Digital reflection; the integration of digital imaging into the creative practice of printed surface pattern and textile designers.

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Summary:

This paper discusses the findings of the first phase of phenomenological research into the impact of digital imaging on the working practice of artists and designers of printed surface pattern and textiles. The issues discussed involve the changing visual language, hybrid craft techniques and the impact of electronic communication.
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Cathy Treadaway is a surface pattern designer who has worked digitally since 1982 and has been an exponent of CAD for surface pattern and textile design within UK art education since the early 1980’s. She has worked as a freelance designer for industry worldwide for the last sixteen years and has exhibited regularly internationally.

As Research Assistant (Textiles) and part of the research team at the University of Wales Institute Cardiff, School of Art and Design, she is investigating the impact of digital imaging on printed textile practice. She writes and lectures on the subject and has a number of papers pending for academic publication.

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Abstract:

Early phenomenological research into the impact of digital imaging on the creative practice of artists and designers of textiles and surface pattern indicates three key areas in which its deployment is initiating change in surface design. These include the development of a new visual language, the evolving of processes and craft techniques in the elaboration of surface and the use of digital communication, Internet and email as an integral resource in the generation and dissemination of work.

This paper seeks to explore issues fundamental to the changing nature of practice that arise from the integration of digital technology. New material sourced from case study research, informal recorded interviews, meetings, and personal correspondence, illustrates the way in which a selected group of individual innovatory artists and textile practitioners are using digital technology in their working practice. Reflection upon the creative strategies deployed and the visual outcomes produced indicates several emergent issues. These include the implications of working in virtual rather than physical space, the difficulties posed by the lack of global true colour fidelity, and the way in which the digital workspace is impacting on creative practice. The digital functions of cut and paste, layering and the ability to record and iterate the actions that build the surface are influencing the visual nature of the work created. This along with the rapid production of virtual surfaces is stimulating new methods and processes in their physical elaboration.

Historically, technological innovation has been instrumental in changing the visual dynamics of the final textile or surface outcome. Digital technology is likely to prove no exception. Problems, difficulties and concerns that are highlighted indicate areas of current and likely future research in this field.
Digital reflection; the integration of digital imaging into the creative practice of printed surface pattern and textile designers.

In a world of rapid technological change there is little time to pause, reflect and evaluate its effect on the creative working practice of artists and designers or the inherent social and psychological implications. When the opportunity is provided to do this, insights into the nature of creative practice that have both personal and universal epistemological implications are revealed. This paper discusses some of the emergent issues resulting from the first phase of phenomenological doctoral research being undertaken at University of Wales Institute Cardiff, School of Art and Design, into the creative use of digital imaging by printed surface pattern and textile practitioners. These issues include the development of new visual language and craft techniques in the elaboration of surface; and the integration of digital communication into practice as resource for generation, collaboration and dissemination of work.

Although a significant body of knowledge exists concerning the technology and techniques used in the printing of textiles and related media, there is little published research on the affect that digital imaging is having on the creative process, working methods and artefacts produced. The main focus of this study is on creative working practice; it seeks to reveal the ways in which practice is being changed and if and how creativity is being affected. Research carried out by London Institute at the end of the millennium confirmed through quantitative data that a number of textile artists, studio designers and agents were making use of digital imaging technology in their practice (Jenkyn Jones 1999). The human issues and aesthetic implications of working with technology are however, best approached by a qualitative phenomenological research methodology. Through the process of watching and analysing creative practice it is possible to bend the metaphorical light of experience back into the mind...
of the practitioner in order to create a bridge between experience and learning\(^1\) (Reed 2003). It enables a practitioner to move forward in their creative journey learning from their experiences (Schön 1987). Artists and designers practice this tacitly in much of the iterative experimentation that formulates their creative process, but they rarely have the opportunity to be objectively observed and analysed in their reflection. This is the purpose of phenomenological research, which seeks to explore the nature of the experience as exhibited in its visual and physical outcomes\(^2\) (Cazeaux 2000). To achieve this kind of observation it is necessary to collate a large amount of visual data indicating the methods and techniques used in the innovation and building of the design concept as well as visual evidence of the final product. To achieve this, the use of digital technology has itself proved invaluable.

The first phase of the investigation has involved establishing areas of experience and expertise within the domain of printed surface pattern and textile design through both a literature search and field study visits. The Internet has proved useful in pinpointing areas of related research and in building networks of practitioners who are interested in the field and willing to participate in the project. Email communication amongst practitioners in different countries has provided a rich source of dialogue on the subject; it has also facilitated the fostering of invaluable research relationships. Without the technology the research into its implications would have been difficult.

As a result of citations in the reviewed literature, and at the suggestion of other academics and researchers a number of practitioners were invited to contribute to the initial phase of the project. These consisted of artists and designers working in a variety of ornamented formats who were consistent in their use of technology within their creative process and in their

\(^1\) Reflection is a term that is derived from the Latin *reflectere* meaning “to bend back.”

\(^2\) Cazeaux describes phenomenology as involving theories of how words relate to experience. “Those aspects of ‘our being’ normally regarded as physical, abstract and descriptively elusive, i.e. conscious thought, memory, the actual ‘having’ of experience, Merleau-Ponty declares can be shown to unfold from our condition as beings physically immersed in the world.” Mikel Dufrenne comments, “Thus the artwork expresses a world in the sense that it lets us see the structure of experience.”
decoration of surface using printed output at some stage in the production of their work. In order to identify commonalities between practitioners a set of questions has been devised to explore practical, psychological and philosophical issues that may impact on the creative process. This forms the basis of the research interview and provides stimuli for the dialogue. A map, diagram or visual description of the creative process also informs the analytical verbal reflection of the creative journey (Lawson 1997); each practitioner is asked to describe their methodology from generative idea to end product in this way. An example, produced by the textile artist Alison Bell during a case study interview, of this can be seen in fig.1. The information from these diagrams helps to communicate to the researcher the approach taken during the creative process and also aids in the practitioners self reflection so that they are well placed to describe their journey in detail at a later stage. It also provides a standard to differentiate between the self-perceived route described and the actual practice as it occurs.

3 A debate about false consciousness and rigor in researching practice has been ongoing on the JISC-LIST summer 2003. The use of the expression “to identify commonalities” is used by Jan Coker 03.10.03 http://www.jiscmail.ac.uk/cgi-bin/wa.exe?A1=ind0310&L=phd-design

4 The diagram contains few words, but those that have been used are of paramount importance. They include “Colour” which is written along the central core of the diagram and “Curiosity” which has been placed inside a box to highlight its importance. The central strand is branched, each ending with a question mark, indicating the many questions that provoke, distract and enhance the creative flow. Bell states that it is not these branches that are important to her but rather the flow or rhythm that they punctuate. This she has described her method using a flowing curved line indicating that the process is not inherently linear or direct. Rather it is contemplative, winding and sometimes slow.
The video recording of case studies and field study interviews has provided visual evidence of the impact of the digital process on work in practice and resulting artefacts. It is from these interviews and case studies that the findings of the first phase of the research have been drawn.

**Digital Imaging - Tool and Medium**

Computer aided design technology has been used and developed by industry as a production tool to speed up processes and reduce manpower for economic benefit (Leak 1998). In the printed textile industry CAD systems have been used predominantly for scanning existing artwork rather than creating new designs; for the reduction of product lead times and to facilitate communication of design data between departments and suppliers (Crawford 2000). Early software was often unfriendly and unresponsive as a creative tool and more suited for its use in the manipulation of hand rendered imagery for pre-print production. Developments in the software and hardware over the last decade have provided affordable systems that give textile practitioners freedom to innovate design concepts electronically once they have mastered the software tools and begun to explore the digital medium.

In order to be creative in any medium it is essential to become free of technical constraints, to acquire a degree of fluidity with the tools so that the crafting process becomes ‘transparent’ and does not interfere with self-expression or conceptual development (McCullough 1996). The creative use of digital imaging requires the same elements of craft learning and practice so that its use becomes tacit knowledge comparable with skilled making in any other discipline (Harris 1999). The problem with the acquisition of tacit crafting skills is that they

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5 Harris states “software, run on a computer, provides a medium with its own aesthetic, open to the influence of ‘crafting vocabularies’, as is any other material.” Harris, J. (1999). Preparing a medium for the next millennium: The “crafting” of computer graphics: A textile makers perspective. Design Cultures 1999, Sheffield Hallam University.
require time to develop and mature (Dormer 1994). The opportunity to learn from practice, to reflect on mistakes or happy accident is not often afforded the computer user of the twenty first century. In a world of rapid change and tight deadlines, the software technology renews itself so rapidly that before one can be secure in the in-depth knowledge of a given package it has been upgraded, restyled and extended. Different transferable digital crafting skills are required to provide the ability to graze and pick and mix amongst software packages, platforms and devices.

The digital medium provides access to the focused knowledge and craft skill of countless others captured within the software (Dormer 1994). There is an inherent danger in working within the structure of this embedded knowledge. Marshall warns of being enframed in a particular way of thinking (Marshall 1999) and Dormer notes that by using embedded knowledge rather than acquiring skills for oneself, ‘it is possible to be trapped by other peoples thinking’ (Dormer 1994). It has been frequently noted that visual styles are evident as a result of the use of a particular software package, notably filters in Photoshop® (Candy and Edmonds 2002); the objective of any successful creative exploitation of digital imaging ought to be the determination to achieve the artist’s aesthetic objective rather than to conform to the software engineer’s logic (Braddock and O’Mahony 1998).

It is argued by some that to make best use of any technology it is imperative to understand how to craft without the machine first (Myerson, J.). The skills of hand rendering techniques, repeat pattern construction, and colour theories are invaluable in the underpinning of the

6 “One can say that computers of all kinds including those in automatic cameras, are a means of making available the effects of other peoples skills to an individual without that individual having to acquire them. However by acquiring no skills for oneself, then one is liable to be trapped by other people’s thinking” Dormer, P. (1994). The art of the maker : [skill and its meaning in art, craft and design]. London, Thames & Hudson.


8 Prof. J. Myerson cited in Peter Dormer “The Culture of Craft” Manchester University Press, 1997 pp11 “One needs a separate experience of making in order to use the computer software knowingly.”
technology for design creation. There is no doubt that a body of aesthetic knowledge is required to frame any creative enquiry with software or technology and this involves engagement with craft and kinaesthetic skill. Collingwood describes craft as being the physical manifestation of the cerebral activity of art making9 (Collingwood 1958). The computer provides the means of making this manifestation but in a virtual rather than a physical environment and the software provides the tools with which to do this.

The difficulties in acquiring tacit software tool skills, the dangers of being enframed in the engineer’s logic, the rapid changes in technology and the lack of time available to learn and explore the medium have doubtless discouraged some practitioners. For others however, the findings of the research indicate that fluency and transparency in software tool use is acquired through practice, play and proficiency in specific functions or tools. Most of the artists who have contributed to the research project to date commented on the difficulty in learning to use software; most claimed to be novices, to not have explored the software fully and to have particular functions that were used repeatedly if not exclusively. The most frequently used of these were copy, cut and paste and layering.

When working with physical tools many artists and designers develop a specialism in a particular range of techniques and it is apparent that software tools used in the digital medium are no exception. An example of this can be seen in the practice of the artist Charlotte Hodes10 who has used the cut and paste function as a major theme in her work. Her recent pieces presented at the Tate Britain June 2003, included the production of a collection of printed art

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9 “By creating for ourselves an imaginary experience or activity, we express our emotions; and this is what we call art.” Collingwood, R. G. and cited by Paul Greenhalgh in his essay ‘The History of Craft’ Dormer, P. (1997). The culture of craft : status and future. Manchester, Manchester University Press.

10 She has recently worked as part of the team from the London Institute exploring digital media in their art. “Digital Surface within Fine Art Practice” a collaboration with London Institute, National College of Art and Design Dublin and University of Art and Design Helsinki. Work produced was exhibited in the “digital responses” exhibition at the Victoria and Albert Museum, London. May 2002-March 2003.
wallpapers in which her themes are developed through a combination of electronic and physical cut and paste techniques, (fig.2). The concepts are explored on computer in Photoshop® through the manipulation of scanned and photographic imagery and output through a large format digital paper printer. The print is then manually intercut to explore the interplay between virtual and physical cut and paste.

The Digital Soup

The use of the cut and paste function has enabled Hodes to use more detailed imagery in her work. It has also made possible the conjoining of visual research from different formats, scanned textiles, photographs, and hand rendering into a single physical surface. It is this facility to virtually mix imagery captured in various formats, that has provided a source of inspiration for the work of many of the artists included in the research. The vast array of menu options, functions and facilities, devices for input of visual data: scanners, cameras, Internet,
video has been described as a digital soup\textsuperscript{11}. All contribute and can be blended together to
create a digital image, each one providing a range of options and new directions for the
embryonic work. The virtual layering of image is providing a new format for exploring
influences and inspiration for the generation of new ideas. Becky Earley (Chelsea College of
Art), described the role of the computer in the development of her visual concepts as ‘a
massive scrapbook, a massive sketchbook’ (Earley 2003). Working with a digital camera and
scanner she is able to make use of collected visual data from a variety of sources and blend
them into one in the electronic dimension. The ability to source visual imagery from the
Internet, collect photographs digitally and blend them with sketches and visual notes aids in
the speeding up of concept generation. The material can be gathered more quickly, with little
physical effort or expense and new ideas can be explored with ease and saved and stored for
future reference.

The layered and blended images facilitate the inclusion of more complex visual information
in a concept and for some it provides the means of making a more literal interpretation. This
approach is evident in the work of American textile artist Susan Brandeis (fig.3). She uses
both a physical sketchbook and photographs scanned and manipulated digitally to blend a
variety of images from a particular geographic location to convey her sensuous response to
that particular place. Her aim is to produce an image that gives the viewer multiple
simultaneous glimpses of the original location comparable with the way the eye informs the
mind, as it perceives a place in time. The computer facilitates a ‘more literal image’ of her
chosen visual environment (Brandeis 2003).

\textsuperscript{11} Professor Paul Coldwell coined the expression ‘digital soup’ at the Digital Surface Approaches to
current research in contemporary art practice International conference held at Tate Britain 26\textsuperscript{th} and 27\textsuperscript{th}
June 2003
The inclusion of more detail is changing the types of images that some practitioners are producing. Like Brandeis, Alison Bell’s imagery is the result of blended visual source material. Photographs, scanned images and textiles, hand rendered and computer generated line work are melted and mixed together in the virtual image through layering and cut and paste functions in Photoshop®. The result is radically different from the hand rendered painterly products of her pre-digital work in the amount of detail and line they exhibit (fig 4).
For many artists it is the manipulation and exploitation of the serendipitous moment that spurs on the creative progression in their work. The implicit logic of the computer does not readily facilitate this. However it is clear that through the development of virtual layers it is possible to engineer a form of spontaneity. Bell’s use of layering provides this as she builds each one and uses the eraser function to reveal and combine elements from other layers to produce a new image.\(^\text{12}\).

The use of virtual layers enables the artist to try out colour combinations, line-work and imagery with speed and without financial outlay or commitment. For the indecisive this facility is not a bonus. The ability to step backwards and change layers and colours within an image makes possible an infinite number of variations from a single starting point. It is clear from those interviewed that it can provide a means for better expression but the decision making process can be exhausting (McCullough 1996). The design of a work does not necessarily speed up through the use of digital imaging. Bell comments in the case study research on her need to leave the work and reflect on it for a while before it is completed (Bell 2003). It is possible to become saturated with the decision-making process and lack the confidence to reach the stage at which the image is output into physical form. The reflective process in digital image building is therefore essential. The time that is required for this is not always available. For commercial designers working to deadlines reflection time is money and the perception that the role of the computer is to speed up tasks fuels the pressure that may inhibit the risk taking required for enhanced creativity (McCullough 1996).

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\(^{12}\) This is surely the informed spontaneity that Dormer claims that craft skill provides and artists and studio crafts people depend. Dormer, P. (1994). *The art of the maker: [skill and its meaning in art, craft and design]*. London, Thames & Hudson.

\(^{13}\) In Abstracting Craft, MacCullough asks:

Digital Printing

The use and development of complex multi layered digital imagery for printed surface is a direct result of recent advances in digital ink jet textile printing. The previous technical constraints of analogue printing need no longer apply\(^\text{14}\) and consequently the nature of the imagery used and its format are open to new interpretation. For a number of the artists interviewed for the research it is this enquiry into what pertains a textile design and the evolving nature and substance of textile imagery that inspires their work. Through the use of photography, scanned and digitally generated motif, Hitoshi Ujiie\(^\text{15}\) explores movement, scale, use and non-use of repeat, and placement of image on textile surface (fig.5).

\(^{14}\) The repeat of an image or pattern on cloth was historically necessitated by the circumference of the roller (the drop) and its width, which determined the size of the unit of repeat. The number of colours were also limited.


The use of photographic imagery on textile is not new but the recent ability to digitally print millions of colours on to fabric is inspiring artists and designers to combine photographic realism within their work. A number of the artists interviewed were using photographic imagery to explore the dialogue between image and its relationship with garment form. J.R. Campbell (Iowa State University) seeks to utilise design imagery in his work that is unconventional or which is placed on the garment in an unusual way. Themes in his work have included both natural form and man made structures through which he explores ‘the visual, cultural and technological aspects of digital textile printing as he creates connections between two-dimensional print design and three-dimensional garment forms’ (Campbell 2003). Like Campbell, Philip Delamore (London College of Fashion) is also using digital textile printing in the design and structure of the garments he designs. His interest is in the form of the garment and his work explores how the pattern pieces can themselves generate the surface pattern design.

Photographic imagery is also being used by some of those interviewed as an expressive means of communicating the narrative content of their work. The digitally generated and printed fabrics used by Michael James in his art quilts have made possible the inclusion of material that is more personal and appropriate to his themes (fig.6). Like James the beaded textiles of Amy C. Clarke make use of digitally manipulated and printed photographic imagery to convey her narrative. For James and Clarke digital printing provides the means of producing individual art fabrics, each unique and available for further elaboration. The computer makes replication of images simple but equally the economic production of original pieces, each one subtly different, is also possible.

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Changing Craft Process

The technology may provide textile artists with a simple means of producing a complex digital image on cloth, inspire new pattern forms and help convey narrative content of work but textiles printed using this process are judged by many to lack aesthetic appeal. Brandeis, Bell and Earley described them as being ‘flat’ and lacking ‘sensuous’ quality. This perception is a result of the lack of hands-on interaction with the cloth and dissatisfaction with the printed colour.

In his essay ‘The Work of Art in the Age of Mechanical Reproduction’ (1934)\textsuperscript{17}, Walter Benjamin uses the term ‘aura’ to describe the emotive element that is lacking in the machine manufactured product. The aura of a crafted product is a unique accumulation of responses to a material and is derived from the hands-on workmanship of risk involved in human manufacture (Pye 1964). The reaction of Bell, Brandeis and Earley indicates that they perceive digitally printed textiles to lack aura. Bell describes the print as being too ‘perfect’

and Earley stated that she regards a digital print as ‘a stage in between’ and advocated further embellishment or manipulation through other print techniques, embroidery or laser cutting. By implication, the additional hands-on physical work would reintroduce the element of risk to restore the desired aura of the piece.

The frustration with the digitally printed outcome has led to a new enquiry into surface ornamentation via various craft techniques. Susan Brandeis describes how her embroidered fabrics result from her desire to ‘convert the monologue of the machine printed product to a dialogue between artist and cloth’ (Brandeis 2003). For Brandeis this dialogue is essential in her work and something that must be reclaimed through subsequent elaboration by hand to ‘endow the work with a powerful emotional charge’ (Wilson 1998). This emotional connection is both satisfying to the maker and ultimately perceived and valued by its audience. Like Brandeis, Bell also describes the need to physically interact in the embellishment of the textile and this is done through the further application of colour, stitch and appliqué by hand to the digital print. For Amy C. Clarke the digital manipulation itself has influenced the crafting process. Her beaded textile art makes use of the light reflecting quality of beads and this corresponds to the light emitting pixels of the monitor. The photographic imagery is adjusted and digitally printed to provide the substrate onto which the beaded image is constructed using an ancient North American spiral craft technique (fig. 7). Clarke, Brandeis and Bell combine digital technology with their craft techniques to develop new hybrid practices. The ability to incorporate complex multi layered images through digital printing inevitably changes the visual outcome of the created artefact.
Developing Visual Language

The changes in the characteristics of expressed visual language within the domain are becoming evident in the nature of the imagery used, the complexity of image produced and the vocabulary of colour. Briggs and Bunce contend that throughout history the legacy of technological change has been the adoption of stylistic change into the textile design practitioners’ visual vocabulary\textsuperscript{18}. Each change creating ‘a visual language that contains a wide range of dialects and which expands as new developments occur (Briggs and Bunce 1995). Briggs argues that the use of photography and digital imaging in the design of printed textiles is producing a ‘new visual language’ (Briggs 1997).

Most of those interviewed for this research have felt strongly that the use of digital imaging in their process is changing their visual language (fig.8). Bell describes it as a ‘totally new visual language’ comprising ‘colours, textures, surfaces, subtleties’ and Hodes describes it as being ‘completely locked into the technology.’ However, she feels that it is not a ‘digital language,’

\textsuperscript{18} An example of this is the way in which floral designs have dominated printed textile designs since the importation of Indian prints in the seventeenth century. The emulation of techniques and stylistic influence resulted in the European ‘Indienne’ designs that were subtly adapted visually to suit a European market. Prior to this floral motifs did not predominate.
‘the computer is simply a tool in the process.’ The visual words are being rearranged into a new sentence; new paragraphs are being built in visual forms through the software that would not have been possible any other way.

![Diagram of visual language](image)

**Fig. 8 Diagram of visual language**

Perhaps the most evident manifestation of this development in visual language is in the use of colour. Earley describes her digital textile work as being ‘radically different… the use of colour is more ambitious, it’s more varied, the amount of texture and detail within one design is much, much broader. ….The inclusion of so much detail and colour on one piece of fabric is what the language is all about.’ (Earley 2003) Previous printing techniques provided the textile designer with limitations of scale, structure and numbers of colours that could be printed. Digital printing has removed most of these constraints and provides the means to make physical almost any virtual image. The communication of colour within the language is not, however, without its problems.
Colour, Communication and Collaboration

The lack of sensuousness of the digitally printed textile can be attributed in part to the lack of depth in the colour. The findings of the research indicate that frustration with the colour output compared to the colours viewed on the computer screen was a major factor in the desire to manipulate the surface further using additional hand painted colour, stitch or appliqué. The colour problem arises from the fact that computers are capable of producing up to 16.4 million colours; far more than the human eye can see. This vast colour range available on the monitor inspires practitioners with the desire to achieve the same results as printed product. The colour output from the computer monitor is manifested as a result of additive optical mixing of light whereas printers are using the subtractive colour properties of dyes. The disappointing output from digital printers is due to the disparity of gamut with that of the monitor\(^\text{19}\). Colour is also changed by the substrate onto which it is printed and the light source by which it is viewed. There are many variables in the colour equation.

Colour is also a psychophysical phenomenon\(^\text{20}\) and as such is difficult to quantify and communicate between media and to other people. Sight is not vision but is a subjective response to a sensory stimulation\(^\text{21}\) (Leak 1998). The perception of colour is bound up with

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\(^{19}\) Leak writes: Printers create colour by subtractive optical mixing, the majority using a mixture of cyan, yellow and magenta inks…The printer is unable to reproduce all the colours that the average human eye can see. While some colours are common to both devices, there are printer colours not covered by the monitor and vice versa” Leak, A. (1998). A Practical Investigation of Colour and CAD in Printed Textile Design. Nottingham, Nottingham Trent University.


\(^{21}\) ‘Research into colour vision emphasises that colour depends on the action of the individual’s subjective brain, therefore, the sensation that is colour is caused by the brain interpreting signals sent by the eyes when reacting to light, but light is not colour…Designers using systems, soon realise that there are restrictions in terms of colour and, therefore, they work with and around them, dependent on the specific working context’ Leak, A. (1998). A Practical Investigation of Colour and CAD in Printed Textile Design. Nottingham, Nottingham Trent University.
the activity and the environment in which that activity takes place\textsuperscript{22}. For practitioners concerned with how to deal with these issues there are two approaches. The textile industry is seeking to address this by working with software providers to establish world standards in colour communication that will enable the rapid transfer of accurate colour data globally and between platforms and media\textsuperscript{23}. For printed textile designers whose work is directly involved in informing others in the production process, the ability to communicate accurate digital colour will be of great benefit\textsuperscript{24}.

For those outside industry the huge difficulties of metamerism, light sources and reflective surface of substrates are of minor concern in comparison with the basic problems inherent in the communication of colour from the computer to the printed output without calibration tools and colour management software. The practitioners creating textile art interviewed have unanimously taken the view that this problem is too big to concern themselves with at this stage and each one works with the colours produced accommodating the issue through iterative adjustments or additional hand rendering of colour into the work through dyes, stitch or appliqué. The findings of the research reveal that difficulties in the translation of digital colour frequently provoke creative exploration. Artists work with what they get and allow this to stimulate the imagination further.

\textsuperscript{22} “Visual perception is better conceived as the visual guidance of activity in an environment that is constituted largely by that very activity” from Ways of Colouring, pp 352 Noe, A. and E. Thompson (2002). Vision and mind ; selected readings in the philosophy of perception. Cambridge, Mass. ; London, MIT Press.

\textsuperscript{23} This immense task is being tackled by the Society of Dyers and Colourists in conjunction with the American Textile Chemists and Colourists Committee C2C (Communications Subcommittee-Electronic Standards Sub Committee)

\textsuperscript{24} Software developers, such as Lectra, have been actively engaged with those in the textile colorant industry to develop software that will manage colour through the design manufacturing and distribution network and the use of this and similar packages are being advocated within the industry. The difficulties being encountered centre upon the need for global standards within software and the certification of standards once defined. This is an area of intensive and urgent research since even white does not have an internationally agreed standard.
The ability to communicate accurate colour data between systems will be invaluable for those practitioners who are engaged in collaborative design. For industry on-line artwork is an important advantage in this respect. Digital designs can be viewed around the world instantly saving costs in both carriage and time and can be visualised by other members of design staff as well as those involved in marketing and manufacture. The digital production of designs also facilitates rapid alterations without costly preparation of revised artwork; colours can be changed, repeat and scale altered rapidly. Surface pattern designs can be integrated into pattern cutting and merchandising software, saving time and providing accuracy in visualisation. This process has been described as ‘design by committee’; numerous people are involved in the whole design process and each one contributes to the decision-making process (Crawford 2003). Rapid communication of visual data combined with the interactive potential of the technology is changing the way designs are created and the ability to share and communicate visual design information is making commercial textile and surface pattern design development increasingly collaborative.

Communication of design imagery between software applications and between practitioners has provided opportunities for collaborative creative design partnerships. In the USA the collaborative work of textile designer J.R. Campbell and fashion designer Jean Parsons is a good example (fig.9). Their research into digitally engineered prints at Iowa State University makes use of photographic imagery, digital manipulation, and digital fabric printing to produce customised ‘art to wear’ garments. Email and Internet sites are facilitating collaborative projects between designers from different countries around the world providing ways of sharing imagery as well as professional support. The Internet is also

25 Craig Crawford, Director of Technology at Liz Claiborne Inc used this expression in his presentation to the Hands-On Surface Design Conference, Kansas City, 2003
26 Elaine Polvinen (Buffalo State College, New York) has been producing printed textile designs with Shen Li (Capital Normal University in Beijing), and Yimeei Wang (Fu Jen University in Taipei) exploring the possibilities of email and Internet for global collaboration Polvinen, E. (2003). “West meets east: collaborating across continents.” Surface Design Journal 28(1): 16-21.
opening up opportunities for the marketing and sale of bespoke garments, textiles and artefacts; increasing the communication between designer and client; facilitating artist and audience engagement.

![Fig.9 Cathedral Coat, engineered digital print - J.R. Campbell and Jean Parsons](image)

**Findings**

The findings of the first phase of the research indicate that the creative use of digital imaging is changing the visual outcome of the artefacts produced in a number of ways. A visual language is emerging that contains complexity of colour and image that until recently had not been possible on cloth. For some artists the limitations of the medium in providing the desired aesthetic outcome have resulted in the hybridisation of digital and craft techniques: forging new processes and providing new means of expressing narrative. For some this involves the use of stitch, thread and appliqué and a desire to intervene into the digitally printed fabric surface. The elaboration builds both the colour and textural qualities of the artefact and
provides additional opportunities to enhance the narrative content of the work. The imagery that can be digitally printed has the potential to reflect a more personal and direct narrative as the artist has greater freedom in its production. The facility to include photographic and scanned imagery provides an increased repertoire that can be used to convey the narrative. Traditional textile techniques are being combined with new digital processes: hand painting and stitching combined with digital craft and print (fig.10).

The technology is providing greater communication between designers, technicians and clients and the ease with which design concepts can be visualised and communicated is leading to an increase in creative collaborative engagement between practitioners. Email and
Internet access are speeding up the communication process reducing costs and facilitating decision-making.

The findings identify areas for further investigation. Many of the practitioners interviewed expressed frustration with the computer interfaces. Mice and keyboards feel alien and unresponsive; software can be expensive and difficult to learn. The hands, which are so important in traditional textile crafting skills, are deprived of the sensory stimuli that feed the mind and imagination. The eye follows the cursor on the monitor rather than the hand, as it does when drawing with a pencil, and the flow between hand, eye, tool and material experienced in hand crafting is disjointed in time and space. The findings of this research reveal that the practitioner’s desire to kinaesthetically intervene in the creative process has resulted in new craft practice that combines digital imaging within it. It is likely that as a result of current research into the humanization of technology future software and peripheral devices will enhance the physical crafting of the digital image itself.

The opportunity to reflect on creative practice has been a valuable experience not only for the researcher but also for those who have contributed to the project. For individual practitioners it has provided an opportunity to understand the how their concepts and working processes are evolving as a result of technology. The self-perceived design method, illustrated by the process maps produced during the research interview, does not emphasise the importance of reflection. It is evident, however, that each phase of the design process may stimulate new ideas each requiring a new set of choices to be made. Digital imaging has been shown to speed up concept generation, print production, and communication but its intensive decision-

27 Scientists working in the area of human and machine haptics at MIT and Media Lab researching into the humanization of technology were recently involved in a three-day symposium with Haystack Mountain School of Crafts “exploring the hand as it relates to aesthetics, expression, craft and technology.” Seelig, W. Ibid. “Digital Dialogues: technology and the hand.” (1 Pushing the Edge): 6-11.
making demands on the practitioner mean that making time for reflection must be regarded as an essential part of the creative process.

References


