# Tinker tailor: the disembodied practice of a milliner using CAD technologies to think through designing and making.

Keywords: millinery / designing / technology

# Abstract

Tinkering while designing is often a way to design and make ideas concurrently, and when working within the discipline of millinery, tinkering has become an integral part of my design process, a bodily experience. Computer software designed for fashion is skewed towards the technical processes of pattern making, replicating twodimensional paper based methods. Three-dimensional fashion software exists in the form of components, systems and rules for the designer to follow. The software appears unintuitive, lacking the distinctive characteristic of the hand that is the designer's signature. The individual is homogenised, and the software writer is the author of the design by default. This need not be the case; the shifting practices of architecture (Burry et al. 2006), industrial design and engineering have modelled successful uses of digital technology in the design process. Designing and making millinery in the digital sense can be defined as creating individual hand made pieces which stimulate (or simulate) the imagination. One cannot touch or feel these conceptual pieces, they are contained in a three-dimensional digital visual diary. Experimental and critical methods of working have challenged me to remove millinery designing and making from the secure implicitly known embodied environment and to relocate the practice of designing in an ambiguous disembodied CAD space. The traditional notion of hand - eye - material - tool exchanges are reconsidered, thus altering the definition of the bodily experience in the millinery design and making process. The design experience is informed by the methodology of action research; furthermore the cyclic process of problem diagnosis, action intervention and reflective learning creates the opportunity to encompass new discoveries and directions, enabling the development of both questions and answers. This paper establishes new ways of working which maximise the creative opportunities offered when using three-dimensional CAD technologies in a millinery context.

#### Introduction

The impact of computer processes on the area of designing and making, including the disciplines of architecture, engineering and industrial design cannot be denied, but where is millinery situated in this digital age? And where could it be?

The practice of making as a material process offers the opportunity to critique perceptions and potentials of and through designing and making in the digital, physical and liminal spaces offered. As I move through the projects, ideas evolve through interactions with tools and materials in diverse settings which include new themes, methods and processes.

Fashion is an area of the creative disciplines which everyone is involved with, to varying degrees, on a daily basis. Fashion can be considered to be an accessible form of art, the product we interact with the most closely, because regardless of our culture or our time in history, it is a way to express ourselves. Fashion is the outcome of the inter-relation between the viewer, the wearer, the body and the fashion product, and fashion discourse is generally around body / artefact relationships. The products interact with the body, directly on the body; both the body and object are three dimensional manifestations and millinery is contextualised when worn on the head.

Throughout this paper I discuss an element of my PhD research project which explores designing while making and making while designing. The project investigates and critiques my experience designing within a three dimensional environment, making models, and the knowledge gained as a maker while designing and making millinery ideas. The aim of the project is to use the exploratory process of sketching and making in three dimensions to generate millinery ideas. It is not the goal to find a new way to mass produce hats.

The element of this research project which is discussed within this paper is the bodily interaction of designing using digital technology and how it differs from the bodily interaction of designing using traditional means such as paper and pencil or draping directly on the millinery form. The millinery pictured below is the result of a design experience which occurred solely within the designed 3D digital environment and was later constructed as a physical object.

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**Figure 1.** Sweetie, felted wool millinery designed using 3D digital technology. The physical object was constructed from an unwrapped digital pattern. The author for Mild Red.

I reveal my position on the use of three dimensional computer aided technology to create and communicate design ideas to myself, the designer maker milliner. This process could be of use to designers of three dimensional objects who enjoy tinkering and playing while designing in a three dimensional physical environment.

# **Context and literature review**

Tinkering while making is an important element in millinery – the craft of making millinery requires the milliner to design directly onto the hat block to tinker while designing, to let the material and tools talk (Schön, 1992), to find the design solution through exploration and concurrent designing and making. In a physical world practice, the milliner will expose many design opportunities while designing but is often unable to capture these designs adequately for later use. There is a long tradition of designing and making concurrently in fashion within couture and dressmaking, e.g. when draping designs directly on the dummy, the material talks back to the practitioner. It is a spontaneous and fluid experience. Reproduction is often impossible. My millinery sits within this practice.

Millinery is a sensual medium, something to fascinate and lure, an object of desire, as demonstrated in this paper. Traditionally millinery has been designed and made in three dimensions, simultaneously on a hat block using hand made techniques, as opposed to many contemporary fashion practices which often separate designing from making in the ideation process. Hat making refers to mass produced everyday headwear, often made from fashion / garment textiles and machine stitched. Conversely my perspective of millinery refers to model millinery or one off millinery, destined for high fashion situations. These pieces are usually hand blocked or manipulated, often stitched by hand, crafted using tools and processes from bygone days which make mass production impossible. Tinkering and crafting is time consuming and therefore the millinery is expensive if destined for sale. Materials utilised fit into the specialist fabric area and can include materials that are not usually associated with headwear, such as acrylic as shown below.



Figure 2. Match, printed acrylic millinery, the author.

My model millinery in the digital sense is making individual / hand made pieces which stimulate (or simulate) the imagination, concepts that may or may not come to life in the real world, a three dimensional digital visual diary. Encircling digital millinery allowed me to experience the form of the piece, and explore and develop ideas more fully and interactively. Through simultaneous consideration to conceptual and technical / making issues, designing, making and communication were brought together in a hybridisation of practice and studio space.

Computer Aided Design (CAD) softwares designed to be used in a fashion context are predominantly two dimensional; and at this point in time there are limited developments of three dimensional CAD software for fashion and millinery. Fashion industry practitioners, who use computers within their design process, by and large do so to achieve a production ready result. Most commercial CAD programmes created for fashion designers continue to be skewed towards the technical processes of pattern making and cutting and replicate two dimensional flat paper based methods of patternmaking. Improvements on two dimensional technologies are imminent; with industry software businesses e.g. Gerber, PAD System Technologies and Lectra creating commercial three dimensional softwares for fashion which aim to replicate draping on a tailor's dummy. Considerable discussion and research in this realm has been undertaken by fashion academics and trade publications (DesMarteau and Speer, 2004; Kang and Kim, 2000; Hardaker and Fozzard, 1998).

The predominance of computer usage which is more suited to technical developments rather than creative or design developments is not confined to the area of fashion, as confirmed by design theorist Bryan Lawson (1997) who states: 'Thus in spite of all the enthusiasm and spectacular claims, today CAD in practice still mainly stands for computer-aided draughting rather than computer aided design.' Ten years on from Lawson's publication, I reflect on whether millinery / fashion CAD has lived up to the promise of a better way of working.

There is limited published material on the use of three dimensional CAD technologies as interactive designing tools for fashion and millinery; however there is the implication that the fashion industry wants to advance fashion design practice to encompass new technologies. The focus is primarily on technical or production uses, such as draping flat patterns on a three dimensional avatar, unwrapping patterns (Yang and Zhang, 2007), also shown in the images below; and as potentials for post production sales tools (Magnenat-Thalmann and Volino, 1997).



Figure 3. Swoop swoop, screen save of digital millinery pre unwrap, the author.



Figure 4. Swoop swoop, screen save of rendered digital millinery and the unwrapped pattern, the author.

Many designers speak of the desire to make things; speculative designing in the real world assists designers to work in an exploratory way in the computer world (Dormer, 1997; Knight et al. 2005; Rees, 1997) and designing within a CAD environment allows the designer to challenge the laws of nature and the way we perceive the world, thus opening up the designer and designed to new possibilities that were not previously possible (Fifield, 2004; Sacher, 1991).

The notion of the computer world expanding ways of thinking and working is highlighted by Sacher (1991, p. 335) who states.

"When I first learned 3-D computer graphics, I wanted to rotate the "eye" in one of my animations, in order to slowly move around and view a scene from the other side. .... He (the teacher) looked at me with great surprise and said "just rotate the whole scene. It's the same thing." This had never occurred to me! I had thought of the scene as a stable world.'

Although my practice is firmly based in the discipline of fashion, a conscious decision was made to concentrate on subverting generic design and art CAD softwares, and not to use any fashion specific CAD softwares. I drew on technologies and processes from other related areas of design (industrial design, architecture and engineering) and art practice (animation and sculpture). By using these broader technologies as tools for making and designing concurrently, new territories for millinery design and making were explored.

Employing softwares used by other creative areas of design and art offers opportunities to develop new ways of working that can subvert, expand and multiply traditional millinery processes and products. There is a closeness to real world processes within the digital practice (Fifield, 2004), real world practice informs our digital practice and vice versa (Parkes, 2006) and, when we first come to the digital environment we may believe that real world restrictions apply, when they don't (Sachter, 1991). Sculptors, for example, creating three dimensional artworks in a CAD environment have commented that the beauty of the new spaces and processes of working can be defined by the innovative way of working which often defies the laws of nature, within all areas of the object and the process, including making, materiality, world and perspectives (Fifield, 2004; Ganis, 2004; Sachter, 1991). The discussion of authenticity or materiality of abstract objects has occurred prior to the digital age (Wollheim, 1975). This conversation continues today within design and art practice where the notions of physical practice informing and modifying digital practice and digital practice informing and modifying physical practice continue to be in a state of flux (Schön, 1992; de Freitas, 2007; Díaz-Kommonen, 2007). Furthermore shifting definitions of spaces and artefacts, both physical and digital are shaped by the lived bodily experience (Vaughan, 2007).

Multiple realities and possibilities come to the fore when my design practice circulates between accelerated, decelerated, still and real time, environment and product. This fluidity of the

designing body in time and space, in the virtual and real creates a rich tool for practice. Flexibility in process which accommodates creativity, intuition, tinkering and responsiveness helps to ensure that I have a successful experience following a creative glimmer. The glimmer of an idea is a point of departure, it is a direction to travel but the route and destination are unknown. To make the best use of the digital technology, the digital programmes I used needed to accommodate and reflect attributes which are in keeping with the distinctive qualities of a designer (Cross, 1995. p106-107)<sup>1</sup>.

This paper draws on a project that focuses on the transitory practice of blending the physical world and digital world design processes. In the project, technology is used as a means to create design ideas, which may or may not come to life as real artefacts within a physical environment, and which have virtual presence. In my practice I use technology as a thinking device, as tool, material and environment. The movement between the bodily and disembodied space gives effect to a unique corporeality which cannot be found in one space alone.

## Methods

The paper has evolved from an ongoing collection of projects aimed to expand and develop bodily interactions with CAD technologies. Each design experience informed the next; layering physical and digital knowledge and skills. Like the design process the project was not linear. It was a multidimensional event with interlinking themes and foci. I explored and experienced a way of "knowing" which I developed by making, doing, and being, interacting through and with the work and considering cultures and contexts. My aim was to create a satisfactory way of working which did not pose any of the technical hitches sometimes imposed by the software writer.

The project is experienced and communicated from my point of view as a designer / maker using the discipline of millinery. Millinery is employed as a vehicle and as a lens to explore, inspire and develop new methods and processes of using three dimensional technologies, to create models, prototypes and products. While exploring and critiquing my experience of designing and making models within three dimensional environments, the millinery paradigm is expanded and redefined.

Drawing on the methodology of action research, a cyclical process of problem diagnosis, action intervention and reflective learning, enabled me to:

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- reflect on my past practices;
- experiment with potential softwares for ease of use; and,
- critique and analyse the results of these experiences.

Two physical world processes which were commonly used within my model millinery practice were harnessed in the CAD situation.

Within physical world practice these processes are defined as:

- 1. Sketching a paper visual diary which allow for the designs to develop on paper and where the designer's pencil takes them.
- 2. Modelling the millinery directly onto the hat block or form, playing with and developing the millinery as the material and form respond to the touch of the hand and tools.

Within digital world practice the two processes of sketching and modelling are reconfigured as one:

 Tinkering – within a three dimensional space, both sketching and modelling at once. Saving the designs as they evolve at any stage along the process and accessing these at will. Sketching and modelling in a three dimensional environment allowed me as the designer to view many perspectives evolving at once, to tinker with the designs.

The traditional design process for millinery within the real world was used as the method for exploring both the design process as well as the designed product. In traditional or real world practice this takes the form of designing with physical materials on physical head forms as well as sketching in a visual diary. When I used new technologies the material and head form have no presence in the physical world, however the interaction with the technology is informed by my past practice in the physical world.

This project posed the problem that reliability and validity, in the traditional sense were difficult to achieve, as it is the nature of any individual self-study research project to contain partialities. Subjectivity was embraced as an important part of the work; design / artistic endeavours was seen to be a subjective area and hence biases were an important and genuine part of the personal design practice.

Internal validity was demonstrated through:

- a one off intervention in a specific context;
- relevance for a unique setting;
- impossibility to repeat the research; and,
- improving, enriching and advancing personal practice.

While these factors were useful in my reflective practice, to ensure wider validity other studies would need to also demonstrate their relevance.

# Findings

Initially I focussed on how to use the technology as an alternative to replace my current way of working. I had expectations that the technology would be able revolutionise my design process and replace physical world practice. As I progressed and became familiar with its capabilities my way of interacting with the technologies shifted. I realised that my established physical world way of working informed my digital practice and vice versa. From my perspective, both elements were equally important to my new process of designing.

Key to the success of the using this technology in my practice was the moment when the technology became invisible to me as a designer. All I was aware of at this moment was the embodied experience of the design process. My ability as a milliner in the physical world was at this point matched by my ability to manipulate the digital technology, they had become one. The key result for me was developing confidence in both arenas to an equal ability. I was then fully immersed in the creative experience. The table below depicts how the flow in confidence changed my practice.



Figure 5. Flow in confidence in the use of technologies in practice

Without my physical world knowledge and experience I would not have been in a position to use the technology in constructive ways. This starting point enabled me to contextualise and inform my digital practice which in turn gave me the opportunity to reflect on past practices with a fresh perspective. The process was not entirely without challenges.

# Discussion

Problems were faced in both digital and physical world practices. Interaction between body, material and tool was entirely different within a digital realm, and this difference offered me new opportunities to respond to challenges that surfaced in the design process.

The main hindrance identified with digital world millinery practice was that the responsiveness of the material and tools with the hand or mouse was determined by the memory of my experiences as a designer in the physical world.

The main problem identified with my physical world millinery practice of sketching and modelling was that as the design ideas evolved, some of the interim or passing phases of the designed piece could only be partially captured or were sometimes lost entirely. Using traditional practice,

I found it difficult to back track to a certain moment in time which held promise. A secondary problem was that sketching<sup>2</sup> occurred in a two dimensional environment, allowing for a singular view at any one time.

Ideas evolved in the mind and on paper quickly, saving these ideas as they developed and restarting designing from any step in the process was not easy when working two dimensionally. When drawing on paper in two dimensions the full view remained obscured through lack of movement, when making toiles or draping, the model evolved in three dimensions, as in the physical world, the whole design is visible. I could record this process by moving image or still photography to inform further designing, but I needed to construct the piece identically to the desired stage before designing could recommence, costing both time and materials. Visualising three dimensional ideas in my mind could be also utilised within the design process, rotating ideas is easy, but allowing for multiple outcomes and an easy to access storage system was not.

Through this project I found that designing in a digital space offered a place to:

- conceive and develop the ideas;
- see the object transform from the privilege of multiple viewpoints;
- store incremental workings and final designs; and,
- gain easy access to these files.

These elements of the tool offered me the opportunity to back track in history and recommence a new design direction from any stage along the design process conduit, as illustrated below.

CONFIDENCE IN PRACTICE					
PROCESS DRIVEN: HOW can I use CAD in my practice?	1. Physical objects developed, some CAD interaction	2. Physical objects and CAD representations	3. Physical objects, CAD representations and outputs to give the ability to design and make ideas and objects	4. Physical / CAD objects; integration starting between the practices	DESIGN (meaning) DRIVEN: WHY would I use CAD in my practice?
Starting point was a physical world design process which had tacit knowledge and which lacked self awareness. This could be described as intuitive or implicit expertise	<ul> <li>Confidence in physical world practice is high and intuitive</li> <li>Confidence in CAD is low</li> </ul>	<ul> <li>Confidence in physical world practice is high and intuitive</li> <li>Confidence in CAD is starting to develop through intuitive processes brought from the physical world proctice</li> </ul>	<ul> <li>Confidence in physical world practice is high and intuitive</li> <li>Confidence in CAD is showing promise through the starting to integrate CAD with physical processes</li> </ul>	Confidence in both areas, technology is becoming invisible to designer	Endpoint shows practitioner that invisibility of technology assists in a successful integration of desired tools and methods and a fluidity of the design process

# Figure 6. Work in progress, incremental screen saves of digital millinery, the author.

Moving around a form allowed me to experience the many shapes, undulations and silhouettes of a piece. The ability to perform this process in sketchbook mode in a virtual environment enabled me to explore ideas more fully and interactively. When working in digital studios I was liberated from the physical laws of nature of the real world, and the imprecise / unknown natures of material often resulted in exciting and unpredictable ways of working. For many people making implies that a material exists in the real world, however I now see the lack of tactility<sup>3</sup> in the experience as an advantage rather than an obstacle. My millinery making in the computer space does not require real materials or even the consideration of real materials, thus stepping away from materiality in making.

The computer was utilised to assist the mind's eye, to help the glimmer grow brighter, the imaginings develop and sometimes find a reality. However, the computer was merely a tool, a

relatively new addition to my millinery tool box. My designing experiences were firmly based in the memory of bodily practices of the hand made. I used that knowledge and understanding to drive the perceptive and making opportunities through the use of digital technologies. When I used a pencil on paper, my eye followed the hand; my hand and eye were linked, whereas when drawing using a mouse or a pen tool, my eye follows the cursor on the computer screen, my hand is often not in the field of vision. The link between my hand and eye is redefined in three dimensional computer spaces; the gap in the gaze and in materiality is addressed through my remembered bodily experiences. Within my millinery practice the digital object is real to me. I can imagine it. I can reside there. I know the form. I know the material. I do not need to touch it or have it worn.

# Conclusion

Engaging in making as a material practice within both physical and digital realms has expanded my array and depth of tacit knowledge and developed further possibilities for practice and product. Designing and visualising the complete three dimensional fashion piece was accomplished by physically making the model, a toile or prototype. The virtual or disembodied space both replicated the physical three dimensional studio space of making ideas, and expanded the paper based two dimensional visual diary into three dimensional virtual forms. By using three dimensional CAD as the tool and the environment, the result was an interactive and easily managed visual diary which could be directly linked to the physical output. Three dimensional CAD offered me the ability to uncover many more design potentials which were ready to be analysed and prototyped by digital means.

Through engaging with designing in both physical and digital environments in this project, I have developed a deeper understanding of the effects and potentials of CAD technologies on design practice. This project established a new way of working using CAD and allowed me as a practitioner to develop an understanding that for technologies to be harnessed in the most useful way they need to be invisible or in harmony with the natural process of designing, allowing tinkering and playing while designing. I envisage that this way of working has wider applications in the areas of designing three dimensional objects for fashion.

By developing the object and the idea concurrently within a three dimensional visual diary, and in some cases outputting three dimensional physical models, millinery practice has been reconsidered. Physical experiences influence the computer and vice versa, furthermore technical or making and conceptual or designing issues are most successful when considered together in a concurrent practice. The new technologies I have used in this study can be considered to be both mechanisms and materials, and these continue to inform the process of designing and making through constant flow of knowledge and understanding.

Prior to commencing the study the idea of using a computer to tinker in three dimensional spaces, seemed like a simple request. During the study I discovered that there are many concepts which influenced the notion of three dimensions, not the least the summation of experiences, perceptions and knowledge from all areas of the process and product.



Figure 7. Artificial elegance, digital millinery, the author.

Invisibility of the technology assisted in a fluidity of the design process and a successful integration of desired tools and methods from both physical and digital environs. Digital millinery is a thinking tool; a layering of experiences, skills and understanding, expanding the field through tinkering.

# Endnotes

<sup>1</sup> Cross in his paper Discovering Design Ability, discusses three key themes of a successful designer. p106-107

- 1. 'importance of creativity and intuition'
- 2. 'problems and solutions in design are closely interwoven'
- 3. 'the need to use sketches, drawings and models of all kinds as a way of exploring problem and solution together'

<sup>2</sup> It is acknowledged that as a person who is adept with drawing, I am able to draw several views of a designed object, but also that these views will not evolve as one, concurrently.

<sup>3</sup> There are new developments in technology eg FreeForm Modelling<sup>™</sup> allows the same touch for virtual and real clay to be felt through force feedback mode. This tool could be utilised to some extent in this project.

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