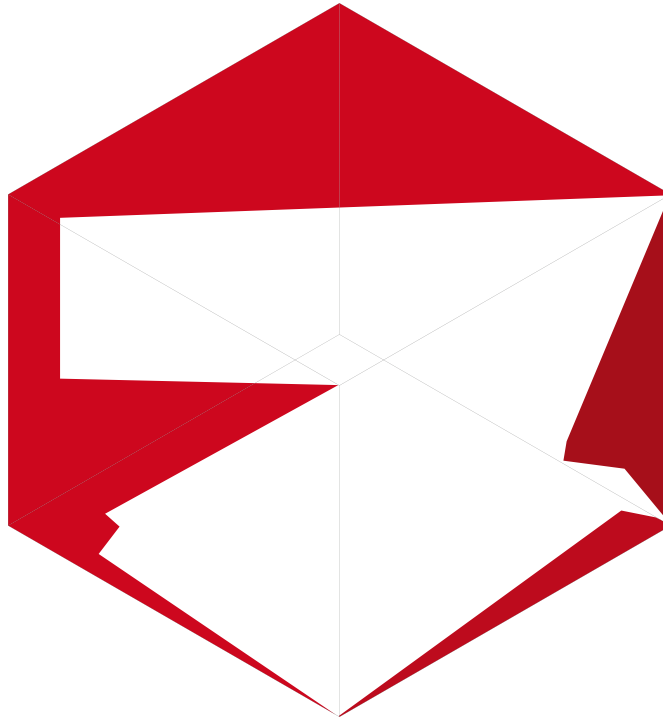


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Engineering Opportunities for Originality and Invention: The importance of playful making as developmental method in practice-led design research.

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Abstract: Donald Schön (1995) describes the development of design through making as a reflective 'conversation with the materials of the situation'. In design practice and research this dynamic dialogue often originates from playful making processes built on intuition and embodied knowledge. Using ludic research methods in practice-led research allows one to work spontaneously and without pre-meditated purpose. It offers opportunities to break out of linear patterns of thought and established ways of working ingrained by institutional education and years of professional practice. But how is it possible to preserve this precious playfulness within institutional constraints that often prioritise intellectualised, rationalised and well-documented methodologies? To achieve balance and rigor it is necessary to devise systems to record and reflect upon both the pragmatic and the phenomenological aspects of the research without losing the spontaneity of embodied, playful and intuitive design practices. This paper investigates the use of methods such as 'reflection-in-action' and 'active documentation' that allows the later evaluation and analysis of playful research activities whilst maintaining the ability to play authentically at the point of making. It explores how such methods might best support the development of original practice-led design research that retains playful practices of making at its core.

Key Words: Practice-led research; play; active documentation; reflection-in-action; diverse exploration; specific exploration.

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Introduction

This paper investigates the opportunities and challenges presented by playful, loosely bounded approaches to practice-led design research, exploring how these might promote the development of original outcomes. The methods used in the research focused in particular on exploratory play carried out on an individual basis rather than group play or role-play activities.

Firstly, the paper describes the value of using ludic research methods and endeavours to outline a definition of 'play'. It then goes on to discuss how playful methods can be a process of knowledge generation. Illustrated by examples from my own practice, the paper examines the development of a methodology that aimed to achieve balance between free playful exploration and containing boundaries in order for creative practice-led research to flourish and advance beyond that which could be achieved by controlled, scientific research methods used in isolation.

My practice-led PhD research developed production processes incorporating origami, shibori, printing and fusing techniques to create textiles that sustain three-dimensional, adaptable form with little or no supporting substructure (figure 1).



Figure 1: Deployable textile structure, silk-screen printed and hand folded polyesther.

The controlled packing, deployment and structural stability offered by these textiles suggest potential application in many areas e.g. engineering, apparel, product and architectural design. Both form and material behaviour of these textiles can be customised, enabling properties such as thermal or sound insulation, electrical conductivity or light transmission to be varied, as the situation demands.

Originating from loosely themed, introspective, process-led experimentation carried out



prior to academic research, my PhD project progressed through several stages. My early approaches to research within an academic framework were too risk-averse, constrained and rigid to develop innovative and original ideas. I found the challenge of documentation disrupted the flow of the studio practice leading to a loss of spontaneity in my making processes. Exposure to a plethora of external influences expanded and enriched the practice immeasurably, suggesting previously undreamt of potentials but also temporarily adjusting the emphasis of my approach from process to outcome.

By drawing on my experience of the Alexander technique, employing an unobtrusive system of 'reflection-in-action' and 'active documentation' of playful making practice, and balancing both 'diverse' and 'specific' exploratory methods I was able to reintroduce freer exploratory play methods into my practical work, which impacted positively on my conceptual process. On re-establishing playful iterative practice as a key approach, designs were created to raise debate regarding the potentiality of folded textile form, production processes and materials for a range of purposes.

The value of ludic research methods

Why play?

My PhD research focused on the development of 3-D deployable textile structures. These structures had shape-memory properties and could be customised to display different performance characteristics e.g. fire resistance or water repellence. There were three distinct strands to the research, the development of composite textile materials capable of sustaining 3-D form, the development of deployable 3-D structures, and the development of production processes for creating both novel materials and forms.

To date such developments have more usually originated from material science, engineering and textile technology contexts. Such research has used well-established scientific research methods to create and quantitatively test the performance capabilities of the materials, as well as the loads and stresses acting on the 3-D forms. However, by building on research carried out by these disciplines to develop self-supporting folded structures but emphasising a 'poetic', design-orientated outlook I aimed to explore the potential for a more intuitive, playful and non-linear approach to highlight hitherto overlooked elements in the design process.

Using ludic research methods allows one to work in a way that is spontaneous and without pre-meditated purpose. The purposeful purposelessness of play cultivates a very particular mind state in which one is relaxed enough to relinquish control and allow the unknown to occur. By being immersed in the moment, totally absorbed by the task in hand and acting through intuition not intellect, one not only finds fulfillment (Csikszentmihalyi, 1991) but also allows space for the development of new concepts and processes. According to Robbins (1980: 19): "Humanity has advanced, when it has advanced, not because it has been sober, responsible and cautious, but because it has been playful, rebellious and immature." Noeteny, the retention of immature qualities such as playful behaviour into adulthood, is therefore to be actively encouraged to promote originality and invention.

Such playful behaviour is commonly seen in the conceptualisation and making processes of the design disciplines, perhaps being a key feature of 'design thinking'. Play can be useful in design practice and in the practice-led research process as a method to increase understanding and skill, to explore potential applications for an object or making process, and to synthesize and structure information.

My pre-academic research approach was almost entirely studio based, centering on the progression of ideas and outcomes through playful, process-led making and material experimentation. Undertaking a PhD I encountered the challenge that faces many design practitioners when moving into practice-led research in an academic institution. How is it possible to preserve that precious playfulness within institutional constraints that often prioritise intellectualised, rationalised and well-documented methodologies?

What is play?

It is important at this stage to attempt a definition of play. Play can be a process of exploration and explication as well as a means of individual expression. Play is a spontaneous, free, light, aimless movement or activity. It is freely undertaken without coercion, arising from and



foregrounding personal passions. It transgresses societal or procedural norms however, the separateness of play from everyday life means such transgression is tolerated when it occurs within the boundaries demarcated by the activity of play (Raabe, 1980: 6).

Stuart Brown (2010) characterises play as an intrinsically attractive activity in which one has an altered, joyful and unself-conscious state of mind with the potential for improvisation. In play,

we aren't locked into a rigid way of doing things. We are open to serendipity, to chance. We are willing to include seemingly irrelevant elements into our play...The result is that we stumble upon new behaviours, thoughts, strategies, movements, or ways of being. (p. 18)

As previously mentioned, this paper is focuses on play by an individual rather than group play. It specifically investigates the potential contribution of exploratory play to the creative process and to practice-led research in particular.

Exploratory play in practice-led research

Piaget, Erikson, and Vygotsky in their theories of child development all held the view that play is a method of self-teaching, with children playing through ideas in a similar manner to which an adult will think through problems and situations in later life (Gross, 1987). This 'playing through ideas' has proved to be a productive method for me in both design and practice-led research contexts, assisting the evolution of new materials, forms, making processes and concepts.

Many creative projects begin in a loosely directed, playful fashion with the collection and production of individual elements before the design brief or the research problem has been defined fully. This is often carried out instinctively, the designer/researcher being guided by what feels 'right' rather than by intellectually rationalised responses to the materials gathered. Engagement with ideas through this process of intuitive and playful exploration gives an opportunity for the externalisation of internal dialogues and is a method of reasoning free from the constraints of more formal academic methods. As Gross avers, play

...is not simply what we do when we are not working, not just a non-serious pastime or diversion but rather is often an attempt by the individual to resolve the psychological crisis they are currently experiencing... the child is playing when it builds a structure with bricks...and the physicist too, is playing when putting forward a model of the universe. (p. 691)

Construction Play

Construction play has been an invaluable exploratory method in this practice-led design research, particularly for the evolution of new deployable 3-D forms and processes of making. Such activities, where an individual is 'learning by doing', are prevalent in pre-school and early-years education. Toilet rolls, egg boxes, cereal packets and other detritus that can act as catalysts to the imagination are common components in the classroom. This becomes less and less common the further the child progresses through education. However, construction play remains a common method in the design disciplines with designers 'thinking through making' to increase skill and understanding, and using models and prototypes to promote and encourage constructive debate.

Making that involves the development of new skills inevitably begins with a period of 'learning-by-rote', replicating processes and designs established by others. However, once an acceptable level of mastery has been acquired one can begin a process of exploratory construction play that engages less controlled and more inventive methods.

Reflecting this process of knowledge development, in my early research I started making paper models, folding some of Alex Bateman's tessellated geometric designs (Bateman n.d.) (figure 2) to improve my practical origami skills. 'Learning-by-rote' how to make the repeating 3-D patterns that I intended to develop further. At this stage I also began to fold flora and fauna, although the forms were seemingly unrelated to those that I intended to carry forward in my research. Birds, elephants, flowers and frogs were created, playful exercises that as-



sisted me to understand fully how classic origami bases might be dismantled and reconfigured in novel ways.



Figure 2: Moulded silk-organza using an origami pattern designed by Alex Bateman.

This led to a productive period of improvisational construction play in which the ability to employ a variety of folding techniques and to predict the potential behaviours of different folds fostered a more fluid way of working in which structures could evolve iteratively, without pre-meditation. Here motif and structure were generated intuitively from physical experimentation, employing my understanding of the relationship between materials, process and form to create complex geometries and novel forms.

Bruner (1972) believed that free play promotes spontaneous and improvisational combination and recombination of actions, movements and patterns of behaviour that could increase creative use of objects and problem solving abilities. Experiments by Smith and Dutton allowing children to freely play with 'tools' that could be inventively combined to retrieve an object support this view that play helps develop 'innovative' problem solving skills (Smith, 1995). I found an approach incorporating exploratory construction play activities to be productive when investigating if aspects of the processes of origami folding might be re-imagined or transferred into previously unexplored materials and applications.

The development of skill and conceptual knowledge through playful engagement with embodied processes of making was a metamorphic process. Designs were generated, analyzed and evaluated throughout the making activities; process and form evolving as insights gained through the practice delineate the parameters for subsequent models. Ultimately My PhD research developed folding templates for deployable structures that mimicked the unique behaviour of auxetic forms, which expand in all dimensions when stretched in one direction. These templates could be translated into wide-ranging scales and a variety of materials.

Diverse and specific exploration

Hutt (1966) discerned two different types of exploratory behaviour, diverse and specific exploration. Diverse exploration is a divergent, generative activity that freely explores multiple options, creating and investigating ideas without self-censorship. Such activity can be regarded as analogous to the types of play described above.



Specific exploration is convergent and more circumscribed, being undertaken for a focused purpose e.g. devising and revising solutions to problems, and therefore could not be described as play according to the definitions outlined earlier. However, such activity is crucial if diverse, exploratory play is to be constructively integrated into practice-led research. These more clearly structured activities devise, explore and refine design solutions through a conscious process of evaluation and editing.

As discussed previously, diverse exploration is often adopted at start of the design or practice-led research process to generate and note initial ideas. In my case this playful compilation of fragments included still and moving images, texts, samples, objects, an eclectic mix of materials collected from external sources as well as self-generated through studio practice and its documentation (figure 3).



Figure 3: Origami 'washing line' and postcards, from initial collection of diverse elements.

Ward (2008) notes the prevalence of designers using vision as the primary means of interaction with what he terms their 'reflective washing lines' or miscellany, but researchers must delve deeper to find more than purely visual connections. According to Goett (2005: 2) "The image of the washing line is used as a connective device, a metaphoric as well as 'real' line stringing together reminiscences and ruminations in a flow of imaginative investigation." The process of selection within the assemblage is crucial for setting the foundations of the project, defining and outlining its parameters even if the decisions made at this point are largely subconscious. These instinctive choices impose a degree of order even though the significance of each component chosen or grouping made might not be apparent at the outset of this enterprise. However, while it's easy to collect, it's harder to connect. In the words of Edmund de Waal (2009: unpagged), "It is not enough to cut it out. One must sew it together again."

**Challenges to retaining
playful approaches in
practice-led research**

The content of these initial collections of materials and concepts, created through a process of diverse exploration, must be deconstructed and reassembled to make meaning that takes them beyond merely being cabinets of curiosities (Goett, 2008). In practice-led research this seeking out and reconstruction of meaning is particularly important, as the hidden processes of making as well as intuitive and embodied knowledge must be raised into consciousness and clearly articulated to others. In such cases this re-establishment of order often involves the manipulation of incongruent parts of the collection requiring the designer/researcher to move from generative, diverse exploration activities to specific exploratory exercises.

At the beginning of my PhD research, finding myself in an unsettling new environment where the rules and boundaries were not yet recognised or clearly delineated, a high level of anxiety and the overwhelming freedom to direct my project as I desired left me not knowing where to start. Graves (2003: 47) notes: "when designers work to a brief, the constraints of that brief, including the technical restrictions, are often the impetus which stimulates their best creative efforts; fine artists invent their own briefs." Desperate to gain a feeling of security through structure, the identification of key institutional regulations as well as some misguidedly rigid self-imposed restrictions provided a foundation from which to start the work. Although initial practical work was developed through an approach founded on construction play, applications and possible outcomes of these preliminary textile samples were identified prematurely with no secure grounding. This narrowing of the scope of the project before carrying out a period of comprehensive and playful 'diverse exploration' of both materials and production process ultimately proved to be too limiting to maximise the potential for the production of creative and original outcomes.

One's mind and methods must be open in order to discover the original knowledge necessary for the PhD, a mind state perfectly exemplified by the fittingly imaginary character Dr Mary Malone as she tried to solve a problem: "She wasn't sure what she wanted to do, except that she knew that if she fooled around for long enough, without fretting, or nagging herself, she'd find out." (Pullman, 2005: 226) Yet while I could recognize the innate need for relaxed, playful interaction with materials and processes to gain the insight necessary to evolve novel outcomes I found it extremely difficult to give myself permission to 'fool around' without 'fretting or nagging' myself as to what the outcome would be or how I could properly document the activity for later analysis. I thereby effectively curbed my essential forays into the unknown territories. Play can help overcome the paralysis that can occur when shifting roles from 'designer' to 'academic researcher'. However, in order for play to lead to original outcomes it is necessary to remove the fear of failure, seeing mistakes as springboards for new iterations of the work.

The excitement of play is generated through risk taking, breaking free from externally imposed order and transgressing established rules. Yet under such unregulated conditions the potential for disaster is high. Young children generally have little fear of failure and the negative judgment of their peers, leaving them free to play and innovate e.g. finding multiple ways in which a common object such as a cardboard box could be employed. As they grow older the child becomes gradually more and more inhibited and by adulthood this can lead to an increased conservatism of approach (Brown, 2008). Additionally adults habitually want to categorise things very quickly and so are less exploratory in their conceptualisation of the world around them. Embarking on PhD research having given up full-time employment I had a high aversion to the possibility of failure. I found it difficult to trust that novelty and innovation would emerge from loosely directed playful investigation even though such an approach had proved fruitful prior to my academic research.

Optimum-level theories originating in the discipline of psychology maintain that we have an innate desire or tendency to achieve an optimum level of arousal in order to mitigate boredom and to avoid high levels of stress or excessive stimulation (Berlyne, 1969 [1935]). If we are calm we are more likely to embrace challenging new experiences to intensify levels of stimulation but if we are stressed we favour that which is already familiar and comparatively undemanding. It is necessary to feel secure in order to feel comfortable enough to take risks.



Note the trouble taken by innovative creative companies such as Google and Pixar to create relaxing spaces and a permissive environment in which their staff feel safe enough to experiment freely. Returning to education after a long break was intimidating. Rules governing the working paradigms of the educational institution were many and enigmatic. The debate surrounding acceptable practices in practice-led research were myriad and contradictory. An acclimatization period was necessary to become accustomed to unfamiliar studios and new ways of working.

Society is increasingly target driven and education has been formalised to the extent that if the benefit of an activity is not quantifiable and measurable it is often disregarded and seen to have no inherent value to, or place in the educational system. The process of negotiating today's audited education system with its measurable outcomes can have a deadening effect when, as Jung (Jacobi, 1986: 276) points out: "The creation of something new is not accomplished by the intellect but by the play instinct acting from inner necessity. The creative mind plays with the object it loves" My early research approach, contrary to my pre-PhD playful and improvisational practice, was very cautious and excessively controlled in an over-zealous attempt to be measurable and 'scholarly'. According to Darrieussecq & Dillon (2008: 10): "... we often have this a priori sense that when you have fun it's not serious—it has to be bleak to be serious." An overpowering desire to do 'proper' research meant I restricted my methods of exploration, emphasising pragmatic verbal description and controlled material experiments. This was in part due to what I found to be the onerous task of documenting the often spontaneous and playful practical processes of making. The playful and artistic elements of the project fell victim to my potent self-censorship until it became apparent that such overly restrictive constraint deadened this iterative voyage of discovery.

Mary Schoeser's butterfly (2008) illustrates the problem of explicating creative inspiration. This metaphorical butterfly remains in one's peripheral vision fluttering around one's shoulder, disappearing the instant one attempts to scrutinize it closely. The nature of PhD research forces one to focus on the butterfly, meaning that to retain valuable playful approaches to making and conceptualisation in academic contexts methods must be devised that enable this scrutiny with the least disruption.

**Incorporating ludic
research methods into
academic research**

**Addressing anxiety and
avoiding 'end gaming'**

Drawing on my experience of the Alexander Technique I attempted to overcome my aversion to uncertainty. The technique challenges habitual tendencies to focus on outcomes of actions, referred to as 'end-gaming', rather than on the action or 'means whereby' (Gelb, 2004). Students are encouraged to live in the present moment, concentrating on 'how' rather than 'what.' Cultivating this approach promoted recognition of the value of interim steps. As a result I became more at ease with allowing the practice to develop freely, drifting from order into chaos followed by the re-imposition of order. I became more accepting of ambiguity and vagueness, privileging unintended effects where appropriate, allowing them to supersede original intentions and embracing error as part the progression of the work.

A concrete example of this approach is given by my efforts to devise a new folding pattern based on a complex origami fold, the double sink. Even after careful construction of paper models, in the first textile attempt I omitted a hinge line. Whereas previously I may have abandoned the exercise, instead I improvised the folded form (figure 4). I eventually made a second sample to the original 'new' pattern (figure 5) but due to my error and subsequent invention now benefited from two novel forms with two distinct behaviours. This more relaxed and playful approach to the process of exploration allowed the work to blossom into a series of open suggestions for future use rather than a constrained selection of precisely specified functional outcomes. I became comfortable with each sample suggesting future developments rather than being ends in themselves. They became part of an ongoing iterative series, part of a larger whole, an overlapping ensemble rather than disconnected singularity. Each object within the series is compared, assessed and evaluated not only against its precursors in the series but also against those objects yet to come, an open ended series or system that raises the spectre of an object that is never finished (Julier & Lury, 2009).



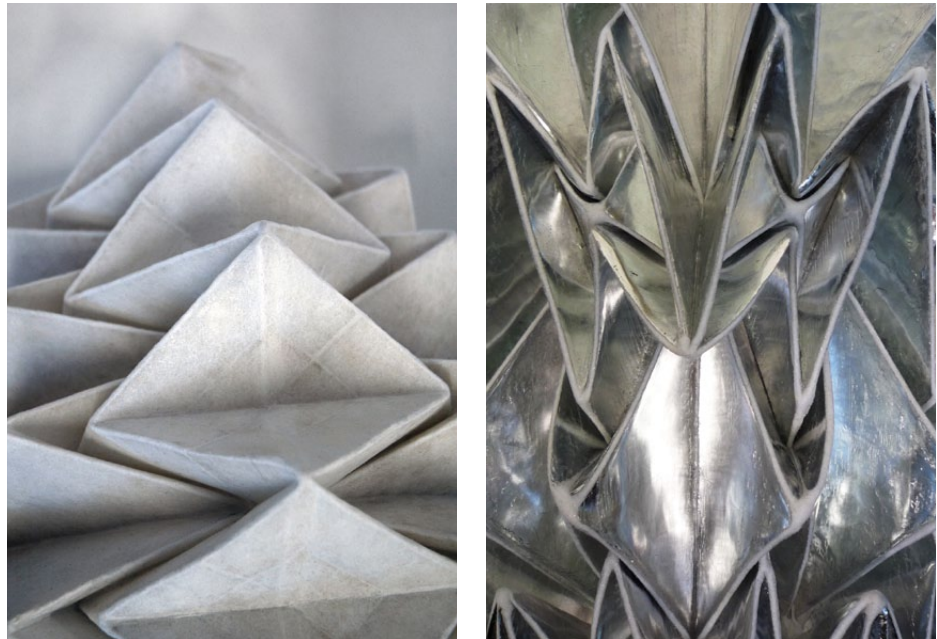


Figure 4 (left): Deployable textile with shape-memory, form improvised after an error discovered in making process.
Figure 5 (right): Foil-finished deployable textile with shape-memory, made to original folding pattern.

Reflection-in-action

Embedded in design practice and practice-led research is the development of knowledge through physical making. In my practice there is often a disparity between what I actually make and what I had intended to make once the materiality of the textiles imprint their mark on the process. The development of the work is challenged by unexpected events and unforeseen material behaviours that arise in the process of making, forcing the creative adaptation of processes and outcomes in order to approximate the original conception of the object.

Donald Schön (1995: 78) describes the evolution of design forms and concepts through the making process as a reflective 'conversation with the materials of the situation'. In design practice and research this dynamic dialogue often originates from the playful manipulation of materials driven by making processes built on intuition and embodied knowledge. In such making practice tacit knowledge and technical skill prepare the ground for averting and exploiting potential disaster but it is necessary to go through a crisis of thought and action in order to improve and evolve. Seeming errors can be recast as opportunities for invention if the body and mind are primed to recognise the potential to advance ideas given by deviations from anticipated patterns. John Dewey says of the artist stumbling across a relevant but unexpected scene:

The motor co-ordinations that are ready because of prior experience at once render his perception of the situation more acute and intense and incorporate into it meanings that give it depth, while they also cause what is seen to fall into fitting rhythms. (Dewey, 2005 [1934]: 101-2)

This is illustrated in my practice by a diverse exploratory process that investigated materials and making procedures, creatively adapting standard 2-D textile printing processes to exploit the form-finding capacity of textiles. Here I drew on empirically gained knowledge of the reaction between substrate and print medium to maximise the transformation of 2-D planar surface to 3-D planar form. I evolved motifs to create the optimal 3-D transformation of the substrate, using expanding binders as well as foiling and flocking in unconventional ways to alter the behaviour, handle and structure of the substrates.



The many stages of preparation in the printing process limit the spontaneity of the activity yet, as previously discussed, unexpected material behaviour can provide fortuitous and impromptu opportunities. I initially intended to foil one sample but I mistakenly substituted the flocking adhesive for foiling adhesive, not realising the error until the motif had been silk-screened (figure 6). Without a comprehensive background knowledge of both process and material recognition of this opportunity might have been lost. However, aware of the substitution I could appreciate that printed onto stretched lycra the unmixed flocking adhesive created a series of pronounced domes similar to a previously completed sample (figure 7) on release of the tension, though the resultant fabric was much more pliable and had a softer aesthetic than its expanding 'puff' binder predecessor. Additionally, being clear, the adhesive gave no problem of incompatible colouring.



Figure 6 (left): Cotton/lycra mistakenly silk-screen printed with flocking adhesive.

Figure 7 (middle): Cotton/lycra silk-screen printed with puff binder.

Figure 8 (right): Cotton/lycra and silk mousaline layered fabric, silk-screen printed with flocking adhesive and flocked.

This accidental discovery acted as an imaginative catalyst, leading onto a period of playful experimentation with the adhesive on a variety of materials and in combination with other textile printing products. This resulted in the development of a bonded two-layer fabric that remains pliable whilst simultaneously retaining its 3-D relief texture (figure 8). The large quantity of samples produced and the lack of self-censorship in the experimentation, key features of playful diverse exploration, were crucial to enabling the production of subtle iterative developments that eventually led to novel outcomes.

Harrison (1978), Schön (1995) and more recently Cross (2007) and Pallasmaa (2009) have discussed the potential of 'reflection-in-action' as a means to advance understanding. If the maker scrutinises and assesses their actions as they make this can advance the practice, as they can respond rapidly to insights gained whilst making and amend their actions as necessary. Reflective making can enrich the design process, revealing hidden areas of enquiry, sub-conscious influences and obstacles.

However, "according to conventional wisdom thinking interferes with doing...reflection-in-action paralyzes action." (Schön, 1995: 276). It is sometimes the case that performance can suffer if an attempt to think too deeply about the action is carried out simultaneously to the action. This is particularly true of activities such as sports where an immediate response to a situation is needed. Reflective thought in such situations would delay the response and impede the action. However, practice where the activity is slower often gives an extended period of time where one is involved in the same activity. This allows many opportunities for detailed reflection on the processes occurring as the activity unfolds.

Although it may appear that efforts to reflect-in-action in the early stages of my research were causing a 'paralysis of action', the paralysis actually occurred as a result of my attempts to capture this reflection whilst engaged in productive play. The problems of documenting the spontaneous, creative explorations of physical materials led to an increasing conservatism in my practical work. The challenge faced by me 'the researcher' (as opposed to me 'the designer') to make my embodied, playful and intuitive practices explicit resulted in the loss of the organic spontaneity of my design methods. Although initial samples were freely made



**'Active documentation'
of playful practice**

with minimal censorship, the time consuming effort to frame and conceptualise process and outcome prevented further developments being made in a timely manner. I found that to achieve balance and rigor in academic research-by-practice it was necessary to devise systems to record and reflect upon both the pragmatic and the phenomenological aspects of the research without losing the spontaneity of embodied, playful and intuitive design practices.

Models for 'active documentation' of practice have been explored by people including de Freitas (2002) and Pedgley (2007). De Freitas studied the studio practice of postgraduate art and design students who were using 'active documentation' methods including visual, written, video and audio documentation alongside the physical making. She found that such methods can assist practitioners conceptualise and communicate the tacit and embodied knowledge used when making intuitive decisions in the design process. However, to advance the practice significantly such methods of documentation must be carefully amalgamated with reflective making. Work carried out by a number of designer/researchers confirm this view. For example, Pedgley (2007) investigated a variety of self-reportage methods before concentrating on diary writing to document the practical aspects of his PhD examining technical innovation in industrial design practice. These studies have shown that such methods can be particularly beneficial in situations where the practitioner has to perform a dual role, carrying out practical work whilst simultaneously applying systems of self-analysis (Philpott, 2012). Through recording and noticing previously unobserved, unvalued or abandoned details of the making process novel critical theory can emerge.

Using these studies as a model I developed a system of documentation of my physical practice to remove pressure from and cultivate a free approach at the time of making. It was essential that these documentation activities were as unobtrusive as possible, leaving me free to engage fully and playfully in the studio-based design practice. Firstly, I devised a paper-based datasheet that facilitated the easy capture of important process information at the time of making e.g. fabric compositions, timings and temperatures of treatments (figure 9). Photographs of work in progress and the final outcomes gave a visual record of the textiles created. I also videoed the production process to make the methods of making explicit: a method of documentation that emphasised process rather than outcome. These recordings were supplemented by audio recordings, where I verbalised ideas that surfaced during the making process as they occurred.

These physical records provided a backbone to the research practice, capturing information about activities and approaches unnoticed at the time of making that were only recognised through later analysis and evaluation. They were ultimately organised into multiple archives and searchable electronic databases that encompassed the multiple methods, perspectives and potentialities of the project (figure 10).



Figure 9 (left): Paper-based datasheets.



Figure 10 (right): Example of electronic database entry.



**Balancing 'diverse' and
'specific' exploration**

I believe that practice-led research that uses ludic research methods must achieve a fine balance between methods of playful diverse exploration and analytical specific exploration in order to be successful. This research employed both modes of exploratory behaviour at different stages in the design process, recurring on a cyclical basis. I propose that the recurring transition from one exploratory mode to the other throughout the project was essential for its effective development.

The confines of an optimally structured methodology can actually prove more liberating than an entirely free approach. Too narrow or too broad a focus can both stifle ideas. In my experience totally unbounded play and extremely constrained exercises can both create anxiety and block creativity. In order to break out of the overly restrictive framework of institutional and self-imposed 'scholarly' rules that I adopted at the start of my research but to avoid anarchy in the design-research process it was necessary to develop alternative rules and boundaries. I found that by setting small creative projects with flexible boundaries within the larger structure of the research I could explore, reflect upon, and analyse how a defined theme or method lent itself to a variety of interpretations and outcomes. This is exemplified by my use of the thematic photographic series, discussed below.

A visit to Alison Watt's *Phantom* exhibition (Wiggins & Paterson, 2008) proved to be a powerful catalyst for my work. Her artistic interpretation of folded cloth provided creative inspiration, highlighting the potential of abstraction to stimulate imaginative meanderings that lead to novel concepts. Her work, strongly thematic and unified by style of presentation motivated my development of an exploratory series of small, loosely bounded creative exercises that focused my investigation while still allowing a broadness of scope. These constraints gave comprehensible structure to what had hitherto appeared formless and endless. This enabled me to focus on the creative process rather than 'end gaming', giving me the freedom to play spontaneously generating images that ultimately advanced concepts relating to folding and folded structures.

To generate initial ideas a brainstorming exercise was carried out, noting a wide range of folded materials and objects as well as where they might be found. To limit opportunities for self-censorship at this stage and maximise the quantity of ideas produced it was beneficial to carry out the exercise within a short time frame and at high speed. This led on to a process of diverse and playful exploration, the creation of a photographic series. The images were thematically united by the fold and clearly connected by the format of presentation: visual explorations bounded by their frames but components of a divergent and potentially infinite series (figure 11).



Figure 11 (left): Photographic spot series, my fabric folds – Running stitch on polyester.

Figure 12 (middle): Photographic spot series, natural folds – Leaf.

Figure 13 (right): Photographic spot series, man-made folds – Pewter vase, Toby Russell, 1998.
V&A Museum, London.

Here photography was not employed primarily as a tool of documentation and recording, but as a tool for creation. Not only capturing a frozen moment in time (an image), but capturing a becoming, a conceptual process. In an attempt to break away from habitual readings of the



pictures, to make the familiar strange I abstracted the image by using close-up as well as by allowing adjustment of the objects' original orientation in the framing of the picture. I avoided standard 'A' size paper formats for presentation as I felt this restricted the image to a single viewpoint. A square design still limited the viewing of the print to one of eight possible angles. The circular frame ultimately proved to be most effective, encouraging viewing of the image from any position.

From the primary loose thematic boundary sprung new and tighter categories as images were evaluated and compared: a process of specific focused exploration. An investigation of different types of folds with contrasting properties and behaviours resulted in the categorisation of a number of distinct folding types. Collections of 'Natural' and 'Man-made' folds were collated from a number of walks and the observation of my local environment (figures 12 & 13). A series of photographs of sculpted drapery elicited the category of 'false folds' (figure 14), immobile folds carved from intransigent materials that possess only the appearance of pliability and dynamism. These groupings arranging like with like began to describe a branching system of classification, a ranked hierarchy in which main classes divided and subdivided. Verbally conceptualised categories such as 'controlled' and 'uncontrolled' or 'hard' and 'soft' folds emerged from visual taxonomies, intertwining theory and practice.



Figure 14: Photographic spot series, false folds – Marble sculpture 'Maternal Affection', Hodges-Baily, 1837, V&A Museum, London.

Moving back to a more playful approach to generate diverse ideas, the juxtaposition of pictures from different categories led to an investigation of the extent to which the properties of these disparate folding types could be controlled and cross-pollinated in my textile practice to create infinitely variable forms. This reflects a statement by Carpo (2004: 14-15) describing: "...forms that can change, morph and move: a new category of objects defined not by what they are, but by the way they change and by the laws that describe their continuous variations." Montages of images depicting my own samples and a variety of folded objects and materials prompted re-evaluation of samples created as well as the conceptual framing of the project. However, to achieve this it was necessary to cycle between diverse and specific exploratory approaches and methods.

Conclusion

The methods I used to pursue my research were multiple, 'soft' logic, play, and intuition alongside the 'hard' logic of scientific experimentation. I found that by retaining elements of playful making in the research practice I was able to advance ideas and develop physical artefacts much more quickly and more fluidly than by using scientific methods in isolation.

Play is an important method for creative production and should not be overlooked in practice-led research. Play offers opportunities to break out of linear patterns of thought and established ways of working ingrained by institutional education and years of professional practice. However, in order for playful practices to flourish it is important to create a permissive and safe environment where the practitioner feels able to take risks and embrace failures and mistakes as part of the creative process.

Playful creation of models, prototypes and simulations through exploratory construction



play (and the subsequent re-imagination of these outputs through processes of specific exploration) allows for the cheap, safe investigation of ideas, mitigating the risk of engaging in time consuming and costly developments. In my own practice, changing my attitude to my textiles to consider them as experimental models, not as concrete outcomes, gave me the freedom to juxtapose materials and forms that were not necessarily functional, to create conceptual sketches rather than working prototypes. These more open experiments could lead on to the development of more specific practical applications once a range of ideas had been 'played out'. This approach encourages inventive and potentially risky improvisations that fall outside the known and the tested to explore the unlikely and the unexpected, maximising the potential for the generation of innovation.

Playful methods can be beneficial for the promotion of originality and invention in practice-led research if the investigative journey encompasses and alternates methods that use both diverse and specific exploration to achieve a balance between free and constrained approaches. Diverse exploration, in which large quantities of samples, models or sketches are created without self-censorship, is valuable for the generation of innovative and original ideas. These ideas can then be evaluated, selected and refined through activities of specific exploration that have clearly defined boundaries and goals. However, in order for playful approaches to be truly useful in contributing to rigorous academic research it is essential that a robust system of documentation be established. Combining methods such as reflection-in-action and active documentation allows for the conscientious evaluation and analysis of playful research activities whilst maintaining the ability to play authentically at the point of making.



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