2010, no. 92, 2009–2010.

# Australia's Textiles and Clothing Industries

BY SALLY WELLER, SENIOR RESEARCH FELLOW AT THE CENTRE FOR STRATEGIC ECONOMIC STUDIES, VICTORIA UNIVERSITY, MELBOURNE

As tariff barriers fall, garment related importing and exporting is governed increasingly by fluctuations in the Australian dollar's exchange rate. The main beneficiaries of higher exchange rates are clothing importers that

can buy more with each Australia dollar, whilst the main losers are Australia's handful of garment exporters. Counter-intuitively, however, the strong Australian dollar in 2006–2011 has appeared to have promoted local production

by reducing the costs of imported fabrics.

Source: 'Retail, Clothing and Textiles Production in Australia', Centre for Strategic Economic Studies, Victoria University, October 2007.

## Imports

### Imports assistance

#### Import Credit Scheme

The 10-year Import Credit Scheme encourages clothing and finished textile firms to achieve growth in their value-added product. The scheme is capped at \$5 million per annum.

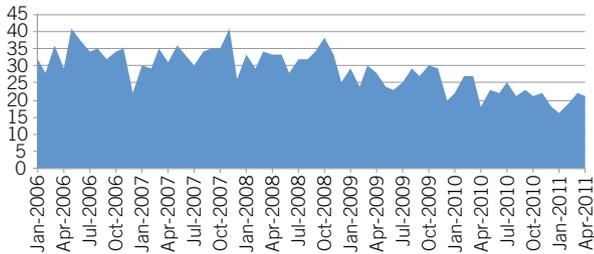
#### Product Diversification Scheme

The Product Diversification Scheme is designed to give clothing and finished textile manufacturers an extra incentive to achieve growth in value-added production, to globalise their sourcing arrangements and to diversify their existing product range.

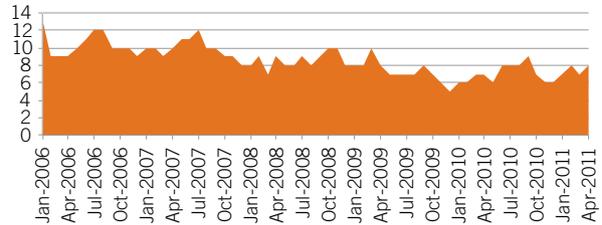
It is also designed to assist clothing and finished textile manufacturers and designers located in Australia to internationalise their sourcing arrangements and complement their product range. It will do this by providing duty credits that can be used to offset duty payable on qualifying finished clothing or relevant finished textile articles. Over 10 years through to 2016, this scheme will provide \$5 million per year in duty credits.

## Sourcing and importing

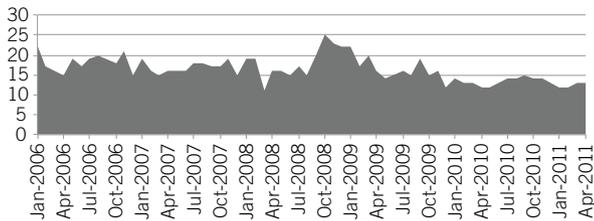
Textile yarn imports (\$A millions)



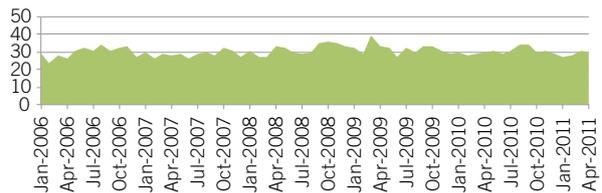
Cotton fabrics, woven imports (\$A millions)



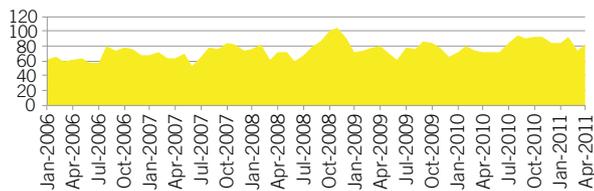
Fabrics, woven, of man-made textile materials imports (\$A millions)



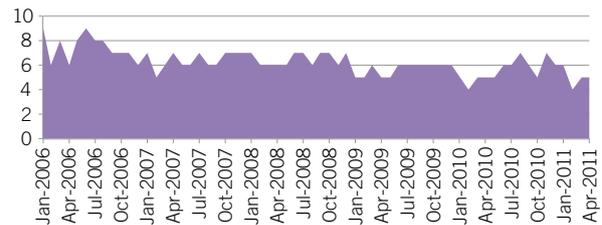
Special yarns, special textile fabrics and related products (\$A millions)



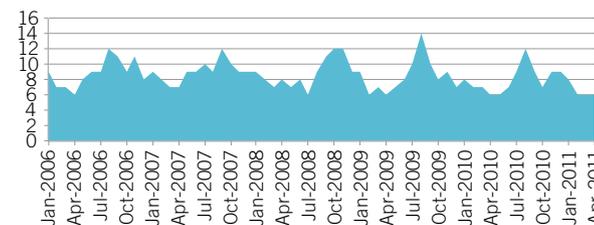
Made-up articles, wholly or chiefly of textile materials (\$A millions)



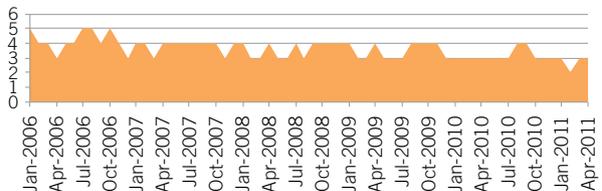
Other textile fabrics, woven imported (\$A millions)



Knitted or crocheted fabrics (\$A millions)



Tulles, lace, embroidery, ribbons, trimmings and other small wares (\$A millions)



Data source: Australian Bureau of Statistics

# Sourcing and importing

BY SALLY WELLER, SENIOR RESEARCH FELLOW AT THE CENTRE FOR STRATEGIC ECONOMIC STUDIES, VICTORIA UNIVERSITY, MELBOURNE

All imports to the Australian market arrive as the result of purposeful sourcing activities by firms in different parts of the clothing production system. Retailers, agents and wholesalers draw on similar sourcing strategies and most use a combination of strategies, sourcing garments locally and from overseas depending on the fabrics, labour content and fashion orientation of particular styles in the context of cost, quality and time comparisons. Strategies – and therefore the ratio of locally

made to imported products in the market – may shift from season to season or stock turn to stock turn, depending on the fashion mood, the exchange rate and the availability of manufacturing capacity.

Before trade barrier liberalisation, garment importing had been governed and constrained by the quota system. But after liberalisation, larger manufacturers ‘hollowed out’ their operations, retaining management, design and logistics functions in Australia whilst shifting their manufacturing

activities to low wage countries, principally to China. In effect, they became importers. Australia’s largest clothing manufacturer Pacific Dunlop, for example, initially closed down local production (with the loss of some 10 000 jobs) and opened its own factories in China. But these factories were later sold, and Pacific Dunlop became a sourcing wholesaler, Pacific Brands.

Source: ‘Retail, Clothing and Textiles Production in Australia’, Centre for Strategic Economic Studies, Victoria University, October 2007.

## Export assistance

The Australian Government has set up Export Hubs around the country to provide businesses with information and advice on products and services to help them enter and develop international export markets. The hubs bring together the government services provided by Austrade TradeStart and AusIndustry, which already provide substantial assistance in this area.

Developing an export business involves market promotion, new production capacity, overseas travel, complying with overseas standards and a host of other factors. A return on this expenditure can take time. Fortunately, the cost of export marketing has been reduced by the use of the Internet, electronic transactions and international telecommunications.

To help establish an export business, Austrade administers the Export Market Development Grants (EMDG). This program has operated for over 30 years and provides small and medium business with up to 50% reimbursement of certain export promotion expenses above a \$15 000 threshold. (First-time applicants can combine two years’ expenses in order to meet this threshold.) Eligible expenses claimable under EMDG include overseas marketing visits, producing promotional brochures for overseas markets and providing free samples to potential buyers.

State and territory governments can also provide financial assistance, often on a dollar-for-dollar basis. These schemes can help in the preparation of a business export strategy and other costs involved when starting to export. Austrade TradeStart and AusIndustry provide valuable services and assistance to Australian businesses.

## Austrade TradeStart

This program provides services and assistance, including:

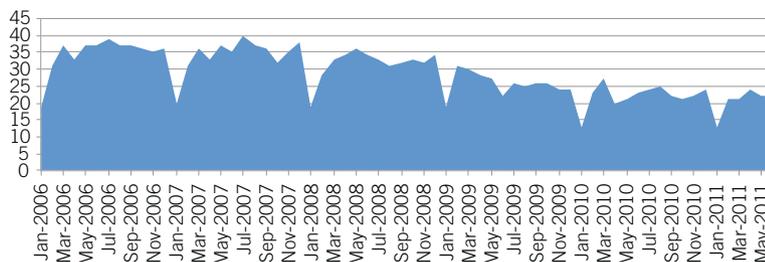
- practical export
- identification of overseas opportunities
- on-the-ground exporting support overseas and within Australia
- trade exhibitions
- identifying potential overseas business partners.

## AusIndustry

This specialised business program provides assistance such as:

- conducting research and development
- encouraging small businesses
- taking up new technology
- undertaking industry-specific manufacturing and production
- commercialising a new technology or venture
- applying for a tax or duty concession for research and development.

Textile yarn, fabrics, made-up articles,  
and related products exports  
(\$A millions)



Data source: Australian Bureau of Statistics

### Case study

## Austrade Australian Fashion Week

Fashion exports are important to Australia's economy.

Austrade has brought over 50 key international fashion buyers to Australian Fashion Week (AFW) from all over the world, including the United States, Europe, South East Asia and North East Asia.

Austrade has also seen a boost in the number of Australian designers

seeking export assistance. Designers themselves are increasingly seeing the value and importance of selling their collections overseas.

Austrade's aim at AFW and Fashion Exposed is to ensure the designers have the opportunity to show and meet with international visitors to maximise their chances of making significant export sales. In

2005 over \$60 million in wholesale orders were estimated to be written at AFW.

Austrade provides a wide range of assistance to Australia's fashion industry. For example, Austrade provides export advice, introduces clients to potential customers overseas and provides financial assistance through Austrade's

Export Market Development Grants (EMDG) scheme. The purpose of the EMDG scheme is to encourage small and medium-sized Australian businesses to develop export markets. EMDG reimburses up to 50 per cent of expenses incurred on eligible export promotion activities, less the first \$15 000.

Austrade also helps businesses get into exporting for the first time through the New Exporter Development program. The Program provides a wide range of free services including advice and information about getting into exporting, export coaching, and assistance on the ground in foreign markets.

Courtesy of Leigh Derigo, Manager Education Programs, Austrade

Source: [www.austrade.gov.au](http://www.austrade.gov.au), 2007.

## Case study

# Nicky Adamo – Julianne

Sydney-based designer Nicky Adamo, designer for her fashion label, Julianne, creates ethereal, sumptuous sleepwear with straightforward shapes and luxurious fabrics. Nicky was inspired by her travels abroad and Italian heritage to create a fashion label that combines daily life and beauty with sophistication and decadence, in a range of contemporary camisoles and slips.



Julianne Boutique



Creation for the Julianne label

# Women in export

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## Reasons for getting into export

Julianne's Chief Designer and Managing Director Nicky Adamo had spent time living and working in the UK, and decided to pitch her luxury lingerie and sleepwear there first. 'Attitudes to sleepwear are very different in the UK than here in Australia,' she said. 'Sleepwear is very important to people there, so we knew our products would have a market.'

## Benefits derived from exporting

Export is a very important part of Julianne, in fact Ms Adamo estimates about 70% of its sales come from international markets. Sales have grown in Australia, but exporting continues to be the company's main focus.

## Market entry strategy

Being a new designer, the company was careful to position itself in countries that were more receptive to the product. Ms Adamo said the company had done plenty of homework to research markets within each target region, especially in relation to competition products. This homework is done religiously before Ms Adamo meets with a buyer.

## Biggest challenge or obstacle

The greatest obstacle Julianne has faced is distance, and the challenge of making a competitive product when there are 'huge' freight charges that must be built into the cost. Ms Adamo said many international buyers needed to see product ranges frequently, and this sometimes presents logistical challenges. 'Being competitive means we have to get over there regularly,' she said.

## Advice for new exporters

Getting into the best stores first up was the key to success for Julianne. Ms Adamo said exporters should not be afraid to aim high, provided they were willing to do the hard work to get there. 'You really need to research your market and make sure you have something to offer that is unique,' she said.

## Other key points for consideration when exporting

Understanding what is involved in overseas customs and keeping up to date with regulations is vital for successful exporting. Ms Adamo said trade shows were a good place to start when considering exporting.

## If you have received assistance from Austrade, how has it assisted your business?

Austrade is well set up in the US and UK fashion markets and has offered the company invaluable advice and introductions to potential buyers. 'Austrade opens doors. They carry that element of respect,' Ms Adamo said.

Source: 'Women in export:

A collection of case studies of successful business women in export', Austrade, 2006.



22.4 Austrade and Australian Fashion Week

# Level of protection

## Increased skill level of workers

The need for ACTFAI employers to initiate change is imperative. Organising diversification of their skill base, retraining and technical training in technological advancements is necessary for workers to be gainfully retained in this fast-changing industry.

There have been many job losses in the manufacturing sector of ACTFAI. Retrenched TCF workers who are eligible for a special Labour Adjustment Program can receive immediate, intensive and customised employment assistance. This package was provided by the Australian Government to assist individuals, business and TCF-dependent communities affected by the changes to the competitive arrangements for the industry. The program will run for 10 years from 1 July 2005.

## Changing consumer demands and lifestyle

The ATCFAI needs to remain competitive in meeting changing consumer demands in the marketplace that are driven by changing Australian lifestyles. Areas where specific consumer demand has driven innovation and new design for textiles include:

- **Sun-safe clothing:** Increased awareness of sun damage has led to a demand for sun-safe clothing.
- **Australia-made clothing:** An increased awareness of Australia's place in the global market and the strength of the local economy has led to a demand for products made entirely in Australia.
- **Australia's ageing population:** People are staying in paid work for longer or are going into job share or semi-retirement positions. This demands specific clothes that are more suitable for older people who remain in the workforce.
- **Fitness:** Fitness levels have increased for a wider population demographic, so there is increasing consumer demand for clothing for fitness activity.
- **Clothing from organic sources:** Consumers feel they should be addressing environmental issues and want to buy 'green' products or eco-labels.
- **Sizes:** A wider variety of sizes are now available due to consumer demands for items to fit taller, shorter, petite or larger people.
- **Celebrity status:** The 'tweeny generation' is dressing above its traditional age level, which is driven by globalisation and media influences.
- **Fashion cycles:** Cycles such as the ever-changing height of jean waistbands are dependent on fashion cycles and driven by media influences.
- **New technology:** People demand performance fabrics rather than the basic requirements of comfort and protection.
- **Sports teams:** Supporters demand team merchandise for all ages, sizes and styles.
- **Accessibility to elite equipment:** People demand the same products, clothes and equipment used by elite athletes, especially when those products are endorsed by athletes.
- **Innovation of children's clothing:** Multi-sized clothing for children is in demand, such as elastic with button holes for the waistband to expand, so the garments can be worn for a longer time.



22.5 Consumer demand

## Sun protection factor clothing



Increased consumer awareness of the damage caused by the sun has resulted in increased consumer demand for clothing that provides sun protection. Australia has the highest rate of skin cancer in the world, and prevention is aided by the production and wearing of textiles that protect the consumer from most ultraviolet radiation from the sun.

In Australia, testing and labelling of sun-protective clothing is created according to Australian/New Zealand Standard AS/NZS4399. This standard outlines the testing procedures and also specifies appropriate wording to be placed on Ultraviolet Protection Factor (UPF) labels. Before fabrics can be given a UPF label they must be tested to determine the UPF ratings. Companies can have their materials tested to determine the UPF ratings then follow the directions in the standard when adding the rating to the UPF labels on their materials. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) can supply ready-made UPF tags if required.

ARPANSA's ready-made UPF tags feature the UPF Certification Trademark, owned by ARPANSA. If a company wants to use the ready-made tags, they must pay a licensing fee for the trademark to ARPANSA. Manufacturers that make their own UPF labels not incorporating the UPF trademark do not need to pay a fee to ARPANSA.

Information about ARPANSA was provided courtesy of Alan McLennan



### 22.6 Sunsafe clothing



The ARPANSA UPF certification trademark

# Australian Made, Australian Grown Campaign

The Australian Made, Australian Grown Campaign is a not-for-profit organisation that administers and promotes the use of the famous green and gold logo on products that are Australian Made, Australian Grown or a Product of Australia.

The origins of the campaign date back to shortly after Federation (in 1901) when the merits of buying products made in Australia was advocated in Federal Parliament. In the 1930s the NSW Chamber of Manufacturers championed the cause of Australian made in a major campaign and by 1961 the Associated Chambers of Manufacturers of Australia founded a nationally coordinated campaign called Operation Boomerang. The campaign aimed to raise the profile of the manufacturing industry and encouraged people to buy locally made goods.

In 1986 a new era began when the federal government commissioned a new logo. Shortly after, the iconic green and gold kangaroo triangle was introduced. The Australian Made logo was designed by Ken Cato and initially marketed by the Advance Australia Foundation until its closure in 1996.

Changes to the *Trade Practices Act 1974* (Cwlth) in 1998 clarified country of origin rules, and the Australian Chamber of Commerce and Industry network established a new not-for-profit Australian Made Campaign on 1 July 1999. In 2007 the federal government introduced a scheme called Australian Grown and the logo's name and rules were extended to promote the fresh, clean and great-tasting produce our farmers grow.

The Australian Made, Australian Grown logo is a Certification Trade Mark (CTM). This means products have to meet certain criteria in order to carry the logo and the business has to pay a licence fee. Other well-known CTMs are the Heart Foundation Tick and the Wool Mark.

Much has happened since the idea of promoting Australian products and produce was first born. Australia has become a valued and admired global player and our products are now shared with the world. The Australian industry has changed, but the campaign's message is as relevant and important today as ever: as Australians we can be proud of who we are and of the goods we produce. Buying Australian is not just about helping our industry and creating a solid future for our children, it is also about getting quality products manufactured to our high standards.

The Australian Made, Australian Grown Campaign has never been stronger. The number of licensees using the logo on products sold around the world continues to increase. There are currently 1750 businesses registered to use the logo on over 10000 products.

Roy Morgan Research shows 94% of Australian consumers recognise the logo and 86% trust it over other country of origin symbols such as flags, maps and pictures of animals.

Information courtesy of Helen Jacobs, PR and Communications Executive, Australian Made, Australian Grown Campaign



All of the product's significant ingredients come from Australia, and all, or nearly all of the manufacturing or processing has been carried out in Australia.



The product has been made here and more than 50% of the cost of making it has occurred here.



All of the product's significant ingredients are grown in Australia, and all, or nearly all of the processing has been carried out in Australia.

Australian Made

## Australian made designs

# Fashion designer Katie Perry stands by Australian manufacturers

Live the dream and support the Australian economy. That's the philosophy behind Australian fashion designer Katie Perry. The 29 year old who manufactures her garments from jersey fabrics knitted and dyed in Melbourne, will release her latest collection – Trust – this Spring.

Since the conception of her self-named label in 2007, Perry has been adamant in ensuring her garments are made in Australia. 'I am proud to be able to say my collection is made in Australia and the AMAG logo helps display this fact to consumers,' she says. 'It is important for consumers to realise that by supporting Australian made products you are helping the Australian industry – in my case the fashion industry,' the Sydney-based designer says. 'If consumers choose

not to support Australian made collections this means fabric mills and manufacturers don't get the work; they will be forced to close down which will force designers to go offshore – so there is a ripple effect throughout the industry.

Quality control is another important factor in her decision to manufacture on-shore, she says. 'What it means for me is that I am able to create a great team that I can visit weekly. It allows me to test the market by doing smaller runs but most important, I love that I have absolute quality control over the product.'

The upcoming collection is based on one of her label's core values – trust – she says, and targets women with a high disposable income looking for comfort, quality and style.

'The Katie Perry customer is appearance proud and wants clothing that allows her to look stylish – whether relaxing at home, going to a work conference or travelling around the world.' She uses AMAG stickers prominently on her products' swing tags to catch shoppers' attention immediately. And with four stockists already on board, Perry aims to increase the label's presence in the retail market, as well as online.

'It's hard work but I feel really privileged I'm living my dream.'

Source: 'Fashion designer Katie Perry stands by Australian manufacturers', Australian Made Australian Grown Domestic Case Study, [www.australianmade.com.au/case-studies](http://www.australianmade.com.au/case-studies).



Katie Perry



22.7 Australian Made Campaign and designer Katie Perry

# Manufacturing strategies, and niche and mass-produced goods

## Mass-production versus niche markets

Mass-produced goods are created by those businesses that manufacture vast amounts of merchandise to be sold. This means they cannot cater to every market segment – only to the mass market.

A niche market is a smaller portion of a larger market. It generally refers to a special or narrowly defined group whose needs are not being addressed by conventional mass-produced goods.

When businesses cater to the mass market, they leave smaller segments of a market with precise needs that are not being met. This is known as a gap in the marketplace and creates a profitable opportunity for smaller, more specialised niche businesses. Increasingly, consumer demand for niche products is rising, as consumers do not feel their needs are being met by mass-market businesses. A niche product also appeals to a consumer's sense of individuality and the need to stand out from the crowd.



22.8 Understanding niche markets

22.9 Understanding mass-production



'Aromatherapy socks' by Bellview are an example of a niche marketing technique.

Leigh Derigo from Austrade says:

The future for the industry in Australia is in the small, niche design businesses exporting to their specialised markets, rather than trying to compete with the Chinese in mass-produced manufacturing. The key point is that we help businesses to use globalisation to Australia's advantage. With our high level of education, Australians do not choose to work in factories, but use their abilities in the knowledge economy by designing products and running global businesses. Many of our businesses now specialise in the design aspects and have their products, or parts of their products, manufactured under license overseas, so a very small designer can have goods made without a large capital costs.

Source: Interview with Christine Castle, 2007.

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Define the term *globalisation* and discuss the impact globalisation has on the Australian textile industry.
- 2 What is the main purpose behind FairWear Australia?
- 3 What is the main purpose behind Ethical Clothing Australia?
- 4 Define the term *import*.
- 5 Define the term *export*.
- 6 Define what the Australian support mechanism known as Austrade does and how it can assist emerging designers.
- 7 Changing demands and consumer lifestyle means that textile clothing often changes. List four changes you can think of where lifestyle has changed the type of products available in the marketplace.

## Websites

- ☺ Austrade ([www.austrade.gov.au](http://www.austrade.gov.au)): This site outlines the current government assistance packages in imports and exports.
- ☺ FairWear ([www.fairwear.org.au](http://www.fairwear.org.au)): The FairWear Campaign addresses the gross exploitation of workers who make clothing at home in our Australian community.
- ☺ Ethical Clothing Australia ([www.ethicalclothingaustralia.org.au](http://www.ethicalclothingaustralia.org.au)): An organisation assisting the local textile, clothing and footwear industry to ensure Australian workers receive fair wages and decent conditions.
- ☺ Australian Made ([www.australianmade.com.au](http://www.australianmade.com.au)): A website dedicated to finding Australian made and manufactured goods.
- ☺ ARPANSA ([www.arpansa.gov.au](http://www.arpansa.gov.au)): A website outlining the issues of radiation protection and nuclear safety in Australia.
- ☺ Australian Fashion Week ([www.rafw.com.au](http://www.rafw.com.au)): This website highlights Australian Fashion Week and the emerging and current designers of Australia.
- ☺ Julianne ([www.julianneboutique.com.au](http://www.julianneboutique.com.au)): Australian designer Nicky Adamo's work.
- ☺ High Tea with Mrs Woo ([www.highteawithmrswoo.com.au](http://www.highteawithmrswoo.com.au)): Details the designs of three talented Australian sisters.
- ☺ Katie Perry ([www.katieperry.com.au](http://www.katieperry.com.au)): Australian fashion designer Katie Perry has been adamant in ensuring her garments are made in Australia.



22.10 Industry issues  
palm cards

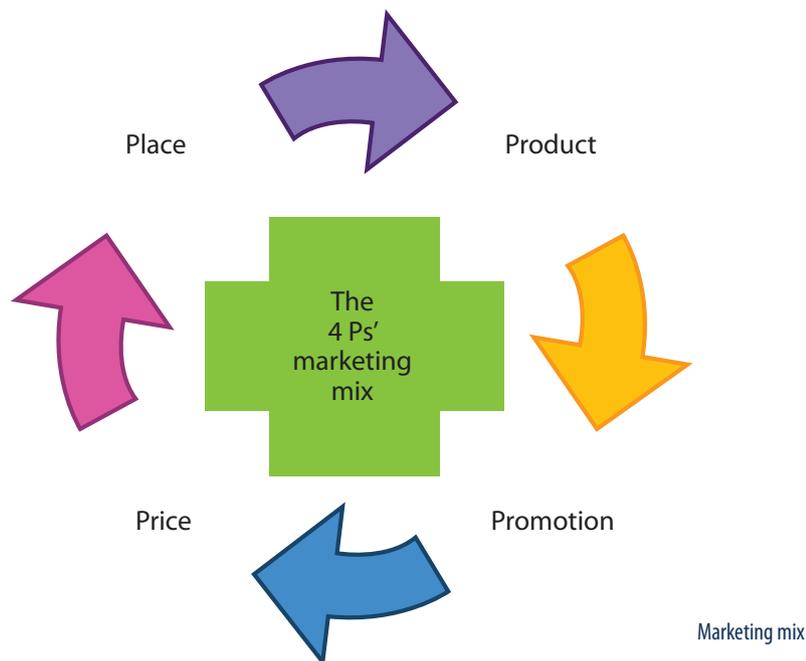


# Marketplace

## Aspects of marketing textile products

The marketing of products is a complex business concept. For most people in Australia marketing affects many aspects of daily life.

There is a multitude of choices available when purchasing goods and services. The brand names you purchase or shops you purchase from can be affected by the product, price, place and promotion strategies employed by the marketer. These elements have come to be known as the 4 Ps. How well a business or product is marketed depends on these four critical elements and a company, business or organisation can mix these elements together to suit the demands of their consumer base. This is sometimes referred to as the marketing mix. It is up to each business to determine the best marketing mix for its products. In the course of providing all these choices, marketing drives companies to focus on what it takes to satisfy the consumer.



### Product planning

A product is the good or service offered to a consumer. Product attributes include the actual product itself, as well as aspects of the product that may attract customers. Customer research is a key part of building an effective marketing mix. Knowledge of the projected target market as well as competition in the marketplace will enable marketers to offer a product that will sell well.

In planning and producing successful textile products, designers and manufacturers should consider:

- the quality of the product
- key features that set the textile product apart from others available in the marketplace
- a range of options for the product, such as mix-and-match, fashion staple and coordinating options
- elements such as packaging, labelling, guarantees, eco-labels and the logo Australian Made.
- a brand name
- fashion statements, such as Signature Prints in furnishings or Collette Dinnigan in fashion apparel
- innovation in design or materials
- functionality or usability appropriate to the intended end-use
- consumer loyalty to product, for example, iconic items that have been bought by generations of Australians: brands such as BONDS and Driza-Bone.

A product should always meet the needs of a particular target market. Successful marketers pay close attention to the needs of their target markets and adjust their marketing mix to address consumer demand. For example, a luxury, high-end designer product from exclusive design company Spencer and Rutherford may be marketed for 'customers who have everything'.

## Place and distribution channels

**Place** refers to where a product is marketed and the distribution channels used to get products to consumers. The type of product will influence how it is distributed. There are many types of distribution channels. Businesses that produce, assemble or manufacture a product have two main selling or distribution options:

- direct selling to consumers
- selling as wholesalers or retailers through reselling or agency-managed product sales.

Embellished handbags from  
Spencer and Rutherford



Spencer and Rutherford



A selection of direct selling techniques

## Direct selling

This type of selling involves direct contact between the maker of the product and the consumer or retailer, either personally or electronically. This marketing approach can involve direct sales of goods and services to consumers or retailers through personal explanation and demonstrations, frequently in their home or place of work. Direct selling occurs without intervention of a third party.

## Wholesalers and retailers

In textiles and design commerce, a wholesaler can be defined as a person who purchases and stores bulk goods purchased from manufacturers or importers, and then resells smaller quantities of the goods directly to retailers. These retailers in turn sell to the general public. Some textile wholesalers open their doors to the general public, especially at end-of-year sales.

Retailing can be defined as the sale of goods or products from a permanent location (such as a department store) in small or individual lots for direct purchasing by the consumer. Retailers are at the end of the supply chain, and will often purchase from wholesalers. Manufacturers use the practice of retailing as a necessary part of their overall distribution strategies.

The main difference between retail reselling and agency-managed product sales is that the agency-managed product sales usually stipulate a price to be paid. Clothing companies such as Fred Bare – which retail through concept stores in David Jones, selected Myer stores and selected boutiques – ensure the mark-up on their distributed products is equitable among all retailers of the brand.

For long-term trading benefits, a local agent can be appointed to build and maintain relationships with local buyers. The leading agents tend to represent more upmarket international designer brands. Many of these agents are looking to establish long-term business partnerships, and teamed with mutual interest and support from principals, are willing to invest in concept stores for the brands they represent. An example is the relationship that Li & Fung (Distribution) Ltd has established with Country Road and Timberland.

## Price structure

Price refers to how much is charged for a product or service. The process of determining a product's price can be complex, as pricing should reflect the appropriate positioning of the product in the market while covering costs and making a profit. Pricing an item too low will make it impossible to sustain business, especially in the textile industry. Selection of a pricing structure should ultimately be based on the qualities of the product itself, consumer demand and competition in the marketplace.

The price of a product is often linked to whether consumers will buy that product. Sometimes items priced too low in the textile industry are perceived as being of inferior quality. At the opposite end of the scale, price structures that are high are considered 'worth paying for', especially when a consumer is considering brand loyalty, buying designer names or purchasing high-quality, innovative or unique designs. Price structure also needs to reflect the demographics of the target market to which a product is aimed. In textiles, clothing and footwear in Australia, pricing also tends to reflect current market trends in fashions or fads at any given point in time. The desire for an item can increase the price. Australians tend to love a bargain, and a sale will attract many consumers at every distribution channel.

The case study on the next page shows how designer labels and affordable pricing can merge to make such labels accessible to the broader public.

# Stella McCartney for Target, 2007

Fashion designer Stella McCartney has teamed up with Target to launch a limited-edition, 42-piece collection for Autumn/Winter 2007.

Available in selected Target stores nationally from March 12, the one-off Stella McCartney for Target range takes inspiration from Stella's own unique signature style and includes key items from her collections. Oversized knits in shades of charcoal, oat and dusk, skinny jeans in black, indigo and oat, and taffeta trench coats in ash and stucco make up some of the iconic pieces.

'I'm really excited by this collaboration,' McCartney says. 'I wanted the collection for Target to reinterpret all the best-of's and must-haves of Stella McCartney for Winter and make my designs more accessible to a wider audience in Australia.'

The Stella McCartney for Target collection builds on the belief that all Australians have the right to look and feel great, and have access to designer clothes at very affordable prices.

The women's collection incorporates a full range of separates including jeans, pants, tailored jackets, dresses, chunky knits, swing coats, blouses, t-shirts and camisoles in a range of colours and fabrics.

Target's General Manager of Women's Apparel, Larice Lewis, says, 'We're so thrilled to announce this very exciting collaboration. Stella McCartney for Target will offer our customers a beautiful range of winter essentials from one of the world's leading designers, at an accessible price.'

Target's own range of accessories and footwear have also been developed to tie back with the

Stella McCartney for Target garments and, to reflect Stella's own environmentally-friendly stance, no leather or animal products have been used.

The range, priced from \$29.99 for a printed scarf to \$199.99 for a trench coat, will be supported in-store by a specially designed 'concept' area and bio-degradable designer shopping bags.

Stella McCartney launched her eponymous label in 2001 as a joint venture with Gucci Group. The brand already includes a successful range of women's ready-to-wear, accessories, fragrances and eyewear. Coming up is the launch of CARE by Stella McCartney, the first luxury organic skincare line to launch in 2007.

Source: *Stella McCartney for Target*, Tamara Jenkins, Public Relations Director, Style Counsel, 2007.



*Stella McCartney for Target dress and matching button-up coat*



*Stella McCartney for Target trench coat*

# Stella McCartney for Target, 2010

Her name has become synonymous with enduring style and as one of the most iconic British designers of our time; it is no wonder that the excitement and anticipation surrounding Stella McCartney's latest capsule collection for Target is reaching peak proportions in Australia before its imminent launch at the end of October.

The latest collaboration between Stella McCartney and Target makes designer fashion accessible to all with Target promoting the fact that a budget shouldn't force you to compromise your wardrobe.

'Stella McCartney's signature style is incredibly appealing to the Australian market. After the overwhelming response to Stella's initial range for Target in 2007, we are thrilled that she and her team

have agreed to a second Designers for Target range,' Target's Managing Director, Launa Inman said.

With the line hitting stores across the country on Friday October 29th, Stella fans and Target shoppers alike will love the new Designers For Target collection that showcases more than forty fabulous pieces priced from as little as \$20.00.

Incorporating key items from her recent ranges as well as garments created exclusively for Target, Stella's signature style shines throughout the range. 'This collection is really much more about evening, much more luxurious,' Stella says, when asked how the new collection differs from the previous one. 'We addressed daywear specifically with the last collection and with this one we focused much more on cocktail

styles that can also adapt to day wear', she says.

In typical Stella-style, and working from a serene colour palette with splashes of brightness thrown in to accentuate strong lines and detail, each component of the range has been designed with simple 'Stella' elegance and quality in mind.

Shoppers can expect Stella McCartney's designers for Target Spring/Summer 2010 collection to incorporate a full range of separates including jeans, pants, skirts, dresses, blouses and t-shirts and an array of must-have accessories to complete the look, on-trend, on-budget – just the way we like it!

Source: *Stella McCartney collection to hit Target*, [www.westfield.com.au](http://www.westfield.com.au).



*Stella McCartney for Target Australia 2007 launch*  
*Behind the scenes with Stella McCartney for Target*  
*Stella McCartney for Target Vogue Australia launch*



Stella McCartney



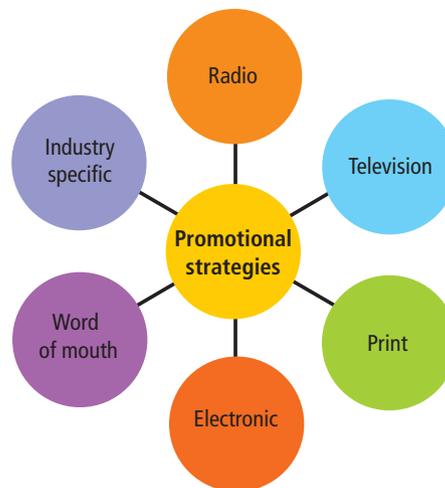
Stella McCartney for Target

Photos from Getty Images

## Promotional strategies

Promotion refers to the advertising and selling aspect of marketing. It is probably the most well-known part of the marketing mix. The rationale of promotional strategy is to get people to recognise your product and understand how it satisfies their needs and fulfils a function. Promoting an item is an attempt to convince a consumer that they desire it, and persuade them to buy it.

Successful promotional strategies should contain a clear message targeted to a specific audience via an appropriate method or promotional strategy. The target market drives the decision behind the type of promotional strategy that will be employed. The message must be consistent with a company's overall marketing image, must get the target audience's attention, and must extract the desired reaction. Promotional strategies employed in the marketing of textile items may involve advertising, public relations, personal selling and sales promotions.



A selection of promotional strategies employed by the textile industry

## Product lifecycle

The **product lifecycle** of a textile item consists of four distinct stages:

- Introduction stage: The textile item is launched into the market and consumers have little knowledge regarding the qualities and advantages of purchasing such a product. Marketing strategies are used to promote the product so consumers are aware of its existence and its qualities. Sales are usually slow at this stage, with little profit being earned.
- Growth stage: As consumers become aware of the product, sales increase. Further promotion of the product by the retailer results in selective demand and a growth in profits.
- Maturity stage: This is the stage of greatest sales and profit. Supply of the product meets demand and the marketplace becomes saturated with the product. Competition increases, so marketing strategies such as advertising are required to remind customers about the qualities of the product and ensure product sales remain high.
- Decline stage: In this stage a number of things may happen. Newer or better products may replace the textile product; promotion is then reduced or stopped; and sales and profits decline. Alternatively, the product may be modified and repromoted to extend its life.

## Example of product lifecycle: Chesty BONDS singlets

### Introduction stage

In 1915, American George Bond established a company in Sydney to import women's hosiery and gloves. Over the next few years the company started to manufacture underwear. Men's cotton athletic singlets were one of the original products. In 1928 BONDS supplied Charles Kingsford Smith and Charles Ulm with athletic singlets for their first historic aeroplane flight across the Pacific, and their letter of thanks was used in BONDS advertisements.

### Growth stage

In 1938, BONDS requested that an advertising agency develop a campaign for their men's athletic singlets and the idea of 'Chesty BONDS', a character loosely based on Popeye, was born. By 1940, the Chesty BONDS cartoon strip appeared in the Sun newspaper three times a week. Chesty BONDS became a superhero when he pulled on his trusty Chesty BONDS singlet, always managing to triumph over the forces of evil. The comic strip ran for the next 20 years.



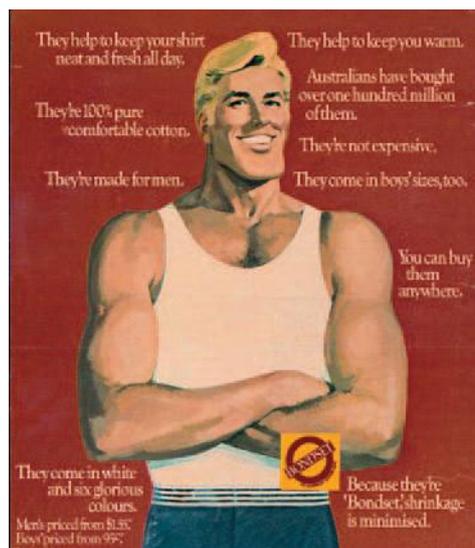
You're an action man — so get with the action singlet . . . "Chesty Bond" Athletic

Made from absorbent 100% super combed cotton, Chesty Bond are tops for comfort, easy care and longer life. And the Bonds process suits shrinkage 100.

Don't forget Continental and Higgings for the women in your life. Now in white and a rainbow of colours.

**BONDS**

Original Chesty BONDS



BONDS magazine advertisement



Muscle Chesty

### Maturity stage

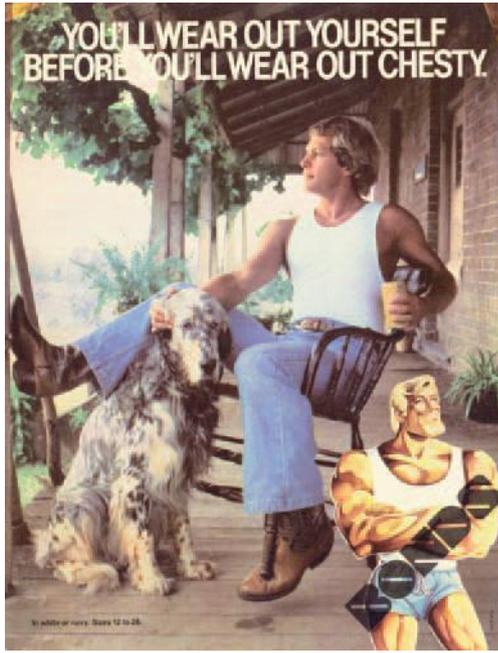
The Chesty BONDS label became synonymous with Australian masculinity and the icon was recognised Australia-wide. Approximately 50 million singlets had been sold by 1960, 100 million by 1972 and 150 million by 1983. In 1964 it was decided that Chesty BONDS no longer represented the total company identity. The Chesty BONDS comic strip and major Chesty advertisements were discontinued, although Chesty is still used for special promotions and competitions.

### Decline stage

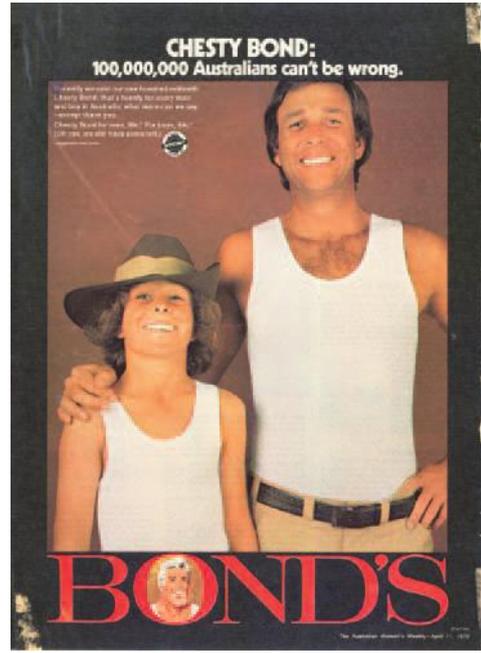
Chesty BONDS singlets are an example of a textile item that has been modified and repromoted to extend its lifecycle. In 1992, Paul Mercurio, the star of the Australian film *Strictly Ballroom*, wore Chesty BONDS singlets, and a new generation saw them as a desirable piece of clothing.



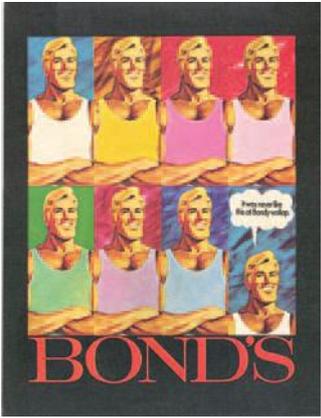
Chesty BONDS – Everybody's best mate



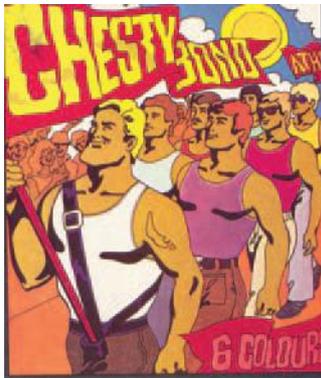
Outdoor Chesty



Aussie Chesty



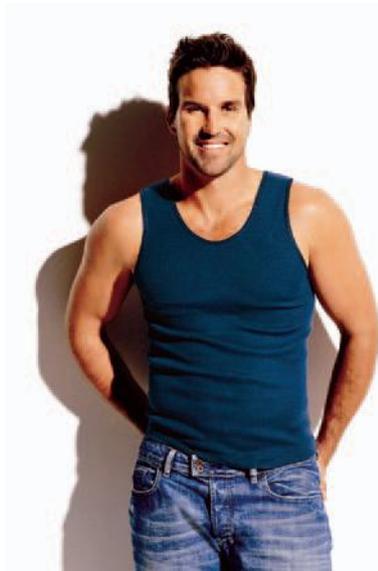
Chesty colours



Pop-art flag

Chesty BONDS singlets are now worn as outerwear. They are available in a range of fashion colours and marketed for both men and women. In 2006, Chesty BONDS were produced in green and gold for Australian sports fans. Today, around 2500 Chesty BONDS singlets are manufactured every day.

BONDS uses various forms of strategically placed advertising to reach its target markets, including television, Internet, radio, magazine and in-store promotions. Strategies are planned well in advance of the next season's launch and release. Heavy advertising occurs during key shopping periods such as Christmas. Pat Rafter and Sarah Murdoch are currently the brand ambassadors for BONDS and are a key part of the brand's ongoing success, ensuring Chesty BONDS is worn by a new generation of Australians.



Pat Rafter



A new generation of Chesty BONDS

All images courtesy of BONDS Australia

# Target markets

All Australian marketers must employ the 4 Ps in order for their products to be successful in both local and international markets. This section will investigate two Australian brands, Sportsgirl and Collette Dinnigan designs, and outline the strategies used in the marketing of their products.

## Sportsgirl

Sportsgirl is one of Australia's favourite retail stores. The Sportsgirl brand is easily recognisable, and the colours and designs of Sportsgirl's signature range are synonymous with quality. Marketers for Sportsgirl use the following strategies to ensure the success of the brand.

### Product

The Sportsgirl label has always produced upmarket, leading-edge trends in design for youth fashion. The products are well constructed, show designer style and are of high quality. Sportsgirl garments often feature designs by some of Australia's finest designers who have gone forward to create their own labels and products, including Prue Acton, Trent Nathan, Norma Tullo, Simona, Country Road and Craig Kimberley, founder of Just Jeans.

### Price

The price-points at Sportsgirl reflect the target market, the quality of the fashion, competition, designer style, range of design styles and functionality of the mix-and-match clothing ranges. Pricing is quite reasonable considering the quality clothing that is produced by this label. A variety of pricing levels means the target market should always be able to find something affordable.

### Place

Sportsgirl was established in Australia in 1948. The label began in Melbourne and reached the Sydney market in 1960. By the 1980s, there were 100 Sportsgirl stores Australia-wide.

In 1991, Sportsgirl opened stores in New Zealand, Singapore, Thailand and Hong Kong. In 2000, the Sussan Corporation purchased Sportsgirl and launched a new-look generation of the Sportsgirl label. A full history of their journey can be read on the Sportsgirl website.

Sportsgirl's place of distribution is a retail store. The stores are a definite selling feature as they are visually stunning and exhibit style, sophistication, creativity and a unique ambience. The memorable style in their retail outlets is fun and exuberant.

### Promotion

Sportsgirl is an innovator, leading the way in apparel promotion and marketing in Australia and in some overseas destinations. Successful and creative promotion strategies have paved the way to a highly successful marketing mix for Sportsgirl.

Promotion strategies used by the brand include:

- innovative, creative and unique shop-front window displays
- destination stores with high-energy ambience
- special events
- in-store parades
- Sportsgirl's own magazine: initially *Frontline* and now *Listen*
- celebrity models and guest artists in design, hair and make-up

Sportsgirl



Sportsgirl



23.1 Sportsgirl product activity

23.2 Sportsgirl price activity

23.3 Sportsgirl place activity

- unique advertising campaigns using television, radio, print and electronic
- countless competitions to win exclusive prizes including cars, overseas trips and education packages
- collaborative projects with *Cleo* and *Cosmopolitan* magazines
- innovative website mixing contemporary music and fashion
- podcasts
- movies on YouTube
- fashion-on-the-street initiatives.

## Collette Dinnigan

Collette Dinnigan is undoubtedly one of Australia's most famous designers. Her designs consist of exquisitely made, high-end fashion garments. Collette is famous worldwide for her attention to detail, luxurious fabrics, vintage beads, unique designs and feminine lines. Her lacy, embroidered and beaded work is different from any other apparel product available in the Australian marketplace.



Collette Dinnigan  
Collette Dinnigan Fall 2011  
show, Paris Fashion Week  
Collette Dinnigan interview



Collette Dinnigan



A Collette Dinnigan ribbon embroidery strapless lace wedding gown

Collette Dinnigan Photography by Nicole Bentley (Work Agency);  
model: Valerija (Chic)



23.4 Collette Dinnigan  
product activity  
23.5 Collette Dinnigan  
price activity  
23.6 Collette Dinnigan  
place activity

## Product

Collette Dinnigan's designs are synonymous with the quality and luxury of high-end fashion apparel and are a definitive red carpet favourite for actresses and the glamour set of Hollywood. Her signature-style slip dresses, which are hand embroidered and beaded on luxurious fabrics, are still evident in her stunning bridal collections.

## Price

The price point of Dinnigan's designs reflect her target market. Her clothes are specifically aimed at people who would like to purchase a special-event outfit or a highly tailored designer style and are prepared to pay the price of a high-end fashion style. Dinnigan's pricing reflects the prestige of the designer's name.

## Place

Dinnigan began her journey in design by working for the Costume Department of the Australian Broadcasting Commission in Sydney. Attention to detail and a historical perspective on both fabrication and design were the result. Dinnigan launched her signature label in 1990. Her distinctive style meant her in-demand designs were

immediately snapped up by hip boutiques and department stores in Australia and New Zealand. Barney's New York, Neiman Marcus, Harvey Nichols and Joyce in Hong Kong were soon to follow and an international presence was established.

In Australia, Dinnigan's designs are featured in Collette Dinnigan Boutiques in Sydney and Melbourne. They also appear in David Jones in-store boutiques in Sydney, Melbourne and Perth, and Dinnigan also has stockists in Brisbane, Adelaide and on Hayman Island. Internationally, Collette Dinnigan designs can be found in over 20 countries.

## Promotions

Collette Dinnigan designs are promoted through her Collette Dinnigan Boutiques, in-store David Jones boutiques and various stockists worldwide. Other promotion outlets include television media, fashion parades and events, celebrity red carpet events, print and electronic media. Her website is a stunning and sophisticated visual promotion. Dinnigan herself is a passionate advocate for design and associated promotion. Her design and business insight have been documented on many occasions, which has aided the promotion of her internationally well-known and respected signature label.

## Review questions

Use the information in this chapter to answer the following questions.

- 1 Define the term *marketing mix*.
- 2 What is a target market?
- 3 Outline three ways a product can be distributed to the marketplace.
- 4 Describe a method of promotion used by a jean company such as Just Jeans, Jeans West or General Pants.
- 5 Explain how a price-point of a textile item can vary so much in textile apparel. In your answer, give reference to the designer range sold inside stores and the designer brands in their own right (such as *Stella McCartney for Target* compared with her own label).

## Websites

- ☺ Bonds Australia ([www.bonds.com.au](http://www.bonds.com.au)): This iconic Australian underwear company's website highlights advertising campaigns and current trend ranges, as well as classic-style Bonds items.
- ☺ Stella McCartney ([www.stellamccartney.com](http://www.stellamccartney.com)): Website of international designer, Stella McCartney.
- ☺ Collette Dinnigan ([www.colletedinnigan.com.au](http://www.colletedinnigan.com.au)): Website of Australia's most elegant fashion designer, Collette Dinnigan.
- ☺ Sportsgirl ([www.sportsgirl.com.au](http://www.sportsgirl.com.au)): Current trend retail shop in Australia.



23.7 Marketplace palm cards



## The Major Textiles Project explained

The Higher School Certificate assessment in Textiles and Design consists of two sections: the written examination worth 50 marks (explained in detail in Chapter 25), and the Major Textiles Project (MTP) also worth 50 marks. The MTP has two components: the textile items and the supporting documentation. Each section of the MTP is worth 25 marks.

As both sections of the MTP are worth equal marks you should spend equal time on each section. Each student must create a textile item in one of the following focus areas:

- Apparel – all types of clothing that are functional and can be easily cared for. Examples include children's wear, formal wear and sportswear.
- Furnishings – textile items for the interior. Examples include cushions, bed linen and curtains.
- Costume – clothing related to a particular culture, historical period or occasion. Examples include costumes for dance, theatre or a fancy dress party.
- Textile arts – highly decorative textile items. Examples include wall hangings, decorative cushions and wearable art.
- Non-apparel – functional textile items. Examples include tents, sleeping bags, toys and umbrellas.

When your textile item/s and supporting documentation are completed, the project will need to be packaged and sent away for marking. It is important to consider the packaging dimensions when selecting your project. Large projects like a lounge chair or a range of garments will not be suitable unless they fit into the specified package size.

The overall volume of the packaging container, which includes both the supporting documentation and the item/s, must not exceed  $0.2 \text{ m}^3$ . Examples of package sizes that equal the maximum volume are  $1 \text{ m} \times 1 \text{ m} \times 0.2 \text{ m}$  and  $1.2 \text{ m} \times 0.5 \text{ m} \times 0.33 \text{ m}$ . Note that the maximum length of any side must not exceed 1.2 m.

When selecting a textile item for your Major Project you should also consider the assessment criteria. Full marking guidelines are available on the Board of Studies website: [www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au).

## Textile item/s (25 marks)

The fully completed textile item/s should reflect a high degree of proficiency in manufacture and be appropriate to the intended purpose. The item/s should also demonstrate creativity and/or innovation and a degree of difficulty in the use of design features and/or specialised fabrics and/or construction techniques.



24.1 Textile skills and experience

## Marking guidelines

Criteria	Marks
<ul style="list-style-type: none"> <li>• Design is clearly appropriate to the intended purpose with aesthetic and functional aspects balanced and related to the overall design</li> <li>• Choice of fabric/design features/construction techniques demonstrates creativity/innovation and has a direct line to the overall purpose</li> <li>• Displays complex design features and/or use of specialised fabrics and/or application of specialised or advanced construction techniques and/or application of decorative techniques</li> <li>• Utilises appropriate techniques in the construction and/or design and completes the item/s to a high standard of manufacture</li> <li>• Completes item/s reflecting efficient time management</li> </ul>	21–25
<ul style="list-style-type: none"> <li>• Relates design features to purpose with consideration of aesthetic and functional aspects</li> <li>• Shows innovation and creativity in the choice of either fabric, design, or construction methods with a link to the overall purpose</li> <li>• Complex design features and/or specialised fabrics and/or application of specialised or advanced construction techniques and/or application of decorative techniques are attempted, without complete mastery or successful integration into item/s</li> <li>• Shows proficiency in most areas of manufacture in relation to the construction and design</li> <li>• Completes item/s but requires further attention to some finishing details</li> </ul> <p>Candidates may achieve 16–20 marks as indicated above OR by satisfying a combination of the criteria for other mark ranges.</p>	16–20
<ul style="list-style-type: none"> <li>• Relates some design, aesthetic and functional features to the intended purpose</li> <li>• Shows innovation and creativity in the choice of either fabric, design, or construction methods, though with a limited link to the overall purpose</li> <li>• Uses limited complex design features and/or specialised fabrics and/or specialised or advanced construction techniques and/or application of decorative techniques</li> <li>• Shows proficiency in some areas of manufacture in relation to the construction and design but requires more attention to detail</li> <li>• Generally completes item/s but requires more attention to detail in all areas</li> </ul> <p>Candidates may achieve 11–15 marks as indicated above OR by satisfying a combination of the criteria from other mark ranges.</p>	11–15
<ul style="list-style-type: none"> <li>• Indicates little relevance of design to purpose and does not consider aesthetic and functional features in relation to overall purpose/design</li> <li>• Shows limited innovation and creativity in the choice of either fabric, design, or construction methods</li> <li>• Provides little evidence of application of advanced/complex construction techniques or design features or difficult fabrics</li> <li>• Little proficiency is shown in the manufacture of the item/s to an appropriate standard or appropriate choice of manufacturing techniques</li> <li>• Item/s show incomplete sections, appears rushed with little evidence of management</li> </ul> <p>Candidates may achieve 6–10 marks as indicated above OR by satisfying a combination of the criteria from other mark ranges.</p>	6–10
<ul style="list-style-type: none"> <li>• Does not indicate relevance of design to purpose and chooses inappropriate design features for the purpose</li> <li>• Shows no innovation and creativity in the choice of either fabric, design, or construction methods</li> <li>• Provides no evidence of application of advanced/complex construction techniques or design features or difficult fabrics</li> <li>• Elementary proficiency only is shown in the manufacture of the item/s combined with inappropriate choice of manufacturing techniques</li> <li>• Item/s incomplete, reflecting poor management of time</li> </ul> <p>Candidates may achieve 1–5 marks as indicated above OR by satisfying a subset of the criteria from other mark ranges.</p>	1–5

## Points to consider when selecting a textile item for your Major Textiles Project

- Analyse your textile skills and select a textile item you feel competent to complete. Seek your teacher's advice on a suitable project for your skill level.
- Ensure the project has the degree of difficulty required for the HSC. A cot quilt panel may be suitable in Year 10 but in Year 12 the expectation is to create the design yourself.
- Make sure you identify the intended purpose of the textile item in the supporting documentation.
- Remember, some projects will have more aesthetic aspects than functional. The function of a textile art wall hanging is to be aesthetically pleasing, so markers would expect to see a highly aesthetic project that has the ability to be hung on the wall. If your textile item was an umbrella, markers would expect the item to be highly functional: it should open and close easily, and should use fabric with Ultraviolet Protection Factor (UPF) to protect people from the sun and so the fabric does not fade or break down.
- Creativity is an essential feature of your textile item. It is important to develop an original idea. Contemporary designers may be inspired by an Elizabethan costume, but they use this as inspiration to design their own original idea. They do not create a copy of an existing textile item. Creativity may be incorporated into a textile item by:
  - modifying a commercial pattern
  - fabric manipulation in the form of darts, tucks, pleats or gathers
  - use of unusual fabrics
  - free-motion embroidery.
- Your textile item may also be innovative. An innovative product is something new, such as:
  - use of new technology to create fabric designs using digital imaging
  - use of water-soluble material to create your own fabrics
  - use of fabrics with different properties together, such as silk and hessian
  - use of bamboo to create shape in a garment.
- For a textile item to achieve a high result, it does not have to be highly decorative. Items that display complex design features (for example, tailored suit or jeans) demonstrate a high degree of difficulty without being highly decorated. Specialised fabrics, such as lycra, organza, chiffon, satin or microfibres, require specialised or advanced construction techniques and therefore exhibit a high degree of difficulty.
- Remember your project is marked on the textile materials used, including fibres, yarns and fabrics. You will not receive any marks for non-textile materials such as metal, mirrors, wire, wooden frames or glass.
- The cost of a project does not necessarily determine the quality of a project. You do not have to spend hundreds of dollars to gain a pleasing result. You may use textile materials from home or recycled materials.
- Whichever textile item you select, it must be completed on time and to a high standard of manufacture. Take the time to press each seam after completion, clip all curves and points so shaped edges sit flat and cut all threads close to the fabric.
- Make sure that your textile item is clean and neatly pressed before you package it to be sent away for marking.



## Examples of MTP textile items



Corset with urban cage by Mandy King –  
Focus area: Textile art



Marionette costume by Ester Karuso-Thurn –  
Focus area: Costume



Wearable art by Jodie Do –  
Focus area: Textile art



24.3 Finding inspiration –  
Mandy King

24.4 Finding inspiration –  
Jodie Do



African wall hanging by Kathryn Peters – Focus area: Textile art



Fairytale costume by Caroline Ngo – Focus area: Costume



Evening gown by Tiffany Tjugito –  
Focus area: Apparel ('specialised apparel')



Culturally inspired costume by Neela Rahman –  
Focus area: Costume



Lion puppet by Megan Baehnisch – Focus area: Non-apparel



24.5 Finding inspiration –  
Neela Rahman  
24.6 Finding inspiration –  
Megan Baehnisch



Fabric book by Bettina Roy – Focus area: Non-apparel



Wearable art by Natasha Sum – Focus area: Textile art



Wall hanging by Jenn Peters – Focus area: Textile art



Haute couture dress by Sarah White – Focus area: Apparel



19th century costume piece by Janene Dalrymple – Focus area: Costume



Wall hanging by Kate Gabbot – Focus area: Textile art



24.7 Design inspiration table

## Supporting documentation (25 marks)

You should commence your supporting documentation at the same time as you commence making your textile item. You can use either an A4 or A3 folder for your supporting documentation; do not use an unusually shaped folder that is not A4 or A3. Use your time wisely in the production of the textile item and the content in the folder; do not spend valuable time making a folder or a book.

The Board of Studies sets a page limit for supporting documentation: 24 pages for an A4 folder or 12 pages for an A3 folder. It is important to stay within this page limit. Do not include fold-out or lift-up sections as these are counted as extra pages.

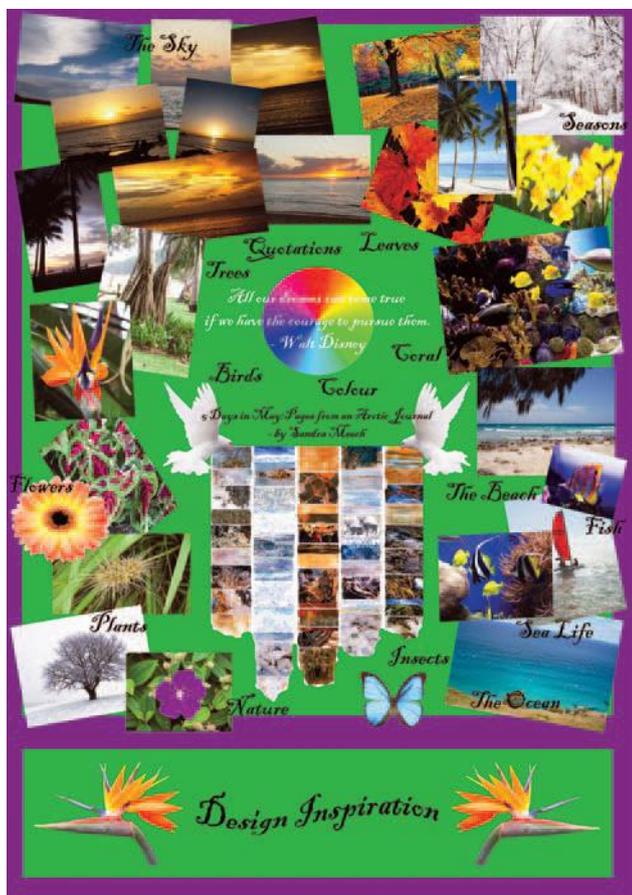
The supporting documentation is to be presented in a contemporary manner. Where possible, it should be computer-generated. The presentation of your folio should reflect your textile item; if you have made a historical costume, your documentation may have an antique look to it. Borders can be created on the computer or by using a variety of decorative papers purchased from art supply or stationery shops. The term 1 holiday would be an ideal time to create the pages so you will then be ready to attach the information as you complete each section. Blu-Tack can be used to experiment with page layout before you secure your work in place with glue or double-sided tape. The font used in the documentation is very important. Make sure you select a font that is easy to read, not too small or too decorative.

Only include what is stated in the syllabus as the required supporting documentation. No title page is required.

### Design inspiration (5 marks)

*Maximum length: 4 pages (A4)  
or 2 pages (A3)*

Inspiration is the spark that will help you commence your MTP. During Year 11 it is important to collect sources of inspiration. On a holiday you might use a camera to capture images of another culture (its clothing or architecture), a beautiful sunset or an underwater scene. You might be reading your favourite magazine and find a picture of an exquisite formal garment or an inspiring quote. Look through books to find designs from nature (such as butterflies or dragonflies), or skin patterns (such as those on zebras, giraffes or the scales of brightly coloured tropical fish). Keep up to date with world events to gain inspiration for MTPs that make a statement. Watch DVDs to observe theatrical costumes and clothing worn by your favourite movie stars. Remember, inspiration is the first step in creating a successful MTP.



Design inspiration by Jennifer Peters

The section on inspiration in your supporting documentation communicates the thought processes and overall development of the concept that occurs prior to designing, and how ideas develop or snowball. This is done through a combination of written text, graphic and other communication techniques, and could include illustrations and samples from various sources.

## Marking guidelines

Criteria	Marks
Clear communication of the design inspiration by: <ul style="list-style-type: none"> <li>explaining the relationship of the design inspiration to the nominated focus area</li> <li>justifying particular creative and/or innovative design ideas or techniques developed from the design inspiration</li> <li>critically analysing and explaining the relationship of the design inspiration to the historical/cultural or contemporary factors that have contributed to the design and manufacture of the item/s</li> <li>supporting written information through communication techniques such as collages of pictures, samples from various sources or graphical communication techniques, presented in a contemporary manner.</li> </ul>	4–5
Limited communication of the design inspiration by: <ul style="list-style-type: none"> <li>relating some design ideas of the design inspiration to the nominated focus area</li> <li>listing some design ideas or techniques developed from the design inspiration</li> <li>listing a few historical/cultural or contemporary factors that have contributed to the design or manufacture of the item/s</li> <li>including some pictures, samples or sketches.</li> </ul> Candidates may achieve 2–3 marks as indicated above OR by satisfying a combination of the criteria for other mark ranges.	2–3
Minimal communication of the design inspiration by: <ul style="list-style-type: none"> <li>identifying the focus area</li> <li>briefly mentioning the intention of the item/s.</li> </ul> Candidates may achieve 1 mark as indicated above OR by satisfying a subset of the criteria for other mark ranges.	1

## What makes a good design inspiration?

This is a very important section of your supporting documentation as it is the first page the marker looks at and should set the tone for the remaining documentation. Everyone should be able to achieve full marks in this section if they follow the marking guidelines.

You have two A3 or four A4 pages to complete the design inspiration documentation. This section should consist of images or samples of your design inspiration plus information explaining the use of your design inspiration. It is important to have four to six sources of inspiration and make sure they are labelled. Remember, all sources of inspiration should be reflected in your textile item. For example, if you have used a rainbow as a source of inspiration, the colours or shape of the rainbow should be visible in your textile item.

The information regarding the design inspiration can be presented in a table format or in paragraphs. If using paragraphs, make sure you include headings. The first paragraph or table column must explain the relationship of the design inspiration to the nominated focus area. Make sure you clearly identify the focus area. For each of the sources of inspiration you must explain the creative and/or innovative techniques you have used to reflect the inspiration in your project. The last section in design inspiration relates to historical/cultural or contemporary factors that have contributed to your design. You do not have to include all three factors as inspiration.

There is no right or wrong way to present your work; however, it must fit within the page limit and contain all relevant information.



24.8 Visual design development

## Example of a table format used for design inspiration – by Kathryn Peters

Design Inspiration	Relationship of design inspiration to textile arts	Creative and/or innovative design ideas developed from inspiration	Historical, cultural and contemporary factors relating to design inspiration
Wild cats – lion, tiger and leopard	Intricate skin patterns found on wild cats, including the rich gold fur of the lion and broad mane, the stripes of the tiger and spots of the leopard allow for the development of a highly creative, textural and decorative art project, incorporating a variety of yarns, fabrics and techniques.	The wild cats will be depicted using a variety of creative and innovative techniques. The innovative technique of digital imaging will be used to portray the images of the wild cats. <i>Lion:</i> the use of free-motion machine embroidery, in a variety of coloured rayon threads (brown, beige and cream, gold and brown metallic) is used to embellish the entirety of the lion's mane. <i>Tiger:</i> free-motion machine embroidery is used to create definition of the detailing on the tiger's fur, in a brown metallic rayon thread. <i>Leopard:</i> machine embroidery and beading are used for the detail in the leopard. Each animal is backed with Pellon to create definition and the eyes of the animals are embellished with beads to create another dimension.	Wild cats can be found predominantly on two continents – Africa and Asia. They are a contemporary source of inspiration but also historical as they have been used traditionally by these cultures as inspiration throughout the ages. In contemporary society, wild cats are used as inspiration in both apparel and furnishing items. Contemporary textile techniques, including digital imaging, free-hand machine embroidery, and manufactured yarns and fabrics have been used as to develop this Textile Project featuring the wild cats of Africa.
Sunsets in the African landscape	The earthy colours of the African landscape contrasting with the vibrant colours of a sunset are ideal for a textile arts project. The contrast of colours of the sunset and textures of the grass, animals and trees allow for the development of a highly decorative textiles art wall hanging.	The sky is created by fabric layering, using a variety of solid fabrics in multiple shades including black, navy, blue, purple, pink, orange and yellow with matching shades of chiffon, then held in place with stippling. The desert floor is created by the combination of fabric layering, free-hand embroidery and couching. Felting is used to create the shimmering setting sun and includes a variety of yarns to add detail. The trees are created solely from rayon embroidery threads stitched onto water-soluble solvy.	The African landscape is a cultural factor as this image is unique to the African continent. The harshness and contrast of the African landscape has inspired my Textile Project.

Design Inspiration	Relationship of design inspiration to textile arts	Creative and/or innovative design ideas developed from inspiration	Historical, cultural and contemporary factors relating to design inspiration
Warm colours	As the colour scheme is vibrant, diverse and aesthetically pleasing it is well suited to textile arts as this focus area is highly decorative and must be aesthetically pleasing to fulfill the focus area requirements.	The warm colours of the desert are created by a variety of different tones and textured fabrics and yarns. Fabric layering is used to create the background that is also quilted to create a 3-D effect. The desert grasses created using free-hand embroidery and couching contrast with the colourful sunset.	The warm colour scheme is a contemporary factor as I was inspired by the diverse range of natural and manufactured fabrics and yarns available today to create this image. I used a variety of contemporary textile techniques to create the landscape.
Free-hand machine embroidery	Free-hand machine embroidery allows the textile artist to create a highly decorative, textured and unique textile product that is essential for the success of a textile arts project.	Free-hand machine embroidery is a highly creative technique that is used to emphasise the design features of the wild cats and to create definition in the landscape.	Free-hand machine embroidery is a contemporary use of the sewing machine. Free-hand machine embroidery has allowed me the freedom to design and create my own original textile item.
Photography – images of Africa	The realism captured in photography allows the viewers to experience their own personal journey into the wilderness of the African environment. The textile arts focus area is a perfect medium to express this imaginary journey.	The innovative technique of digital imaging is the focal point of the textile art project. Creative techniques, including free-hand machine embroidery and beading, are used to embellish the digital images.	Contemporary photographs are the primary inspiration for the textile project. Contemporary techniques are used to create these images on a textiles medium.
Fringing	Fringing is a decorative technique and is not practical, which lends itself to textile arts technique. Fringing adds to the aesthetic design and the African-style beads add to the theme of the project.	Fringing is a unique and original technique. The exclusive choices of beads resembling the African culture were hand chosen for their specific purpose and accentuate the design of my major work.	Fringing is a contemporary technique that allowed me to extend my major work design past the wall hanging. It adds another dimension to the overall appearance of the major work.
Textile artist – Mary Sleigh	The designer Mary Sleigh who wrote the book <i>African Inspirations in Embroidery</i> has been a source of inspiration for my Major Textiles Project. Her highly decorative work is an example of textile arts.	Sleigh's unique use of bright colours, free-hand machine embroidery and felting have been incorporated into my major work to enhance its aesthetic appearance.	Mary Sleigh is a contemporary designer who uses a large combination of contemporary techniques in her embroidery.

## Visual design development (5 marks)

*Maximum length: 6 pages (A4) or 3 pages (A3)*

This section requires you to communicate your design ideas for the item/s via graphic or free illustrations that indicate the mood, feeling and emotion of the design. You must include a description of the final design in relation to the inspiration, development and evaluation of design ideas. You must also include an analysis of the functional and aesthetic design.

## Marking guidelines

Criteria	Marks
<p>Clear communication of the visual design development by:</p> <ul style="list-style-type: none"> <li>including appropriately labelled high-quality sketches/drawings that clearly indicate the link between inspiration and design</li> <li>explaining the inspiration, development and evaluation of design ideas for the item/s</li> <li>critically analysing the functional and aesthetic aspects of the design, considering strengths and weaknesses, with reference to the elements and principles of design</li> <li>providing evidence of creativity throughout concept development</li> <li>presenting the development of ideas and concepts in a logical and sequential way.</li> </ul>	4–5
<p>Limited communication of the visual design development by:</p> <ul style="list-style-type: none"> <li>including labelled medium-quality sketches/drawings that show some relationship between inspiration and design</li> <li>describing the inspiration, development and evaluation of design ideas for the item/s</li> <li>describing the functional and aesthetic aspects of the design</li> <li>presenting some development of ideas and concepts.</li> </ul> <p>Candidates may achieve 2–3 marks as indicated above OR by satisfying a combination of the criteria for other mark ranges.</p>	2–3
<p>Minimal communication of the visual design development by:</p> <ul style="list-style-type: none"> <li>including poor sketches/drawings without labelling that show no evidence of the link between inspiration and design</li> <li>listing one or two functional or aesthetic aspects of the design.</li> </ul> <p>Candidates may achieve 1 mark as indicated above OR by satisfying a subset of the criteria for other mark ranges.</p>	1

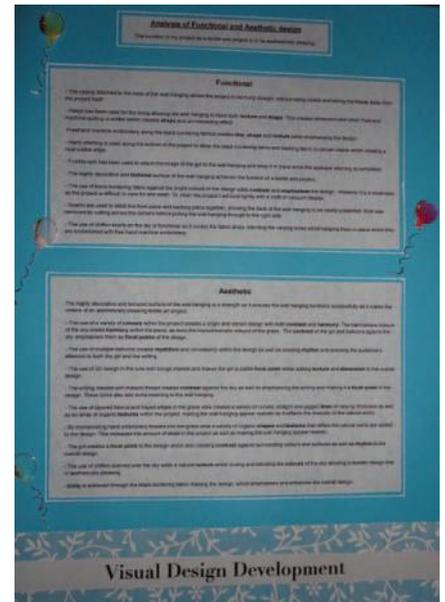
### What makes a good visual design development?

When you are creating a textile item it is very important to spend time exploring many ideas. If you only have one idea, how do you know it is the best idea? Designs need to be refined to ensure you end up with the best possible MTP.

If you are using A3 pages you could allocate the pages as follows: one page for design development sketches, one page for the final drawing and one page for the analysis of the functional and aesthetic features.

Your design development should include three to four sketches or drawings, approximately one third of an A3 page in size. They should be high-quality sketches or drawings created by hand. Each sketch or drawing should be fully labelled with both the design inspiration and design features. Labelling may be directly on the sketch or drawing, or may be a series of notes around the sketch. Each sketch should be evaluated. A PMI is a useful method to evaluate your designs. The minus features you identify in sketch 1 should not be visible in sketch 2 and the same for sketches 2 and 3. Each sketch should be an improvement on the previous sketch.

Remember, the design development relates to your final product. For example, if you are making a formal dress, all the sketches or drawings should show the development of the dress. There should not be drawings of a quilt, cushion and jeans and then a final drawing of the formal dress.



Visual design inspiration by Kate Gabbot

The design development should be presented in a logical and sequential way. Number your sketches 1 to 3 or 4. If you are making more than one textile item, you must show design development for all items. This can be very difficult to do within the page limit. Think very carefully before selecting to make a range of textile items. Consider how long it will take to construct the range and whether you will be able to document all aspects within the specified page limit for the supporting documentation.

In the visual design development section you must also include a fully rendered high-quality presentation drawing of your final textile item. It should show both the front and back views and be approximately one A4 page in size. This drawing should be fully labelled, including inspiration and design features. The rendering should be related to the fabric type. For example, use a soft pencil to convey a chiffon fabric and a heavy pencil to convey a leather fabric. If the fabric is printed, the rendering should reflect the design. In industry, this drawing would be used to sell the textile item to a retailer.

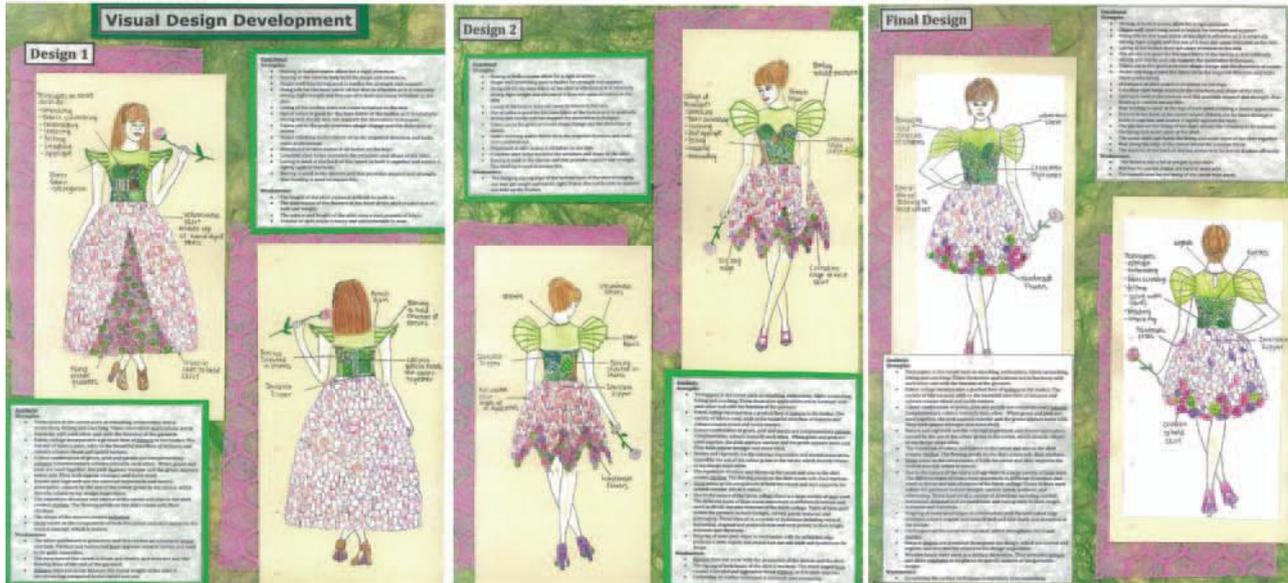
In the written section of visual design development you must critically analyse the functional and aesthetic aspects of your final design, considering its strengths and weaknesses, with reference to the elements and principles. This section is quite difficult: you will need to develop each aspect individually and then bring them together.

First, identify the functional and aesthetic aspects of the item. Functional aspects relate to the design features that enable the textile item to perform its required task, such as a casing to hang a wall hanging or an invisible zipper to allow a garment to be worn. Aesthetic aspects relate to surface decoration or design that enhances the appearance of the textile item. Examples may include shibori dyeing, beadwork or free-motion embroidery.

All textile items have strengths and weaknesses. A strength may also be a weakness. For example, the strength of a textile art cushion may be the highly textured surface decoration, but this is also a weakness as it would make the cushion difficult to clean.

You also need to explain the elements and principles of design. You need only include the relevant elements and principles for your project. It is useful to bold or highlight the element or principle as you explain each one so the marker can easily identify it. Refer to Chapter 1 for detailed information on functional and aesthetic design, and elements and principles of design.

The following student samples show examples of design development, presentation drawings and the evaluation of functional and aesthetic aspects.



Visual design development by Rebecca Khuu



Visual design development by Jenn Peters

## Manufacturing specifications (5 marks)

*Maximum length: 6 pages (A4) or 3 pages (A3)*

This section requires you to develop detailed manufacturing specifications, as if your textile item/s is to be put into commercial production.

### Marking guidelines

Criteria	Marks
Detailed communication of the manufacturing specifications by: <ul style="list-style-type: none"><li>• describing item/s accurately and in detail</li><li>• producing drawings that clearly reflect the textile item/s and which are of professional standard</li><li>• including all the required details in the technical production plan</li><li>• including a product label that contains all the required aspects appropriate to the selected focus area.</li></ul>	4–5
Limited communication of the manufacturing specifications by: <ul style="list-style-type: none"><li>• describing item/s briefly or incompletely</li><li>• producing drawings of an elementary standard</li><li>• including some relevant details in the technical production plan</li><li>• including a product label that may not contain all the required aspects OR contains aspects that are not appropriate to the selected focus area.</li></ul> Candidates may achieve 2–3 marks as indicated above OR by satisfying a combination of the criteria for other mark ranges.	2–3
Minimal communication of the manufacturing specifications by: <ul style="list-style-type: none"><li>• describing item/s in a basic way OR listing pattern company and number</li><li>• producing drawings of limited standard.</li></ul> Candidates may achieve 1 mark as indicated above OR by satisfying a subset of the criteria for other mark ranges.	1

### What makes good manufacturing specifications?

Everyone is capable of getting full marks in this section. The greatest challenge is to fit all the necessary information into the page limit; therefore, it is a good idea to take the time to experiment with the page layout.

The description of your textile item that you include in this section should be detailed enough so that the reader can visualise the project without seeing it. It should be approximately 10 lines in length or no longer than half an A4 page.

If you used a commercial pattern for your project you must identify the brand name and number; if you had a dressmaker create a pattern, you must explain it in this section. If you have made modifications to a commercial or a dressmaker's pattern, this is where you explain the process. One way to show pattern modifications is to show the original pattern piece and, using a red pen, show the modifications.

You must include all pattern pieces labelled with all pattern markings. These are to be drawn to scale and in proportion. Pattern markings include grainline, seam allowance, notches and darts, and all must be labelled with the pattern piece name and the number of each piece to cut in order to make the item.

As well as the pattern pieces, you must also include production drawings for the front and back views of your textile item. In industry, production drawings are detailed drawings used by pattern makers to create the pattern pieces for the garment. They must be drawn to scale and be fully dimensioned, including the seam size, number of seams and other specifications. These should not be rendered and should not be drawn on a figure.

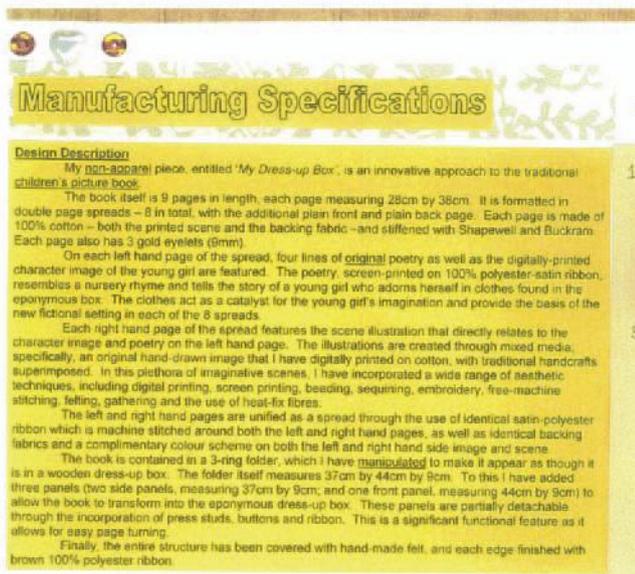


The technical production plans must include the following information.

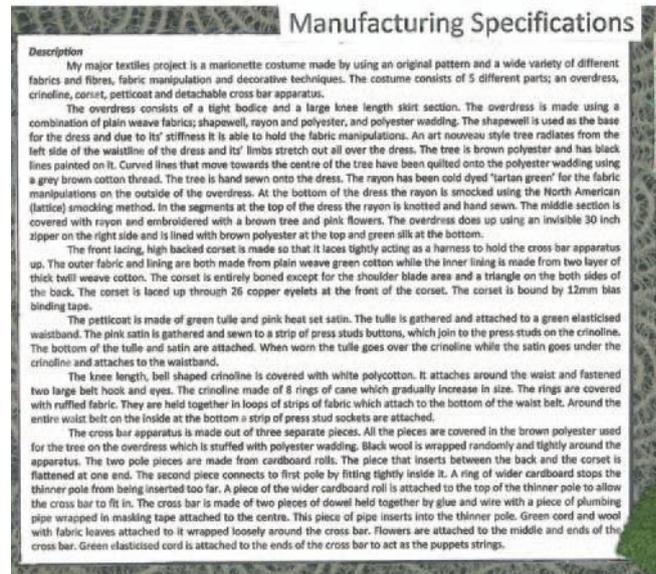
- Fabric swatches: Make sure they are neatly presented and labelled with the fabric name and fibre composition. When you purchase fabrics, always record the fabric details so you have the information to refer to later. Fabric swatches can be displayed as a border, under cardboard windows or trimmed with pinking shears.
- Quantity of material, notions required, itemised cost and total cost: Notions are the extra items you will require to complete your textile item. Notions include items such as zippers, buttons and lace. It is easiest to present all this information in a table. Make sure you highlight or bold the notions in your table so the marker can easily identify this section of your technical production plan.
- Order of construction: A flowchart is an excellent way to present this. The order of construction is not as detailed as the instructions on a commercial pattern. For example, you only need to state ‘insert invisible zipper into centre back seam’ – you do not need to explain step by step how to insert the zipper. It is not necessary to include pictures or diagrams in the order of construction.
- Product label: This includes care instructions, fibre content, size, where the product is made and the brand name. Do not attach the product label to the textile item as it may fall off. Include it in the supporting documentation. Do not make the label double-sided as the marker may not remove it from the plastic sleeve and may therefore miss important information. If the label is double-sided, present it as two labels in the supporting documentation. Care instructions must be relevant to the textile item. You can write ‘dry-clean only’, but this is not suitable for an easy-care garment such as a denim skirt. It is acceptable to write ‘lightly dust’ or ‘vacuum’ on a highly textured textile art project. Symbols can be used for care instructions.

The student samples following show examples of manufacturing specifications.

Please note that the information has been edited for use in this textbook.



Manufacturing specifications description by Bettina Roy



Manufacturing specifications description by Ester Karuso-Thurn





## Investigation, experimentation and evaluation (10 marks)

*Maximum length: 8 pages (A4) or 4 pages (A3)*

In this section of your supporting documentation you are required to justify the use of materials, equipment and manufacturing processes involved in your textile item/s and to evaluate the properties and performance of the fabrics, yarns and fibres used.

### Marking guidelines

Criteria	Marks
<ul style="list-style-type: none"> <li>Experiments with materials, equipment and manufacturing processes applicable to the item and modifies design and/or construction as a result of the experimentation</li> <li>Provides thorough details of materials, equipment and manufacturing processes used and justifies their use on the basis of comprehensive investigations</li> <li>Evaluates the properties and performance of the fabric, yarn and fibres used in relation to the end-purpose</li> </ul>	9–10
<ul style="list-style-type: none"> <li>Experiments with materials, equipment and manufacturing processes applicable to the item and modifies design or construction</li> <li>Provides details of materials, equipment and manufacturing processes used and justifies their use on the basis of sound investigations</li> <li>Evaluates the properties and performance of the fabric, yarn and fibres used, though not clearly in relation to the end-purpose</li> </ul> <p>Candidates may achieve 7–8 marks as indicated above OR by satisfying a combination of the criteria for other mark ranges.</p>	7–8
<ul style="list-style-type: none"> <li>Carries out some experimentation without indicating how the results of experimentation have been used in design or construction</li> <li>Provides details of materials, equipment and manufacturing processes used and justifies their use based on limited investigation</li> <li>Describes the properties and/or performance of the fabric, yarn and fibres used</li> </ul> <p>Candidates may achieve 5–6 marks as indicated above OR by satisfying a combination of the criteria for other mark ranges.</p>	5–6
<ul style="list-style-type: none"> <li>Minimal evidence of experimentation or investigation</li> <li>Provides basic details of materials and/or equipment and/or manufacturing processes used</li> <li>Briefly describes some of the properties and performance of the fabric, and/or yarn and/or fibres used in the item/s</li> </ul> <p>Candidates may achieve 3–4 marks as indicated above OR by satisfying a combination of the criteria for other mark ranges.</p>	3–4
<ul style="list-style-type: none"> <li>Provides no evidence of experimentation or investigation</li> <li>Lists materials, equipment and manufacturing processes used</li> <li>Lists the properties of fabric, yarn and fibres used in the item/s</li> </ul> <p>Candidates may achieve 1–2 marks as indicated above OR by satisfying a subset of the criteria for other mark ranges.</p>	1–2

## What makes a good investigation, experimentation and evaluation?

This section is the most complex part of your documentation. You should start this section as soon as you commence making your textile item, as you will be experimenting with materials, equipment and manufacturing processes throughout the manufacturing process. Make sure you keep all the samples, as you will need to include

them with documentation of each experiment. A snap-lock bag or shoebox can be used for storage.

The marking guidelines ask you to complete comprehensive investigations. This means at least three or four experiments for materials and a similar number for equipment and manufacturing processes. It is not sufficient to just complete the fabric tests you completed in Year 11. Refer to Chapter 10 as a guide for the fabric tests you might use. The experiments must be relevant to the end-use of the textile item. For example, abrasion resistance testing may be relevant to a sleeping bag or tent but not a formal dress. Materials experimentation may relate to textile properties, including drape, lustre, sun resistance or elasticity. An experiment may involve visiting a fabric store and gaining information regarding suitable fabrics and then writing the findings up in an experiment format. Cost is an important consideration and sometimes the most desirable fabric may be eliminated as it is too expensive. The following is a suggested format for your experimentation:

- **Aim:** To determine the most appropriate ...
- **Method:**
- **Result:**
- **Conclusion and justification:**

Diagrams or photos may be used to explain the method. In the conclusion and justification section of your experiments it is important to comment on how you modified the design and/or construction as a result of the experimentation.

When testing equipment you are determining the most effective equipment to complete a task. Equipment experiments may include testing the most appropriate machine needle to use when completing free-motion stitching with a metallic thread, or the most appropriate cutting utensil for patchwork shapes. Remember to apply the results of the experiments to your project.

You will complete many different manufacturing processes on your textile item and you should complete experiments on the most relevant processes. These may include the most appropriate seam to use to construct a chiffon blouse or the most appropriate method of creating a quotation on a wall hanging.

It is essential to include textile samples for each experiment. Again, layout is very important to ensure all the necessary documentation is included. You may decide to use one A3 page for each set of experiments for materials, equipment and manufacturing processes and the final page to evaluate the properties and performance of fabric, yarn and fibres.

When you evaluate the properties and performance of fabric, yarn and fibres it is important not to just copy the information straight from the textbook. The textbook will list all the properties for cotton but they are relevant for different end-uses. The properties you would evaluate for a cotton beach towel would be different from the properties you would evaluate for denim jeans. A table format is a useful way to present your evaluation of properties and performance.

The student samples on pages 385–6 show examples of investigation, experimentation and evaluation. Please note that the information has been edited for use in this textbook.

### Investigation, Experimentation and Evaluation

#### EXPERIMENT 1 MATERIALS

**Colour to Use**

1. To determine which material, either in silk or more appropriate for digital printing, and that is suitable when both in more appropriate to create the print in 2 paper.

**Equipment**

1. Paper for white paper  
2. Inkjet printer  
3. Computer with Adobe Photoshop program  
4. Paper for white paper  
5. Paper for white paper  
6. Paper for white paper  
7. Paper for white paper  
8. Paper for white paper  
9. Paper for white paper  
10. Paper for white paper

**Method**

1. Start the silk and the cotton sheets were washed with a black enzyme on the cotton sheet.
2. Cotton, being a thicker and more absorbent fabric, produced more highly coloured images than the silk.
3. When printed on the silk, better results were seen.

**Conclusions**

Cotton is more appropriate, as the images produced are brighter in colour. Also, when the fabric has more absorbent than silk, and will therefore be better for the application, such as an artwork, in an art class.

#### EXPERIMENT 2 MATERIALS

**Colour to Use**

1. To determine which material, either in silk or more appropriate for digital printing, and that is suitable when both in more appropriate to create the print in 2 paper.

**Equipment**

1. Paper for white paper  
2. Inkjet printer  
3. Computer with Adobe Photoshop program  
4. Paper for white paper  
5. Paper for white paper  
6. Paper for white paper  
7. Paper for white paper  
8. Paper for white paper  
9. Paper for white paper  
10. Paper for white paper

**Method**

1. Start the silk and the cotton sheets were washed with a black enzyme on the cotton sheet.
2. Cotton, being a thicker and more absorbent fabric, produced more highly coloured images than the silk.
3. When printed on the silk, better results were seen.

**Conclusions**

Cotton is more appropriate, as the images produced are brighter in colour. Also, when the fabric has more absorbent than silk, and will therefore be better for the application, such as an artwork, in an art class.

Investigation, experimentation and evaluation by Bettina Roy

### EXPERIMENT 3 MANUFACTURING PROCESS

**Phase 1: The Silk**

1. To determine which material, either in silk or more appropriate for digital printing, and that is suitable when both in more appropriate to create the print in 2 paper.

**Equipment**

1. Paper for white paper  
2. Inkjet printer  
3. Computer with Adobe Photoshop program  
4. Paper for white paper  
5. Paper for white paper  
6. Paper for white paper  
7. Paper for white paper  
8. Paper for white paper  
9. Paper for white paper  
10. Paper for white paper

**Method**

1. Start the silk and the cotton sheets were washed with a black enzyme on the cotton sheet.
2. Cotton, being a thicker and more absorbent fabric, produced more highly coloured images than the silk.
3. When printed on the silk, better results were seen.

**Conclusions**

Cotton is more appropriate, as the images produced are brighter in colour. Also, when the fabric has more absorbent than silk, and will therefore be better for the application, such as an artwork, in an art class.

### Experimentation: Evaluation and Justification of Materials

1. To determine which material, either in silk or more appropriate for digital printing, and that is suitable when both in more appropriate to create the print in 2 paper.

**Equipment**

1. Paper for white paper  
2. Inkjet printer  
3. Computer with Adobe Photoshop program  
4. Paper for white paper  
5. Paper for white paper  
6. Paper for white paper  
7. Paper for white paper  
8. Paper for white paper  
9. Paper for white paper  
10. Paper for white paper

**Method**

1. Start the silk and the cotton sheets were washed with a black enzyme on the cotton sheet.
2. Cotton, being a thicker and more absorbent fabric, produced more highly coloured images than the silk.
3. When printed on the silk, better results were seen.

**Conclusions**

Cotton is more appropriate, as the images produced are brighter in colour. Also, when the fabric has more absorbent than silk, and will therefore be better for the application, such as an artwork, in an art class.

### Evaluation of the Properties and Performance of Fabric, Yarn and Fibres

Material	Properties	Performance	Yarn	Fibre
Cotton	Soft, breathable, absorbent	Good for everyday wear	Wool, Cotton, Polyester	Wool, Cotton, Polyester
Wool	Warm, elastic, durable	Good for winter wear	Wool, Cotton, Polyester	Wool, Cotton, Polyester
Polyester	Smooth, wrinkle-resistant	Good for formal wear	Wool, Cotton, Polyester	Wool, Cotton, Polyester
Silk	Lustrous, smooth, strong	Good for luxury garments	Wool, Cotton, Polyester	Wool, Cotton, Polyester

INVESTIGATION, EXPERIMENTATION & EVALUATION

Investigation, experimentation and evaluation by Kathryn Peters

### Experiment: Manufacturing Processes

**Aim:** To determine which typical finishing will effectively maintain the structure of the fibres and will be most cost-effective.

**Materials/Equipment:**

- Shirring Machine
- 3 or 4 cones of 1.5mm white & 1.5mm grey
- Shirring Machine
- Thread
- Shirring (1.5mm white & 1.5mm grey)
- Highly stretchable fabric
- 100% Light Fabric
- Shirring Machine
- Shirring Machine

**Method:**

- Use 4 separate pairs of the Shirring fabric. Each pair should be 1.5m x 1.5m.
- Use each pair together, with a 1.5m cone of shirring.
- Use the cones being used in the rest of the fabric piece.
- Insert the Shirring fabric into the shirring machine and then using the shirring machine.
- Repeat step 1-4 using the 100% light fabric and then using the 100% stretch fabric.
- Use the 1.5m of the fabric, use the shirring fabric (with cones being used) being used in the rest of the fabric.

**Results:**

The different types of finishing proved to be effective in holding the structure of the stretch fabric, where some appear to be better than others. The 100% stretch fabric and the 100% light fabric were the most effective in holding the structure of the stretch fabric. The 100% stretch fabric and the 100% light fabric were the most effective in holding the structure of the stretch fabric. The 100% stretch fabric and the 100% light fabric were the most effective in holding the structure of the stretch fabric.

Thread	Shirring	Fabric Construction	Properties	Method
1.5mm white	Shirring Machine	Highly stretchable fabric	Highly stretchable fabric	Highly stretchable fabric
1.5mm grey	Shirring Machine	Highly stretchable fabric	Highly stretchable fabric	Highly stretchable fabric
100% Light Fabric	Shirring Machine	Highly stretchable fabric	Highly stretchable fabric	Highly stretchable fabric
100% Stretch Fabric	Shirring Machine	Highly stretchable fabric	Highly stretchable fabric	Highly stretchable fabric

Investigation, experimentation and evaluation by Rebecca Khuu

### Some Some Some

**Aim:** To determine the most effective thread colour to create lyrics with.

**Method:** Create samples using:

- Metallic silver thread
- Grey thread
- White thread

**Results:** The white thread creates a bold letter against the blue material, however this colour appears bland amongst the bright colour scheme. The grey thread creates a dull lettering where as the metallic silver thread creates a shimmering coloured letter that appears aesthetically appealing against the blue and captures the attention of the viewer.

**Justification:** I have chosen to use the metallic silver thread as it appears harmonious amongst the colour scheme of the project. The metallic nature of the thread also emphasizes it allowing the writing to stand out as a focal point of the project.

Investigation, experimentation and evaluation by Kate Gabbot



24.10 Experimentation scaffold

Investigation, experimentation and evaluation by Kate Gabbot

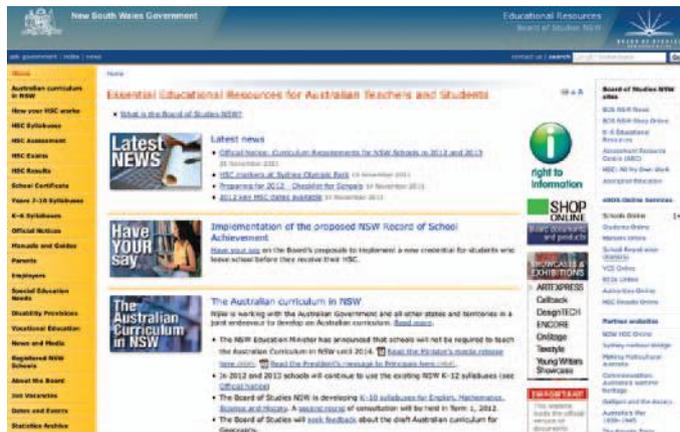
# Written examination

## The written examination explained

The Higher School Certificate in Textiles and Design consists of two sections: the written examination worth 50 marks, and the Major Textiles Project (explained in detail in Chapter 24) also worth 50 marks. The written examination is one and a half hours in duration and includes questions from the three areas of study:

- Design
- Properties and Performance of Textiles
- Australian Textile, Clothing, Footwear and Allied Industries.

It is important to keep checking the official Board of Studies website to ensure you have the most up-to date information regarding all HSC examinations.



Board of Studies website

## Textiles and Design – written examination format

	Section I	Section II	Section III
Mark value	10 marks	25 marks	15 marks
Suggested time to complete section	15 minutes	45 minutes	30 minutes
Areas of study	Design Properties and Performance of Textiles ATCFAI	Question 11 – ATCFAI (5 marks) Question 12 – Design (10 marks) Question 13 – Properties and Performance of Textiles (10 marks)	Question 14 – Design Question 15 – Properties and Performance of Textiles
Question style	10 multiple choice	Short, structured response questions Each question will consist of a number of parts	Extended, structured response questions
Compulsory or optional?	Compulsory	Compulsory	Answer EITHER Question 14 or 15. Both questions are of equal value.

## Understanding key words

The Board of Studies uses a selection of key words in HSC examinations and syllabus documents in all subject areas, including Textiles and Design. These terms will also be used in your class assessment tasks. The use of key words is intended to help provide a common language and consistent meaning throughout the HSC so that when such a word is used in a Board of Studies document, the meaning of that word will always be the same. You need to be familiar with the meaning of each of these terms so that you understand exactly what is being asked of you in the questions in the exam.

### List of the key words and their meanings

Account	Account for: state reasons for, report on. Give an account of: narrate a series of events or transactions
Analyse	Identify components and the relationship between them; draw out and relate implications
Apply	Use, utilise, employ in a particular situation
Appreciate	Make a judgement about the value of
Assess	Make a judgement of value, quality, outcomes, results or size
Calculate	Ascertain/determine from given facts, figures or information
Clarify	Make clear or plain
Classify	Arrange or include in classes/categories
Compare	Show how things are similar or different
Construct	Make; build; put together items or arguments
Contrast	Show how things are different or opposite
Critically (analyse/evaluate)	Add a degree or level of accuracy, depth, knowledge and understanding, logic, questioning, reflection and quality to (analyse/evaluate)
Deduce	Draw conclusions
Define	State meaning and identify essential qualities
Demonstrate	Show by example
Describe	Provide characteristics and features
Discuss	Identify issues and provide points for and/or against
Distinguish	Recognise or note/indicate as being distinct or different from; to note differences between
Evaluate	Make a judgement based on criteria; determine the value of
Examine	Inquire into
Explain	Relate cause and effect; make the relationships between things evident; provide why and/or how
Extract	Choose relevant and/or appropriate details
Extrapolate	Infer from what is known
Identify	Recognise and name
Interpret	Draw meaning from
Investigate	Plan, inquire into and draw conclusions about
Justify	Support an argument or conclusion

Outline	Sketch in general terms; indicate the main features of
Predict	Suggest what may happen based on available information
Propose	Put forward (for example a point of view, idea, argument, suggestion) for consideration or action
Recall	Present remembered ideas, facts or experiences
Recommend	Provide reasons in favour
Recount	Retell a series of events
Summarise	Express, concisely, the relevant details
Synthesise	Putting together various elements to make a whole

Source: [www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au).

## Steps to success in Textiles and Design

Achieving success in HSC subjects requires hard work and determination. Below is a list of strategies you might use to gain the most from your studies, particularly in Textiles and Design.

- Every assessment task is important. Aim to achieve your personal best in every task.
- Study and learn key concepts in Textiles and Design. Use the palm cards to form the basis of your summaries.
- Try your best to understand, and absorb what you are studying, so you can apply it to new situations. Make sure you ask your teacher lots of questions so you understand what is required in each task. Familiarise yourself with the list of key words, which will also clarify what is being asked in each task.
- Ensure all your work is your own and not someone else's.
- Always compile a list of resources (a bibliography) as you work, so you can return to websites or textbook information for clarification or qualification when required.
- Aim for accuracy by reducing careless mistakes. Create a draft of your work, and read over and edit the draft to ensure it addresses the task in the required amount of detail.



25.1 Key words  
25.2 Palm card template  
25.3 Bibliography template



HSC: All My Own Work

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**HSC: All My Own Work**

The **HSC: All My Own Work** program is designed to help Higher School Certificate students to follow the principles and practices of good scholarship. This includes understanding and valuing ethical practices when locating and using information as part of their HSC studies.

The program has been developed as part of the NSW Government's **Respect and Responsibility** strategy and complements other approaches such as brochures for teachers, students and parents and strengthened student and teacher declarations for the HSC.

The HSC: All My Own Work program is integrated with other NSW syllabuses and programs. The program is designed to be delivered flexibly as self-paced learning modules.

The program's content is divided into five modules:

1. Scholarship Principles and Practices
2. Accommodating Sources
3. Plagiarism
4. Copyright
5. Working with others

Each module contains:

- Information and advice on the module focus questions
- Quiz questions
- Summary
- Frequently Asked Questions (FAQs)
- Link to a glossary
- Links to relevant websites.

There is a **Sitemap** available if you wish to see a more detailed view of how the site is organised.

**Why?**  
Higher School Certificate assessment tasks such as independent research projects and major works are likely to be the most challenging learning you will undertake during your time at school. HSC - All My Own Work is a short guide to help you complete your assessment tasks honestly and with confidence.

In order to use some parts of this site, **Adobe Flash** is required. This is free to download and install.  
[Get Flash Player](#)

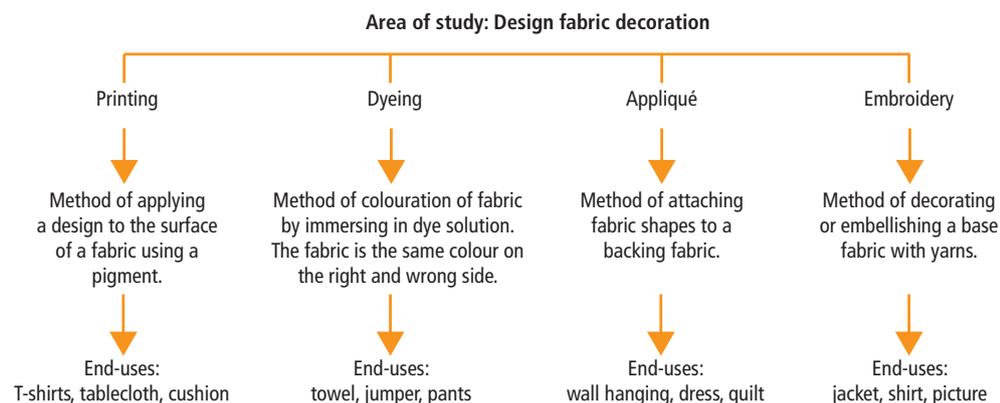
In order to use some parts of this site, a **PDF reader** is required. We would suggest using **Adobe Acrobat**. This is free to download and install.  
[Get Adobe Reader](#)

All My Own Work

- Presentation is important in any design field, so always deliver tidy and well-prepared work to help you achieve your personal best.
- After each theory lesson read over your class notes. Start to make a summary of each of the topics to use as revision later. Everyone revises in different ways; some people like to create a mind map of the topic, others like to use palm cards, while others highlight the key words or concepts in their class notes.



25.4 Mind map template  
25.5 PMI template



An example of a revision mind map: fabric decoration

- A PMI is also a useful tool to help create a summary of the key elements in a topic. It allows you to identify the positive (plus) features, the negative (minus) features and the interesting facts.

### Example of a PMI table – globalisation in the Australian textile industry

Australian textile industry	Definition
Globalisation	Globalisation refers to the increasing worldwide connection, integration and interrelationships in the economic, social, technological, cultural, political and ecological spheres. Advances in and rapid development of technology are creating links between people of all cultures and integrating the whole Earth in one global system.
PMI	How is the Australian textile industry affected by globalisation?
Plus	Increases global connections and awareness of world and environments Increases Australian designer profiles Increases market size Opens up opportunities for innovative designs and marketing concepts, particularly in the niche market sector
Minus	Could lead to job losses in the manufacturing industry in Australia due to manufacturers sourcing labour in countries that have access to a cheaper labour force: could lead to exploitation of workers and resources in poorer countries
Interesting facts	Is not a new concept, people have been trading for years Is occurring at a rapid pace due to communication access and Internet technology Strong export markets are essential if Australia is to compete internationally

- If you create a summary of each topic as you complete it in class, you will already have your notes summarised and ready to use for the trial and HSC exams. This will save time later. Creating summaries also gives you an opportunity to find out if there is information you do not understand and if you need to seek help from your teacher.

- The best revision for the HSC exam is to complete past HSC papers. Your teacher may have copies of these, but otherwise they can be found on the Board of Studies website. Marking guidelines are also available so you know what is expected for each question. If you answer past exams, give them to your teacher for feedback.
- Notes from the marking centre and sample answers for past papers are handy tools you can use to inform your examination technique.
- HSC Online is another excellent resource. At this website you can work through a variety of tutorials that will supplement your class notes.
- Be very selective if you use websites that host unqualified notes from student sources. The information posted on such websites cannot be verified and you have no way of knowing whether or not it is accurate. It is important to source information from a reliable textbook or a website qualified by your teacher or a respected university or government agency.
- When studying for the HSC exam, revise all the theoretical content and practical applications, such as fabric decoration. Also read over your assessment tasks and summarise the important elements.
- The glossary that follows this chapter will give you a greater understanding of textile terminology. This will be very useful, especially when you are answering the multiple-choice questions.



Board of Studies  
HSC Online

HSC Online

## Hints for the exam

- Before you commence answering a question, underline the key words in the question. This will help you understand how you need to answer the question.
- Use the space provided for the short-response questions. The number of lines given for a question is an indication of the amount of detail required. If there are five lines the question can be answered in five lines.
- Write a quick plan of work before you begin an extended response question. This will give you the opportunity to organise your thoughts and make sure you have sufficient knowledge to answer all parts of the question in the required amount of detail. Use specific and relevant examples to demonstrate to the examiner the depth and scope of your textile knowledge.
- Remember to use your time wisely in the exam. Keep to the suggested time for each section of the paper. If you finish a few minutes early, use this time to read over your work and add any further information to your answers.

# Glossary

- abrasion resistance** the ability to withstand rubbing or wear and tear
- absorbency** the ability to absorb moisture
- acid** a chemical compound that may damage fabric
- aesthetic design** relates to the visual appeal of an item
- alkali** a chemical compound that may damage fabric
- antibiosis** a reaction between two or more organisms that results in the destruction to at least one of the organisms
- appliqué** the technique of applying fabric shapes to a fabric backing
- ATCFAI** Australian Textile, Clothing, Footwear and Allied Industries
- Australian Consumer Law (ACL)** the national law for fair trading and consumer protection that ensures all consumers and businesses in Australia have the same rights and obligations
- balance** the visual weight of shape, texture, colour, line and space; there are three types: symmetrical, asymmetrical and radial
- bamboo kun** an antimicrobial agent found in bamboo
- bamboo** the fastest-growing woody plant on Earth
- batik** a resist method of creating pattern on fabric by applying wax to the parts not to be dyed
- bias** refers to the 45 degree angle across the fabric warp of a fabric; a bias cut imparts stretch and promotes drape
- bicomponent yarn** yarn containing two filaments, staples or natural fibres that are either chemically or physically different
- blend** a combination of two or more generically different fibre types in any fibrous assembly, such as a sliver, yarn or fabric
- boucle yarn** yarn created by combining different plied yarns together
- breeches** an undergarment worn from the waist down and separated at the crutch to cover each leg
- burning test** a test to determine the fibre composition of fabric
- bustle** a structural framework that provides a garment with an exaggerated silhouette, forming a shape to accentuate the drape of fabrics and the design of a dress
- carded cotton yarn** fibres in various lengths, resulting in a more uneven yarn
- care labels** labels used by businesses to convey important information about most goods, such as foods, clothing and packaged items, so that customers can make informed choices about the products they intend to buy
- clipping** making small incisions into a fabric to allow a seam curve to lie flat
- colour** one of the most important elements of design, colours appear when light waves are reflected and absorbed by objects; levels of colour are described using the terms hue, value and intensity
- colourfast** the ability to withstand colour change after exposure to heat or water
- combed cotton yarn** fibres of long, even lengths; combed ring-spun cotton is noticeably softer and higher in quality than carded cotton
- communication** the ability to impart an understanding or meaning using text, speech, visual signals or behaviour
- computer-aided design (CAD)** various technologies, both hardware and software, that can be used to create fashion illustrations or pattern design
- computer-aided manufacture (CAM)** various items of technological equipment or machinery that can aid in the production of textile design and construction
- contemporary influences** current trends, such as concern for the environment, sustainability and attention to ecodesign
- contrast** an unexpected change in the visual elements of a design; contrast can be created through colour, shape, line or texture
- core-spun yarn** yarn with a centre or core of one fibre composition, around which another fibre is spun or wrapped
- corset** a bodice stiffened with buckram, wood or metal
- cotton gin** a drum with fine, hook-shaped wires projecting from it that held the seeds back while the cotton lint was pulled away; invented in 1794, the cotton gin could do the day's work of several men in one hour
- cotton** a cellulosic fibre produced by the cotton plant, which is a member of the *Hibiscus* family
- couching** the process of attaching decorative yarns or cords to a fabric
- course** a horizontal row of loops in knitted fabric
- crinoline** a stiffened hoop or petticoat that provides a structural support for a skirt; often creates a dramatic silhouette
- cultural influences** the influence of a culture's dance and movement, its art, social life and practising artists, such as music icons or celebrities
- culture** a system of shared beliefs, values, customs, behaviours and artefacts that are unique and transmitted from generation to generation
- darts** formed from triangular shapes on the pattern piece that taper to a point; they are used to shape the fabric to fit the body and may be found at the bust, waistline and hips
- decorative technique** a technique to enhance a design that is also appropriate to the end purpose
- denier** a unit of weight that measures the fineness of a yarn
- design** a process that uses a combination of aesthetic and functional components to create solutions for an identified need; a sketch or plan for work so a project can be developed

**Design for Environment (DfE)** an initiative that encourages businesses to give greater thought to the design of products to avoid or minimise significant environmental impact; also sometimes called ecodesign

**digital image transfer** a process in which a digital image is transferred to a textile item using a paper medium and heat

**dimensional stability** the inability of a fabric to stretch or shrink

**direct digital printing (DDP)** printing directly onto fabric using inkjet technology and computer-aided design (CAD) systems and programs

**direction** relates to how the eye is led around a design, determined by the type of line used and the direction of the line produced in the design

**drape** how a fabric hangs or falls

**dyeing** the process of applying a comparatively permanent colour to a fibre, yarn or fabric via immersion in a dye bath

**ecodesign** see **Design for Environment (DfE)**

**economic value** value determined by the market and how much people are willing to pay for goods or services

**economics** the costs of all materials, designing and manufacturing

**elasticity** the ability to return to an original shape after being stretched or compressed

**elastomeric** a natural or synthetic polymer with the elastic properties of natural rubber that can be used in fibre, yarn or fabric manufacture

**embellishing machine** textile machinery specifically designed to create surface decoration

**embroidery** the method of decorating or embellishing a base fabric with yarns

**emphasis** the focal point; the part of the design that captures the viewer's attention

**environmental sustainability** the preservation of biodiversity and natural ecosystems over an indefinite period of time; the ability to maintain the qualities that are valued in the physical environment

**farthingale** an underskirt made from cane, wire or whalebone hoops

**fashion drawing** the illustration of garments

**fashion silhouette** the outline of a garment pertaining to the shape and proportion of design lines

**felt** non-woven fabric that has been manufactured directly from matted or compressed fibres

**fibre** a fine, thread-like substance with a length at least one hundred times greater than the width; fibres are the raw materials used to make yarns and fabrics

**finishing techniques** processes that improve the properties of fibres, yarns or fabrics; they can be permanent or temporary, durable or renewable

**font** complete set of printing type of one style and size

**free-motion stitching** a method to incorporate line into textile projects as the stitching can be in any direction: forward or back, left or right

**functional design** relates to the specific end-use or purpose of an item

**fusible web** a non-woven, synthetic material that melts when heated

**gathering** the process of drawing up a fabric by using rows of stitches

**girdle** a type of belt worn around the waist to cinch the waist and accentuate a silhouette

**globalisation** the increasing worldwide connection, integration and interrelationships in the economic, social, technological, cultural, political and ecological sphere

**godet** a shaped piece of fabric that is inserted into a seam to add fullness to a hemline or sleeve

**grading** cutting back the layers of fabric inside a garment to remove bulk so structural components of the garment may sit flatter when pressed

**grain** the direction in which yarns run

**graphic communication** communication through graphics and graphical aids to promote an understanding of a design concept

**handcrafted** refers to items considered to be of great value because they are usually not mass-produced, making them traditionally more unique and therefore special

**harmony** a combination of colour, shape, line and texture; the similarities of the design or repeated design features are consistent and blend together to create an aesthetic design

**haute couture** the exclusive end of high fashion apparel

**heather patterning** two-tone, dyed colouring of yarns to create a patterned fabric with two different tones or shades of colour

**heirloom** an object of sentimental value passed down, generally within the family, from generation to generation

**hem** a finish used on the bottom edge of a textile item, whereby the edge is folded under and stitched

**historical influences** the influence a particular era or historical period, such as events, people and resources available during that particular period

**Hmong people** also known as the Meo, Miao or Meau, these people originally came to China from Mongolia, Tibet or Siberia, 95% of whom now reside in southern China, Laos, Burma, Vietnam and Thailand

**hue** the name of a colour; for example, primary hues are red, blue and yellow

**ikat** a specialised way of tying and dyeing yarns warp or weft that are subsequently woven into fabrics showcasing complex design patterns

**industry production drawing** an illustration that provides the mechanical instructions to create and manufacture a garment structure from beginning to end; it includes all measurements and details of construction

**interfacing** a textile material, such as Vilene, used to support, shape and stabilise areas, edges and details of textile items

- interlining** a textile material, such as organza, that is placed between the outer fabric or face of the garment and the lining
- jacquard loom** a loom that produces tapestry fabrics
- Kunin felt** felt made from acrylic and polyester
- leg o'mutton** a term given to a sleeve style that resembles the shape of this meat cut
- lines** significantly longer than they are wide, lines can divide space or outline an object, can express emotion and movement, and can communicate feeling; examples are horizontal, vertical, diagonal and zigzag
- lustre** the gloss, sheen, sparkle or shine of a fabric caused by light reflecting from its surface
- microfibre** a fibre less than one denier thick
- mordant** a chemical substance used to fix dye to fabric
- muff** a circular piece of fabric that serves to warm hands, sometimes created out of animal fur
- non-verbal communication** understanding imparted through visual aid, behaviour or text
- notching** a system of triangular cuts used to assist garment manufacturers or home sewers to match pattern pieces together
- nuno felting** a felting technique that involves attaching a sheer fabric to wool tops or batts
- nylon** a synthetic fibre with a protein-like structure and tough, lightweight and elastic properties
- OHS** occupational health and safety
- orthogonal drawing** a type of technical drawing
- panniers** a structural framework worn as an under garment with the specific purpose of changing the silhouette of a garment at the hips
- Pellon** a fusible textile material made from polyester that is used as a fabric layer to add bulk to a textile item
- perceived value** the value that a buyer subjectively attaches to a textile item
- pictorial drawing** a type of freehand drawing
- pleat** a fold in the fabric
- pleating** the art of producing folds in fabric at predetermined intervals
- pollution** the contamination of the natural environment (including air, water or land) by harmful substances
- polyester** a synthetic fibre that is light, strong and weather resistant
- printing** the textile art of imparting a surface decoration design via a pigment-based paint and a devised tool (such as a carved stamp) to the surface of a garment, fabric, yarn or fibre
- product lifecycle** the four distinct stages in the life of a product: introduction, growth, maturity and decline
- proportion** the relationship between two parts of a design, or between one part of a design and the entire design piece; for example, proportion can be a comparison of sizes, shapes or amounts of specified design elements
- quality assurance** checking to maintain the standards from the beginning of the production process, and to ensure the product will be suitable for end-use application; it ensures that a textile item is produced to a specified level of predetermined quality in a manner that is safe, cost-effective and efficient
- quality control** the inspection and checking of products and processes; measures are used to assess the quality of a product at various stages of the manufacturing process
- ramie** a plant from the same family as the nettle
- rayon** an artificial fibre made from wood pulp
- regenerated fibre** a fibre made from a combination of natural and manufactured resources
- rendering** colouring or shading a design
- rhythm** the repetition of various elements in a design to create a feeling of organised movement, such as colour, shape, texture and line
- ruff** a neckpiece or collar of lace gathered into deep, full, regular folds
- safety standards** minimum safety requirements that products must meet before they are supplied, specifically in regard to performance, composition, contents, methods of manufacture or processing, design, construction, finish or packaging
- seam** a line formed when two pieces of cloth are stitched together; the basic structural element of all textile items
- seam finish** a technique used to make a seam neater or to stop the raw edges of the seam allowance from fraying
- seamless technology** the process of making seamless garments
- selvedge** the reinforced edge of a fabric that does not fray
- shape** a closed line; there are two main types of recognisable shapes: organic (such as free-formed natural shapes) and geometric (such as squares, circles and triangles)
- shirring** a technique similar to gathering, except an elastic bobbin thread is used to draw up the fabric
- shrink resistance** the inability of fabric to contract or distort
- slub yarn** yarn that can be made from either single or ply yarns
- spinning jenny** a machine that allowed 16 or more yarns to be spun simultaneously by one person
- spunlacing** a method that involves bonding a web by interlocking and entangling the fibres using high-velocity streams of water
- stabiliser** a textile material used to support and stabilise fabric during decorative sewing processes, including appliqué, machine embroidery and free-motion stitching; there are four basic types: cut-away, tear-away, heat-away and wash-away
- staple fibres** short fibres
- story cloth** pictorial embroideries, known by the Hmong people as *paj ntaub tib neeg*

- strength** the ability to resist breaking
- sublimation** a dyeing process in which the dye changes from a solid to a gas without passing through the normal liquid stage in between; this means the textile fabric does not require wetting out
- sublimation printing** a process that uses a medium and heat to transfer a visual element to a textile product such as fabric meterage
- sun resistance** the ability to withstand deterioration when exposed to the sun
- TCF** textile, clothing and footwear
- text type** a style of font
- texture** refers to the surface characteristics of a design; texture has two main types: visual and tactile
- textured filament yarn** yarn made from synthetic filaments that have been modified to add texture, bulk and elasticity to yarns
- thermal property** the ability to withstand and transfer heat
- toga** a semicircle of woollen fabric that was draped around the body
- trademark** a mark used for the identification of goods or services, such as a word, phrase, letter, number, sound, scent, shape, logo, picture or aspect of packaging, or a combination of these; the suffix 'TM' can be used in superscript after the word or logo, and a registered trademark is indicated with the ® symbol and is a way of determining quality in textiles
- trimming** application of a braid, lace, motif and so on to embellish a textile item
- tucks** stitched folds of varying widths, which normally have a space between them
- tunic** a loose fitting garment that has a neckline, armholes, sleeves or sleeveless, and a hemline that traditionally falls below the knee
- unity** a composition that has a completeness of design
- value** the lightness or darkness of a colour; value can add depth and volume to a design
- verbal communication** assisting understanding of a concept via speech
- vintage clothing** clothing more than 25 years old
- wadding** a textile material usually sewn in between two layers of fabric to add bulk and insulation to a textile item; it can be made from a variety of fibre types, including cotton, polyester, wool and bamboo
- wale** a vertical row of loops in a knitted fabric
- warp** (yarns) running the length of a fabric
- warp knitting** uses one yarn per needle or wale, and the loops run the length of the fabric; each row of loops interlocks with the adjacent row or wale
- washable webs** fabrics manufactured from non-woven sources
- waspie** a belt worn around the waist to make the wearer's waist physically smaller; sometimes referred to as a waist cincher
- Watt wash** a unique technique to distress denim, using a laser to fade the colour and much less water than traditional distressing methods
- weft** (yarns) running across the width of a fabric
- weft knitting** uses one length of yarn, and the loops are formed along the width of the fabric; each row of loops interlocks with the row above and below, holding the fabric together
- wool** a natural bicomponent fibre taken from the fleece of domesticated sheep, but can also come from other animals, such as alpaca, Angora and Kashmir goats (cashmere), camel, llama and vicuna
- woollen yarn** short staple wool fibres that are not always uniform in length; they are less parallel, softer and looser than worsted yarn
- worsted yarn** long fibres; when spun, they are more uniform in length, smoother and are more compact than woollen yarn
- written communication** assisting understanding of a concept via text
- yarn** the basic thread component of all fabric construction; yarns have a continuous length but a small cross-section, and are usually held together by twisting or spinning
- zipper** nylon or metal teeth that are attached to fabric tapes; there are three main types: conventional, open-ended and invisible

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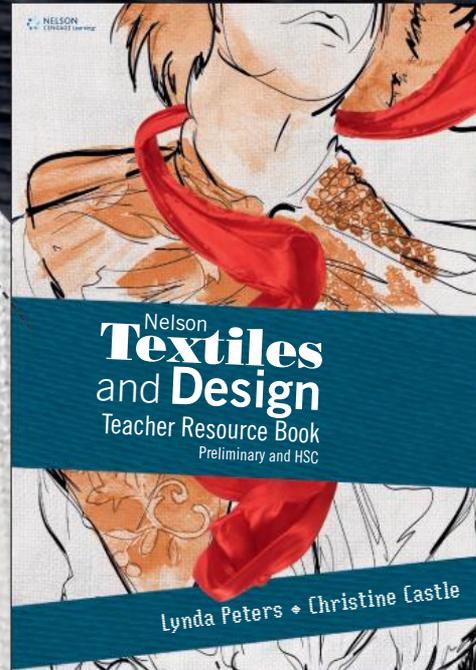
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