

New Models for Design Management in the Textile Industry in Response to Direct Digital Textile Print Technology and Manufacture.

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With changes from 'analogue' to Direct Digital Textile Printing methods there are implications for Design Management within the textile industry. Through careful examination of the requirements of the end user, design solutions will present themselves within the seemingly endless constraints which will now start to present themselves to the textile designer.

Objectives

The objective of this research is to look at potential models of Design Management for the Textile Industry that will be useful as this industry struggles to embrace the quantum leap necessary to effectively work through the changes in manufacturing methodology. Significant and substantial research has already been undertaken in the area of Design Management. This research has provided models of Design Management that have been implemented in many types of businesses and methods of manufacture. The preliminary findings show little or no evidence of the implementation of these Design Management models being implemented in the textile industry.

Given the existing models of change in Design Management that have been effectively implemented in the Printing Industry (paper and boards) I believe that considerable parallels can be drawn with the changes facing the Textile Industry.

Methods

Human nature is such that in order to fully understand a concept or philosophy it is necessary for us to experience these in a tangible way. Through the research undertaken in the Design Management area of printed paper manufacture this research will capture a persuasive and tangible set of illustrations of successful Design Management models. Through analysis of current textile manufacturing models coupled with these accessible and functional models that can readily be executed and integrated into the Design Management area of Direct Digital Textile Printing in textile manufacture.

The 'real time changes', (to be discussed in relation to research presented by Yamashita and Bodden) that are necessary within any corporation are organic. Today the resultant effects are more holistic in their reach across the various divisions within the company than has been historically the case. Leadership that embraces and impacts on vision, communications, brand, customer service and the culture of the company are prerequisites to keep the company on line and moving forward in the correct direction.

Objectivity, rather than a more subjective approach to working through the design process is key to designers understanding of their role in any corporate team. A collaborative synergy is paramount in the highly competitive global market place for designed product. Creative thinking and knowledge coupled with sound analysis and excellent communication skills are integral to sound Design Management.

Main Findings

One or two key factors that are crucial to Design Management emerge as important aspects of this research. These are leadership and internal organisational structure. If one considers the two notions of a flat management structure as opposed to a hierarchical model, it poses the question of finding the appropriate point of management for the implementation of the Direct Digital Textile Print sector of a given company. When considering the findings of David A. Owens, in his analysis of hierarchy in design teams it appears that even in a flat management structure it is critically strategic who is selected to manage this new aspect of design within the organization in order for it to have successful implications for the company. The goals of the company, embedded in its brand philosophy may influence the choice of person or position of the incumbent of this potentially strategic role.

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Introduction:

This paper is based on initial research including a literature review of the management of digital printing processes and technology in the paper and textile industries. For the purposes of this paper I will use the scope of thought evolved from the Design Management Institute in Boston USA. Continuing research will be augmented by quantitative data analysis and comparative analysis of case studies and also research of the philosophical underpinning of these business ventures.

This paper is an introduction to the argument for a systematic approach to the impact of direct digital printing processes and technology on textile design using a design management model. It identifies various issues experienced in the paper printing industry which has adopted management strategies to accommodate these changes. Since literature in this field is in its infancy, an integrated strategy approach based on Hambrick and Fredrickson provides a starting point from which continuing research can develop a model for the textile industry.

Direct digital print on paper:

The use of direct digital printing on paper media today has a respected history spanning more than ten years. The pace at which this method of production has grown is exponential. We can attribute this to the variety of benefits that this method of production has been able to offer the field. The positive take-up of this technology can be best described by looking at the strategies that have been implemented to bring this production method to the fore, working along-side the 'analogue' methods of off-set and other printing methods on paper media and in some instances replacing these methods.

Integrated Strategy use:

The integrated strategies of sound business planning have been well documented in regards to digital printing of paper. A look at the web site <http://ep.pennet.com> can testify this. Articles published on this site from experts involved in both the creation of these strategies and their implementation gives us considerable insight into the logic and success of these strategies. Similarly articles have been published in many academic journals testifying the approach taken by the paper manufacturers and those of the digital printer manufacturers. Looking at the five major elements of an integrated strategy which includes arenas, stages, vehicles, differentiators and economic logic, (Hambrick and Fredrickson 2001 : 50), the glue required to fix the strategy together are all found to be in place, well established and executed by the major players in the field of digital paper printing.

The geographical spread of take up of direct digital paper print production has been established in most of the major cities around the world, this is widened considerably if one also includes small scale and domestic pick-up of this process. The global pick-up of the process is testament to the varied suitability and sustainability of the breadth of application the process can address. Similarly the technologies used directly and indirectly are varied and diverse creating a diversity of responses to the value-creation chain for the businesses involved.

Print-on-demand:

A significant differentiator in terms of this type of technology can best be classified as 'on demand' practices as opposed to mass production. The constraints here are primarily to do with the availability of suitable stock to print on. In this regard there have been some noteworthy joint ventures which have worked through strategies to create significant benefits for the companies involved. These have been managed to strategic advantage, the value-creation stage, in placing digital print as a viable alternative and in some cases a superior alternative in the area of paper print manufacture.

It is these joint ventures or collaborations that some considerable design management benefits can be extrapolated, and implemented, from the positive results of these strategies that have evolved for the business of digital paper print, to that of direct digital textile printing.

Paper companies are experiencing a rise in the digital paper arena. Consumers, especially professionals who frequently print on offset machines expect that when printing digitally, they will be able to order papers with similar grades. Merylyn Dunn, director at CAP Ventures in USA reports, 'We did a survey a year ago last July and asked people how important it was for them to have paper for their colour digital equipment that are compatible to offset. We were stunned that 40 percent indicated that it was very important.' This can in some instances be attributed to the necessity of marrying these two methods of print production. It can also be attributed to the significant differences that continue to exist between available papers for digital print and that of offset print production.

Most digital devices work best with papers that have been digitally optimised, (pre-treated) for these machines. Monadnock a significant paper manufacturer periodically publishes a brochure called 'Edge' to educate customers on its papers. Xerox, Cannon, Stora Enso and IP all work hard to keep up with their customers' demands for better and wider ranges of suitably finished papers for digital paper printing, resulting in specialty papers which are now a standard for many involved in the paper manufacture for digital printing. This demand by a growing digital print market and a shrinking offset print market has seen many new and innovative products hit the market including an innovative, metallized polyester that will run through the Xeikon-engine digital presses. Printing on metallized substrates on digital devices is problematic because they conduct electricity and throw off a charge, but this recently developed substrate with its neutral charge prevents any repellent effect.

As quickly as digital print technology advances, paper suppliers try to meet the demands of the new devices and the requirements of their customers, both in terms of innovative products and in terms of cost and variety.

“As the variety of digital media increases for digital presses (plateless presses from Xeiko, Indigo, Xerox, IBM and A. B. Dick), and the types of possible applications expand, the gap between digital and offset printing narrows.”

(Hitchcock N. 2003: 1) She goes on to discuss the synergistic manner in which the paper manufacturers and the print press manufacturers are working together to overcome the many challenges that face them in this evolving field of print production.

The on-demand, ‘real-time’, challenge:

A critical example of this joint venture strategy is in the on-demand market. A requirement for paper manufacturers to supply papers on-demand for the printer has been recognised. The challenge has now been met by several paper suppliers. Being able to order papers on-line from Meadware, a major paper manufacturer, via their website, by the job in ‘real-time’ gives the print customers greater flexibility.

As an alternate to this strategic method of solving a new problem other paper manufacturers and printer manufacturers have treated this same problem in a different manner. Indigo a manufacturer of papers has changed the acidity of some of their paper range in order for it to be compatible with the digital print process. This strategy has the added benefit when using “untreated” papers for digital print, that there is now an additional cost saving with the elimination of a pre-treatment such as ‘Sapphire-treatment’, a cost saving in time and process. Another example of managing this issue in regards to improving the on-demand advantage of digital print and the paper supply, Xeikon, a digital printer manufacturer has managed the challenge by creating a press that can print on a wide variety of standard offset paper substrates. The strategic advantage here is one of both cost cutting and with a far greater selection of papers available for this process; an advantage is created in the extensive selection of substrates at a cheaper base price.

The strategic advantage:

Looking at the diversity of product that is now falling into the domain of direct digital paper print we see that there has been a significant shift in the range of products on offer. This is due substantially to the positioning of these joint ventures strategies in both paper production and in the manufacture of printers. Linked with these are the advancements of ancillary technology.

RIT in New York and PIRA in the UK have ‘qualified’ more than 1200 paper substrates for Xeikon’s duplex machines. There are also more than 400 ‘qualified’ substrates and 100 ‘authorised’ substrates for the 320 D device and the DCP 500 press. What this means is that when a substrate has been ‘qualified’ or ‘authorised’ the quality level and scrip file inform the machine how to

run the substrate. Customers can download the scrip file from Xeikon's web site. When papers are authorized that means they have passed a quality test by the paper mill. Xeikon also tests the samples. With many more options in digital papers and presses, the applications are expanding. Niche markets are now in the domain of digital print on paper. The print on demand book market is one of these.

A further example of this, indestructible maps that are tear resistant, water resistant and almost indestructible are being produced by Color Concepts in Kansas in the USA. This joint venture was instigated by The Johnson County Wastewater facility in need of these indestructible maps and Color Concepts with input from Hanita Coatings with their 'Duracoat'. The solution is reliable, flexible and a more economical use of resources: An innovative design solution to a complex design brief.

It is increasingly substantive that the success of digital paper print is due to the nature of the collaborative enterprise strategies engaged in by these convergent businesses.

Direct Digital Print on Textiles:

Direct Digital textile Printing is a reflection of several unique and contrasting models that create challenges, threats and opportunities to the future markets of textile printing. Fabric, unlike paper, is a three dimensional structure and the ink and colorant requirements vary over a large range. While most digital textile print manufacturers produce equipment that boast the ability to print on all fabric types, the fabrics, like their paper counterparts need to be pre-treated. There are a growing number of vendors offering a range of stock fabrics suitably pre-treated to suit a portion of the available market. According to research offered by Dupont, cotton is the most commonly printed substrate, (48 percent of print production).

Printed textiles offers some unique variables not found in the paper world of print and these include the following:

- More than six different common types of synthetic and natural fibres used in textile production each requiring its own dye/ink compatibility characteristics
- Textiles are porous, stretchable and textured
- Heavy wear, abrasion, water fastness and light fastness requirements
- The need for assembly of various parts to produce a finished textile piece i.e. a garment
- Touch and handle as well as look are important

Analogue printers continue to look at this technology through the existing workflow and throughput systems of 30 plus year old printing technology. They continue to try and replace products that have been conventionally printed with those that have been digitally manufactured. The result being more focussed on what digital textile print can't do as opposed to what it can do.

If we compare this with a pilot study that I conducted with a case study site in Sydney the growth of direct digital textile print in meters shows similar in growth. I looked at D.D.P. in Sydney and evaluated their growth over the passed 5 years. The growth of the market for direct digital textile print has grown exponentially over this period.

Similar ground between paper and textile digital print:

Pre-treatment of textile products prior to direct digital textile printing is necessary in order to create a suitable substrate that will handle all of the above mentioned variables of the textile medium. This is not vastly different from that of digital paper printing with one or two marginal variables; textiles differing with a greater variety of both substrate and ink chemistry solutions. Given this similar scenario there has been less complimentary joint ventures prevailing in the textile market in regards to digital printing.

A look at what are the liable drivers for this relatively new market and considering some of the strategic advantages, we can start to see that from a design management perspective that the anomalies are few.

In the article; "A Primer in Digital Textile Printing" Ross talks of 'agile manufacturing' referring to an integrated, on demand order and fulfilment process that includes the textile printing and product fabrication manufacturing process. To implement 'agile manufacturing' Ross states that one must have the ability to print, cut, sew and ship immediately on demand. This can dramatically change the way sewn product and other printed textiles are produced. Receiving the design and product information digitally and electronically, creating the finished goods, thus creating the potential for cost saving in the supply chain and a reduction in inventory and design risk in the marketplace. The theory here is a case of, real-time, design management, strategy for the printed textile business. The single most costly element in today's textile business is the holding of product and parts in anticipation of a sale. This system supports the process of mass production as the most economically viable solution. The manufactured goods are stock piled in staged production surpluses, and then are these finished products are sold at a tiered discount cost. This type of manufacture has always been accompanied by a high degree of risk in terms of selling the inventory at a sustainable profit. Direct digital textile printing offers a viable solution to deliver customised product on demand.

A challenge then for direct digital textile print, from a design management perspective, is that the textile element can be seen as nothing more than a new media for the wide format printing industry. The challenge can be described here for the wide format print industry is to learn about the textile industry. Similarly there is a challenge for the textile industry to learn about digital printing and the business models under which they can sell their products.

Substantive differentiators:

The most important of these anomalies is that textile patterns tend to be in a repeating format. The particulars of the repeating form need to be articulated in the digital file information in order for the printer to realise the end product to that of the designer's specifications. There are a given number of variables that lend themselves to the use of repeating patterns. This then becomes a prefix to the design file name. For example; Dragon-fly ½ drop 32 cm X 64 cm. Another anomaly and a particular to the textile print industry is the selection of a particular colouration; here we have another addition that is required to be integrated into the re-call of a particular design, repeat and colouration of a given design. The implementation of direct digital textile printing effectively requires rethinking the overall system of recall when a digital file is sent to a digital print facility.

A design management perspective:

From a design management perspective the challenges exist in both the area of wide format printing and in the textile industry. Taking the success of the partnerships and joint ventures with paper manufacturers and the paper printers where they have embraced the criteria of integration of externally oriented concepts to achieve their objectives; these businesses have successfully articulated the five major elements of strategy expounded by Hambrick and Fredrickson and are reaping the sustainable benefits.

Dialogue and focussed design management input between the relevant participants is imperative for the successful strategic placement of direct digital textile print in the business world. It is the job of design managers to work towards articulating these challenges and fostering the strategies necessary to maximise the benefits to this new business in the marketplace.

Models for the type of collaborative efforts required for suitable non compartmentalised silos within a business and its suppliers in the technology support area have been outlined in principal by such eminent theorists and business, software expert, Gene Thomas. Thomas' published model for this type of 'pictionary' solution for data recall can be sited in his paper, "Configuring Collaboration for Mass-Customization Manufacturers", 2003. MSI International-PowerShop ERP has similarly evolved a software solution that with modifications may suit the particulars of this type of specific design management challenge in the digital textile print business.

One area that raises a significant challenge for design management in regards to digital textile print is that of real-time digital data retrieval. If the work undertaken by such innovators of this type of digital data retrieval for digital paper print as WebNative Venture can be successfully adapted for the specific design specifications discussed earlier in regard to repeat and colourway, then there may be a solution for this challenge.

Conclusion:

By further researching the philosophical underpinning within the paper and printer manufacturers involved in this area and by making a comparative study

within the textile area, my hypothesis is that some informative anomalies will present themselves. By investigating this it is my intent to add question to the particular approaches necessary in regards strategy in the design management area for direct digital textile printing.

An initial investigation of the writings by Bookchin, in his developments on the philosophy of ecofeminist thinking speaks of a flourishing society, (here I am including business), as one where social relations are non-hierarchical. Bookchin proposes eliminating psychologies of domination to ensure that our relations will be reciprocal and benign. If we consider the strategies formed in the digital paper business, Bookchin's philosophy seems to have at first sightings some validity within the paper print industries. Can this be substantiated? What is the entrenched philosophy prevalent in the textile industry?

The continued convergence of IT with production systems remains one of the principle drivers to enable pervasive collaboration. Viewing digital print as a service industry, a system that encompasses the software, architecture, platforms and expertise to deliver services on demand may therefore be the key required for this emergent enterprise of direct digital textile printing.

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