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Textile Design & Print in The Digital Age

The advent of digital printing technology for textiles is proving to be the most important design catalyst for surface design since the introduction of the silk-screen in the nineteen fifties. The introduction of new technology however does not usually result in an immediate change in design styles, and initially design for industrial production continues to reflect the styles defined by the preceding technology. It is hardly surprising then, that a mature style for digital print design is only just beginning to come in to its own.

The adoption of digital printing by textile manufacturers has the potential to affect individual designers as well as the surface design industry in two ways. This technology can be thought of as a double edged sword as it is equallly capable of facilitating the copying of pre-existing designs as it is of acting as a tool that fosters the creation of unique and truly modern designs. Digital designing and printing is the perfect tool for the creation of limited editions and is almost analogous to a craft based industry. The accessibility of this technology through the use of service bureaus makes it possible for artists and designers who do not have specialist knowledge of textile printing to design and produce their own fabrics and other decorative surfaces.

There are other advantages that digital textile printing has over traditional methods. The most significant of these include rapid turnaround time, the ability to print

millions of colours at a high level of detail as well as extreme tonal effects, the capability to print images on a much larger scale and finally a reduced impact on the environment. Inkjet printing on textiles consumes significantly less dye, water and energy than the rotary screen-printing process does.

Historical Context and Technological Parameters

In order to place the new styles that are emerging within a historical context, and to explain the ways in which they differ from the earlier styles that were the product of traditional printing methods, a summary will be given of the technology behind analogue printing. Most traditional methods of textile printing are based on processes that are similar to stenciling techniques. Broadly categorized these include the silkscreen, wood block and gravure methods of transferring artwork on to fabric. All these processes are restricted to the number of colours it is practical to print and often several days may be required to prepare the "templates". A separate template must be created for each colour and the image is then built up in stages, as each colour must be laid down separately.   The more colours, the more expensive and time-consuming the process will be so that the number of colours is limited by what is practical, and in some cases places significant restraints upon the designer.

The most common method used today in the industrialized mass production of printed textiles is rotary screen-printing. Silk-screen printing, as we know it was patented in 1907. The principle behind the silk screen involves the use of a fine porous mesh that is either stretched over a rectangular frame or built into the form of a cylinder. The design is then delineated by a mask, which leaves open areas for each colour through which the ink is pushed by means of a squeegee.

The use of digital print is still relatively new to the textile industry, with the first viable short run inkjet textile printers such as the Mimaki TX2 becoming available for general use in 1998. The next highly significant step in inkjet technology, was the release in 2003 of the first industrial scale inkjet printers capable of mass production. Amongst these systems are the Italian developed DReAM by Reggiani and Robustelli's Monna Lisa. Ichinose have also developed the Artistri printer, which is capable of longer run production. However currently less than 1% of the world's textiles are digitally printed as the technology is only really cost effective at the high-end of the fashion and textile design markets, as we will see from the range of examples discussed in this paper. This is due to the elevated cost and limited production capabilities of digital technology as opposed to analogue methods of production. Rotary screen printing factories are able to print up to 55 linear meters per minute at a cost of less than 1 Euro per meter which gives rotary screen printing the advantage. At the time of writing the industry standard for the speed of mass production digital textile printers reaches only 4 linear meters per meter. In the UK runs of less than 10 meters costs at least £30 per linear meter. However the newly developed ISIS digital textile printer by Osiris looks to be capable of rivaling traditional printing methods as it runs at 30 linear meters per minute although the image quality is not as detailed as other production printers.

Comparative Advantages and Disadvantages.

To a certain extent it is inevitable that technology dictates style. The most significant disadvantage of traditional textile printing methods is the limit of colours it is practical to print as well as the scale of an image. The galvano method of engraving and the

use of photochemical processes as a technique for exposing a template onto a silk-screen that has been coated with a light sensitive emulsion increased the range of effects that could be reproduced accurately using traditional technology. However the majority of print designs found on the high street have been rendered in such a way that either much of the integrity of the original artwork is lost in the process of translation necessitated by analogue technology or designs are simplified in order to accommodate the technology.

Digital printing has not only brought a whole new range of design imagery and style within the orbit of the textile designer, it has also brought the ability to print an image on a much larger scale. In traditional printing techniques the template for a repeating pattern was restricted either by the size of the pattern block or by the size of the screen or circumference of the roller. By discarding the screen, digital print has changed the whole premise of textile design and the decision to use a repeating pattern may now be based upon a conscious desire to create a flowing visual rhythm that is pleasing and restful to the eye.

Traditional methods of textile printing have however produced an irreplaceable wealth of beautiful fabrics and should in no way be considered inferior to designs that have been created digitally. The evolution of technology is inevitable and computer aided design should be seen as simply another tool available to artists and designers. It is also to be hoped that the hand techniques used in the decoration of cloth will never be entirely replaced but used alongside digital methods. Creativity will always transcend the limitations of any method where technique is secondary to the achievement of a designer's vision.

As the first inkjet printers capable of printing on fabric were only capable of producing short runs their primary use was to generate exact reproductions of goods that were destined to be printed using traditional printing methods. At this point in the design cycle very little creativity was involved and the printer essentially served as a kind of glorified albeit sophisticated copying machine. Such samples were however valuable in facilitating print on demand so decreasing the need to stock pile goods as well as shortening the time needed to test a design idea and the realization of a final product.

Photography as Catalyst

One of the most important changes in style for modern textile design is the introduction of photography as medium for surface design. Dye sublimation or heat transfer printing which was the first viable method for printing full colour photographic images on to fabric was discovered in 1957. However the process only works with synthetic high polymer content fabrics, such as polyester. As a result of this innovation polyester garments printed using this new technology were the height of fashion during the nineteen sixties and seventies, reflecting the bright multi coloured aesthetic of the period. Dye sublimation continues to be the primary method used in the printing of swim and sports wear clothing today.

As software such as Photoshop was not yet available the first designers who began to experiment with the possibilities of using photographic imagery on fabric tended to use a style that was based on photo- montage or collage.

The ability to manipulate and transform an image digitally has meant that the incorporation of photography in textile design has now become much more sympathetic to the very nature of cloth as a material. Cloth is essential to our

everyday lives. It comes to life in a way that paper does not in that it moves and reflects light. Photographs formatted as for a print onto paper can appear as a stark incongruous statement when translated literally on to fabric. Designing a textile, ultimately intended as a decorative surface, often involves a very different sensibility from that inherent in pure photography. On paper, photographs are often intended as story-telling documents whereas the hybrid use of photography in textile design has now begun to create a very different style in which the image is subtle or abstracted - rendering it more mysterious.

Ambassadors of elite fashion, Jean Paul Gaultier, Gilles Rosier and Hussein Chalayan have used digital photographs as an elegant device for the embellishment of their creations. Although the prints used in the garments illustrated below are subtle and understated in terms of colour and imagery they are the focal point of the garments and perhaps even their *raison d'être.* Gaultier has added a level of mystery to his gown, drawing the viewer's eye into the textures and patterns in a digitally manipulated photograph of the frayed pages of antique books. The same is true of Chalayan in his creation of a print which when viewed from a distance, appears as an abstract texture but upon closer examination reveals itself to be an entirely different motif based on a photograph of broken glass.

Prior to the introduction of digital printing it was not possible to translate all the nuances and details of a photograph or painting on to fabric. The ability of digital printing to reproduce millions of colours at a higher resolution than traditional printing methods has opened up an almost infinite range of design possibilities to fashion and textile designers.

Trompe l'oeil is a style that particularly lends itself to digital surface design. Comme des Garçons and the French designer, Giles Rosier, have used this to full effect through the conceptualization of a garment and its draping on the body by printing a full-scale image of a dress upon a dress. These images have been carefully engineered from photographs that appear almost as if they have been projected onto the model. London College of Fashion student Jula Reindell also employs a trick of the eye through the extreme realism of her humorous and surreal "hair cut " shirt.

Paul Smith is another pioneer of digital surface design, using inkjet prints in both his men's and women's wear collections. True to his trademark use of bright yet sophisticated colour his designs make reference to tradition while also being very modern in their impact. The majority of Smith's digital textile designs are photographic in style.

Painting and Digital Print

In the same way that digital printing has made it possible to accurately reproduce a photograph on to fabric it has also meant that all the details and subtleties of a painting or drawing may be captured in the final print. Hussein Chalayan demmostrates this with a subtly rendered futuristic print for his Spring Summer 2009 collection. The tonality and blending of the colours found in this design, the motifs of which are somehow suggestive of machine parts, although possible would be difficult to capture using analogue technology. The old master-style oil painting used in Chalayan's Autumn Winter 2008 collection also illustrates digital printing's ability to render the subtle nuances of a painting as does the water colour style print by Etro.

<u>Digital Tailoring</u>

The fact that digital printers are easily able to accommodate large scale designs coupled with the streamlining of other technologies such as body scanning and automatic pattern generation means that an increasing number of designers are using engineered prints as part of their collections. Such integration of print is becoming as vital to the designer's vision as the form of the garment or product itself, due to the immediacy and spontaneity that digital tools afford. Notable designers of the twentieth century such as Sonia Delaunay, Emilio Pucci and Gianni Versace favored engineered screen-printing. These designers knew that their garments would be perceived as being more luxurious if a placement print was employed as such designs are more costly and time consuming to produce. More recently Tristan Webber, Jonathan Saunders and Basso & Brooke have employed the technique using digital textile printing.

The print used by McQueen's dress in his Spring Summer 2008 collection was inspired by the feathers of exotic birds and epitomizes the way that the use of digital tools facilitates tailored prints. The different colored bands of overlapping feathers have been laid out so that they circle the model's waist and then spread out to fit the skirt as it widens. Such an "engineered" print requires careful planning and accuracy in its draftsmanship.

To the same end a group of designers, from the Fashion Science Research Hub at the London College of Fashion collaborated in order to explore the ways that state of the art technology could be used to create a one-of-a-kind garment where the use of a carefully constructed digital printing as a means of embellishing a garment adds to the perceived level of value and luxury of the piece.

Graphic Styles

The cross-disciplinary use of graphics programmes, digital photography, video stills and special effects by a hybrid generation of young designers is creating a new look for printed fabrics. As the generation that has come of age in the digital era, many young and emerging designers have begun to use digital prints in their collections. For some it provides a natural foundation in the conceptualization of their work, seamlessly integrating their other design skills as graphic and illustrative artists into the creation of each piece of work.

Hussein Chalayan's name has long been synonymous with technology and his use of digital print goes far beyond the obvious decoration of a garment. His seemingly effortless use of graphics emphasizes the sculptural form of the garment itself. The graphic style of his "robotic" dress is emblematic of surface design in the digital age. London College of Fashion student Georgie Ichikawa also attracted attention through the bold use of prints that were the focal point of his MA collection.

 "The Garden of Eden" by Heather Ujiie was exhibited as a large-scale wall hanging at Moore College of Art, Philadelphia, USA. The piece demonstrates Heathers considerable skills in draftsmanship and her elegant graphics are again representative of the new design styles that are emerging.

 The Revival of The Textile Industry

As the cost of a large format inkjet printer is considerably less than the equipment necessary to set up a rotary screen-printing plant, many small digital print bureaus

are emerging that specialize in the printing of textiles. Bureau printing services provide an invaluable resource to students, independent designers and larger commercial companies alike. The potential markets for digital textile printing ranges for example from the fashion industry, through costume and set design to interior design and the recreation of antique textiles to be used in museum conservation. Some bureaus operate out of an artist's loft while others are set up like small factories with multiple printers, catering to a growing demand for innovative and unusual products.

These small businesses will support the growing demand for designer and bespoke goods and may result in a revival of the textile industry in countries that have lost their fabric production to Asia. An example of a bureau currently operating in the UK is Elanbach founded by Sir Bernard Ashley formally of Laura Ashley. Elanbach offer their own line of exquisitely coloured home furnishing fabrics as well as a custom fabric printing service for any artwork provided by the client. The company's home furnishing designs are semi customizable as the client may choose from a range of coordinated palettes. Prince Charles recently commissioned one such design by Elanbach.

There are at least 13 digital print bureaus currently operating in the UK only 2 or 3 of which are capable of offering mass production. As the lead-time for completing an order is usually 2 weeks this suggests that demand for printing exceeds the combined capacity of bureaus in the UK. The market is wide open and there is room for growth in this area. Heat transfer printing aside, banner and signage printers tend to print on to synthetic substrates where the end result is not washable and as the use of PVC is increasingly discouraged due to it's effect on the environment it would

be advantageous for such businesses to invest in the kind of specialized digital textile printing technology described in this paper.

Perceived Value

Perhaps the true worth of digital surface design and print in a world of throw-away fashion is in the creation of designs that will be kept and treasured by the consumer. The hand of the designer will speak through the uniqueness of each piece. It may be hoped that aesthetic values will play an increasing role in our sense of well being as the trend towards considerate design gains momentum. Shopping from the high street ultimately dresses us as clones and the ability of digital printing to aid in the creation of limited edition products should aid in the celebration of the individual. The images included in this paper speak for themselves in illustrating the way in which surface designers are currently using computer-aided design in conjunction with digital printing. They are developing a more mature style in which these digital tools are beginning to come into their own.