Textile Design Education in Digital Inkjet Fabric Printing

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Abstract

Historically textile-printing technology has changed the style and workflow of the textile design field.
In addition to the conventional printing workflow, digital fabric printing technology has now created two new textile design workflows: 1) Digital strike-offs and 2) Full digital production.   These two structural production shifts have influenced the definition and methodology of printed textile design in both the commercial industry and the textile education field. Textile designers of the future will be trained in short run-production samples, individual entrepreneurship, as well as have a broader understanding of the definition of textile design. Ultimately, the study of textile print technology will have an impact on a designer's creativity and business sensibility, and this is the core for a successful textile design education.

Introduction

The success of an innovative textile designer is twofold: first, an exploration of original ideas, and secondly an understanding of print design marketability and technology. Until now, textile designers have provided original designs to manufacturers, jobbers, and textile converters. These companies usually have their own design studios, which modify designs to their own production methods. Due to the new digital print production technology, textile designers of the future will have a more direct involvement from start to finish in the design workflow process.   A shift from the conventional workflow paradigm has created two new workflow developments: digital strike-off and full digital production. Textile education in the future will integrate these workflows into their curriculums in order to facilitate a more innovative and independent textile designer.

Conventional Textile Printing Workflow

In the existing conventional textile design process, designers create patterns on paper, which are inevitably translated into a limited number of spot colors and repeat sizes for printing. The number of transferring devices such as, rollers and screens specifically dictate the amount of colors and repeat sizes. Once the jobbers, converters, and manufacturers have acquired these patterns, they are sent to the engravers for translation into the printing process. Engravers, who are affiliated with the print mills, use CAD systems to digitally scan these paper designs into spot color separations. In general, these color separations are translated into separate films, in which opaque black motifs represent each spot color for printing. The number of spot color films directly corresponds to the number of screens. After the engraving process is completed and approved; the printing is executed at the print mills. Sampling and proofing the engraved patterns before actual bulk production is critical: this process is called a strike-off. The strike-offs are often sent back and forth between the engravers and design studios for approval. For the final production, print stylists go to the printing mills to approve the final strike-off before the bulk production is executed. Millwork is a lengthy and laborious process for the stylist, who works (along with the mill) on 24-hour shifts. This process requires an excellent knowledge of conventional printing methods, including a proficient understanding of matching the color, repeat, and style to the original pattern. This workflow is still the mainstream of the textile industry today. A thorough knowledge of conventional textile printing technology is instrumental in the qualitative outcome of manufactured cloth. Informed professional design decisions are based on work experience, and more importantly, from a well-rounded textile education.   For this reason, a proper textile education should include a strong foundation in color, repeat making, and design aesthetics, as well as an understanding of the printing process. Hands-on skills for mixing and matching paints to fabric swatches, accuracy of repeat making, and a fluency in drawing are all essential components for success in the professional workplace.
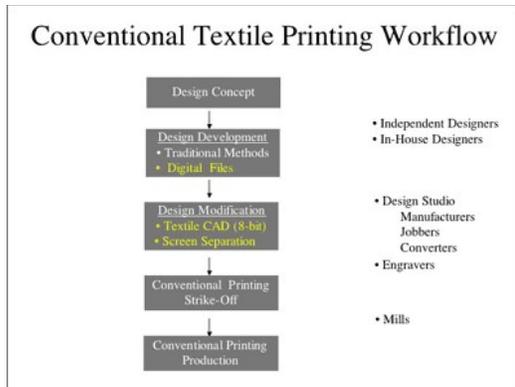
Figure 1. Conventional Textile Printing Workflow

Digital Strike-off Workflow

For the past several years, a new digital strike-off workflow has been integrated into the conventional printing and marketing process. Instead of using conventional printing techniques to create strike-offs, (where engraving processes are needed); manufacturers have begun to utilize large format digital inkjet printers to create digitally printed strike-offs. In this workflow process, manufacturers can use digital strike-offs for market testing only, without having to go through the conventional engraving screen process. Thus, only the marketable designs proceed to be engraved and produced by conventional methods. In contrast, every conventional strike-off is engraved into screens for printing, even though approximately 40% to 60% of them make it into final production sales. Obviously, the advantage for utilizing digital strike-offs is that the new process eliminates extra engraving costs, which can sometimes save the companies millions of dollars. At the same time, quick design alterations can be made in a short response time to market needs. For the most part, this is the most dominant use of digital textile printing today, and has continued to gain popularity. In addition to strikeoffs, sample making has become another popular outcome of digital inkjet printing technology. This is demonstrated in the domestic Bedding and Fashion industry, where they both assemble printed samples for presentation in tradeshows. A buyer's decision can more easily be persuaded if dress samples and bedding ensembles are available for viewing. As soon as business is established, and orders approved, the digital design samples are sent to the engravers and mills for conventional production printing. It is foreseeable, that in the near future, once digital production has a lower cost factor and higher printing speed, this printing and marketing process will have larger ramifications in full-scale bulk production. In the textile education field today, implementation of digital printing technology will allow for a more comprehensive understanding of the textile design workflow process. The concept of a digitally printed, one of a kind sample opens a brand new arena of design aesthetics and job classification. Designers today have the opportunity to demonstrate viable personal work, which is digitally printed on fabric to prospective clients. A new breed of independent entrepreneurs, with access to digital printers will be able to produce their own limited yardage. Unlike technicians at mills where conventional printing takes place, designers will be able to function as their own quality control technicians. Designers will be responsible for operating and maintaining their own printers in their own conveniently located design studios. Unlike conventional printing, digital printers do not occupy a lot of space, are environmentally friendly. They can also be extremely convenient to the designer if they are located inside of major cities, instead of at specific printing mill sites. Textile Design Education should emphasize an understanding of CAD software, and technical know-how on the mechanics of digital printers. For the digitally literate textile designer, knowledge of digital color theory and the creation of custom color profiles, leads to superior color management. Today's textile job market demands a thorough knowledge of operating CAD, and most design studios implement digital design software and CAD labs into their facilities. An effective digital textile education should include an understanding of manipulating and editing designs on CAD, scanning in images, and utilizing digital cameras. Textile designers today should know how to manipulate repeats and create color ways in reduced 8-bit spot color. Digital literacy is mandatory for successful competition in the current textile market, whether for individual entrepreneurial success, or for industry standards. Therefore, textile education needs to be on the cutting edge of new developments in digital printing technology, and impart textile students with current technology information.
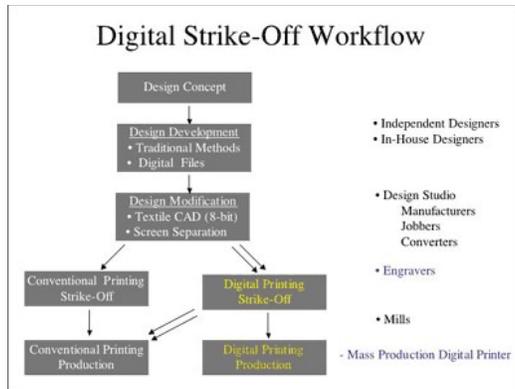
Figure 2. Digital Strike-Off Workflow

Full Digital Production Workflow

In the current textile printing market, many textile printers are forced to be more competitive due to the world wide economical slow down. Competitive survival depends on finding a niche in order to differentiate themselves from their peers. As previously mentioned, one business solution is the advent of the digital printer. Digital production fabric printers have been under development for a while, and they will be introduced into the mainstream soon. Full digital printing workflow, with production quality digital textile printers, allows for more original designs in a short run production capacity. This type of printing process has more flexibility in terms of style and mechanics. In other words, any photographic image, or tonal design can be articulated without mechanical limitation on the number of color screens or the repeat size. This differs dramatically from conventional printing methods, and offers a competitive edge for the textile printer. Individual designers can create their own short run printed textile collections, unlike traditional printing, which requires long run printing and high engraving costs.   Most significantly, because of the digital printing process, the definition of textile design will be broadened into a larger category of surface design. Digital technology will allow surface designers to virtually print any image, or colorant, on any type of substrate surface. For this reason, textile/surface design will most likely integrate more experimentation between the tactile surface and printed image. A more innovative exploration between surface and print elements will introduce a "new" look in textile design. Not only will the surface change, but also the design motifs will no longer have to be in specific repeat sizes, allowing for experimentation in scale of figure to ground. One of kind digitally printed fabric has the potential to be exhibited as installation pieces, advertisements, stage sets, and art objects.   It is an exciting time for textile educators today. Textile designers have the potential to be both technicians and cutting edge designers in today's job market. The sequencing of current curriculums should include problem solving in specific computer software, as well as formal study in the principles of art and design. CAD systems such as Adobe Photoshop should be reinforced because of the 24-bit color possibilities and flexibility in visual effects. Textile designers will learn to broaden their preconceptions of textile design to create design work with a more cross-disciplinary outcome. Collaboration between architects, fashion designers, and graphic designers will be encouraged due to the digital inkjet printing capacities. To illustrate; a textile designer could easily collaborate with an architect, by creating an installation of printed fabric into an entranceway of as specific building. In the future, the creative possibilities will be endless.
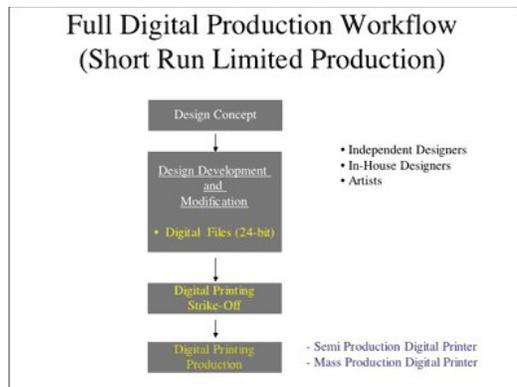

Figure 3. Full Digital Production Workflow

Conclusion

The year 2000 was a pivotal year for the introduction of production digital printers. Because of the new digital inkjet printing technology, today's job market will possibly change from a few major textile mills, to many smaller diverse independent textile-printing shops. Digitally trained textile designers, will have more flexibility to work in smaller printing shops, large mills, or as independent agents. Above all, the aims of an effective textile education should reflect currently established concepts of textile design, as well as developing new technologies. These include:

A) Understanding traditional textile design principles such as hands-on painting, repeat making, color, and stylization
B) Preparing all students for CAD related procedures in the textile industry
C) Informing future designers on the full digital and conventional printing technology
D) Researching current trends in the Textile Market

In order for innovative designers to reach their full creative potential, activities in science and technology should be integrated with culture and aesthetics. Textile design does not come from the void, and designers need to go beyond what is currently happening and create new trends. Designers should constantly be researching in magazines, newspapers, museums, websites, etc., to come up with new ideas and concepts. Above all, the scope and sequence of an effective textile education should encourage problem solving in digital inkjet fabric printing and cutting edge design concepts.
 Sample Works

Sample 1. Sample of Digital Strike off
*Printed by McDermid Colorspan Fabrijet, Stacy Testa ©2001*

Sample 2. Sample of Digital Strike off Collection
Printed by Encad 1500 TX, Laura Robinson ©2000

Sample 3. Sample of Digital Printing Collection
Printed by Mutoh falcon, PrinterLaura Slote ©2002

Sample 4. Sample of Design for Full Digital Production, Tonal Application
Printed by McDermid Colorspan Fabrijet Carol Kanopinsky ©2002
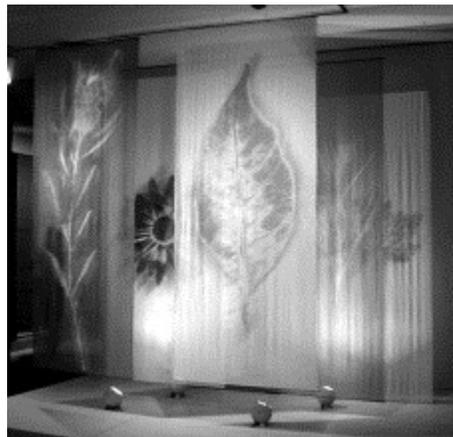
Sample 5. Sample of Design for Full Digital Production
Non-repeat Image for Exhibition at The Textile Museum, Printed by Mimaki Tx 1600, Hitoshi Ujiie ©2002

References

1. Joyce Storey, Manual of Dyes and Fabrics, The Thames and Hudson, London, UK, 1978.
2. L.W.C. Miles, Textile Printing, Dyers Company Publications Trust, West Yorkshire, UK, 1981.
3. *Textile Chemist and Colorist & American Dyestuff Reporter,* pg. 26-27. October (2000).
4. *Textile World,* pg. 49, April (2001).