How changes in technology stimulate the creative process

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Abstract

The role of the designer is not simply to translate patterns but to creatively interpret them. The pattern designer's creative choice of tools, whether pencil and paper or computer-aided design (CAD)/computer-aided manufacture CAM, is central to the realisation of two-dimensional (2D) pattern pieces into three dimensional (3D) garments. There is a need for research investigating the impact of integrating developments in technology on the creative processes and output of designers.

As pattern cutting technology has advanced, perceptions have changed. With CAD/CAM the creative aspect of pattern cutting often ignored; the pattern designer is now sometimes viewed as a mere technologist. Consequently, there is a need for the fashion industry to be reminded of the creative output and skills provided by pattern designers. Furthermore, there is a lacuna in knowledge surrounding how technical tools impact on design processes. The hypothesis behind this research is that CAD/CAM can foster and galvanise creativity in the designer and enhance their outputs rather than merely speeding up processes.

Through a review of literature in this field, this paper investigates the interplay between changing tool technology and creativity, and how tools are utilised by designers to realise their own creative potential. This interplay invites consideration of whether or not a pattern designer's creativity is affected by the tools selected. As technology becomes more sophisticated and designers become fluent in its use, it is now being used to interpret pattern designs before they are even cut out. This is explored through reflective and critical examination of designers' tool use and consideration of how appropriate tool choices best support and enhance the process of creating garments.

Keywords: creativity; creative process; digital technology; CAD/CAM; pattern design

Introduction

The effect of digital technology on the design process is as yet poorly understood. Pattern cutting is the translation of designs to actual garments and designers are now frequently interacting with technology during the design process. This paper will consider the degree to which the use of different technologies (in this case pen and paper and CAD/CAM) can stimulate the creative process and lead to a greater understanding of the 'ill-defined' (Cross 2008: 94) problems in garment design. It will consider aspects of material productivity together with creative intelligence as it is applied to pattern cutting and design.

The tools that are used by the pattern designer, like many design tools, have evolved over the years and increasingly we are witnessing a blending approach which draws from both physical and digital practices. In order to translate designs into a reality the designer needs to choose tools and materials,

all of which have an impact on the outcome. Tools (paper and pen and/or CAD/CAM) are used by the pattern designer to create garment templates that are then transformed into reality (the garment) by using materials (the fabrics) and the imagination (the design).

The questions that need to be considered are, is CAD a neutral tool in the design process? or does it stimulate different ways of visually thinking or restrict the creative process? As noted by Barbara Bolt (2010: 29-30) when discussing what she terms 'material productivity',

> *Materials are not just passive objects to be used instrumentally by the artist, but rather, the materials and processes of production have their own intelligence that come into play in interaction with the artist's creative intelligence.*

Research that uncovers how this intelligence is developed and applied would improve our understanding of pattern cutting and its resultant outputs.

As with many of the creative arts, fashion design plays a pivotal role in reinventing the new. Designers deal with 'ill-defined' (Cross 2008: 94) problems, that do not have logical solutions. Fashion and pattern designers aim to create garments for clients that they predict they will desire based on future fashion trends. The designers' abilities thus lie in being creators of the future, '...design is about invention rather than inquiry into the nature of what exists...' (Parsons and Campbell 2004: 88). As a result of societies continuous focus on improvements and creating 'the new', digital based tools are increasingly being adopted by fashion and pattern designers. These changes to date have mainly focused on the speed and efficiency of the production processes. For fashion and pattern designers the creative benefits of digital tools as they move garments from 'imaginary' to 'reality' may have been overlooked. As argued by Parsons and Campbell (2004: 88):

> *...the use of new technology forces designers to expand their understanding of the design process and alter methods for designing, thus potentially generating new products.*

As the interpretation of pattern designs through technology becomes more effective, we are witnessing an altering and blurring of the pattern development stage. The impact of technology on designers' envisioning designs, has been studied by many researchers (Allen and Evans 2012; Bilda and Demirkan 2003; Bunnell 2004; Evans and Allen 2012; Lawson 2002; Pan, Kuo and Strobel 2013; Parsons and Campbell 2004). Tracking digitally savvy fashion students Allen and Evans (2012) and Evans and Allen (2012) highlighted how they co-designed on research projects with their tutors. They investigated the journey of self-discovery that students and tutors engaged in when researching and the impact of restricting access to the digital environment. Evans and Allen suggest that students often have the instinct to digitise whilst tutors are more likely to return to the physical. Evans and Allen evolved a concept of '...a notional pendulum of learning that needs to maintain a momentum to cope with the ebb and flow of our digital and physical environments' (Evans and Allen 2012: 304). These findings suggest that combining and shifting between digital and physical environments may also enhance creative output when designing. The role of computer programmes on creative three dimensional (3D) pattern prototyping processes (Cambridge 2013; Page 2013), garment sizing, prototyping and fit (Gill 2015) has also been analysed to a lesser extent.

Research into how traditional (pen and paper) pattern cutting methods may inform new technological methods (CAD/CAM) however, has yet to be found and subsequently there is a gap in our understanding of how two-dimensional (2D) pattern tool usage may impact on the pattern designer's creative design process. Such research would establish knowledge that could be useful to enhance

the creative use of technical pattern tools by future practicing pattern designers.

Creativity is fundamental to the design process; it manifests across many aspects of life, not only everyday solutions to simple problems, but also in more sophisticated sparks of creative genius. Creativity can be novel for the individual or the collective (Boden 2004). Creativity is not confined to any specific field so can occur in any area from science and writing to pattern design. Creativity is the ability to produce novel responses and solutions (Boden 2004; Sternberg 1999) that enable new approaches to emerge. Creative scholars acknowledge that creativity is often hard to define (Boden 2004; Runco 2004), it is not something that is tangible. For an idea to be creative it needs to '...be useful, illuminating or challenging...' (Boden 2004: 30). However, this can only happen as the culmination of an ongoing process of creative enquiry.

Through creativity, new methods, ideas and knowledge emerge. Creative ideas introduce new ways of thinking and alternative approaches. Such ideas can sometimes be seen as radical, extreme and unworkable. Creatives are often alienated and dismissed due to their forward-thinking methods and approaches (Runco 2014; Sternberg 2012). Creative ideas require risk-takers who are not afraid of making mistakes along the way.

Sternberg and Lubart's investment theory goes on to suggest that six resources are required to converge to enable creativity to take place: intellectual abilities, knowledge, style of thinking, personality, motivation, and environment (Sternberg 2006, 2012; Sternberg and Lubart 1991). These can be considered resources that a pattern designer would require to enable them to produce creative solutions. Environment including developments in tool technology, could potentially impact on the designer's style of thinking refining and enhancing creative output.

CAD tools are now commonly used across many design fields including architecture, textiles, interior and fashion (Jhanji 2018). Fashion designers use CAD tools within the Design Phase to produce customer boards, garment designs and technical drawings. Garments then move into the apparel Production Phase, where pattern designers and the Production team have the role of interpreting the fashion designers' drawings into completed garments. To maximise profits many larger companies now work closely with computerised pattern design software (PDS) and 3D simulation software (Dennis et al. 2016) in the Production Phase. These software packages are used to develop and fit patterns and they are able to replicate fabric appearance and drape on avatars.

The pattern designer and production team's insight, vision and understanding ultimately enable the designs of the fashion designer to be creatively interpreted and manufactured; they translate the design drawings to inform shape, production and size. This realisation of the garment through pattern often takes place within a studio environment that will contain all the tools (traditional and digital) required to construct and prepare patterns. The pattern designer and production team's skills lie in their ability to draft creative patterns that will ultimately interpret the 2D design into a 3D reality. There is limited research investigating the creative impact of using these digital tools within the fashion industry. Page (2013) conducted research into the use of 3D fashion design modelling technology when pattern designing. She proposed that combining digital and craft is the future; interacting with technology designers through their skills and abilities will create new possibilities (Page 2013: 97).

As CAD/CAMs started to be introduced into practice within the field of architecture, research that combined the use of hand and CAD/CAM tools emerged. Schön and Wiggins (1992: 155) advocate

the use of visual media to '…see things in new ways'. They do not dismiss the use of digital tools, rather, they suggest '…research should focus on computer environments that enhance the designer's capacity to capture, store, manipulate, manage and reflect on what he sees' (Schön and Wiggins 1992: 156). When considering whether CAD had enhanced creativity, Lawson concluded that CAD may '…conspire against creative thought…' (Lawson 2002: 329) that impressive CAD work is being presented with poor design. He proposed that it is beginning to look as though CAD is not a neutral tool and '…like all tools it is suggesting being used in a certain way…' (Lawson 2002: 331). Lawson also suggested that there are two conditions that must be established for digital creativity to occur, firstly the program must offer new possibilities to the designer, secondly the tool must be in the hands of a creative designer competent in its use (Lawson 2002).

Bilda and Demirka defended the creative nature of digital sketching and propose that '…designers visual thinking could be different in digital media…' (2003: 28). Bilda and Demirkan's findings (when analysing interior designers) identify that '…designers sketching activity seems to have different dynamics in different representational media in terms of design thinking and making…' (2003: 48). Both Lawson (2002) and Bilda and Demirkan's (2003) research compared the use of traditional tools with digital. They suggested that CAD can affect design thinking and outputs, and that further research into the creative implications of CAD use is required.

Katie Bunnell is a creative practitioner working with ceramics who integrates digital and physical processes in her practice (Bunnell n.d.). Her work explores craft-based methods of working, using digital ceramic transfer printing techniques to create commercial forms of customisation (Bunnell 2000). She argues that for '…professional makers both process and their products are embedded in a continuous internal dialogue between maker and technology while being both consciously and subconsciously influenced by the external forces of the cultures of craft, design and beyond.' (Bunnell 2004: 5).

Bunnell's words are echoed by Sennett (2009: 127) who discusses the 'domain shift' of tools and suggests new transformations and inventions can be seen to emerge. A tool initially used for one specific task sees a metamorphosis into another domain. The principles of one practice are applied to another often with interesting results. The metamorphosis is reflected in pattern design where traditional tools are being superseded by digital tools or occasionally integrated with them. These changes offer the potential for new developments and a domain shift in creative design production cultures.

Creativity has a role in design because it adds a humanised, individual feel to outputs; this is something that cannot be done by tools or machines. Therefore the designer's creative input is key to producing meaningful design outputs. This is always true whatever tool or combination of tools are used. This, however, must be balanced with the practitioner's skill, ability and knowledge when using their tools. Tool skill and understanding enables total emersion in design activities and helps foster the achievement of significant creative results.

In order to fully reflect on how designers creatively practice and engage with digital tools there is a need for further practice led research. Bolt (2010: 33) suggests that practice led research needs to consider the process, not just the outcomes, in order to reveal knowledge, that '…theorising out of practice is, I would argue, a very different way of thinking than applying theory to practice'. It, however, has to be acknowledged that getting designers to articulate visual thinking could be challenging,

'…people know how to do something but they cannot put what they know into words' (Sennett 2009: 94).

This paper has considered the creative impact of designers integrating digital tools into their practice. Through a review of the literature in this field, it has found that introducing digital tools into the designers' environment has the potential to alter protocols and methods. For the pattern designer integrating digital technology into practice is the future; it provides opportunities to reassess approaches and ways of thinking. Interacting with digital tools provides designers with new possibilities to stimulate their creative responses. It is essential that these digital designers understand both physical and digital tool usage and have appropriate specialist skills to enhance their creative abilities. This will prevent them from being viewed as mere technologists. In order for new creative approaches to emerge from the use of digital technology there is a need for designers to continuously explore and challenge its use, to ensure they lead the way in any future developments and innovations.

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