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Citation: Gaston, Elizabeth (2017) Crafted Futures: A Craft/Technology Collaboration. Journal of Textile Design and Research Practice, 5 (2). pp. 157-174. ISSN 2051-1787

Published by: Taylor & Francis

URL: <https://doi.org/10.1080/20511787.2018.1449074>
<<https://doi.org/10.1080/20511787.2018.1449074>>

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Crafted Futures: A Craft/Technology Collaboration

ABSTRACT

Crafted Futures is a craft/technology visual response to William Gott's Dyehouse Pattern Book produced in 1815 whilst Gott was an apprentice in his father's woolen mill. The work utilized craft practice to explore theories of color contrast, assimilation and optical mixing in color production. In collaboration with print technologist Muriel Rigout, applied craft thinking was employed in the development of the work, tacit knowledge of materials and skill were employed with formal color theory, using textile craft processes and digital print as a modelling tool. The project was important as an example of a craft/technology collaboration, identified as a driver for commercial growth. The success of the project was discussed in terms of individual research outcomes, the success of the visual response and the success of the collaborative process. The work was exhibited at Leeds Industrial Museum, Armley Mills, Leeds, 14th October to 27th November 2016.

KEYWORDS: collaboration, craft, digital technology, color

Introduction

This paper will discuss Crafted Futures, a collaborative craft/technology project from the point of view of a designer using craft practice in the design process. It highlights the importance of collaborative practice in a design methodology and situates the project within contemporary economic strategies.

Crafted Futures is a collaborative craft/technology investigation of color production developed as a response to historic representation of color research. It considered an original, joint outcome that was the result of two separate research projects. The commission was originally proposed as part of the Yorkshire Year of the Textile, an Arts Council England funded project at the University of Leeds which aimed to highlight textile history and contemporary textile research from across the county in any discipline through public art collaborations. Many of the rich textile collections housed in Yorkshire museums provided initial inspiration. William Gott's Dyehouse Pattern Book (this can be viewed at <https://library.leeds.ac.uk/special-collections-explore/57697/>) produced in 1815 whilst Gott was an apprentice in his father's woolen mill in Leeds and on display in the newly opened Treasures of the Brotherton Gallery at the University of Leeds was a key focus of the year of celebration. It was central to one of the first commissions of the yearlong project, a poetry response to the book by poet Linda France (2016). Elizabeth Gaston textile designer and researcher and Muriel Rigout, lecturer in print technology and researcher, both in the School of Design, University of Leeds were approached by the organizing committee to produce a visual response to Gott's pattern book to be exhibited at the Leeds Industrial Museum at Armley Mills, Leeds, a partner in the Yorkshire Year of the Textile. Armley Mills already had an association with William Gott and had hosted an exhibition of dye experiments by the Heritage Dyers Group based at the museum. The group had reproduced Gott's original recipes to achieve a wide gamut of color on a variety of substrates.

Project Aims

It was recognized that the short lead time between commission and exhibition would preclude the development of a new project, unique to the Yorkshire Year of the Textile commission. The limited time available resulted in the integration of two ongoing projects that would be united through the public art project. Crafted Futures was a precursor to further research from both participants and a communication tool for research already undertaken.

Though colleagues, Gaston and Rigout had not worked together previously, however their common research aims explored the extension of color gamut in their preferred medium; for Gaston knitted and stitched textiles and for Rigout print. The collaboration framed the two disciplines within the same research question; how can color gamut be extended through manipulation of a narrow spectrum of materials?

Gaston's previous stitch commission was a textile response to the research of structural biologist Michael Levitt the inaugural speaker in the Astbury Conversation, a biennial biological sciences research symposium at the University of Leeds, UK. This work explored her doctoral findings on color and pattern manipulation in knitted fabrics through stitch. The Astbury commission utilized craft practice to explore the theories of color contrast, assimilation and optical mixing in color production. Layered stitch of varying size and density was used to create a wide gamut of color from a limited palette of threads. This practice echoed Gott's nineteenth century color mixing experiments with dyes and was a natural vehicle for exploring his work.

Print technologist Rigout sought to investigate the breadth of color gamut available in digitally printed natural dyes using madder and indigo. The dyes were based on Gott's original recipes and printed using a Fujifilm Dimatix Materials Printer which enabled a diverse range of materials to be printed on a variety of unconventional substrates. This allowed Rigout to produce innovative digital printing inks from natural sources. The final work incorporated further color manipulation through stitch over digital print.

The Importance of a Craft/technology Collaboration

A craft/technology collaboration was timely. Craft as a notion has romantic connotations of a past rural idyll, of lone artisan practitioners, producing bespoke items that are far removed from ideas of mass production and low cost; craft as the antithesis of progress (Frayling 2001; Adamson 2010). Since the advent of industrialization, which introduced the division between design and making, the currency of crafts has lost its widespread value as a commercial necessity in the production of functional products and has become a niche commodity accessible to a few (Dudley and Mealing 2000). However, as Frayling (2001) identifies, there is more to craft value. He re-reads the Bauhaus manifesto of "return to craft", suggesting that craft is more important than industry, as "turn to craft", emphasizing the position of craft as a planning or modelling tool in industrial production. The concept of craft as a catalyst for commercial growth is currently being explored by the Crafts Council who commissioned "Innovation through craft: Opportunities for growth" (KPMG 2016). The report identified craft/technology collaboration as a prime driver for economic development. The report highlights that the iterative nature of craft production has the potential to develop "open innovation" through collaboration and that active collaboration with technology is key to commercial success and wider social and economic benefits (KPMG 2016).

Digital Craft

The technology strand of Crafted Futures was situated within digitally printed textiles. As early as 1996, McCullough had counter-intuitively identified digital technology as a craft process on two

levels. Firstly, he recognized that to use digital processes effectively required skill and creativity; that a digital interface is essentially a tool, with no distinction from a needle in textile crafts or a hammer in metalworking. It still requires human interaction. Secondly, the use of a digital interface may also enable small producers to compete with large manufacturers who have an economy of scale within their production process (McCullough 1997). This use of craft and technology for commercial growth is exemplified by Unmade who use the latest Shima Seiki Wholegarment© knitting machines to produce individual bespoke garments for individuals and short production runs for small businesses.

The collaborative use of technology in craft undertaken in Crafted Futures differed from McCullough's view that the use of digital technology is a craft in itself. Instead traditional concepts of craft located in materials and process utilized technology for innovative production. Collaboration within craft is not new despite the pervading view of the craftsman as lone practitioner. Historically craftsmen were organized into guilds, sharing knowledge and marketing. Contemporarily the production of a bespoke couture fashion requires a range of skilled craftspeople, cutters, beaders, embroiderers, etc. all working on the same piece and contributing individual expertise. Crafted Futures was collaboration between participants from independent specialist areas, each contributing different but equally valid expertise, in a similar approach to commercial design practice (Eckert and Stacey 2000). Furthermore, Gaston and Rigout were initially not directly concerned with the same outcomes; each was investigating a specific but different outcome in the same process so both had control of their own practice.

Applied Thinking; Craft as a Methodology

Perhaps the most interesting aspect of Crafted Futures was its use of craft as a methodology for design. The Crafts Council view of craft as a catalyst to economic change negates the traditional view of craft as an historic practice and situates craft in the future, positioning it as a tool for applied thinking and problem solving. This articulates what has long since been understood by craft practitioners. In 1970 Hepworth described her left hand as her thinking hand as opposed to the motor actions of her right hand, intimating that decisions made during the physical making of her work was inherent in the overall design of her sculpture (Hepworth 1970: 79). This echoed the design practice in Crafted Futures, where a deep understanding of theory and process was used tacitly in the production of each visual representation. Whilst the tacit knowledge developed through experimentation and iteration in making has great importance in the generation of new ideas, personal tacit knowledge is notoriously hard to articulate which can be hugely detrimental to the success of collaboration (Barrett and Bolt 2010: 3). The lack of common language as a bar to the success of a collaborative project is recognized by the KPMG (2016), but they do not offer a solution.

Methodology

There is potential during a craft/technology collaboration for misunderstanding not only in the different language used by participants but also in the methodology used for problem solving. Technology traditionally sits in a positivist paradigm where a defined question can be verified or falsified with a single answer that is revealed through deductive reasoning; this can be articulated verbally. Craft has an inherently broader approach to research and development, using divergent thought processes and abductive reasoning; results are often communicated through product or exhibition. The division in the teaching of specific subjects from an early point in children's education, where pupils are identified as either "arts and humanities" or "science" has resulted in a lack of an overall awareness of the differing methodologies employed in both creative industries and technology.

The dominance of Positivism as a problem-solving strategy in western research has led to a devaluing of alternative strategies and this can act as a bar to successful collaboration between practitioners using different types of research methodology.

Positivism emerged from two differing philosophical approaches to research, empiricism and rationalism. Empiricism argues that all knowledge is generated by observation and experimentation; this can be repeated and verified. It is evidence based and utilizes convergent, inductive reasoning to reveal a correct answer. In contrast, rationalism situates the generation of knowledge internally. It utilizes the deductive of mathematics and logic to produce knowledge that is independent of experience (Thompson 1995). Emmanuel Kant (1724–1804) reconciled these two opposing philosophies by recognizing that evidence identified during experimentation using an empirical approach was interpreted internally through rationalist methodologies. This dual approach was furthered by August Comte (1798–1857) into the positivist approach to research; it considers reliable knowledge to be objective, consistent and observable and produces immutable laws that reject intuition and tacit knowledge which are inherent in design research (Barrett and Bolt 2010; Howell 2013).

Design research methodologies can refer to research-for-design which would include the acquisition of information to support the production of a product, based on technical specifications, functionality and aesthetics. In this discussion design research or research-through-design is the generation of new knowledge that emerges during the design process. It is “is a process of investigation leading to new insights, effectively shared” (HEFCE 2011). This broad definition of research from the Higher Education Funding Council of England provides veracity to less conventional research methodologies providing that the knowledge generated is useful to its intended audience. The knowledge produced experientially during research-through-design may be tacit and personal, it is developed through iteration and revealed through reflection on the process of designing. Design research embraces the Bergsonian concept of intuition used in conjunction with deep and pluralistic research as a methodology (Watts-Cunningham 1924), and utilises abductive reasoning which reveals what could be rather than a definitive single answer. A key difference between the use of a positivist research methodology and a research-through-design methodology is the concept of creativity and originality. In design, originality is valued and outcomes that are repetitive are considered derivative whereas in positivist research outcomes that are repeatable are a specific goal of the research.

The Crafts Council (2016) recognize that different approaches to research can be detrimental to effective collaboration however in Crafted Futures Gaston and Rigout recognized the similarities between the two research methodologies rather than focusing on the differences. Primarily, positivist research and research-through-design both generate new knowledge, and the practices of the two frameworks clearly overlap. The iterative process employed in design reflects the empirical approach employed by positivist research. Where differences did occur, their experience as colleagues allowed them to acknowledge the expertise of the other in their field of practice and respected the different problem-solving methodologies and modes of communication used. In new craft/technology collaborations a period of establishing trust between the partners is necessary to develop a thorough understanding of each practice.

In Crafted Futures this occurred naturally. Also in the initial staged of the project the two strands of practice remained separate and that each participant completed their element of the project independently. Whilst this was a successful solution in this project considering time restrictions, it should be acknowledged that greater understanding can be developed where there is an exchange of practice with each contributor and if this occurs successfully, collaboration results in an outcome

that would not be possible individually. This is exemplified by the trans-disciplinary craft/dance project Side by Side (Carnac and Diallo 2012) where artist Helen Carnac and dancer Laila Diallo explored each other's practice to extend their own, echoing the modernist ideas of Elsie Fogerty (1937) who questioned whether an artist in one medium can extend the practice of an artist in another. In a review of the project both Gaston and Rigout expressed a desire to collaborate again but with a more trans-disciplinary approach which has the potential to produce wider and more unexpected outcomes.

Communication

Fogerty (1937) also recognized the importance of clear communication and shared language in a successful collaboration. Differing communication channels were identified as one of the main differences between positivist and craft based research (Gaston 2016) both in the language used during the project and the dissemination of results. This was evidenced in the early stages of the project, where the initial project discussion and was framed around an exchange of practice. As a visually literate practitioner, Gaston took a visual approach, consistent with a craft/design methodology. She brought a broad selection of work to the initial meeting to explain not only the techniques she used but also visually demonstrated how she made design decisions utilizing an evolutionary methodology. At this meeting she expected Rigout to be able to make visual links between her previous work and her initial ideas for the Crafted Futures project. Rigout used a verbal approach to explain her practice, describing in precise language the equipment she expected to use and actual recipes for dyes that she would be using; this is consistent with a positivist methodology. Any negative effects caused by a difference in communication styles was reduced by the clarity of the aims of the project articulated through a clear research question however this was serendipitous and reflected the participants prior knowledge of each other's work and that both participants are experienced educators and communicators. On reflection greater focus should have been given to communicating initial ideas and this would be particularly important in a collaboration with previously unknown partners.

The outcome of the project was already confirmed as an exhibition of visual art. This followed the aims of the Yorkshire Year of the Textile, of which Crafted Futures was part of, to explore the textile heritage of Yorkshire through public art interventions. As an outcome this was familiar to Gaston but superficially outside of Rigout's experience who conventionally uses journal articles to communicate her research findings. The use of a visual methodology in positivist research can be seen at academic conferences during poster presentations of research ideas, however these usually contain varying amounts of text and do not rely solely of visual imagery.

Phase One: Separate Projects

Inspiration

Both participants had undertaken individual research on the Gott pattern book and again both participants had approached this differently. Rigout took a textual approach her research, she studied the recipes included in the book, investigating the historic practice of color production and its application to twenty-first century technology. Her aims were specific, to produce a printing ink based on the natural dyes used by Gott. Gaston approached the work visually and was particularly interested in the materiality and three-dimensionality of the book. Her aims were less defined and she undertook a broad investigation of color manipulation with no specific outcome in mind. An online resource provided by The Treasures of the Brotherton Gallery at the University of Leeds, which presented a digital image of each page of the book, was important to each practitioner

(<https://library.leeds.ac.uk/special-collections-explore/57697/>). The original manuscript is currently on display under glass and so only one page is available concurrently. The digitization of Gott's original work enabled Rigout to study each recipe but perhaps the greatest impact of the digital images was on Gaston's work. The arrangement of thumbnail images of each page on screen allowed the whole book to be seen simultaneously in a way that would have been unimaginable to Gott. This global view of the book was influential in the form of each piece.

Material Use

The two strands of the project were linked through material use for the substrate used by each participant and this referenced the Yorkshire woolen industry. The project was kindly sponsored by A. W. Hainsworth based in Pudsey, West Yorkshire, who have been manufacturing since 1783, and therefore contemporaries of Gott. During a visit to the mill, Gaston and Rigout selected a range of fabric weights to experiment with. They selected an undyed melton (100% merino wool, plain weave, 275gsm), with off-cuts of Hainsworth's finer weight merino cavalry twill (100% merino wool) in air force blue and a heavier weight melton (100% merino wool, plain weave, 340gsm) in scarlet, referencing Hainsworth's history of supplying military uniform fabrics.

Color

Gaston's previous color research was predominantly situated in knitted fabric, more specifically investigating the inter-relationship of color, form and the knitted stitch in the perception of pattern in Fair Isle knitted fabrics. Of particular interest was the instability of contiguous color produced through mechanisms such as contrast, assimilation and optical mixing. This work had employed a tacit knowledge of materials and process with formal color and pattern theory, using textile craft processes as a modelling tool. The outcomes were communicated in exhibition and performance as well as a traditional written thesis (Gaston 2016). This successful methodology was employed during the creative practice of Crafted Futures. (It must be noted that images of the fabrics may not display the same qualities as the original fabrics themselves.)

The primary aim of Gaston's research in Crafted Futures was to extend the useful color gamut that could be created from a limited palette of color. Previous work in stitch had identified the ability to exploit optical mixing which is commonly used in textiles. Warburton and Lund (1956) explored color effects in woven fabrics produced through juxtaposition and size of color units building on Chevreul's 1836 study on color contrast and color harmony based on his experience of dyeing tapestry threads. They demonstrated the widely used moderation of color in textiles through contiguous color use was the result of size and proximity of discrete color units. This was exemplified in Crafted Futures by the work shown in Figures 1 and 2. The first image demonstrates a broad range of color use where each stitched block is perceived as one of eighteen different colors and the second image shows the limited palette of ten threads that they were produced from. The ten threads have the potential to create approximately 1000 subtly differing colors if three different threads are used in each blend.

Figure 1 Color palette created by optical mixing. Source: Photograph Elizabeth Gaston.

The new work produced for Crafted Futures furthered this work on optical mixing through a wider exploration of the effect of stitch density and assimilation on color perception of optically mixed color based on a limited intuitive palette. Initial tests using a dense seed stitch over a colored background created conditions that promoted assimilation, where contiguous color is perceived as more similar to its neighbor rather than contrast effects where the difference in contiguous color is perceived as being stronger (Figure 3. In test samples this caused the color of the stitch to become

more like the background, for example the yellow stitch on a yellow background appeared “yellower” and “pinker” when viewed on a pink background. The pink stitch on a pink background became “pinker” and “yellower” when viewed on a yellow background. This occurred when the thread and background color were similar in terms of hue and saturation (White 2010).

Figure 2 Blend of original thread color. Source: Photograph Elizabeth Gaston.

Figure 3 Test swatch demonstrating assimilation of color. Source: Photograph Elizabeth Gaston.

Assimilation occurred less in the final pieces when a more saturated color was used in the background however using the scarlet background emphasized the variation in hue modification that could be achieved through varying the stitch density (Figure 4). Experimentation with size and density of a simple seed stitch produced textural and tonal differences in blocks of color.

An unexpected visual effect that was achieved was the appearance of illusory brightness in areas of negative space in the stitch. This effect causes background areas with a low spatial frequency (no stitch) to appear brighter than the background when it is surrounded by areas with a higher spatial frequency (dense stitch) than when the background is viewed in isolation, further extending the palette of colors achieved through stitch manipulation (Kanizsa 1979) (Figure 5).

Rigout focused on developing a range of primary color inks starting with red using madder as a dye and blue using indigo as a dye (Figure 6). These dyes were selected for their widespread availability. The inks produced were dilute in terms pigment content and were printed at four strengths, the strongest being 100% ink at 65 DPI. Both colors were printed on pre-mordanted un-dyed melton. Alum (potassium aluminum sulphate) was used as the mordant for the madder and sulphuric acid was used as the mordant for the indigo to create the saxon blue discussed in Gott’s original work. Pre-mordanting the fabric was problematic in terms of the finished print in that drying the pre-mordanted fabric before printing would affect the effectiveness of the mordant. Due to time constraints there was a three month break between applying the mordant and the final printing which allowed mildew to form on the fabric causing discoloration. To create a stronger depth of color the test samples were over printed. Two test pieces were produced, one red and one blue. At this stage in the project it was anticipated that Rigout’s research would be extended and that there would be the opportunity to discuss the form and depth of color produced. Unfortunately due to time constraints this didn’t occur and the final work was produced on the initial test prints.

Form

The form of each piece of Gaston’s work was informed by the layout of pages in Gott’s original manuscript. This was revealed when digital images of the separate pages were viewed concurrently on screen. The form of the pages was explored initially in paper using mark making and intercutting in a variety of media. The final form wasn’t a direct representation of a particular page but an amalgamation of ideas from several pages. The color used referenced both the color in Gott’s original work and the color used in the exploratory paper research. In many cases the form of the fabric swatches in Gott’s pattern book appeared as negative space in the paper work and consequently in the final works.

Rigout used a formal arrangement of test squares arranged in four rows of five squares, the color in each row being progressively stronger (Figure 6).

Materiality

Gaston's initial interest in Gott's pattern book had been in the three-dimensionality of the book. Each page had swatches of dyed fabric attached to it which had added bulk to the book and caused page distortion. In some areas the swatches had fallen out and left only an imprint of the fabric. This was referenced in one of the final pieces. All of the stitch work was produced using a substrate of undyed melton fabric. The areas of stitch changed the materiality of the fabric, adding structure and reducing flexibility. Further three-dimensionality was created through the use of appliqué using the finer weight cavalry twill and the heavier melton.

Limitations

During the production stage of the commission the two projects separated and there was little communication between the partners about the development of the individual strands of work. This was not problematic in that the two defined projects had separate aims and could develop concurrently. The major drawback to the separateness of the

Figure 4 Optical mixing affected by stitch density. Source: Photograph Elizabeth Gaston.

Figure 5 Illusory brightness caused by differing spatial frequency of stitch. Source: Photograph Elizabeth Gaston.

Figure 6 The integration of print and stitch outcomes. Source: Photograph Elizabeth Gaston.

projects was a difference in time expectation. Hand stitch is an inherently slow process and as such for Gaston to be able to work with Rigout's experiments they needed to be completed much earlier in the process. Unfortunately, due to prior commitments and a series of unavoidable technical delays Rigout was not able to complete as much work as anticipated before Gaston started developing the final work for exhibition. This was a result of poorly defined planning at the start of the project in terms of communication of timescales required for the craft production. However as applied craft thinking was employed in the development of the work, with the outcomes determined by the craft process, the final outcome was not known at the start of the project reducing the ability to produce a defined timeline. The result of this oversight was that much of the early work in the project was completed using Gaston's work on its own.

Outcomes

Initially five pieces were produced and were exhibited at the Stanley and Audrey Burton Gallery, Leeds (4th May-17th September 2016). The first iteration of Crafted Futures did not include any of Rigout's experiments. The work was received well critically and was considered visually successful.

Phase Two: Integration of Practice

During the first exhibition period Rigout's initial print experiments were completed, allowing Gaston to produce an integrated outcome. The lateness of the print research resulted in no further development of the layout of the print. The discoloration of the printed fabrics caused by mildew resulted in the need to crop the prints and apply them to clean melton echoing the appliqué used in phase one of the project.

Color Manipulation

In the final piece, that combined the practice of Gaston and Rigout, the tonal levels of the print produced by Rigout approximated that of the initial stitched test pieces (Figure 3) that had clearly demonstrated assimilation. These experiments were extended in the final piece by over stitching the digitally printed natural dyes with a tonal range of yellow threads. Yellow was selected as the thread

color to complete the trio of primary color under investigation. Each tonal yellow used was stitched at a variety of stitch densities to create a graduated tonal stripe. Again, the form of the work was inspired by the layout of Gott's pattern book as seen in the digitized global view of the pattern book when viewed online. It was interesting to note that the different densities of stitch produced resulted in different optical effects being observed. The work demonstrated optical mixing in areas of high spatial frequency (high density stitch) but assimilation in areas of lower spatial frequency (lower density stitch), indicating that the stitch density had an effect of color manipulation in stitch (Figure 6).

Further Outcomes

In preparation for the second iteration of the exhibition (Figure 7), which was held at the Leeds Industrial Museum, Armley Mills (4th October -26th November 2016,) Gaston returned to both the manuscript and to France's poetry response to the manuscript for inspiration for two final explorations. Had more printed fabric been available they would have represented further collaborative outputs however as the pieces were Gaston's work, she adopted a more playful approach to color manipulation and presentation. In the poem written by Linda France at the beginning of the research process, France situated Gott's research into the political and social context of 1815. She selected many of the color names cited by Gott to describe his experiments, and used them as a refrain throughout the poem. This was used to inform color choice in the last two pieces of the series with particular reference to the lines "lavender, peach, Saxon blue", "fustic, indigo, madder" and "lilac, salmon, bronze" (France 2016). This color range was used to produce stripes of color using combinations of three separate hues. In a further experiment Gaston produced a colored stripe with two colored areas. Again, the optically mixed color was produced from three separate hues, with lavender and peach colored threads consistent across both color areas and the third thread being different in each color area, bronze in one and yellow in the second. This produced a very subtle color difference which was in contrast to the large visual difference between the yellow and bronze. Gaston's background of knit design and research was also evident in the final two pieces which referenced her original color research, albeit in process (knit) and not technique (Fair Isle). Using knit Gaston described the form of the color swatches in Gott's manuscript both three dimensionally and in texture, exploiting the form production properties of knit. Stitch remained the focus of the color work.

Evaluation

Crafted Futures was evaluated on three levels, in the first instance as an outcome of two separate research projects, secondly as a visual art outcome and finally the success of collaboration was assessed.

Success of Individual Projects

Gaston and Rigout both sought to increase the color gamut available in their chosen medium. In this research, success of the development of understanding revealed during the making process was measured intuitively using practice based assessment. Both participants were satisfied with the outcomes of their work but could clearly see the possibility for an extension of practice.

Due to time constraints Rigout successfully digitally printed a tonal range in only two colors using natural dyes. The color was fast to basic wash tests but was not tested for light fastness. The color and form of the print was clear but there were problems with staining of the printed fabrics. A continuation of this project would extend the color range attempted and resolve technical problems revealed during the fixing process. Gaston confirmed that much of the pattern perception findings

revealed during her doctoral research (Gaston 2016) was relevant to the stitch undertaken in this investigation. This was particularly pertinent to optical effects such as assimilation and optical mixing. The work demonstrated that not only color but stitch density was important in the creation of new color. A continuation of this project will investigate color production through stitch using a more controlled methodology using clearly defined criteria, echoing a Positivist approach. This may provide a deeper understanding on which to base further creative practice.

Success of Public Art Outcomes

The outcomes of Crafted Futures were exhibited in two respected regional galleries, in both instances to critical acclaim, confirming the visual success of the project assessed using Dickie's Institutional Theory (Warburton 2013: 163). The project is also cited in *Connecting Threads* (Cassé and Jones 2017), a publication celebrating the Yorkshire Year of the Textile.

Success of Collaboration

Perhaps the success of a collaboration should be measured by the willingness of participants to work collaboratively again. By this measure

Figure 7 Crafted Futures exhibited at The Leeds Industrial Museum, Armley Mills (2016). Source: Photograph Elizabeth Gaston.

the collaboration in the production of Crafted Futures was successful with both partners expressing their desire to continue with the project in some form. There were of course some problems, in particular the lack of communication of the timescales of production necessary to complete both of the separate research areas. Clearer communication of expectations from both partners would be required in further work. The project was fortunate that no conflicting ideas of either creative practice or research strategy/methodology arose, but this would be an area to consider carefully in further craft/technology partnerships. The identification of a craft/technology collaboration as a driver for economic growth was not explored fully in this project and it is expected that a more trans-disciplinary approach to further work will allow the development of commercial outcomes. In this way the project revealed that the craft practice was perhaps not research itself, but a tool for experimentation that can lead to new understanding (Mäkelä and Routarinne 2006: 13–23).

Acknowledgements

The author would like to extend thanks to Dr. Muriel Rigout, The Yorkshire Year of the Textile, Leeds Industrial Museum, Armley Mills, Leeds, The Stanley and Audrey Burton Gallery, Leeds

Funding

This research has been funded in kind by A.W. Hainsworth, Pudsey, West Yorkshire.

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